

Guidelines for the Safe Use of Automated Dispensing Cabinets



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Dear Healthcare Provider:

The automated dispensing cabinet (ADC) represents one of the most widely deployed forms of technology integrated with today's medication use systems. The safety of ADC design and associated workflow processes have dramatically improved since implementation began in the late 1980s and early 1990s. Originally designed as glorified hospital floor stock systems, medications were placed in open matrix drawers and allowed practitioners unlimited access absent a pharmacist's review of orders. However, over the intervening years, progressive changes to ADC hardware and software configurations as well as associated workflow processes have given many organizations the ability to employ these devices in support of safe and secure medication distribution in various settings.

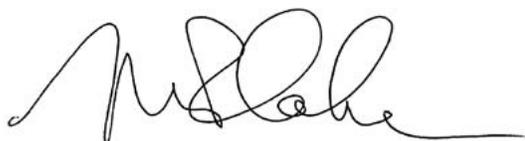
Systems are now integrated with organizational information systems in large health networks as well as small rural access settings. ADCs employ advanced technologies to support secured storage and appropriate access of medications in remote locations outside of the pharmacy. An independent check system is ensured because of a "profiling functionality" that requires a pharmacist's review and approval of the appropriateness of each order prior to allowing access to doses in most areas of practice. Well-designed cabinet configurations employ individual locked pockets or segregated storage for high-alert drugs, to better ensure individual doses are not misplaced or mis-selected and cannot be accessed in a way that bypasses the safety system. There is now the availability of machine-readable scanning for dose selection in the pharmacy, on cabinet restocking, on drug retrieval, and at the bedside, to reduce the possibility of selection errors. Labeling systems have also been added to support safe practices after medication removal.

We are now far more comfortable with the ability of ADCs to support the safety of the medication distribution system while making required drugs readily accessible in a variety of patient care areas. However, this is not to say that there are not continued improvements to be made or potential pitfalls associated with the use of these devices, particularly if workflow expectations are not well designed or defined. Clearly, if remaining risks to safety are not properly managed, patients can be placed in jeopardy.

We have learned a great deal about safety and ADC technology in the 10 years since the original publication of the *Guidance on the Interdisciplinary Safe Use of Automated Dispensing Cabinets* in 2009. Therefore, an update of these guidelines is now in order. Along with new information that has reached the Institute for Safe Medication Practices (ISMP) through our onsite consulting services, information obtained through operation of the ISMP National Medication Errors Reporting Program (ISMP MERP), and a thorough literature review, this updated set of guidelines has benefitted greatly from the input provided by our volunteer expert advisory committee. I would like to extend my personal thanks for the work they contributed to this revision.

We hope you will find these updated recommendations useful as you work with your interdisciplinary teams to further improve the safety of ADC implementation and your overall medication use system.

Best Regards,



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Table of Contents

Introduction	4
ADC Guidelines: Core Safety Processes	5
Core Safety Process # 1 Provide Ideal Environmental Conditions for the Safe Use of ADCs	5
Core Safety Process # 2 Establish ADC System Security	6
Core Safety Process # 3 Provide Profiled ADCs and Monitor System Overrides	7
Core Safety Process # 4 Select and Maintain Appropriate ADC Configuration and Functionality	9
Core Safety Process # 5 Select and Maintain Optimal ADC Inventory	9
Core Safety Process # 6 Implement Safe ADC Stocking and Return Processes	11
Core Safety Process # 7 Display Important Patient and Drug Information	12
Core Safety Process # 8 Develop Procedures for Accurate ADC Withdrawal and Transfer to the Bedside for Administration	13
Core Safety Process # 9 Provide Staff Education and Competency Validation	14
Frequently Asked Questions (FAQs)	15
Definitions	16
References	17
Expert Advisory Committee	19
Acknowledgments and Disclosures	20
About ISMP	20

Introduction

First introduced in hospitals in the 1980s, an automated dispensing cabinet (ADC), is an electronic, point-of-care storage device that serves as a method for medication distribution.¹⁻³ This dispensing technology is also known throughout the healthcare industry as an automated distribution device (ADD) or automated dispensing machine (ADM).^{4,5} An ADC offers the ability to implement varying levels of decentralized drug distribution near the patient's bedside, ranging from a limited selection of medications (e.g., first doses, as needed [PRN] medications, urgent medications, controlled substances) to distribution of the majority of maintenance and PRN doses.^{6,7} The use of ADCs as the predominant distribution model in the hospital setting has increased from 22% in 2002 to 70% in 2017, whereas a centralized manual dose distribution model has continued to decrease over the last 15 years.⁸ Adoption of ADCs over the last decade has included the use of anesthesia-specific devices in surgical suites and procedural settings, as well as application in specialty clinics, outpatient areas, and long-term care facilities.

