Technician Tutorial:
Automated Dispensing Cabinets and Devices

The use of technology in pharmacies and healthcare in general has often been seen as a way to improve efficiency and patient safety. In fact, reports from safety groups continue to push for automation in sterile compounding and other pharmacy processes to reduce errors. Some of us might think of automated dispensing devices such as *Baker Cell* machines in community settings and cabinets (*Pyxis*, etc) in hospital settings as some of the earlier technology we encountered in pharmacy practice. Their use has expanded over time and functionality has improved in many ways. It's important to know the "ins and outs" of using these cabinets and devices properly in order to optimize their benefits while preventing errors and other issues. This tutorial focuses on practical tips for working with automated dispensing cabinets and devices.

What are automated dispensing cabinets used for in hospital settings?

In the most basic terms, automated dispensing cabinets, sometimes called ADCs for short (or automated dispensing machines [ADMs for short], or automated dispensing devices [ADDs for short]), provide compartments to securely store meds. There are different brands of cabinets, such as *AcuDose*, *Omnicell*, and *Pyxis*. Some hospitals use the cabinets to store controlled substances and meds (e.g., acetaminophen, injectable hydralazine or metoprolol, regular insulin) that might be needed urgently on a patient care unit. Other hospitals use the cabinets to store the majority of meds that patients on a patient care unit or in procedural areas need at any given time. (Note that these differences can impact other workflow in the pharmacy, such as whether a cart fill is necessary for dispensing meds to patients.) Cabinets may also be used in the pharmacy to securely store meds, such as controlled substances needed for prepping doses in an IV room.

Depending on the way a hospital uses cabinets, med stock may remain mostly static (i.e., the first example above, where mainly controlled substances are stored), or it may be very dynamic (i.e., the second example above, where most meds a patient is taking are stored). Changing the meds stocked in a cabinet will typically involve "loading" a med using the computer system and possibly removing a med that's not currently being used by a patient, to make room for a new med in a cabinet. For example, some pharmacies might periodically run reports and remove meds that haven't been used in a specified time period to make room for other needed meds.

Automated dispensing cabinets help with accountability of meds since they track activity such as restocking, inventorying, removal of doses, return of unused doses, etc. And they also help with security of meds in a non-physical sense, in that they may track activity by user. Users must sign in to access meds, such as with a password or a fingerprint scan.

The most common users of automated dispensing cabinets are nurses, accounting for about 80% of transactions. Pharmacy technicians are users, of course, since they're typically responsible for managing meds in cabinets, restocking them when a supply runs low, etc. Other users include pharmacists and possibly prescribers, such as anesthesia clinicians in an operating room setting.

There may be variation in the locations where automated dispensing cabinets are placed in hospitals, such as which patient care units have them. In addition, there are different kinds of drawers or compartments where meds can be placed. For example, controlled substances may be kept in compartments with locked lids, so that only one med in an open drawer can be accessed at a time. Certain non-controlled substances may be kept in an open-grid or matrix-type a drawer.

Some cabinets might be "profiled," which means that the system is connected to patient profiles of meds that have been ordered by a prescriber. Other cabinets might be non-profiled, meaning that a user can simply sign in and have open access to remove any med in the cabinet for a patient.

What are some rules of thumb for stocking meds in automated dispensing cabinets?

The way you stock meds in automated dispensing cabinets may impact the risk of med use issues and errors. The following are some important points to consider to help ensure safety.

Choose "par" levels carefully. Having too much of a drug in an automated dispensing cabinet can increase the risk of a nurse accidentally administering an overdose. However, not having enough can increase the risk of treatment delays due to frequent stock outs and the need to restock a cabinet. Follow your pharmacy's policies on setting par levels for meds in cabinets. Other considerations for par levels might include med cost, temporary drug shortages, etc.

Check expiration dates of meds. Follow your pharmacy's policies on not placing "short dated" meds in cabinets. For example, meds with an expiration date sooner than one or two months may be prohibited from being stocked in cabinets, due to the increased risk of expired meds being accidentally administered if they aren't used up or replaced before the expiration. When stocking a med in a cabinet, be sure to enter the actual expiration or beyond-use date of the shortest dated med of the bunch, and not an arbitrary value.

