

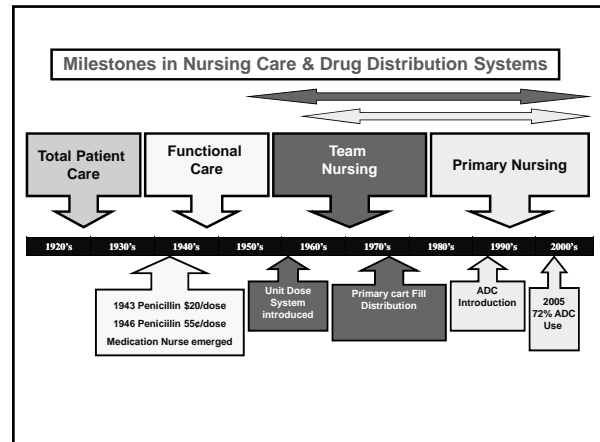
ISMP Guidelines for Safe Use of Automated Dispensing Cabinets in Hospitals

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South Carolina Society of Health-System Pharmacists
2nd Annual Pharmacy Automation and Technology Conference

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Hospital Drug Distribution Systems

- Pre-1960s - floor stock system
 - Locked narcotic safes/boxes (keys) with manual counts
- 1960s – individual patient prescriptions; 3-5 day supply, nurses “poured” own meds
- 1970s – unit dose distribution; IV admixtures
 - Drug cart fills (bin fill by Rx tech and checks by RPh); nurse servers; locked mechanical cabinets or carts for controlled drug storage (keys)
 - Usually 24 hour supply of scheduled and “prn” medications
 - Updated throughout the day – pneumatic tube; pharmacy delivery; nurse gets from pharmacy; borrows from other patient or “stash”

Hospital Drug Distribution Systems

- Late 1980s – Early 1990s. Cabinets with tracking for narcotics; some floor stock items
 - Charge capture
 - Improved security
 - Improved inventory control
- Early 1990s – Automated dispensing for first dose (no RPh screening); allergy checks

ADC Improvements

- 1990s – automated dispensing as primary method evolving
 - “Profile system” to require pharmacist order review prior to dispensing
 - Computerized alerts
 - Decrease order turn around
- 1990s – 2000s – “Pockets” vs. matrix drawers; lidded containers
- 2000’s – Bar code systems
 - For stock replenishment and drug selection
 - Bedside scanning
- Telepharmacy applications after pharmacy hours

ISMP ADC Survey 1999 vs. 2007

- | | |
|---|---|
| ■ 453 respondent | ■ 800+ respondents |
| ■ 75% utilizing ADCs | ■ 94% utilizing ADCs |
| ■ 20% as the primary means of drug distribution | ■ 56% as the primary means of drug distribution |
| ■ Features that promote safety lacking. | ■ More safeguards in place than in 1999 |
| ■ Practitioner safety precautions not established | |

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ISMP ADC Survey

Medication Choices	1999 n = 453	2007 n = 508
Narcotics only	7%	2%
Narcotics and stock/prn medications	49%	15%
Narcotics, stock/prn and 1st dose medications	32%	17%
ADCs as primary distribution system	20%	47%
We don't use ADCs	22%	19%

ISMP ADC Survey

Checking Process	1999	2007
– Pharmacists checking ADC stock medication before leaving the pharmacy	65%	75%
– Verification after stocking the ADC	18%	18%
– Double check after a nurse overrides the ADC	10%	29%

ISMP ADC Survey

Pharmacist Review	1999	2007
– Pharmacist must review orders before removing medication from the ADC	28%	64%
– Nursing perception – front line staff	N/A	56%
– Pharmacist perception	N/A	72%
– Reported that all ADCs are capable of being profiled	N/A	59%

ISMP ADC Survey

Cabinet Design	1999	2007
– Can only remove requested drug from ADC vs. multiple drugs available in a matrix setting	30%	50%

- ### Multidisciplinary Requirements
- Pharmacists
 - Pharmacy technicians
 - Nurses

