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

Three new Best Practices in the 2024-2025 Targeted Medication Safety Best Practices for Hospitals

ISMP has released its ***2024-2025 Targeted Medication Safety Best Practices for Hospitals*** (www.ismp.org/node/160), whose purpose is to identify, inspire, and mobilize widespread, national adoption of consensus-based *Best Practices* to address recurring problems that continue to cause fatal and harmful errors despite repeated warnings in ISMP publications. The *Best Practices*, which are reviewed by an external expert advisory panel and approved by the ISMP Board of Directors, represent high-leverage error-reduction strategies, many of which have already been successfully adopted by hospitals. While the *Best Practices* might be challenging for some organizations to achieve, they are all practical and realistic, and their value in reducing medication errors is grounded in scientific research and/or expert analysis of medication errors and their causes. Their implementation can vastly improve medication safety and reduce the risk of significant patient harm. While these *Best Practices* were created for hospitals, some are applicable to other healthcare settings. ISMP also offers a version for community pharmacy (www.ismp.org/node/65345).

New Best Practices for 2024-2025

Initially introduced in 2014 with six *Best Practices*, the ***Targeted Medication Safety Best Practices for Hospitals*** are updated every 2 years. The 2024-2025 list now comprises 22 *Best Practices*, including three new *Best Practices* described below.

New *Best Practice* 20: Safeguard against wrong-route errors with tranexamic acid.

a) Utilize point-of-care barcode-assisted medication safety checks prior to administering medications in surgical and obstetrical areas.

b) When appropriate, use premixed intravenous (IV) bags of tranexamic acid, which are less likely to result in mix-ups than vials of tranexamic acid.

c) If possible, do not store tranexamic acid in an anesthesia tray.

- Separate or sequester tranexamic acid in storage locations (e.g., pharmacy, clinical areas) and avoid storing local anesthetics and tranexamic acid near one another.

d) To prevent misidentifying medications by viewing only the vial caps, avoid storing injectable medication vials in an upright position, especially when stored in a bin or drawer below eye level. Store them in a way that always keeps their labels visible.

e) Conduct a review to identify any look-alike ampules or vials (including caps) and determine if the risk of a mix-up will be reduced by purchasing them from different manufacturers. If so, purchase them from different manufacturers.

f) Consider labeling vial caps with a label that states, "Contains Tranexamic Acid."

New *Best Practice* 21: Implement strategies to prevent medication errors at transitions in the continuum of care.

a) Obtain the most accurate medication list possible upon admission to the organization before the first dose of medication is administered (except in emergency or urgent situations).

- Include asking about allergies and associated reactions, prescription, and over-the-counter medications (including herbals and dietary supplements), and non-enteral medications.

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SAFETY briefs

HIGH-ALERT

Insulin dosing error close call due to look-alike syringe packaging. Due to a back order of their usual brand of syringes, a hospital purchased Easy Touch U-100 insulin syringes and Easy Touch luer-lock syringes with a metric scale (**Figure 1**), distributed by MHC Medical Products. Both products come as 1 mL luer-lock needleless syringes with similar-looking packaging. A nurse prepared a patient's subcutaneous insulin dose using a 1 mL syringe with a metric scale rather than the U-100 insulin syringe (**Figure 2**). Fortunately, the nurse identified the error before it reached the patient. Luer-compatible needleless insulin syringes may be required for intravenous (IV) administration of insulin (e.g., treatment of hyperkalemia) on certain patient care units (e.g., critical care, emergency department) (www.ismp.org/node/771).

Figure 1. The packaging for the 1 mL Easy Touch U-100 insulin luer-lock syringe (top) and luer-lock syringe (bottom) look nearly identical.

Figure 2. Easy Touch U-100 insulin luer-lock syringe with unit markings (top) looks similar to the luer-lock syringe with mL markings (bottom).

Over the years, similar errors have been reported to us involving measuring subcutaneous insulin doses inappropriately in mL syringes instead of insulin syringes that have unit markings because of a lack of understanding regarding the differences between insulin and other parenteral syringes.

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- List the drug name, dose, route, frequency, indication, and time of last dose.
- Consider assigning dedicated practitioners to obtain medication histories.

b) Ensure the medication and doses collected and subsequently ordered are correct therapy for that patient, given their current state of health.

c) Designate a provider to compare the prescribed medications to those on the medication history list and resolve any discrepancies. Have providers document reconciliation and modifications made to current therapy upon admission, with each change in level of care, and at discharge.