The implementation of ADCs has several advantages and safety benefits including improved efficiency among nursing and pharmacy disciplines, a reduction in medication errors during the dispensing phase, and accurate medication tracking and record-keeping to monitor inventory and deter drug diversion.^{3,5,7,9,10} Two of the most significant safety enhancements within the ADC are the use of individually secured compartments and patient profiling systems.¹⁰ In hospitals, the uptake of individual, **LOCKED-LIDDED POCKETS** as the primary configuration has continued to increase, while the original open **MATRIX DRAWER** as the primary cabinet configuration has correspondingly decreased since 2008.⁸ A **PROFILED** ADC interfaces with the pharmacy information system and medication removal is only permitted after the order is verified by a pharmacist.^{2,10} Without this functionality, the nurse may be unaware of potential duplicate therapy, contraindications, unsafe dosing, allergic reactions, and other significant drug information prior to administration.³

While ADCs can improve safety during the medication use process, challenges are also present. One of the major risks associated with ADCs is the inappropriate use of medication **OVERRIDES**.^{2,11} An **OVERRIDE** often occurs when a medication is removed from an ADC prior to a pharmacist's review when delay in administration could result in patient harm.¹² In some instances, **OVERRIDES** are occurring unnecessarily, or even without a drug order. This could lead to selection and removal of the wrong medication, strength, or dose.¹¹ Another challenge is the misplacement of medications into a wrong ADC compartment. Interfacing barcode technology with the ADC can aid in detecting this type of error during the stocking and removal process, but it does not completely remove the risk.^{3,13} All information technology systems (ADCs being no exception) are intended to support clinical decision making and are not designed to replace human activity.¹⁴ Problems may still arise when a **PRACTITIONER** is over-reliant on the technology, trusting that its design, functionality, and usability results in safe practice. Technology can occasionally malfunction, misdirect the user, or provide incorrect information or recommendations that can lead the **PRACTITIONER** to change a previously correct decision and follow a path that leads to a medication error.

This guidance document is divided into nine Core Safety Processes intended to identify the categories of risks associated with the implementation of ADCs and provide recommendations to promote safer medication use practices by employing dedicated risk-reduction strategies. (Note: **BOLDED TERMS IN SMALL CAPITAL FONT** are listed in the definitions section of the document.)

ADC Guidelines: Core Safety Processes

1	Provide Ideal Environmental Conditions for the Safe Use of ADCs
2	Establish ADC System Security
3	Provide Profiled ADCs and Monitor System Overrides
4	Select and Maintain Appropriate ADC Configuration and Functionality
5	Select and Maintain Optimal ADC Inventory
6	Implement Safe ADC Stocking and Return Processes
7	Display Important Patient and Drug Information
8	Develop Procedures for Accurate ADC Withdrawal and Transfer to the Bedside for Administration
9	Provide Staff Education and Competency Validation

Core Safety Process # 1

Provide Ideal Environmental Conditions for the Safe Use of ADCs

The physical environment for ADC use can have a direct impact on the safety and efficiency of medication distribution and administration. Specifically, the work environment, interruptions, and a busy, chaotic clinical area were cited as contributing factors for medication errors.^{3,15,16} Reports submitted to the ISMP National Medication Errors Reporting Program (ISMP MERP) also suggest that poor environmental conditions (e.g., unnecessary noise, dim lighting, interruptions, remote medication storage locations) can contribute to medication errors.^{17,18}

*Organizational decisions regarding the intended use of ADCs, whether designed for full decentralized drug distribution or for the management of a limited amount of medications (e.g., controlled substances, as needed [PRN] medications, or first doses), are a factor in determining the size and space required for ADC placement. The availability of multiple ADCs in a clinical unit, or the placement of ADCs in strategic locations, can be key to an enhanced workflow for staff. Careful consideration to the number and types of ADC devices, as well as their placement, can aid in the prevention of risky practices and unsafe **WORKAROUNDS** that may result from inadequate environmental conditions. Not having a sufficient quantity of ADCs for the volume of patients and staff, or having them located in remote locations, far from patient rooms, leads to workflow inefficiencies, user frustration, and fosters at-risk behaviors by staff, such as taking medications for more than one patient at a time or taking medications for a single patient for more than one scheduled administration time.¹⁹*

Guidelines:

- 1.1 Provide a sufficient quantity of adequately sized ADCs, considering their intended use.
 - a. Determine whether the ADCs will be used for first doses, PRN medications, controlled substances, or for full decentralized distribution.
 - b. Select the size and quantity of ADCs based on the selected distribution model, considering the variety of medications and formulations necessary, including those that require significant space (e.g., prefilled syringes; large and small volume intravenous [IV] infusions; patient-controlled analgesia [PCA] syringes; and medication-containing boxes, kits, and trays).

