



# Leveraging Automation To Optimize **Inventory Management:** What Goes Around, Comes Around

**THERE ARE TWO BASIC PRINCIPLES OF PHARMACEUTICAL INVENTORY** management:

- ▶ Provide appropriate levels of formulary medications to assure ready access.
- ▶ Limit medication variety and volume to maintain security and control over the supply.

Some of the biggest and most common challenges in inventory management are the manufacturer's back order and inevitable drug shortages, of which we have had about 150 in the past year. A rapid and unexpected increase in demand can also present inventory management challenges. High-cost, slow-moving products can also be tricky to manage. While you rarely use them, you have to keep them on the shelf — and they cost a fortune. You want neither too little, nor too much, of these products in your inventory.

So how do you ensure that you will have a regular supply of pharmaceuticals, so that a just-in-time inventory model actually works? How do you plan for patient care when dealing with shortages with little or no notice? Do you end up overstocking those types of items on purpose?

The goal of inventory management is to prevent hoarding — a natural human instinct. When we think something is in short supply, it is our habit to tuck as much of it into a cubbyhole as possible. However, in the hospital, this practice is simply not economical. The expense and potential for waste associated with overstocking make it an impractical practice. To wit, decentralized distribution is vulnerable to overstocking; because of pharmacy's lack of centralized control over drug inventory, you are less likely to know what inventory you have on hand in unit-based automated dispensing cabinets. As such, it is imperative to keep tight control over your inventory across the continuum of care.

## The Inverted Reward System

Inventory managers and technicians are usually recognized for not running out of stock, not necessarily for having the “right” amount of stock. Think about it: If you are constantly berated for running out of a particular drug, your tendency will be to order more of it to make sure you always have plenty on hand. Everyone thinks you have done a great job in managing your inventory because your stock never runs out. Overstocking is a natural habit, and is encouraged by this inverted reward system. However, it is important to realize the negative impacts of increased inventory and fight the urge to overstock.

## Closed or Open Formularies

Some hospitals carry 5,000 different drugs in their inventories, and they boast that

they never have non-formulary requests. Of course, they don't; they are carrying every drug in the world already. Keeping a tighter inventory, with only a few drug selections in each class, can present challenges. So why not expand the formulary for patient convenience? For one, that practice increases the pressure to keep more items in stock, and it puts a good deal of demand on pharmacists, as they are responsible for knowing the nuances of each drug they dispense. In addition, the larger the formulary, the more look-alike, sound-alike drugs there will be. So a larger formulary



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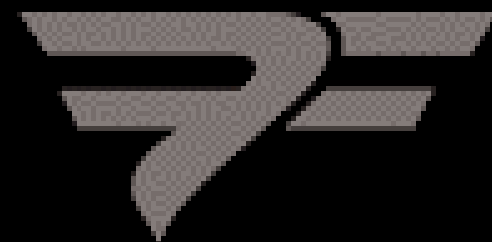
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**To combat overstocking**, you should first **establish reasonable par levels** for your carousel, as well as any unit-based automated dispensing cabinets utilized on your nursing units.

can increase the chance for medication errors, and likewise, a tighter formulary can reduce them.

### The Financial Impact of Overstocking

A lot of people are fairly naïve about the financial impact of overstocking. They think, “What difference does another bottle on the shelf make?” First, think of the storage itself and the space your shelving takes up. Capital equipment like pharmacy shelving and storage can be a costly investment. For instance, in 1958, the Ohio State University Medical Center spent \$6,500 for pharmacy shelving. That may not sound like a lot of money, but in those days, the director of pharmacy made \$6,000 a year.

Stocking and handling excess inventory can also have a financial impact. Every time you touch your inventory, you incur labor expenses. The more drugs you have in stock, the more drugs you have to count, and the more likely you are to spend an exorbitant amount of time managing expiration dates. In addition, you are more likely to waste expired drugs, especially slower-moving items. It has been estimated that it costs 15 cents to keep a dollar’s worth of inventory in stock. Let’s extrapolate that: For every \$1 million dollars of excess inventory, you incur an additional \$150,000 in inventory management costs. That staggering figure is one of the key reasons you want to drive down your on-hand inventory and, subsequently, your overstock costs.