New *Best Practice* 22: Safeguard against errors with vaccines administered in the inpatient and associated outpatient settings.

a) Utilize standard order sets to prescribe vaccines. Require an order prior to administration of any vaccine. Utilize the full generic name and brand name (if applicable) and avoid vaccine abbreviations.

b) Verify a patient's immunization status (in the electronic health record [EHR] as well as vaccine registries) prior to providing vaccines.

c) Provide patients and/or caregivers with vaccine information (e.g., Vaccine Information Statement [VIS]) in their primary language prior to vaccination.

d) Store vaccines in separate bins or containers based on type and formulation. Store two-component vaccines together.

e) Use prefilled syringes when available. If not available, prepare each vaccine dose immediately prior to administration and label with the vaccine name, dose, and if appropriate, the indicated age range.

f) If multiple adults and children are being vaccinated at the same time, separate them into distinct treatment areas; bring only one patient's vaccines into the treatment area at a time.

g) Verify the patient's identity using two unique identifiers.

h) Use barcode scanning technology to verify the correct vaccine and dose are being administered to the correct patient.

i) Document the vaccine's national drug code (NDC) number, lot number, and expiration date prior to administration; document administration in the EHR, and ensure information is sent to the local or state vaccine registry.

j) Provide vaccinators with ongoing education and competency assessment about vaccines and their appropriate storage, selection, administration, and monitoring.

Additional Changes for 2024-2025

Where additional information and/or changes were made to other *Best Practices*, the addition/modification is italicized in the specific *Best Practice* listed below (refer to the full document [www.ismp.org/node/160] to review the complete *Best Practice* statements):

***Best Practice* 7:** Segregate, sequester, and differentiate all neuromuscular blocking agents (NMBs) from other medications, wherever they are stored in the organization.

- Eliminate the storage of NMBs in areas *of your organization* where they are not routinely needed.
- Limit availability in automated dispensing cabinets (ADCs) to *areas where they are needed such as* perioperative, labor and delivery, critical care, and emergency department (ED) settings; in these areas, store them in a rapid sequence intubation (RSI) kit or locked-

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We reached out to the manufacturer to report this concern and recommended differentiating the packaging. If your organization carries these Easy Touch syringes, consider purchasing one from an alternative manufacturer, as the reporting organization did. Limiting use of luer-compatible needleless insulin syringes for pharmacy-dispensed insulin doses or in hyperkalemia kits is preferred due to the risk of administering subcutaneous insulin doses via the IV route. If these syringes are available in certain units, separate their storage from other insulin and parenteral syringes (e.g., stock only in code carts, away from other syringes) with clear labeling on the storage bins so they are less likely to be inadvertently mixed up.

Two phenazopyridine tablets packaged in a single unit dose blister. An organization reported that a patient received a double dose of phenazopyridine, due to how the manufacturer packages the tablets in a blister. The manufacturer (Reese Pharmaceutical) packages two 95 mg tablets, the typical dose (190 mg), into a single blister (**Figure 1**), but each blister is labeled "95mg HCl Phenazopyridine" (**Figure 2**, page 3). Due to the potential for dosage

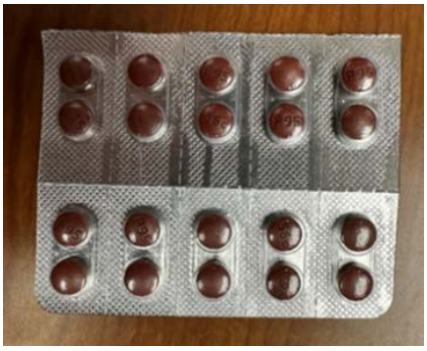

Figure 1. Reese Pharmaceutical packages two phenazopyridine 95 mg tablets into a single blister.

confusion and the fact that the blister card lacks a barcode, the organization typically opens each blister and repackages them as individual tablets. However, a newer staff member was unaware of this process and, upon receipt, restocked the blister cards in an automated dispensing cabinet (ADC) on a patient care unit. A nurse thought that each blister contained 95 mg and administered the contents of two blisters equaling 380 mg (4 tablets) rather than the intended 190 mg

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lidded ADC pockets/drawers.