- 1.2 Locate ADCs and associated refrigerated storage in a secure location, with limited foot traffic (e.g., within a medication room), to limit distractions. Do not physically separate (e.g., locate down a hallway, around a corner, separate rooms) associated components (e.g., cabinets, towers, refrigerators) of the same ADC station.
 - a. Select an area that is easily accessible to authorized staff and near patients to support safe and efficient workflow, reducing the distance and time needed for **PRACTITIONERS** to reach ADC locations and potential **WORKAROUNDS** by staff (e.g., removing medications for more than one patient at a time).
 - b. Consider the use of additional strategies designed to reduce conversations, interruptions, or distractions at ADCs.
- 1.3 Ensure adequate space around ADCs and associated refrigerated storage to allow for the complete opening of the ADC doors and drawers, unimpeded access to refrigerated medications, and protection of staff from possible injury during the opening of medication room doors.
- 1.4 Provide sufficient lighting in the area around the ADC to allow for easy reading of the ADC screen, the medication label, and the medication administration record (MAR).
- 1.5 Provide readily accessible horizontal workspaces (e.g., countertops) for medication preparation and labeling, and sinks for hand hygiene. The surface of the ADC should not be substituted for horizontal countertops for medication preparation.
- 1.6 Ensure the MAR is readily accessible and used during medication selection and removal from the ADC. Allow for sufficient space if mobile carts are utilized to access the MAR.
- 1.7 Store oral and parenteral syringes, medication measurement devices, auxiliary labels, IV tubing, and other medication administration supplies near ADCs and associated refrigerated storage.

Core Safety Process # 2

Establish ADC System Security

Security processes must be established and regularly reviewed to ensure appropriate access, transfer, and control of medications as part of an effort to reduce the potential for medication diversion from automated systems. Dedicated measures such as limiting access, inventory management, and the adoption of advanced technologies should be used to prevent unauthorized access and ensure secure filling and withdrawal procedures.²⁰

Guidelines:

- 2.1 Limit access and define user privileges for specific **PRACTITIONER** types (e.g., respiratory therapists, anesthesia providers), based on their role and need to access specific medications or medications in specific patient care areas.
- 2.2 Define secure procedures to manage ADC access:
 - a. Use biometric identification for ADC access whenever possible. If not possible, establish alternative secure procedures to access ADC systems (e.g., username and password).
 - b. Limit the number of individuals who can assign usernames and passwords to ADC users.
 - c. Define a secure procedure to address forgotten usernames/passwords for ADC access.
 - d. Restrict the use of temporary usernames/passwords for ADC access.
 - e. Prohibit staff from sharing usernames/passwords for ADC access.

- f. Ensure that human resource policies reflect the importance of username/password security in conjunction with use of ADCs.
 - g. Update user access upon change in employee status and/or work assignment as necessary.
 - h. Establish a process for user access to be removed immediately upon employee separation from the organization.
- 2.3 Periodically monitor appropriate user access based on organizational workflow requirements and scope of practice.
 - 2.4 Develop a procedure to limit and monitor ADC access when a clinical unit is closed.
 - 2.5 Secure and limit access to medications kept in refrigerated storage associated with the ADC to only authorized users.
 - 2.6 Use security cameras in key locations as a deterrent for diversion and for monitoring ADC access.
 - 2.7 Require staff to log out after each interaction with the ADC. Establish a limited timeframe for the ADC device to automatically time out with user inactivity.
 - 2.8 Minimize the use of temporary patients. If an organization allows users to enter temporary patients, restrict the type and number of individuals who can perform this function. Establish a process to monitor and a timeline to reconcile all transactions performed under this function.
 - 2.9 Implement procedures (based on a pre-determined interval) for two individuals to perform a manual count of controlled substance ADC inventory in all clinical areas including pharmacy.
 - 2.10 Use a **BLIND COUNT** for all controlled substance transactions.
 - 2.11 Stock the smallest sized container necessary to provide the typical ordered dose of a controlled substance to minimize the need for drug waste and limit the potential for drug diversion.
 - 2.12 Implement procedures for addressing ADC discrepancies.
 - a. Immediately address all controlled substance discrepancies as soon as they are identified.
 - b. Require two individuals to perform all discrepancy resolutions wherever they occur.
 - c. Define a process for the escalation of any discrepancies not resolved by the end of the shift.
 - 2.13 Conduct routine audits to verify that issued controlled substances were administered, wasted, or returned as documented in an organization-defined timeframe, and that any discrepancy resolution reasons were appropriate.
 - 2.14 Implement an automated surveillance system to proactively monitor controlled substance usage patterns associated with the ADC system. (Consider using similar tracking for other non-controlled substances with a high rate of diversion.)

Core Safety Process # 3

Provide Profiled ADCs and Monitor System Overrides

*The use of an ADC in a “**PROFILED** mode” is considered an important safety feature throughout the healthcare industry as it directs **PRACTITIONERS** to a patient-specific medication profile and limits access to only medications that have been reviewed and verified by a pharmacist as appropriate for the patient. Use of a non-**PROFILED** ADC (which is not recommended), allows **PRACTITIONER** access to all medications contained within the cabinet, typically bypassing the pharmacist’s review of the order prior to medication selection.²¹⁻²³*

*An ADC **OVERRIDE** occurs when a **PRACTITIONER** bypasses the pharmacist’s review of a medication order to obtain a drug from the ADC when an assessment of the patient indicates that a delay in therapy (to wait for*

a pharmacist's review of the order) would harm the patient. The use of ADC **OVERRIDES** should be situation dependent and justifiable, and not based merely on a list of medications. While there may be a list of drugs with the potential to be obtained emergently, there may be some situations when there is sufficient time for the pharmacist to review emergent medications prior to retrieving the dose.