### Improved Inventory Control

So how do you improve inventory control? First, you have to take a look at your opportunities to decrease your on-hand inventory, and subsequently increase your inventory turnover. Second, you have to decrease your risk of “shrinkage” — a term used to describe the loss of drugs through theft, damage, and product expiration. Drugs on an open inventory shelf can lead to shrinkage; there will inevitably be employees who take advantage of unsecured inventory. In addition to reducing the risk of shrinkage, securing your drug inventory can also decrease your risk of adulteration. For instance, there have been tragic instances in which drug stock has been replaced with water, which was then used in patient care. In these cases, there was so much uncontrolled stock it was possible to move medications in and out of the pharmacy undetected. Therefore, having excess stock makes it harder to control your inventory, and any unsecured stock in your pharmacy is at risk for shrinkage or adulteration. In addition to increased security, improved inventory control can also lead to increased operational efficiency. It is a lot easier to take care of a short inventory list than it is to keep track of months and months of back stock.

### How Will Automation Help?

Fortunately, there are automated ways to both store and track your drug inventory. In automating some of our pharmacy operations, the Ohio State University Medical Center sought to increase the speed of drug storage and retrieval; we wanted to be able to quickly put drugs away and access them again. We did not want to spend time searching for drugs. Automation can also eliminate the risk of misplacing inven-

tory. It is not uncommon for pharmacies to order more of a particular drug because the staff cannot find it on the stock shelves. In other words, you may end up with excess inventory simply because a particular drug was not stocked on the appropriate shelf. Automation can also improve medication security, particularly if your medication storage area is geographically distinct from your pharmacy’s distribution area. Furthermore, automated equipment can increase the accuracy of distribution and streamline your wholesaler ordering process.

Another way automation can help is by decreasing your overall inventory and increasing your overall inventory turns. Doing so will have a positive impact on your hospital’s bottom line.

Automation can also increase your staff’s satisfaction with their jobs. Think about it: Employees charged with stocking shelves have a rather mundane task to perform, and may not realize that their actions impact the hospital’s bottom line and contribute to the facility’s mission. After an automation implementation, they may become more aware of the importance of their activities, the role they play in increasing inventory turns, and their ultimate impact on the hospital’s bottom line. What they may have once considered a mundane task is really an essential component of the economic well being of the hospital. Obviously, this adds to job satisfaction.

### Why Carousel Technology?

So what automation is out there? Drug storage and retrieval carousels offer compact storage for your pharmaceutical inventory. The carousel’s footprint and efficient, vertical use of space takes up substantially less room than standing shelves, and because it is compact, it is often possible to place a carousel at the geographical area of distribution. At the Ohio State University Medical Center, we wanted to place our carousel within feet of our unit dose packaging area, and its size enabled us to do so, thereby closing a gap in our medication management system.

In addition, because it is able to hold thousands of line items, one carousel can service your health-system’s main pharmacy, as well satellite locations, thereby increasing efficiencies and improving inventory control across the system. The carousel’s inventory management software platform can also be used in satellite locations and IV rooms to create a perpetual, real-time inventory system across the health system. Doing so will not only help you better manage your drug inventory across locations, but may also help you gain more leverage when negotiating wholesaler contracts and allow you to set more accurate par levels for those locations.

Secondly, carousels enable pharmacies to adjust easily to volume changes in medication distribution. For instance, if your carousel is interfaced with your unit-based automated dispensing cabinets, you can quickly determine if you need to pick medications for more or fewer cabinets on any given day.

Carousels can be programmed to communicate directly with your wholesaler in order to streamline the ordering process. If a particular line item drops below its des-

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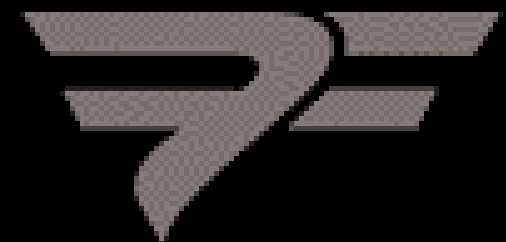


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Photo courtesy of McKesson Automation

ignated par level, the carousel will send an electronic order to your wholesaler, ensuring that there is always an appropriate amount of that drug in stock. This highly automated ordering process takes a time-intensive task off of pharmacy's hands.

### Investing in Automation

Naturally, you will ask:

- ▶ Is it worth the investment?
- ▶ Will the technology actually save your personnel time in completing their daily responsibilities?
- ▶ Will the improvement in inventory control "pay" for the technology?
- ▶ How can you justify the initial investment to administration?

We recommend that you do not suggest that the new machinery will replace a certain number of technicians. People are not motivated to make a machine work so well that it will replace them. Perhaps the best way to justify the purchase is by illustrating the potential for reduced inventory and increased inventory turns. Those factors can easily pay for the equipment. Or justify the purchase by highlighting the ways in which the carousel will maximize your use of your unit-based automated dispensing cabinets, for instance. That kind of information will appeal much more to administration than leveraging the technology against your personnel. In addition, your personnel will respond bet-

ter to the technology, post-implementation, if you use that justification, and high staff morale can ultimately aid workflow efficiency.