- ### Gaps in the Safe Use of ADCs
- New trends with increased use of ADCs
 - Bypassing pharmacy profile functionality
 - Difficulty managing override usage patterns
 - More ADC transactions
 - Lines at the cabinet
 - At-risk practices with drug selection
 - Variable processes for transporting drugs to bedside
 - Increased density of drug storage
 - High-alert medications in matrix drawers
 - Selection errors common

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Creating the ADC Forum

- ISMP convened a Steering Committee with 5 ADC vendors
- Steering Committee concluded...
“There was very **little formalized guidance** to direct healthcare facilities on the safe use of ADCs”
- Steering Committee proposed a project to **identify core processes** when using ADCs that would **challenge** both hospitals and vendors to improve the safety/safe use of ADCs

ADC Forum

- Industry Sponsors
 - Cardinal Health
 - McKesson
 - Omnicell

ADC Forum – March 2007

- Stakeholders
 - 13 hospitals (large, small, general, specialty)
 - Pharmacist and nurse from each facility
 - Members of the ISMP staff
 - Developed “Core Processes” (independent of hospital size, pharmacy hours, or specialty)

ADC Project Scope

- Draft guidelines appeared for public comment on the ISMP website through December 31, 2007
- Final guidelines posted March 2008
http://www.ismp.org/Tools/guidelines/ADC_Guidelines_Final.pdf
- ADC self assessment posted August 2009 and available nationally

ISMP launches first self assessment of ADC safety

More than 50% of US hospitals have implemented automated dispensing cabinets (ADCs) as an integral part of their drug distribution system, making the evaluation of practices surrounding this technology an essential step in ensuring patient safety. To help meet healthcare organizations' growing need for assistance in this area, ISMP has introduced the first Medication Safety Self Assessment for Automated Dispensing Cabinets available at www.ismp.org/selfassessments/ADC.

The assessment contains 22 core elements that support the safe use of ADCs, which are based on guidelines developed by a national forum convened by ISMP comparing practitioners and vendors' best practices in the safe use of ADCs. Many of the core elements represent system improvements and strategies that ISMP has recommended in response to analysis of medication errors and problems identified during recent ISMP consultations with hospitals.

ISMP urges hospitals to use the following process to complete the self assessment:

- Establish an interdisciplinary team to conduct the assessment. Since safe use of ADCs requires collaboration between many different disciplines and departments, hospitals are being asked to convene interdisciplinary teams to provide a wide range of perspectives for the most complete data set possible.
- Assess organizational use of ADCs through a review of one block of team members, after thoroughly investigating the level of implementation of each element.

Continuously updated data to ISMP's ADC Forum is a critically certified Patient Safety Organization. When the self assessment is used for quality improvement purposes and patient safety activities, the data submitted to ISMP are considered patient safety work product and therefore, privileged and confidential. The deadline for data submission to ISMP is December 31, 2009.

Compare your experience with the unique experience of hospitals with similar hospitals. At the end of the self-assessment period, national comparison data will be available through our website.

Document progress toward improvement by regularly using ISMP's tool to measure the organization's ADC use.

ISMP conducted lead, peak, medication safety self assessments for hospitals in 2000 and 2004. It also has created extensive self assessments for medication safety in previous areas: practice and common medication administration, and in the safe use of controlled substances and other drugs. As with its other self assessments, ISMP will use the findings to develop additional educational resources and tools to meet healthcare organizations' and patients' needs with ADCs.

***ISMP's initial ADC Forum was made possible by support from Cardinal Health (Cardinal), McKesson, and Omnicell. Healthcare Organizations are invited to provide their input to the ADC self assessment for a copy of ISMP's ADC guidelines. Visit www.ismp.org/selfassessments/ADC for details.**

<http://www.ismp.org/selfassessments/ADC/Survey.pdf>

ADC Core Processes

- Provide ideal environmental conditions for the use of ADCs
- Ensure ADC system security
- Use pharmacy-profiled ADCs
- Identify information that should appear on the ADC screen
- Select and maintain proper ADC inventory
- Select appropriate ADC configuration