Guidelines:

- 3.1 Optimize the use of ADCs in a **PROFILED** mode that allows medication selection after orders have been reviewed and verified by a pharmacist. Use the **PROFILED** mode in both inpatient and outpatient areas (e.g., the emergency department [ED], preoperative care areas, post anesthesia care unit [PACU], procedural and ambulatory locations).
- 3.2 Require a medication order (e.g., electronic, written, telephone, or verbal) prior to removing any medication from an ADC, including those on **OVERRIDE**. [FAQ](#)
- 3.3 Establish a policy that limits ADC system **OVERRIDES** to the following situations:
 - a. When a licensed independent **PRACTITIONER** controls ordering, preparation, and administration of the medication.
 - b. When medications are required in emergent circumstances and waiting for a pharmacist to review the order could adversely impact the patient's condition, such as the need for:
 1. **ANTIDOTES, RESCUE AGENTS, and REVERSAL AGENTS**
 2. Life-sustaining medications
 3. Urgent comfort measure medications (e.g., to manage acute pain or intractable nausea and vomiting)
- 3.4 Implement strategies that reduce the risk of error when an **OVERRIDE** is used, such as:
 - a. Avoid the use of multiple-dose containers.
 - b. Limit the quantity of vials/tablets and number of drug concentrations available on **OVERRIDE**.
 - c. Assess the patient's diagnosis and medical/surgical history including the patient's allergies and weight, if applicable, to determine if the drug and dose are appropriate.
 - d. Require documentation of **OVERRIDE** rationale.
 - e. Provide an automated prompt and documentation of a witness with another licensed healthcare provider at the ADC when removing organization-identified medications (e.g., ketamine) on **OVERRIDE** or from a non-**PROFILED** cabinet. [FAQ](#)
- 3.5 Review and approve all medications designated for **OVERRIDE**, clinical locations where medications can be removed on **OVERRIDE**, **PRACTITIONER** types who can remove medications on **OVERRIDE**, and associated policies through the Pharmacy and Therapeutics (P&T) Committee, Medication Safety Committee, or equivalent interdisciplinary group. Update the list of medications, clinical locations, and **PRACTITIONER** types approved for access via **OVERRIDE** as appropriate.
- 3.6 Use an interdisciplinary group to routinely analyze **OVERRIDE** reports to identify if an order was obtained prior to removing the medication and whether the rationale for each overridden medication was appropriate. Trend **OVERRIDE** reports by medication, user, and area, and address barriers to the pharmacist's review of the medication order prior to drug removal. Discuss results regularly with all disciplines with ADC access.

Core Safety Process # 4

Select and Maintain Appropriate ADC Configuration and Functionality

*Restricting access to medications limits the potential for inadvertently selecting the wrong medication and dose. Medications stocked in ADCs may be **HIGH-ALERT** drugs, and it is important to ensure that only the right drug is selected. For these reasons, it is important that each drug has its own unique and segregated location within the ADC, so only the specific drug or vaccine needed is accessible.^{3,24} Decisions regarding ADC functionality as well as storage configurations should always be made with safety in mind.*

Guidelines:

- 4.1 Maximize the use of secure storage configurations (e.g., **LOCKED-LIDDED POCKETS**, secure compartments). Select the most appropriate configuration for the ADC based on the type and variety of medications that are expected to be stored in the cabinet.
 - a. Do not use open **MATRIX DRAWERS** (open access compartments), including open storage in towers and refrigerated units, to store **HIGH-ALERT MEDICATIONS** (e.g., neuromuscular blocking agents), controlled substances, **REVERSAL AGENTS**, drugs with common look-alike drug names and packaging, and drugs prone to diversion.
 - b. If **MATRIX DRAWERS** must be utilized, limit the medications contained therein, as much as possible, to non-prescription medications (e.g., non-opioid analgesics [e.g., acetaminophen, ibuprofen], antacids) and 0.9% sodium chloride flush syringes.
- 4.2 Couple the removal of items that are always used together, such as medications that require specific diluents for reconstitution (e.g., vaccines, antibiotics), by linking the items using ADC functionality or placing them together in a kit.
- 4.3 Ensure that there are well-designed alternative procedures for ADC system downtime (planned and unplanned), as well as ADC hardware and software failures, and that staff are trained on the alternative procedures.
- 4.4 If mnemonics or short names are permitted to search for products or populate fields without entering the full drug name, require entry of a minimum of the first 5 letters of the drug name, unless the drug name has fewer than 5 letters.
- 4.5 Display a visible warning on the ADC screen when a **PROFILED** ADC is operating in full access/critical **OVERRIDE** mode.
- 4.6 Consider deploying automated label printers, with the ability to print patient- and drug-specific barcodes, to support proper labeling of all **PRACTITIONER**-prepared medications.

