

Automated Dispensing Cabinets in the Canadian Environment

Automated dispensing cabinets (ADCs), when implemented in concert with unit-dose packaging, pharmacist review of medication orders, and an interface with a pharmacy information system, can improve the safety of the medication system while making required medications readily accessible in patient care areas. As with any new technology, however, there are potential pitfalls associated with these devices that, if not properly managed, can jeopardize patient safety.

The use of ADCs in patient care areas is increasingly being recognized as a way to improve the safety and efficiency of hospital medication systems. However, one of the reasons that ADC uptake in the United States has outpaced that in Canada is not necessarily related to the drive for safer systems. ADCs were initially employed in US hospitals to help capture all patient-specific charges and thus to ensure that a complete itemized bill was available on discharge. ADCs were also employed to track the distribution of narcotics and other controlled drugs in response to a federal monitoring system that places emphasis on the ability to easily retrieve and track such information. In the United States, the use of ADCs has now become commonplace: in a 2005 survey conducted by the American Society of Health-System Pharmacists (ASHP), 71.8% of respondents indicated that ADCs were used within their facilities.¹ Although use of ADCs is less widespread in Canada, it appears to be increasing, driven primarily by the patient safety movement. According to the recently published *Hospital Pharmacy in Canada Annual Report 2005/06*,² 32% of respondents to a similar survey of Canadian hospitals (100 beds or more) reported use of ADCs. This represents a substantial increase, from only 20%, in a survey conducted 2 years earlier. Of the 46 respondents who reported use of ADCs, 8 indicated that these devices were being used to provide medication distribution for at least 90% of inpatient beds.

Guidance on the appropriate use of ADCs is available through a variety of credible sources, including the Institute for Safe Medication Practices (ISMP) in the United States³ and the ASHP.⁴ This bulletin highlights areas of particular concern to Canadian health care organizations and provides guidance on certain commonly encountered challenges. The information presented here has been drawn from the experience and knowledge of ISMP Canada's staff, as well as the previously mentioned guidelines.

Pharmacist's Review of Medication Orders

Review of medication orders by a pharmacist before the administration of any medication is fundamental to the safety of a hospital's medication system. With ADCs, such a review can be ensured by establishing a real-time interface between

the pharmacy information system and the ADC and by allowing access to medications only through the pharmacist-reviewed patient profile of the ADC.

In Canada, where 24-hour availability of pharmacy services is relatively rare, it can be difficult to provide timely review of medication orders that are generated when the pharmacy is closed. Ensuring a quick turnaround on such reviews can also be a challenge in the early morning and during other high-volume periods for processing of medication orders. Access to certain medications without a pharmacist's review is sometimes provided through "override" lists, which are predefined lists of medications that can be accessed by nursing staff at any time without a pharmacist's review (similar to ward stock in nonautomated systems). Here, it is important to focus not only on the particular medications on such a list, but also on the emergent and urgent situations in which a medication must be removed. Some facilities provide full access to the entire ADC stock during hours when the pharmacy is closed (an approach known as "critical override"). Accessing medications through the override function bypasses the safeguards associated with pharmacist review; instead, safety depends entirely on the personal diligence of nursing staff to assess the order and select the appropriate drug and dosage form.

ISMP Canada recommendations:

- Ensure that all ADCs have an interface with the pharmacy information system, and establish the expectation that a pharmacist will review the medication order before a medication can be retrieved from the cabinet.
- Restrict or eliminate use of the "critical override" function, except during system downtime. Explore innovative options to allow pharmacist review of medication orders during evenings, nights, and early morning periods (e.g., off-site review of orders, possibly by sharing services between hospitals).
- Establish clear guidelines and a multidisciplinary review and approval process for medications that will be included on override lists. Such lists should include only medications that have an acceptable risk profile and that are likely to be required on an urgent basis.
- Establish a requirement for an independent double check of selected items removed through the override function.
- Ensure that all orders for medications removed using the override function are reviewed by a pharmacist as soon as possible.
- Establish indicators and targets for use of the override function, and audit these indicators and targets regularly (e.g., monthly). Potential information to be tracked might

include types of medications retrieved on override, along with time of day, day of week, and patient care area. Hospitals have reported that such audits can assist in making improvements (e.g., to reduce patient transfer delays and delays in transmission of orders) and in determining causes of delays (e.g., inadequate staffing).

- Establish clear guidelines related to the manual override of ADCs with keys (most ADCs can be opened with some sort of lock and key system in the event of a power failure or system failure).

Process for Retrieving Medications

The safety of medication use involving ADCs is maximized when medications are retrieved for only one patient at a time, as close as possible to the time of administration. However, through discussions with practitioners at Canadian sites, ISMP Canada has become aware that the retrieval of medications for more than one patient and/or for more than one medication administration time during a single session at the ADC is relatively common. Retrieving medications well in advance of scheduled administration times (e.g., an entire patient supply for nursing shift) has also been reported to ISMP Canada staff.

These practices may have arisen from efforts to reduce the amount of nursing time spent travelling between the ADC and the bedside, or to avoid queuing at the ADC. Unfortunately, these practices can introduce significant opportunities for error. Retrieving medications for multiple patients is also counterproductive from a workload perspective, since this creates the need to separate and identify the medications intended for various patients, adding steps and risk/failure points to the administration process. In addition, if medications are retrieved too far in advance of administration time, there is a chance that the patient's medication orders will have changed by the time the medication administration time arrives. This practice not only increases the potential for an error, but may also create additional workload and queuing problems, and unnecessary return trips to the ADC to return unused doses.