### Logistical Concerns

If you decide to implement carousel technology, you will have to take a close look at the size and the weight of the equipment. Carousels are quite heavy, so you

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SOPs will differ from hospital to hospital, but once you **find a process that works for your facility**, document it and train all of your staff to follow it.



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may want to make sure that your floor can support their weight. You may need structural engineers to inspect the space and give the “OK.” The height of the carousel must also be considered in relation to your pharmacy’s ceiling height. In addition, we found that taller carousels rotate their shelves a bit slower than shorter carousels.

You will also want to install your carousel in an area that facilitates workflow and does not block the movement of your staff. For instance, if you are implementing more than one carousel and want them to face each other, be sure to allow enough space for at least one staff member to work at each carousel simultaneously, in order to ensure an efficient picking process.

Finally, you have to consider ergonomics. You want your employees to be comfortable working at the carousels. Make sure the carousel is the proper height to accommodate them comfortably as they pick medications while in a standing position.

### Managing the Machinery

You should recognize very early on that a carousel without proper management is just machinery. In other words, managing the machinery is a vital component to the process of inventory management. As such, it is of the utmost importance to implement improved processes, in addition to the carousel itself, if you want to see a true improvement in your inventory management.

Overstock is both an operational and an inventory challenge. To combat overstocking, you should first establish reasonable par levels for your carousel, as well as any unit-based automated dispensing cabinets utilized on your nursing units. When setting your par levels, consider your wholesaler delivery schedule; what is the longest time you have to go without a delivery? You should also keep your operational set-up and resources in mind; determine your financial goals and set par levels to achieve them.

You should also make it a goal to increase your inventory turnover rate. In 2004, the Ohio State University Medical Center had an inventory turnover rate of just over 11

turns per year – a little less than one turn per month. Our central pharmacy also services two satellite pharmacies in rural locations. Prior to implementing the carousel, we utilized a manual medication picking and delivery system. We had rolling shelves in an area that was geographically separated from the main operations of the central pharmacy, and we manually picked medications based on low inventory reports generated by the unit-based cabinets. In addition, due to security concerns, only one person could pick medications at any given time. We ordered drug stock based on what was running low on the shelves, using a perception-based, rather than numbers-driven, method. This “walk the shelf” method for picking and ordering was certainly inefficient. Furthermore, we had no established practice for helping our employees manage their time. Staff members could print low-inventory reports in the morning and then again in the afternoon, choosing to pick some medications early in the day and the rest later on. So, in implementing carousel technology, we also sought a way to better manage the pharmacy staff’s time.

Our initial priority was to eliminate some of our overstocked inventory. We wanted to remove drugs from our inventory that were not turning over, and we wanted to increase our annual inventory turns to 14. It was also our goal to stock a majority of our inventory in the carousel, in an effort to create a centralized inventory universe, so to speak.

We also wanted to establish an optimal method for par-level analysis and determine how many days’ worth of inventory we needed on-hand, since there are obviously fees associated with replenishing our stock too frequently. We needed to strike the right balance for our carousel and unit-based cabinets.

Lastly, and perhaps most importantly, we needed to educate and train our staff in best practices for inventory management. We wanted to instill in our staff an understanding of inventory turnover and how the quantity of a drug on-hand relates to the quantity that should be ordered. It was also important to educate the staff on the cost of holding inventory, as well as the vital role communication plays in stocking appropriate levels of drugs. For instance, we urge our staff to inform management if they notice that some items are moving more quickly than they used to. Likewise, they should speak up if they notice an item is on back order, since therapeutic equivalents of that drug will likely experience a higher demand as a result. So across-the-board communication of inventory-related issues is essential to a successful inventory management program.

### Formulary Management

An initial step in improving your inventory is identifying items that should be removed or added to your formulary. Items with little to no usage should be reviewed, as well as those items that may have other clinical equivalents.

### Performance Measurement

Your action plan for improving inventory management via the implementation of pharmacy automation should include the development of measurements for regularly tracking your performance. It is important to define metrics that will keep you informed of how you are doing in your efforts to reduce overstock and improve efficiency. It is simply not enough to say, “We have fewer drugs, and



For every \$1 million dollars of excess inventory,  
you incur **an additional \$150,000 in inventory management costs.**

we're doing a good job of getting our inventory into the carousel."

The Ohio State University Medical Center developed a measurement tool to monitor its performance on a monthly basis. Of the 4,000 items in our formulary, 96 drugs account for about 80% of our purchases. We refer to those 96 drugs as our "Top 80%." We track the inventory turnovers of the Top 80% on a monthly basis, and then annualize that number in order to better illustrate inventory management trends. Our goal is to increase our annualized Top 80% inventory turnover rate to 50, thereby replenishing those top 96 items once per week.