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ADC Core Processes

- Define safe ADC restocking processes
- Develop procedures to ensure the accurate withdrawal of medications from the ADC
- Establish criteria for ADC system overrides
- Standardize processes for transporting medications from the ADC to the patient's bedside
- Eliminate the process for returning medications directly to their original ADC location
- Provide staff education and competency validation

Provide ideal environmental conditions for the use of ADCs

- Ensure a *sufficient number* of readily accessible of cabinets
 - Consider drug distribution model and patient population
 - Monitor for practitioner accessibility issues

Provide ideal environmental conditions for the use of ADCs

- Location, Location, Location
 - Avoid distractions
 - Allow sufficient exterior space around the ADC
 - Provide adequate lighting and comfortable temperature
 - Close to refrigerated supplies and other medications
 - Close to necessary resources

Ensure ADC System Security

- Establish a clear process on how passwords are assigned
- Update the system database daily
 - Remove passwords that should no longer be active
 - Update new passwords issued
- Utilize biometric identification or change passwords quarterly

System Security

- Document the destruction of medication waste at the time of removal
- Routinely review/reconcile the documented medication waste
- Define user privileges
- Provide a remote locking mechanism for refrigerated storage associated with the ADC

Use Pharmacy-Profiled ADCs

- All ADCs should have the capacity to be profiled by the pharmacy, including outpatient areas
- ADCs without “profiling” capability should be used for a limited variety and quantity of medications

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ISMP ADC Survey 2007

■ Pharmacist Review	1999	2007
– Pharmacist must review orders before removing medication from the ADC	28%	64%
– Nursing perception		
– Pharmacist perception	N/A	56%
	N/A	72%

Select and Maintain Proper ADC Inventory

- Oversight by the Pharmacy and Therapeutics (P&T) Committee of drug availability in the ADC
- Establish criteria for including or excluding medications in the inventory
- Establish maximum par levels to prevent multifold overdosing

Error Adverted

- Order for: "calcium gluconate 1 gram IV."
- Nurse believed that *each 10 mL* vial contained only 98 mg.
- A ten-fold overdose was avoided because the drug cabinet contained only six vials of calcium gluconate
- Error was detected when nurse contacted pharmacist at home to obtain more vials

ISMP. ISMP Medication Safety Alert!® Acute Care Edition. 2 December 1998; (3)24.

Select Appropriate ADC Configuration

- Restrict access to medications to limit inadvertent selection
- Provide a unique and segregated location within the ADC for each drug

Select Appropriate ADC Configuration

- Limit the use of matrix drawers
 - Avoid use for high-alert medications, reversal agents, and drugs prone to diversion
- Avoid placing non-medications, (e.g., keys, cameras, patient belongings) in ADCs at the expense of storing additional medications

ISMP ADC Survey 2007

■ Cabinet Design	1999	2007
– Can only remove requested drug from ADC vs. multiple drugs available in a matrix setting	30%	50%

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Safe ADC Restocking Processes

- Encompasses a number of sub-processes that can involve both pharmacy and nursing staff
- Include redundancies to assure that the correct medication is placed in the appropriate location within the ADC

Clinical consequences of an ADC restocking-related error



ISMP Medication SafetyAlert!

That long journey towards a safety-minded Just Culture

The author is thankful to a reader who... **Restocking**... **Hydro**... **Morphine**... **Par level**... **Look-alike names**... **Stocking errors**...

Stocking Errors with ADCs

- Wrong drug concentration
- Wrong location (drawer/bin)
- Restocking or return to inventory
- Par level too high/bin overflow

Stocking Errors: Look-alike names

- A nurse noted HYDRomorphone 4 mg injections had been stocked in the morphine 4 mg compartment in the ADC
- Pharmacy was notified and it was found that two patients may have received the wrong drug

Patient Safety Authority. *Problems Associated with Automated Dispensing Cabinets*. Patient Safety Advisory, Vol. 2, No. 3, 22.