ISMP Canada recommendations:

- Retrieve medications from the ADC for one patient at a time and administer them promptly.
- Examine the use of standard medication administration times to ensure that the degree of consolidation of times is appropriate. (Consolidating medication administration times can reduce the number of trips to and from the ADC, but excessive consolidation can also increase the likelihood of queues developing at the ADCs during peak medication administration periods.)
- Ensure that the number, size, and placement of ADCs in patient care areas are appropriate for patient numbers and for the layout of patient care areas. Take into account the proximity of supplies and other items required to support the medication administration process (e.g., sinks, syringes, auxiliary supplies).
- Provide practitioners with appropriate containers for carrying medications from the ADC to the bedside.

High-Alert Medications

ADCs provide some useful tools for enhancing the safety of administration of high-alert medications and can assist hospitals to achieve the Canadian Council on Health Services Accreditation's (CCHSA) patient safety goal of ensuring "the safe use of high risk medications".⁵ If ADCs are used inappropriately, however, the risks associated with placing high-alert medications in these devices can be similar to those associated with ward stock systems.

ISMP Canada recommendations:

- Place high-alert drugs in single-product drawers and, if possible, set these drugs to be dispensed on a unit-dose basis. Avoid placing high-alert medications in "matrix" type drawers that accommodate multiple products.
- Program the ADC to generate appropriate screen alerts when a high-alert medication is removed.
- Consider the use of a "witness to override" if access to certain high-alert drugs through override is required for critical patient care reasons.
- Many ADCs offer the ability to assign clinical/therapeutic prompts in association with removal of a medication. For high-alert medications, consider assigning such prompts to encourage the most appropriate use of these items.

Stocking and Restocking

When accurately stocked with unit-of-use medications, ADCs can reduce opportunities for selection errors during the medication administration process. Errors can occur during the stocking and restocking process, however, and incorrect placement of a product increases the likelihood that a patient will receive an incorrect medication.

Decisions about the quantities of stocked medications and their placement are of key importance to the safety of the ADC system. Placing look-alike products within the same multiple-product drawer may increase the risk of product selection errors. Placing excessive quantities of drugs in multiple-product drawers may lead to doses being "flipped" between compartments. Providing excessive quantities of medications can also enable the administration of overdoses. For example, ISMP (US) reported a near miss in which a 10-fold dosing error was averted because the ADC contained an insufficient quantity of medication to administer the erroneous dose.³

Use of multiple-dose containers is a concern with ADCs, as it is in any drug distribution system. In addition to concerns regarding the potential for error when the nurse must calculate and withdraw the appropriate dose, this practice increases the amount of time spent at the ADC during the medication preparation process and may contribute to queuing problems.

The need for refrigeration presents an additional challenge. Some ADCs can be used to monitor refrigerated stock, but the system relies on a physically separated refrigerator located outside the ADC. Other ADCs contain a refrigerated cabinet or are connected electronically to a remote refrigerator.

ISMP Canada recommendations:

- Establish *independent* double-check processes for stocking and restocking medications in drawers. Use bar-code verification if possible.
- Establish a clear expectation that all unused doses will be returned to the pharmacy, e.g., by means of a locked return bin. Nursing staff should not be required to return doses to specific locations within the ADC.
- Limit the quantities of medications to be stocked in ADCs. (Restocking cabinets at frequent intervals supports this approach.)
- Carefully consider the selection and placement of medications within ADCs. Avoid placing look-alike products within the same multiple-product drawer. If override lists are used, ensure that drugs available on such lists are not stocked in multiple-product drawers along with products that are *not* available through override.⁶
- Avoid stocking multiple-dose containers in ADCs.
- Do not stock in the ADC medications that require compounding, excessive numbers of calculations, or dilutions. These should be prepared only by pharmacy staff.
- Look for ADCs that either contain a refrigerator within the cabinet or that can remotely link to (and activate a lock on) a refrigerator outside of the ADC cabinet. Both types force the user to use the ADC to retrieve a refrigerated medication.

Education

Although ADCs are deceptively simple to use, it is essential that staff be fully trained in the safe use of these machines and associated medication processes. Staff must receive education about the potential outcomes of unsafe practices such as

removing doses in advance or removing doses for multiple patients.

ISMP Canada recommendation:

- Ensure that all staff members who must use ADCs receive comprehensive education and training on appropriate ADC use. Provide a mechanism for ongoing staff support.

Learning from Reports

As with any new technology, there is much to be learned from examining information on medication incidents and near misses associated with the use of ADCs. We encourage you to report any ADC-related incidents through the ISMP Canada Web site at www.ismp-canada.org or by telephoning 1-866-54-ISMP.

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ISMP Canada is a national voluntary medication incident and 'near miss' reporting program founded for the purpose of sharing the learning experiences from medication errors. Implementation of preventative strategies and system safeguards to decrease the risk for error-induced injury and thereby promote medication safety in healthcare is our collaborative goal.

Medication Incidents (including near misses) can be reported to ISMP Canada:

(i) through the website http://www.ismp-canada.org/err_report.htm or

(ii) by phone: 416-733-3131 or toll free: 1-866-544-7672.

ISMP Canada can also be contacted by e-mail: cmirps@ismp-canada.org. ISMP Canada guarantees confidentiality and security of information received, and respects the wishes of the reporter as to the level of detail to be included in publications.

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