### Calculating Your Inventory Turnover Rate and Par Levels

Why is inventory turnover so important? Obviously, an increased turnover rate means less waste and expense associated with expired medications. In addition, the cost of holding inventory can be exorbitant.

Inventory turnover is calculated by dividing the quantity purchased by the quantity on hand. So if you purchase 10 units, and you have two left, your monthly turnover rate is five and your annualized turnover is 60. In order to increase your turnover rate, it is vital to calculate the appropriate par levels for your carousel and your unit-based automated dispensing cabinets. At the Ohio State University Medical Center, we perform a quarterly analysis of our usage in each of our machines. We then calculate our par levels based on six to 12 months' worth of dispensing data.

### Technology Functionality

Optimize your use of carousel technology; do not use it just for the plain and simple tasks. Dig down into the technology and utilize every available functionality, because that is how you will get the most out of your investment.

### Lessons Learned: People, Systems, and Procedures

Recognize good inventory practices. For instance, recognize your staff if they point out a line item that is not moving as quickly as it used to, or one that is suddenly moving very quickly. It is also important to communicate your efforts and results to the staff. The staff needs to see the impact that they are making. They need to fully understand how inventory management affects them, the pharmacy, patient care, and the hospital's economic well-being.

You should also develop cross-functional inventory management teams. For example, at the Ohio State University Medical Center, our purchasing staff and our main pharmacy staff communicate with each other to explain what is happening in purchasing, versus what is happening in the patient care units. That team helps to ensure that we are stocking the right amounts of the medications our patients need. Unfortunately, the carousel alone will not manage your inventory for you. Inventory is managed by devoting resources to staff education, inventory-control technology like carousels, and defined processes and procedures for the management of that technology. It is very important to remember that.

It may also be helpful to continually educate your staff on the

financial impact of inventory management practices. The importance of inventory turnover and the cost of holding inventory are two things you cannot stress enough. To ensure that your staff adheres to your policies and achieves sustainable results, develop an inventory management culture, implement control measures, and select an operations structure that is trainable. We are not here to produce great results today and tomorrow do nothing.

### How Does Technology Pay for Itself?

Carousels are traditionally known for being reliable and robust, and as such, you are not likely to incur considerable expenses from repairs or maintenance. Furthermore, carousel inventory counts are highly accurate. Therefore, you can confidently allocate the FTEs formerly spent on verifying inventory counts to other activities within the pharmacy. In addition, by integrating your automated dispensing cabinets and your carousel, you are able to optimize both technologies to the ultimate benefit of your pharmacy. At the Ohio State University Medical Center, we have integrated our carousel and unit-based cabinets to optimize our operational workflow. The cabinets interface with the carousel to let us know what to pick and where to deliver it. Also, you can work to set par levels that correspond between the two systems. Both our carousel and our cabinets are set to refill every six days, helping us maintain consistent inventory in both systems.

Lastly, carousel technology can pay for itself via the improved management of your drug assets. After implementing carousel technology and improving our processes, the Ohio State University Medical Center saw a 43% drop in its inventory value – from \$2,882,075 to \$1,646,549 – and we increased our annualized inventory turns from 11.32 to 19.50.

### The Bottom Line

Establishing efficient standard operating procedures (SOPs) is of the essence. At Ohio State, we pick 800 to 900 line items out of the carousel per day. Two people perform that pick in 2.5 to three hours, including interruptions in workflow for emergency medications. All told, 3.5 FTEs deliver approximately 1,400 items, including IV solutions, to our 100-plus unit-based automated dispensing cabinets every day. And we are only able to achieve this level of efficiency due to our standard operating procedures. SOPs will differ from hospital to hospital, but once you find

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a process that works for your facility, document it and train all of your staff to follow it. Of course, if a better procedure is developed, make adjustments to your SOPs. However, you need to establish a baseline for performance.

Lastly, remember that technology, along with proper management, delivers sustainable results. For instance, in our pharmacy, we anticipate another \$100,000 to \$200,000 reduction in inventory value this year, and we hope to reach our goal of 20 annualized inventory turns for 2006. In summation, if you define only three goals for the implementation of carousel technology, let it be these:

- ▶ To use the technology to its full functionality
- ▶ To establish a culture of inventory management by educating your staff on the technology and their role in inventory value reduction and increasing inventory turnovers
- ▶ To develop measurements for tracking your performance in improving inventory management

In meeting these goals, you will be well on your way to achieving sustainable improvement in inventory management. ■

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