Core Safety Process # 5

Select and Maintain Optimal ADC Inventory

The ADC inventory should be determined based on the needs of the patients served and replenished on a regular basis. Medication stock should be regularly reviewed and adjusted based on medication prescribing patterns, utilization, and unit-specific needs (considering typical patient ages and diagnoses).^{3,6,25} Standard stock medications should be identified and approved for each patient care area, with an effort to limit excess volume and quantities that could lead to serious medication errors.^{10,26-28}

Guidelines:

- 5.1 Have an interdisciplinary committee provide medication safety oversight of drug availability in the ADC by establishing criteria for including or excluding medications with special attention to **HIGH-ALERT MEDICATIONS**.

- 5.2 Limit the overall quantity of medications and variety of medication concentrations to a number/selection sufficient to care for patients.
 - a. Specifically restrict the quantity of vials/ampules/tablets/syringes and variety of drug concentrations of medications stored in non-**PROFILED** ADCs.
- 5.3 Provide medications, including oral solutions, in ready-to-use, **PATIENT-SPECIFIC** or **UNIT-DOSE** containers.
- 5.4 Select **UNIT-DOSE** packaging that most closely matches the usual doses administered in that patient care area. Have pharmacy prepare/package commonly-used half tablets and/or oral syringes with oral liquid medications to stock in the ADC when doses require.
- 5.5 Designate emergency medications, **RESCUE AGENTS**, and **ANTIDOTES** as permanent stock in the ADC system to avoid accidental elimination from inventory.
- 5.6 A patient's own medications (brought from home) designated for use during care can be stored in an ADC; however, locations should be individualized and secured per patient, and not intermingled with other patient's medications.
- 5.7 Exclude the following from ADC inventory:
 - a. Medications that require multiple dilutions
 - b. Highly concentrated oral liquid and parenteral opioids (except when provided in **UNIT DOSES** to certain patient care units where significant chronic, cancer, or end-of-life pain is treated)
 - c. Fenta**NYL** patches in areas where only acute pain is treated (e.g., in the ED, operating room, PACU, procedural areas)
 - d. U-500 insulin vials [FAQ](#)
 - e. Hazardous medications that have been restricted from ADC storage based on organizational USP General Chapter <800> assessment of risk
 - f. Vials/ampules of concentrated electrolytes (i.e., potassium chloride, hypertonic sodium chloride for injection [greater than 0.9% concentration], potassium phosphate, sodium phosphate, and potassium acetate). Exception: In surgical areas, vials of concentrated potassium chloride or high-dose potassium cardioplegic solutions are sequestered in sealed kits or locked storage areas and obtained immediately before use; and once the procedure has been completed, there is an effective process in place to return unused products to their secure locations or dispose of the partially empty vials or bags. [FAQ](#)
 - g. Unfractionated heparin vials that contain more than 10,000 units
 - h. Neuromuscular blockers in areas where they are not routinely needed. In areas where neuromuscular blocking agents are routinely needed and stocked in an ADC, storage bins, pockets, or drawers should include a prominently displayed auxiliary label to clearly warn that, upon administration, respiratory paralysis will occur, and ventilation is required (e.g., WARNING: CAUSES RESPIRATORY ARREST- PATIENT MUST BE VENTILATED)
- 5.8 Activate ADC software that prevents clinically inappropriate medications from being loaded into specific cabinets without prior approval. For example, in areas not authorized to stock neuromuscular blockers in their ADC, enable the ADC block load/restrict access feature, if available, to prevent users from inappropriately stocking the cabinet with these **HIGH-ALERT MEDICATIONS**.
- 5.9 Assign appropriate minimum and maximum periodic automatic replenishment (PAR) levels designed to address drug shortages and the risk of multifold overdosing.
 - a. Establish an active notification process to alert pharmacy when ADC inventory reaches critically low PAR levels.
 - b. Establish a process for prompt replenishment between routine deliveries when ADC inventory reaches critically low levels.

- c. Investigate repetitive critical low PAR levels and adjust PAR levels as appropriate.
 - d. Investigate adverse events associated with ADC withdrawal resulting in multi-fold overdoses and adjust PAR levels as appropriate.
- 5.10 Regularly analyze ADC activity reports to determine the appropriate quantity and variety of medications based on the patient unit needs to ensure safety while balancing operational efficiency.²⁵
- 5.11 Develop and implement a plan for monitoring, communicating, and maintaining sufficient inventory levels during downtime.