Also, be sure to follow your pharmacy's policies on identifying and removing expired meds from cabinets. For example, in some cases, expiration dates may need to be checked each time a compartment in an ADC is accessed by pharmacy staff.

As mentioned, using **extra security for controlled substances**, such as locked-lidded drawers or pockets, is important. Another extra security measure is setting "blind counts" for controlled substances. This means that the user must enter the counted number of capsules, tablets, vials, etc, rather than confirming an inventory that the cabinet displays. This helps catch discrepancies in counts. If an incorrect count is entered, a discrepancy is created in the computer system, with the user's name attached to it, and resolution of the discrepancy in a timely manner will be required.

Avoid unloading emergency meds in order to make space for routine meds a patient is taking. If possible, unload a non-emergency med that is not being used. For example, you should avoid removing injectable epinephrine from a machine to make space for cephalexin capsules.

Also, **be cognizant of where you place meds** with regard to convenience and safety. Avoid placing the most commonly used meds in the very back of a drawer or up high on a tall machine, to keep nurses from having to reach far for them. And avoid placing breakable meds such as vials in spots where they could easily fall out and break.

Try to **avoid restocking automated dispensing cabinets at common med administration times** in your hospital. This can create delays if nurses have to wait, and nurses may be tempted to grab extra doses and take other shortcuts to save time. Plus, it can be distracting for nurses and for you, which could lead to errors.

What strategies can reduce errors with meds dispensed from automated dispensing cabinets?

Strategies such as separation of look-alike/sound-alike meds can be used to prevent errors when meds are dispensed from automated dispensing cabinets. For example, placing hydrALAZINE beside hydrOXYzine in an open matrix drawer could increase the chance that a nurse will remove the wrong med to administer to a patient. Not only do these med names look similar, but they also come in overlapping strengths.

Typically, you will be able to determine the location of a med when you are first loading it into the machine. So, at this step, be cognizant of other meds that will surround the newly loaded med, including different doses of the same med. Also, check your pharmacy's policy on preventing errors with look-alike/sound-alike meds for additional guidance. These policies are required to be in place by The Joint Commission (US).

Another consideration is which type of compartment a med should be loaded in. For instance, high-alert meds such as insulin, or meds that are prone to diversion such as opioids, should not be loaded into compartments with open access, such as open matrix drawers. And whenever possible, individual doses of meds should be used to stock cabinets, rather than bulk or multidose containers.

Organize meds when setting up to restock cabinets before you even leave the pharmacy. For example, place each different product in a separate bag. If cabinets require barcode scanning prior to restocking, follow proper procedures and avoid workarounds, such as scanning one package multiple times if each package should be scanned. Try to avoid interruptions or distractions once you reach the cabinet and start restocking. (As mentioned, cabinets should generally not be restocked during common med administration times.) These measures can help prevent accidental misfills of meds that could lead to the wrong med being dispensed and administered.

Also, be sure to comply with your pharmacy's policies on having double checks of meds, especially high-alert meds such as heparin or insulin, prior to restocking automated dispensing cabinets.

Speak up about any issues that could lead to confusion, such as if the drug name on your pick list, the med label, and the cabinet display don't match. These should be standardized to help prevent mix-ups.

An additional measure to consider is watching out for packaging changes that could be confusing to nurses. Alert your admin to encourage communication with your nurse colleagues to prevent errors. One example is the labeling change of meds with ratio strengths, such as epinephrine and isoproterenol, to mg strengths. Also watch out for any look-alike packaging that could lead to errors. For example, *Cardene* (nicardipine [US only]) and *Nexterone* (amiodarone) premixed drips (US only) come in similar boxes, and the same size and type of IV bags.

Another important safety issue is the use of "overrides." This refers to a clinician removing a med without having an order for the med or without having the order for the med reviewed by a pharmacist. One of the problems with the override function is that problems such as duplicate therapy, patient allergies, or inappropriate dosing can be missed. Or the wrong med could be removed from the cabinet. This is why the use of overrides should be limited to situations where a delay could result in patient harm. For example, injectable epinephrine may be needed immediately if a patient has a serious allergic reaction, such as anaphylaxis, where their airways swell and breathing becomes difficult. In fact, hospitals typically have a list of meds that are allowed to be accessed on override, along with which patient care units and clinicians can access them. And in some cases, a system can be set up so that certain meds can't be removed from cabinets using override.