Stocking Error: Look-alike packaging

- Patient in a cardiac cath lab had an order for heparinized saline, concentration of 2 units/mL (1,000 units in 500 mL NS)
 - A bag of heparin was selected from the ADC and 1-2 mLs were infused
 - The bag of heparin selected had a concentration of 50 units/mL (25,000 units in 500 mL D₅W)

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Safe Restocking Process - Pharmacy

- Create a sequestered location *in the pharmacy* for all stock designated for ADC distribution
- Minimize distractions/interruptions
- Designate specific staff for this work

Safe Restocking Process - Pharmacy

- Develop a check process within the pharmacy, prior to dispensing
 - Consider appropriateness for patient population
 - Separate bags for each medication, dose, and dosage form
 - Implement an independent double check for all ADC medications

Safe Restocking Process - Delivery

- Segregate and secure all medications designated for an individual ADC
- Plan delivery time in conjunction with the workflow; avoid restocking during scheduled medication times

Safe Restocking Process - Delivery

- Bar-code scanning
 - to identify the correct drawer/pocket/container
 - to scan the drug being delivered
- Process/restock one individual medication and strength at a time

ISMP ADC Survey 2007

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ISMP ADC Survey 2007

■ ADC Stock	1999	2007
– Multiple concentrations available	35%	35%
– Ready to use medications available	95%	87%
– Non-medication stored in the ADC	15%	23%

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Identify Information that Should Appear on the ADC Screen

- Demographic Information
- Medication Display
 - Drug name, dose, and route
 - Instructions for preparation
 - Location of the medication
 - Warnings/alerts
 - Time of last removal

Identify Information that Should Appear on the ADC Screen

- Supplemental information
 - An ICON to indicate profiling is “online”
 - Drug information ICON with direct link
 - Flag to indicate “new” order
 - Summary page to indicate what has been selected

Lack of Information on the ADC Screen

- Wrong patient selection from a pick list
- Medications administered to patients known to be allergic
- Extended release medications crushed
- Wrong dose or route errors

Develop Procedures for the Accurate Withdrawal of Medications from the ADC

- The contents (concentrations, variety and volume) and configuration of the ADC play a large role in the practitioner’s ability to safely select and remove medications from the ADC

Types of Removal Errors with ADCs

- Wrong drug from a pick list
- Wrong drug from the drawers
 - Look-alike names
 - Look-alike packaging
 - Wrong concentration/strength
- Workarounds
- Overrides

Wrong Medication From Pick List

- Sorted by brand name, the antiarrhythmic **BREVIBLOC** (esmolol) and the anesthetic **BREVITAL** (methohexital) appeared directly next to one another on an ADC screen
- Nurse accidentally removed Brevibloc instead of Brevital and placed the wrong medication at the patient’s bedside
- Fortunately, another nurse and the physician caught the error during the “time out” period immediately before the procedure

ISMP Medication Safety Alert!
June 23, 2006: Volume 11 Issue 4

ISMP Guidelines for Safe Use of Automated Dispensing Cabinets in Hospitals

Look-alike Packaging

- Physician asked for ephedrine, but a nurse selected epinephrine from the ADC, drew up the medication into a syringe, and handed it to the primary nurse
- The patient suffered a period of hypertension and chest pain but eventually recovered

Look-alike Names

- Hespan ordered for a patient who became hypotensive after a B/L hip replacement
- Nurse inadvertently took a bag of heparin 25,000 units from ADC stock and infused it over an hour
- Hespan and heparin share the characters "H-E," "P-A" and "N" in the same order.
- Also, both products are in premixed bags and they are often stored near one another due to their similar spelling

ISMP Medication Safety Alert!
February 11, 1998; Volume 3, Issue 3

Removing Wrong Concentration

- **Roxanol**® (morphine) 20 mg/mL was kept in the ADC along with morphine elixir 10 mg/5 mL
- When a physician ordered "morphine elixir 15 mL," a nurse withdrew the concentrate by mistake
- Fortunately, the patient's only reaction to the 300 mg dose was to sleep the entire day

ISMP Medication Safety Alert!
Volume 3, Issue 2; January 28, 1998

Develop Procedures for the Accurate Withdrawal of Medications from the ADC

- To limit the risk of wrong drug selection:
 - Pharmacy-profiled mode
 - Validate patient information on the screen
 - One patient/one administration at a time
 - Orientation/annual competency update