Core Safety Process # 6

Implement Safe ADC Stocking and Return Processes

*The ADC restocking process encompasses many sub-processes that may involve both pharmacy as well as frontline **PRACTITIONERS**. A safe replenishment process contains redundancies to ensure that the correct medication, concentration, and formulation is selected for distribution to the unit and is placed in the correct location within the ADC. Mistakes in drug selection stemming from incorrectly stocked items in both pharmacy and at the unit level in the ADC have resulted in serious medication errors.^{10, 28-30}*

*A source of incorrectly stocked items is allowing **PRACTITIONERS** to return a medication directly to the ADC **MATRIX DRAWER**, pocket, or auxiliary storage, or to a specific location without the use of scanning technology.^{3,13,27} Errors in drug product returns can occur either because of user distraction, mis-selection of look-alike medication names on an ADC screen, look-alike packages in a **MATRIX DRAWER**, or a slip in procedure. Limiting the return of medications with intact packaging to a designated one-way, secure drawer or bin in the ADC for replenishment by pharmacy or returning to the original secure **LOCKED-LIDDED POCKET** only with the use of **MACHINE-READABLE CODING** technology, will help to eliminate this source of error.^{10,26,27,30} It is also important that the process be defined and organized so staff involved can only follow the correct pathway and the potential for process variation and error risk is limited.*

Guidelines:

Adopt recommended processes within the pharmacy.

- 6.1 Facilitate accurate selection of medications during the refill process by standardizing drug name nomenclature in the ADC system, on pharmacy bin labels, and in the pharmacy inventory system.
- 6.2 Use **MACHINE-READABLE CODING** upon selection in the pharmacy to confirm that the medication chosen for distribution to the ADC matches the medication listed on the ADC fill report.
- 6.3 Implement a check process for product refills prior to dispensing.
 - a. Designate an area for ADC stock management with appropriate space that avoids intermingling of medications and minimizes interruptions and distractions.
 - b. Provide a final **INDEPENDENT DOUBLE CHECK** of all medications selected for ADC distribution to ensure the right drug, strength, dosage form, and correct quantity are verified. Even if technology is used in the selection process, a manual **INDEPENDENT DOUBLE CHECK** should be done prior to distribution.

Adopt recommended processes for the secure delivery of medications to the ADC.

- 6.4 Segregate and secure all medications designated for an individual ADC during transport.
- 6.5 Plan delivery times in conjunction with the workflow in the patient care area, avoiding general restocking procedures during scheduled medication administration times.

- 6.6 Use **MACHINE-READABLE CODING** to promote accurate placement of medications in the correct ADC drawer or pocket location.
- 6.7 Require medication expiration date tracking on all medications stocked in the ADC and remove medications as appropriate.
- 6.8 Avoid multitasking during the drug restocking process.
- 6.9 Regularly evaluate the distribution/restocking process and communicate results as appropriate.

Adopt recommended processes for the safe return of medications to the ADC.

- 6.10 Establish policies and procedures for returning unused medications after removal from the ADC.
- 6.11 Require staff to return all unused non-refrigerated medications with intact packaging to a common secure one-way return bin in the ADC that is maintained by pharmacy, or to the original secure **LOCKED-LIDDED POCKET**, *only* if it is a non-controlled substance *and* **MACHINE-READABLE CODING** verification is used.
- 6.12 Refrigerated medications selected and not used should be returned to the designated ADC refrigerated return bin.

Core Safety Process # 7

Display Important Patient and Drug Information

*Having sufficient patient information and drug information when dispensing and administering medications is key to the safety of the medication use process. Because there is limited space available for patient information on ADC screens, it is important to present essential information that is of the greatest safety value to **PRACTITIONERS** when selecting and administering medications. Systems should provide the ability for unique identification of individual patients, review of their active medication orders, and full integration with the electronic health record (EHR) to provide a closed loop process.²⁷*

Guidelines:

- 7.1 Provide the ability for users to create an assigned patient list in the ADC system to minimize the opportunity to select the wrong patient.
- 7.2 Display the following patient demographics on all patient-specific screens:
 - a. Complete patient name
 - b. Second organization-defined patient identifier
 - c. Patient allergies
 - d. Patient location
- 7.3 Display medication information in accordance with the *ISMP Guidelines for Safe Electronic Communication of Medication Information* available at: www.ismp.org/resources/guidelines-safe-electronic-communication-medication-information.

Core Safety Process # 8

Develop Procedures for Accurate ADC Withdrawal and Transfer to the Bedside for Administration

Processes must be developed to reduce the risk or mitigate the harm associated with accessing a medication without an order, or the selection and administration of the wrong medication, dose, route, or frequency due to medication retrieval errors from the ADC. The contents (variety, concentrations, and volume), configuration, and functionality of the ADC play a large role in the **PRACTITIONER'S** ability to safely select and remove medications.²⁷

A process should be developed that reduces the risk of medications being administered to the wrong patient at the wrong time that may occur during the transportation of medications from the ADC to the patient's bedside.¹⁸ Safety is optimized when **PRACTITIONERS** clearly identify the patient's medications at the time of administration using bedside barcode point-of-care systems.^{10,30} Final visual checks of the medications while at the bedside, the use of an **INDEPENDENT DOUBLE CHECK** for select **HIGH-ALERT MEDICATIONS** and doses, as well as appropriate patient education have also been known to assist in identification of an error in drug selection.²⁷ The safety of this process is also impacted by the organization's ability to secure medications during transport between the ADC and the patient's bedside.¹⁸