Last but not least, regularly observe the area where cabinets on your units are placed. Problems such as dim lighting or a tight or chaotic location could increase the risk of errors. Let your admin or medication safety officer know about any potential issues, so they can work with nursing colleagues to come up with a solution.

How do automated dispensing devices work in the community pharmacy setting?

In the community setting, automated dispensing devices work differently, but they have similar benefits as in the hospital setting. These include streamlining workflow and controlling inventory. The extent of benefits can depend on the type of device. Some devices (e.g., *Baker Cell* machines, *Kirby Lester 1*) simply count pills, while others (e.g., *Parata Max*, *ScriptPro*) also label prescription vials and track inventory. The more advanced devices are often referred to as robots.

Similar errors can occur with automated dispensing devices in the community setting as well, such as filling the devices with the wrong meds, incorrect strengths of meds, or expired meds.

What are some rules of thumb for using automated dispensing devices in the community setting?

It's easy to see how the same care must be taken when working with automated dispensing devices in the community setting as in the hospital setting. Here are some helpful tips:

- Use your own sign in or badge to access the device.
- Match the information on stock bottles with the information on the cell before filling it with medication. Check NDC (or DINs in Canada), keep a close eye on drug strengths and suffixes, and be extra careful with look-alike/sound-alike meds. Always scan bar codes as a double check.
- Follow pharmacy policies on meds that should not be placed in the automated dispensing device (e.g., hazardous meds, original container meds).
- Do a visual check to make sure the meds in the cell match the ones in the stock bottle, especially if you use multiple bottles to fill cells, return a med to stock, or are interrupted during this step.
- Follow your pharmacy's policy on having a double check when you refill a cell.
- Don't mix meds from different manufacturers in the same bin or cell. This can lead to patient confusion and throw off inventory counts.
- Make sure each cell or bin is properly labeled with the drug name, strength, NDC number (or DIN), and expiration date, and that bar codes on labels are readable.
- Avoid adding broken tablets, package inserts, cotton, or desiccants into cells.
- Follow your pharmacy's policy and the manufacturer's instructions for calibrating, cleaning, and maintaining automated dispensing devices.
- Consider doing "sample" counts weekly to check the accuracy of automated dispensing devices. Devices can miscount if they aren't calibrated correctly.
- For robots, make sure supplies such as labels and vials don't run out to avoid delays in the dispensing process.

What are discrepancies in automated dispensing cabinets and how should they be handled?

As mentioned, a discrepancy in an automated dispensing cabinet typically refers to a difference between the amount of a med in a drawer or compartment and the amount of the med that's SUPPOSED to be in the drawer or compartment according to computer inventory. For example, if a cabinet's inventory of immediate-release oxycodone 10 mg tabs is 23 tabs, but a nurse opens the drawer and finds 21 tabs, there's a negative discrepancy.

Discrepancies with non-controlled meds can happen when a nurse takes out more than one dose at a time for a patient or for multiple patients. This is a workaround that can increase the risk of errors, but most often, is not as critical to be resolved. On the other hand, a discrepancy with a controlled med is a very big deal and should be addressed as soon as it's discovered and before the end of the involved parties' shifts. Reasons for these discrepancies could range from a simple miscount to actual drug diversion, administration of an incorrect dose, etc.

What issues come up with operation of automated dispensing cabinets and devices and what are tips for addressing them?

Malfunctions with automated dispensing cabinets and devices are not uncommon. They can be very simple, such as a medication package sticking out of a cabinet drawer causing it to jam. On the other hand, malfunctions can be more complicated to resolve, and may require calling the vendor for assistance.

Be familiar with the steps required to troubleshoot problems with the type of automated dispensing cabinets in your hospital or automated dispensing device in your community pharmacy. Discourage measures such as kicking or shaking a machine. These can make the user feel better but do little to resolve the actual issue! Keep the vendor's phone number handy, in case you need to contact them on your shift. Having this information close by can help resolve problems quickly, minimizing the need for workarounds and workflow interruptions.