- Place auxiliary labels on all storage bins *(both refrigerated and non-refrigerated)* and/or ADC pockets and drawers that contain NMBs.
- *Configure interactive ADC alerts that require users to enter or select clinically relevant information (e.g., the purpose for removing the drug [a code situation], whether the patient is ventilated) prior to removal.*

***Best Practice* 8:** Administer *all** medication *and hydration* infusions via a programmable infusion pump utilizing dose error-reduction systems.

**Unless the rate of the infusion exceeds the delivery limits of the infusion pump.*

- *Further, implement* bi-directional (e.g., auto-programming and auto-documentation) smart infusion pump interoperability with the electronic health record *and establish organizational expectations (e.g., compliance goals) for the use of auto-programming and documentation for medication and hydration infusions.*

***Best Practice* 11:** When compounding sterile preparations, *utilize workflow management systems.*

- *Minimize sterile compounding outside of a pharmacy environment.*
- *Follow safe pharmacy processes for use of technology.**
- *Identify safety gaps specific to each technology and create an action plan to avoid errors.*
- *If you are not currently using workflow management systems, create an implementation plan.*
- *Before implementing compounding technology, perform a failure mode and effects analysis of the new system and workflow process.*

*See ISMP ***Guidelines for Sterile Compounding and the Safe Use of Sterile Compounding Technology*** (www.ismp.org/node/31362)

***Best Practice* 15:** Verify and document a patient's opioid status (naïve versus tolerant*) and type of pain (acute versus chronic) before prescribing and dispensing extended-release and long-acting opioids.

Adult* opioid-tolerant patient: Opioid tolerance is defined by the following markers: Patients receiving, for 1 week or longer, at least: 60 mg oral morphine/day; 25 mcg transdermal fentaNYL**/hour; 30 mg oral oxy**CODONE**/day; 8 mg oral **HYDRO**morphone/day; 25 mg oral oxy**MOR**phone/day; 60 mg oral **HYDRO**codone/day; or an equianalgesic dose of another opioid, including heroin and/or non-prescribed opioids.

***Best Practice* 17:** Safeguard against errors with oxytocin use.

- Require the use of standard order sets for prescribing oxytocin antepartum *and* postpartum that reflect a *standard* clinical approach *in your organization for* labor induction/augmentation and to control postpartum bleeding.
- Standardize to a single concentration *and* bag size for both antepartum and postpartum oxytocin infusions (e.g., 30 units *of oxytocin* in 500 mL of Lactated Ringer's *solution*).
- Communicate orders for oxytocin infusions in terms of the dose rate *(e.g., dosage/time) and not by the volume rate (e.g., volume/time)* and align with the smart infusion pump dose error-reduction system (DERS).
- Provide oxytocin in a standard ready-to-*administer* form.

***Best Practice* 19:** Layer numerous strategies throughout the medication-use process to improve safety with high-alert medications.

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(2 tablets) dose. There was no patient harm; however, the organization is concerned this event may occur again.

Figure 2. Each blister is labeled "95mg HCl Phenazopyridine" but contains two 95 mg tablets (190 mg) and does not have a barcode.

We reached out to the US Food and Drug Administration (FDA) and the manufacturer to report this concern and recommended packaging one tablet in each blister and adding a barcode to the package. If your organization purchases this product, consider unit dosing it into individual tablets with a barcode to facilitate scanning. Alternatively, consider purchasing this product from a different manufacturer.

Become an FDA/ISMP Fellow

ISMP is now accepting applications for our unique Fellowship program that will begin in the summer of 2024. The **FDA (US Food and Drug Administration)/ ISMP Safe Medication Management Fellowship** will help you grow in your career and enable you to make major contributions to medication safety worldwide. For a brief description of our Fellowship program, candidate qualifications, program brochure and outline, please visit: www.ismp.org/node/871. Applications will be accepted until **March 29, 2024**! Apply soon!