Guidelines:

- 8.1 Encourage **PRACTITIONERS** to remotely preselect medications through the ADC system (if available) to reduce the amount of time needed for medication selection and removal at the ADC.
- 8.2 Require that **PRACTITIONERS** remove medications from the ADC one patient at a time, immediately prior to use.
- 8.3 To limit the risk of wrong drug/dose/formulation selections from ADCs:
 - a. Prohibit the removal of medications using an inventory function.
 - b. Confirm accurate selection by visually comparing the drug label to the order or to the MAR. This manual check should include:
 1. Drug identification (generic name and/or brand name if available)
 2. Validation of drug concentration, dose, and dosage form. Usual ADC selection involves removing no more than three vials, capsules, tablets, or ampules. Selection of larger numbers should indicate to the user the need to investigate the original order and the product chosen.
- 8.4 Configure interactive alerts that require users to enter or select clinically relevant information (e.g., purpose for drug removal, whether the patient is ventilated [for neuromuscular blockers]) prior to removal of organization-identified medications. Balance the need for ADC alerts with the understanding of alert fatigue and the ability to have many of these messages directly on the MAR.
- 8.5 Avoid multitasking, interruptions, and distractions (e.g., avoid the use of phones, electronic pagers, and other devices) during the drug selection and removal process.
- 8.6 Restrict users from removing medications ahead of an organization-defined administration window. At a minimum, provide an alert to the user if an attempt is made to remove a medication ahead of an administration window.
- 8.7 Label all clinician-prepared syringes of medications or solutions, unless the medication or solution is prepared at the patient's bedside and is immediately administered to the patient without any break in the process.
- 8.8 Transport medications removed from the ADC to the bedside in their original **UNIT-DOSE** or patient-specific package. Open packages immediately prior to use at the patient's bedside. The only exception may be for medications that need to be crushed, measured, or wasted.

- 8.9 Transport a single patient's medications for one administration time directly to the patient's bedside.
[FAQ](#)

Core Safety Process # 9

Provide Staff Education and Competency Validation

*All users of ADCs (pharmacists, pharmacy technicians, nurses, respiratory therapists, designated physicians, and others) must be educated and have regular competency validation on the use of the device to meet expectations for safe use. Most often this education occurs during the **PRACTITIONER'S** orientation period, or upon ADC installation and software upgrades, but periodic updates may be required to ensure ongoing appropriate use. Users who are not properly oriented to the device may develop practice habits and device **WORKAROUNDS** that are considered unsafe.^{18,27}*

Guidelines:

- 9.1 Provide standardized education concerning the safe use of ADCs at the time of staff orientation and upon ADC system changes.
- 9.2 Employ a formal competency assessment for all ADC users upon hire and regularly as determined by the organization.
- 9.3 Share with staff lessons learned from the regular review and discussion of ADC-related medication events and close call reports. In addition, use external sources of error information to promote safe practices.

Frequently Asked Questions (FAQs)

3.2 When can a PRACTITIONER access a medication through an ADC to administer it to a patient?

Medication access is limited to licensed **PRACTITIONERS** who can administer medications based on organization-defined user privileges for specific **PRACTITIONER** types (e.g., respiratory therapists, anesthesia providers). With the exception of licensed independent **PRACTITIONERS** with prescribing authority (e.g., anesthesia providers), **PRACTITIONERS** should remove medications from an ADC after they have been prescribed for a patient or in response to an approved protocol.

3.4 e. Why is witness verification necessary at the ADC when an organization-identified medication is removed on OVERRIDE or from a non-PROFILED ADC?

When a medication is taken from a non-**PROFILED** ADC, or on **OVERRIDE**, a pharmacist check of the order/drug has been bypassed. Employing a witness verification of the drug and indication allows errors to be recognized before reaching the patient's bedside.

5.7 d. Can insulin pens be stored in an ADC?

Insulin pens should be dispensed from the pharmacy for individual patients as ordered with a patient-specific and drug-specific barcoded label, and not stored in patient care units as non-patient specific unit stock. This labeling is necessary to avoid use of a multi-dose insulin pen on more than one patient and risking the transfer of blood and body pathogens. When pharmacists are not available onsite 24/7, insulin pens can be removed from a **PROFILED** ADC only after the pharmacy has verified a corresponding order (not on **OVERRIDE**); and a process has been implemented to enable the application of a patient-specific and drug-specific barcoded label on the pen body immediately upon removal. Insulin pens should not be stocked in a non-**PROFILED** ADC.

5.7 f. Should 23.4% sodium chloride vials be stored outside of the pharmacy?