If there are updates to functionality of automated dispensing cabinets or devices, ensure that you are trained properly on these, and ready for them when they go live. They may be limited to a new safety feature, or the system may be upgraded completely. Even better, if you know that changes are coming, provide feedback to an appropriate person to help avoid unanticipated snags. Input from frontline staff can be very valuable; you may know details about workflow that would be critical to consider but may otherwise be overlooked.

What information can I get from an automated dispensing cabinet?

One benefit of automated dispensing cabinets is that they can provide records of activity. Here's an example of a practical application. Say there's a shortage of a particular med, and your administration has decided that it's most important to reserve doses of that med for pediatric patients. A report can be run to show which cabinets contain the med, and possibly how much of the med is in each cabinet. This is helpful because pharmacy staff can target these machines to remove the med from adult patient care units and redistribute it to pediatric units. Another example is if a med is recalled. A report can be run to see which cabinets have the med in stock, and efforts can be directed to those cabinets to check for recalled lots.

Functionality for running reports can vary between systems, so check with a pharmacist or an administrator if you need help learning what reports you can run, or are required to run, for your automated dispensing cabinets. A required report might be one that tracks the use of overrides by nurses, to make sure that the use of overrides was limited to appropriate situations such as emergencies and not routine administration of meds.

Cite this document as follows: **Technician Tutorial,** ***Automated Dispensing Cabinets and Devices. Pharmacist's Letter/Pharmacy Technician's Letter.*** **March 2023. [390382]**

--Continue to the next section for a "Cheat Sheet" for Automated Dispensing Cabinets and Devices--

"Cheat Sheet" for Automated Dispensing Cabinets and Devices

What are automated dispensing cabinets used for in hospital settings?

- Automated dispensing cabinets (ADCs), also referred to as machines (ADMs) or devices (ADDs), help provide secure storage to meds both outside and inside the pharmacy.

What are some rules of thumb for stocking meds in automated dispensing cabinets?

- Place reasonable quantities of meds in cabinets, so very frequent restocking isn't required, but also so an excess quantity is not available for administration to patients.
- Avoid placing meds that'll soon be out of date in cabinets in most cases. Enter actual expiration or beyond-use dates of meds when stocking cabinets, not an arbitrary value.
- Avoid placing controlled substances in compartments with open access, to help prevent diversion.
- Keep in mind that emergency meds may need to be kept in cabinets at all times. Avoid replacing these with non-emergent meds.
- When loading meds into a cabinet, be aware of potential issues such as look-alike/sound-alike drug names, or physical barriers such as placing fast movers on high shelves in a tower.
- Avoid restocking cabinets at common med administration times.

What strategies can reduce errors with meds dispensed from automated dispensing cabinets?

- Load meds into appropriate locations, such as by placing high-alert meds in compartments with locked lids as an extra safeguard.
- Prevent misfills of cabinets by keeping meds for restocking cabinets organized in the pharmacy, such as by placing different products in separate bags.
- Follow your pharmacy's policies for having meds that are meant for restocking a cabinet double checked before leaving the pharmacy.
- Check to be sure med names match on pick lists, med labels, and cabinet displays.
- Follow your pharmacy's policies that apply to overrides from cabinets.
- Report any potential issues about locations of cabinets, such as dim lighting or a chaotic area.

What are discrepancies in automated dispensing cabinets and how should they be handled?

- A discrepancy is when the physical count of a med does not match the computer count.
- Help ensure discrepancies are resolved in a timely manner, or reported to the appropriate person if they are not or cannot be resolved.

What issues come up with operation of automated dispensing cabinets and what are tips for addressing them?

- Malfunctions of cabinets are not uncommon. These can prevent meds from being removed, which could delay patient care.
- Cabinet malfunctions may be caused by something simple, such a jam in a drawer, or something more complicated requiring technical assistance from the vendor.
- Know how to troubleshoot cabinet issues. Have needed contact information on hand in case the vendor must be called to help resolve an issue.

[March 2023; 390382]