Join us in celebrating Patient Safety Awareness Week — March 10-16, 2024

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- *Engage patients and family members to improve safe use of high-alert medications by providing targeted education to those receiving select, defined high-alert medications.*
- *Include strategies to address health equity and literacy issues.*
- *Establish criteria to trigger an automatic consultation with a pharmacist or patient educator, diabetes educator, social services, or home care. Specific drugs to consider for targeted education: insulin, U-500 insulin, methotrexate, oral (and injectable) chemotherapy, opioids, investigational medications, anticoagulants, any medication that has an administration device (inhalers, pens, ambulatory infusion pumps), medications that require dose sequencing or 'titration.'*

Prior Survey Results

Between February and March 2022, ISMP conducted a brief survey to obtain a baseline measurement of the three new *Best Practices* added in the 2022-2023 edition. Prior to releasing the ***2024-2025 Targeted Medication Safety Best Practices for Hospitals***, ISMP conducted an additional survey between May and June 2023 to measure the progress with implementing the existing 2022-2023 *Best Practices*. These results were presented at the American Society of Health-System Pharmacists (ASHP) Midyear Clinical Meeting on December 5, 2023. An overview of the survey findings is provided in **Table 1** (pages 5 and 6).

More than five hundred (n=509) respondents participated in our 2023 *Best Practices* survey. Almost one-tenth (9%) of the hospitals that participated indicated they have 500 beds or more; 11% have 300-499 beds; 38% have 100-299 beds; 30% have 26-99 beds; and 12% have 25 beds or less. Overall, 87% of responding hospitals reported having one or more part- or full-time medication safety officer(s) (MSO).

Comparing the 2023 survey findings to previous survey findings in 2022 and 2021, the number of respondents reporting full compliance with the *Best Practices* increased for nearly all items. Of note, regarding *Best Practice* 17, safeguard against errors with oxytocin use, in 2022 86% of hospitals reported full implementation regarding provision of oxytocin in a ready-to-use form and around one-third (36%) responded that they boldly label both sides of the infusion bag to differentiate oxytocin bags from plain hydrating solutions and magnesium infusions. This question and results were aggregated in the 2023 survey, with 66% reporting full implementation of both components.

We were pleased to see that several of the *Best Practices* had large upsurges in hospitals reporting full implementation. This included components from *Best Practice* 2 (require a hard stop verification [or clarification if a hard stop is not possible] of an appropriate indication for daily methotrexate orders, and provide education to patients discharged on oral methotrexate), *Best Practice* 3 (weigh patients as soon as possible on admission/encounter), *Best Practice* 11 (independently verify the ingredients and amount/volume prior to adding them to compounded sterile preparation containers), *Best Practice* 15 (verify/document a patient's opioid status and pain type before prescribing/dispensing extended-release or long-acting opioids), and *Best Practice* 16 (require a medication order prior to removing any medication from an ADC including those removed via override, and monitor ADC overrides to verify appropriateness).

Conclusion

Hospitals and health systems should focus their medication safety efforts over the next 2 years on these new and any not fully implemented 2024-2025 *Best Practices*. The rationale for recommending the *Best Practices*, along with related ISMP publications and guidelines for additional information, can be found in the full document (www.ismp.org/node/160). Related documents that might be helpful to hospitals include Frequently Asked Questions (FAQs) (www.ismp.org/node/14369) and

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Special Announcements

Virtual MSI workshop

Join us for our first ***ISMP Medication Safety Intensive (MSI)*** workshop in 2024. The unique 2-day virtual program will be held **March 7 and 8, 2024**. For more information and to register, please visit: www.ismp.org/node/127.

MSB webinar

On **March 5, 2024**, our subsidiary, *Med Safety Board (MSB)*, will be hosting an educational program in which expert faculty will review therapy considerations for reducing the risk of cisplatin-induced ototoxicity in pediatric, adolescent, and young adult patients. The free webinar, ***Preventing Cisplatin-Induced Ototoxicity in Pediatrics: What You Need to Know to Improve Patient Outcomes***, is sponsored by Fennec Pharmaceuticals. For more information and to register, visit: www.ismp.org/ext/1321.

Survey on new Best Practices

ISMP is conducting a brief survey to obtain a baseline measurement of the current level of implementation of the new *Best Practice* statements. We would sincerely appreciate your participation in this survey, regardless of whether you have implemented any of the *Best Practices*. Please complete the online survey by **April 19, 2024**. To access the survey and submit your responses, please visit: www.ismp.org/ext/1323.

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

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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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an Implementation Worksheet (www.ismp.org/node/1506) to help hospitals identify gaps in the implementation of these *Best Practices* and develop an action plan to address vulnerabilities.