Any IV push doses of 23.4% sodium chloride used in critical care or emergency/urgent care units should be prepared and dispensed from the pharmacy, labeled with appropriate warnings (e.g., CONCENTRATED sodium chloride 23.4%, administer via central line only), and hand-delivered to the healthcare professional who will be administering the drug.

8.9 Is it ever acceptable to transport more than one patient's medication at a time?

While the best practice is to select and prepare one patient's medication at a time, there are unique environments of care where ADC access points are extremely limited, creating unnecessary delays for medication administration. In these rare cases, some organizations allow **PRACTITIONERS** to sequentially remove two patients' medications while at the ADC, provided that each patient's medications are selected individually, bagged separately, appropriately labeled at the time of removal, and bedside barcode medication administration is used. Medications should NEVER be transported in a **PRACTITIONER'S** pocket.

Definitions

BLIND COUNT: Upon the withdrawal of a controlled medication, the ADC prompts the user to physically count the number of remaining products in that location and enter this count at the time of drug removal.

HIGH-ALERT MEDICATIONS: Drugs that bear heightened risks of causing significant patient harm when used in error. Although mistakes may or may not be more common with these drugs, the consequences of an error are clearly more devastating to patients.

INDEPENDENT DOUBLE CHECK OR INDEPENDENTLY DOUBLE CHECKED: A procedure in which two individuals, preferably two licensed **PRACTITIONERS**, separately check each component of the work process. An example would be one person calculating a medication dose for a specific patient and a second individual independently performing the same calculation (not just verifying the calculation) and matching the results.

LOCKED-LIDDED POCKET: A drawer configuration which is used to isolate medications from one another and provide a high level of security by restricting access to one pre-selected medication at a time.

MACHINE-READABLE CODING: Refers to technology in which a set of signs, letters, or radio waves are used to identify people and/or objects, including medications. Examples include barcode scanning technology or radio frequency identification (RFID), which involves wireless emission of radio waves that are transmitted and received to communicate identity and other information.

MATRIX DRAWERS: A high-capacity, low-security drawer, suitable for large quantities of less-controlled medications. Its configuration allows the user open access to all medications within the drawer.

OVERRIDE: A process of bypassing the pharmacist's review of a medication order to obtain a medication from the ADC when assessment of the patient indicates that a delay in therapy would harm the patient.

PATIENT-SPECIFIC MEDICATION (OR DOSE): A ready-to-administer dose of medication that exactly matches the dose ordered by the prescriber for a particular patient. This may or may not correspond to the manufacturer **UNIT-DOSE** package. (See **UNIT-DOSE**.)

PRACTITIONER: A licensed healthcare professional who is authorized within the institution to prescribe, dispense, or administer medications, such as a physician, physician assistant, nurse anesthetist, nurse practitioner, nurse, pharmacist, or respiratory therapist.

PROFILED ADC: A pharmacy-profiled ADC is one in which a **PRACTITIONER** can select a drug from a patient-specific list on the ADC screen and obtain a medication only after the order has been verified by a pharmacist.

RESCUE AGENT(S) (ANTIDOTE OR REVERSAL AGENT): A medication (usually provided urgently) used to reverse an adverse drug effect (e.g., to correct adverse physiologic consequences of a deeper-than-intended level of sedation), or to reverse a pathophysiologic condition (e.g., use of a hypertonic saline rescue to treat severe hypovolemia).

UNIT-DOSE: A single package that contains one dose of a medication intended for one patient (e.g., a package with one tablet, one single-use vial of parenteral medication, 5 mL container holding one dose of oral liquid medication). (See **PATIENT-SPECIFIC MEDICATION**.)

WORKAROUNDS: A process where normal safe processes are bypassed, trading safety for efficiency/convenience.

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About ISMP

The Institute for Safe Medication Practices (ISMP) is the only 501c (3) nonprofit organization devoted entirely to preventing medication errors. During its more than 30-year history, ISMP has helped make a difference in the lives of millions of patients and the healthcare professionals who care for them.

ISMP is known and respected as the gold standard for medication safety information. It also has served as a vital force for medication safety progress. ISMP's advocacy work alone has resulted in numerous necessary changes in clinical practice, public policy, and drug labeling and packaging.

Among its many initiatives, ISMP runs the only national voluntary practitioner medication error reporting program, publishes newsletters with real-time error information read and trusted throughout the global healthcare community, provides confidential consultation services to healthcare systems, and offers a wide range of unique educational programs, tools, and guidelines.

ISMP works with healthcare practitioners and institutions, regulatory and accrediting agencies, consumers, professional organizations, the pharmaceutical industry, and others to accomplish its mission. It is a federally certified patient safety organization (PSO), providing legal protection and confidentiality for patient safety data and error reports it receives.

As an independent watchdog organization, ISMP receives no advertising revenue and depends entirely on charitable donations, educational grants, newsletter subscriptions, and volunteer efforts to pursue its life-saving work. For more information or to donate to protect patients worldwide from harmful medication errors, visit ISMP online at www.ismp.org.