Develop Procedures for the Accurate Withdrawal of Medications from the ADC

- Visual validation of withdrawal
 - *Matched against the MAR*
- Provide patient-specific doses
 - Limit practitioner manipulation of the drug after removal
- Return only to secure, designated bin

Develop Procedures for the Accurate Withdrawal of Medications from the ADC

- Only medications that are available for administration should initially appear on the active profile
- Profile appearance:
 - Separate scheduled/PRNs
 - Indicate location of drug

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ISMP ADC Survey 2007

■ Workflow and Practice Habits (new for 2007)	1999	2007
– Nurse wait in line to access the ADC	N/A	30%
– Nurses remove more than one patient's medication during one session	N/A	31%

ISMP ADC Survey 2007

48% Nurses (2007):

“ADCs not located in areas free from distractions”

Establish Criteria for ADC System Overrides

- Use of ADC overrides should be situationally dependent.
- Emergency access should be available in circumstances in which waiting for a pharmacist to review the order before accessing the medication could adversely impact the patient's condition.

Errors Associated with ADC System Overrides

- Duplicate therapy
- Drugs given too early or too late
- Wrong patient, drug, dose, route

Establish Criteria for ADC System Overrides

- Reduce the risk of error when an override is used:
 - Limit the quantity and number of drug concentrations available
 - Minimize use of multi-dose containers
 - Provide a process where the drug and dose are checked against the patient's allergies, weight, and other appropriate information

Establish Criteria for ADC System Overrides

- Provide override rationale
- Require an independent double-check for high-alert drugs or hospital specific
- Perform competency assessment
- Review overrides regularly to determine
 - Accuracy of medication delivered against the order
 - Trends/barriers to pharmacy profiling

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ISMP ADC Survey 2007

■ Checking Process	1999	2007
A double check is performed after a nurse overrides the ADC	10%	29%

Standardize Processes for Transporting Medications to the Patient's Bedside

- Distribution model selected
- Availability and placement of ADCs related to the physical environment of the unit
- Standardized methods used to secure medications during transportation

Errors Associated with Transportation from the ADC

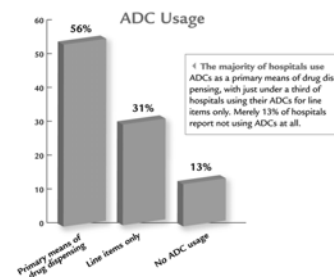
- Medications taken to the wrong bedside for administration
- Medications delayed or omitted (left in uniform pockets)
- Potential errors and diversion issues related to unsecured medications

Use of Automated Dispensing Cabinets: ISMP Surveys

<u>Medication Choices</u>	<u>1999</u> n = 453	<u>2006</u> n = 508
Narcotics only	7%	2%
Narcotics and stock/prn medications	49%	15%
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Use of Automated Dispensing Cabinets: ISMP Surveys

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State of Pharmacy Automation. Pharm Purch Prod. 2008;5(8).

ISMP Guidelines for Safe Use of Automated Dispensing Cabinets in Hospitals

Standardize Processes for Transporting Medications to the Patient's Bedside

- Availability and placement of ADCs to prevent workarounds
- Secure Transport
 - Medications remain in their original unit-dose package as much as possible

Standardize Processes for Transporting Medications to the Patient's Bedside

- Secure transport:
 - Hand-carry a single patient's medication for one administration time directly to the patient's bedside
 - Use computers on wheels (COWs), mobile carts, or workstations on wheels (WOWs) with labeled, patient-specific drawers that have the ability to lock

Standardize Processes for Transporting Medications to the Patient's Bedside

- Have the MAR available at the bedside to support patient ID and safe drug administration
- Open packages at the patient's bedside
 - Only exception-medications that need to be crushed, measured, or wasted

Eliminate the Process of Returning Medications Directly to their Original ADC Location

- All medications should be returned to a common secure one-way return bin that is maintained by pharmacy and not to an individual pocket or bin within the ADC

Provide Staff Education and Competency Validation

- Informed of the risks associated with drug selection
- At-risk behaviors/expectations for practice
- Lessons learned from the regular review and discussion of ADC-related medication errors and near misses reports