Survey to Measure Baseline Implementation of New Best Practices

ISMP is conducting a brief survey to obtain a baseline measurement of the current level of implementation of the new *Best Practice* statements. We would sincerely appreciate your participation in this survey, regardless of whether you have implemented any of the *Best Practices*. Please complete the online survey by **April 19, 2024**, by visiting: www.ismp.org/ext/1323.

Table 1. Percentage of respondents reporting full implementation of the ***2022-2023 Targeted Medication Safety Best Practices for Hospitals**** compared to previous years (2022 and 2021).

	Best Practice Statement	Implementation (%)			Common Barriers (B) or Enablers (E)
		2023	2022	2021	
		Full	Full	Full	
1	Dispense vin**CRIS**tine and other vinca alkaloids in a minibag of a compatible solution and *not* in a syringe	96		94	
2	Use a weekly dosage regimen default for oral methotrexate in electronic systems when medication orders are entered	87		75	
	Require a hard stop verification of an appropriate oncologic indication for all daily oral methotrexate orders	73		52	B: Electronic health record (EHR) limitations, hard stop not an option
	Provide specific patient and/or family education for all oral methotrexate discharge orders	79		52	E: Auto-populate discharge education
3	Weigh each patient as soon as possible on admission and during each appropriate outpatient or emergency department encounter; avoid the use of a stated, estimated, or historical weight	79		43	B: Lack of or limited number of bed scales, commitment by frontline staff is limited during and post pandemic
	Measure and document patient weights in metric units only	61		54	B: EHR system does not allow configuring to metric units only
7	Segregate, sequester, and differentiate all neuromuscular blocking agents (NMBs) from other medications, wherever they are stored in the organization	86		81	B: Kits and trays (e.g., anesthesia carts) have non-lidded pockets
8	Administer medication infusions via a programmable infusion pump utilizing dose error-reduction systems (DERS)	90		72	B: Lack of use in the operating room, medication infusions still being administered via gravity
	Maintain a compliance rate of greater than 95% for the use of DERS	39		33	B: Lack of leadership support, inability to tie compliance to user
	Monitor compliance with use of smart pump DERS software on a monthly basis	50			B: Lack of resources results in analyzing quarterly
	If your organization allows for the administration of an intravenous (IV) bolus or a loading dose from a continuous medication infusion, use a smart pump that allows programming of the bolus (or loading dose) and continuous infusion rate with separate limits for each	76			B: Staff not familiar with how to program a bolus infusion, practitioners adjusting the continuous infusion rate rather than using a bolus function
9	Ensure all appropriate antidotes, reversal agents, and rescue agents are readily available	84		74	B: Cost prohibitive to purchase antidotes that are used rarely
	Have standardized protocols and/or coupled order sets in place that permit the emergency administration of all appropriate antidotes, reversal agents, and rescue agents used in the facility	53		53	B: Limited resources/time to create and implement rarely used order sets
	Have directions for use/administration readily available in all clinical areas where the antidotes, reversal agents, and rescue agents are used	54			E: Build this information into the order sets
11	When compounding sterile preparations, perform an independent verification to ensure that the proper ingredients (medications and diluents) are added, including confirmation of the proper amount (volume) of each ingredient prior to its addition to the final container	63		34	B: Cost of implementing IV workflow system technology, preparations still being made at the bedside by anesthesia and nursing
13	Eliminate injectable promethazine from the formulary	55		37	B: Prescriber reluctancy, reserved as a last line option, restricted use for intramuscular (IM) injection only
14	Seek out and use information about medication risks and errors that have occurred in other organizations outside of your facility and take action to prevent similar errors	88		68	E: ISMP newsletters are the main source used to learn about external medication errors
15	Verify and document a patient's opioid status (naïve versus tolerant) and type of pain (acute versus chronic) before prescribing and dispensing extended-release or long-acting opioids	58		19	B: Undefined for children E: Require a hard stop for prescribers to document this prior to ordering

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	Best Practice Statement	2023 Full	2022 Full	2021 Full	Common Barriers (B) or Enablers (E)
16	Limit the variety of medications that can be removed from an automated dispensing cabinet (ADC) using the override function	77		75	E: Vet the list through the pharmacy and therapeutics (P&T) committee, remove high-alert medications, track data continuously on a dashboard
	Require a medication order (e.g., electronic, written, telephone, verbal) prior to removing any medication from an ADC, including those removed using the override function	89		47	B: ADC allows practitioners to remove medication via override without an order
	Monitor ADC overrides to verify appropriateness, transcription of orders, and documentation of administration	87		56	B: Due to limited resources this is only done for controlled substances or periodically
	Periodically review for appropriateness the list of medications available using the override function	81		79	E: Closely monitored and reevaluated regularly
17	**Safeguard against errors with oxytocin use**				
	Require the use of standard order sets for prescribing oxytocin antepartum and/or postpartum that reflect a standardized clinical approach to labor induction/augmentation and control of postpartum bleeding	79	83		B: Allowing prescribers to bypass the order set
	Standardize to a single concentration/bag size for both antepartum and postpartum oxytocin infusions (e.g., 30 units of oxytocin in 500 mL Lactated Ringers)	84	84		B: Prescriber resistance E: Coordinated with other hospitals in the health system
	Standardize how oxytocin doses, concentration, and rates are expressed	78†	80		B: Still allow mL/hour for postpartum bleeding
	Communicate orders for oxytocin infusions in terms of the dose rate (e.g., milliunits/minute) and align with the smart infusion pump DERS		82		
	Provide oxytocin in a standard ready-to-use form	66†	86		B: Difficulty generating a second label, outsourced compounding pharmacy "supply issues"
	Boldly label both sides of the infusion bag to differentiate oxytocin bags from plain hydrating solutions and magnesium infusions		36		
	Avoid bringing oxytocin infusion bags to the patient's bedside until it is prescribed and needed	58	57		B: Nursing preference to have in the patient's room, perceived risk of leaving the patient to retrieve an oxytocin infusion
18	**Maximize the use of barcode verification prior to medication and vaccine administration by expanding use beyond inpatient care areas**				
	Specifically target clinical areas with an increased likelihood of a short or limited patient stay (e.g., emergency department, perioperative areas, infusion clinics, dialysis centers, radiology, labor and delivery areas, catheterization laboratory, outpatient areas)	42	‡		B: Resource constraints, lack of scanners or lack of space, information technology issues, workflow issues
	Regularly review compliance and other metric data to assess utilization and effectiveness of this safety technology (e.g., scanning compliance rates; bypassed or acknowledged alerts)	78	69		B: Regularly review compliance data but struggle to incorporate reasons for bypassed or acknowledged alerts
19	**Layer numerous strategies throughout the medication-use process to improve safety with high-alert medications**				
	For each medication on the facility's high-alert medication list, outline a robust set of processes for managing risk, impacting as many steps of the medication-use process as feasible	68	64		E: Provide guidance on managing the risks of high-alert medications in policy
	Ensure that the strategies address system vulnerabilities in each stage of the medication-use process (i.e., prescribing, dispensing, administering, and monitoring) and apply to prescribers, pharmacists, nurses, and other practitioners involved in the medication-use process	65	63		B: Lack of buy-in from practitioners outside of pharmacy staff to report close calls or actual errors
	Avoid reliance on low-leverage risk-reduction strategies (e.g., applying high-alert medication labels on pharmacy storage bins, providing education) to prevent errors, and instead bundle these with mid- and high-leverage strategies	64	51		B: Overreliance on low-leverage strategies such as high-alert auxiliary labels
	Limit the use of independent double checks to select high-alert medications with the greatest risk for error within the organization (e.g., chemotherapy, opioid infusions, intravenous [IV] insulin, heparin infusions)	73	66		
	Regularly assess for risk in the systems and practices used to support the safe use of medications by using information from internal and external sources (e.g., The Joint Commission, ISMP)	83	69		E: Review the ISMP quarterly ***Action Agenda*** (www.ismp.org/node/645)
	Establish outcome and process measures to monitor safety and routinely collect data to determine the effectiveness of risk-reduction strategies	56	41		B: Lack of a standard process on how this information can be used, limited resources to review internal event data E: Adding this information to quality dashboards

*Results from three surveys: N=509 (2023), N=188 (2022), N=156 (2021)

† Results were aggregated in the 2023 survey

‡ In the 2022 survey, two-thirds to three-quarters of hospitals reported full implementation of barcode technology in infusion clinics (76%), post-anesthesia care units (73%), labor and delivery (72%), dialysis centers (67%), emergency departments (65%), and perioperative holding areas (63%). Lower levels of full implementation were reported in radiology (31%), cardiac catheterization labs (23%), procedure rooms (16%), and operating rooms (7%)