
# Outpatient Pharmacy Inventory

## *Overview – Enhanced Staging*

***"Envision and Think In Terms of the Future State"***

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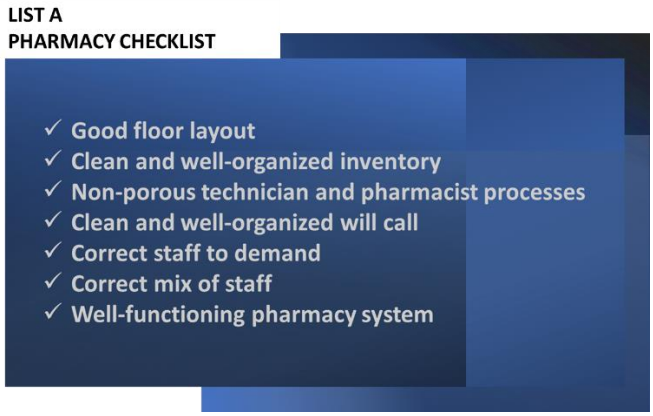
*If "football is a game of inches", then outpatient pharmacy success is a game of seconds.*[1]

Complex hospital market demands cause inventory design and layout to assume greater significance in an outpatient pharmacy pick-to-delivery cycle than drug chain pick-to-production cycles.[2] The former is patient-centric and focuses on the speed at which stock moves from storage to the patient. This means that transformed process, mechanics, technology, and production channel output rates play a larger role in how and where to store inventory.

All forms of inventory staging[3] are *in-scope* for pick-to-delivery models. The goal is to deliver on-demand product to the consumer at the right place and time. This means that *post*-production staging is as important to inventory decisions as pre-production and production staging. Importantly, production channels *must* be in-sync with the *delivery potential* of the staged inventory.

### *Measuring Right*

Because this article includes mechanicals to stage inventory, it is important to caution readers that the *starting point* for all calculations is a *well-run* pharmacy. Your *first* option is always to improve operations with what you have. Consultants and vendors love to see a poorly run pharmacy because it makes their solutions much easier to sell. I recently viewed a testimonial for a machine that credited it for reducing technician count from seven to two. The only problem is that the machine output rate was not the equivalent of five well-trained technicians working in a well-run pharmacy. The oversized mechanical was a costly solution to poor training and management.




Measuring right also means each machine and task are subject to a *marginal* return analysis. *More is not always better*. A client asked for a review of a proposal to replace their old cell-based filling machine with the newest (far more expensive) machine on the market. According to the proposal, the new machine was a slam dunk. However, the review showed the analysis did not consider the intrinsic and extrinsic value of the existing machine. The marginal return on the additional features indicated the investment would *never* pay for itself.

**LIST B**
**MARGINAL ANALYSIS**

**FINANCIAL**

- ✓ Does each feature it provide a marginal return
- ✓ What is the payback period
- ✓ Maintenance contracts

**CONSUMER VALUE**

- ✓ Does it add consumer value
- ✓ Does it reduce pick-to-delivery time

**PRODUCTION CHANNEL RATE**

- ✓ Does it reduce cycle time
- ✓ Does it provide multi-channel capability
- ✓ What is the thru-put rate per minute

**TRAPS, INTERRUPTS, AND LEAKAGE**

- ✓ What is the cycle recovery time
- ✓ What is the error repair time
- ✓ What is the attendance duration
- ✓ What is the attendance frequency

- ✓ What is the back-end time
- ✓ What are the machine interrupts
- ✓ What are the refill requirements and frequency
- ✓ What is the leakage time and frequency
- ✓ Continuous or discontinuous process
- ✓ Divisible gates

- ✓ Does it reduce/eliminate administrative time

List B identifies some of the factors to consider for every increment in machine or fixture feature. These are questions hospitals should ask vendors, as well as calculating for themselves. Consumer Value deserves a special note. Drug chains rarely, if ever, invest in machines which enhance *consumer* value. Hospitals should capitalize on this and recognize the value of low wait time, increased benefits, education, virtual counseling, convenience, and comfort have for their patients and for increasing revenue.

### *Goals for Inventory*

All outpatient pharmacies face the challenge of serving 100% of hospital market scrip potential. One problem is that traditional inventory design focuses on the production cycle rather than delivery rate. Inventory design emphasis is to organize stock for lowest cost picking and to feed a common production channel. The drug chain conversion cycle for raw to finished product, including mechanicals, is not fast enough to serve a complex market with limited windows of opportunity.

Illustration A sets out three outpatient pharmacy inventory goals. First, the pharmacy must store or have ready access to all prescriber drugs. Second, inventory type mix must optimize the pick-to-delivery time. Inventory type refers to how the inventory is stored in an enhanced stage. Finally, pick and return stock task must minimize resource leakage.

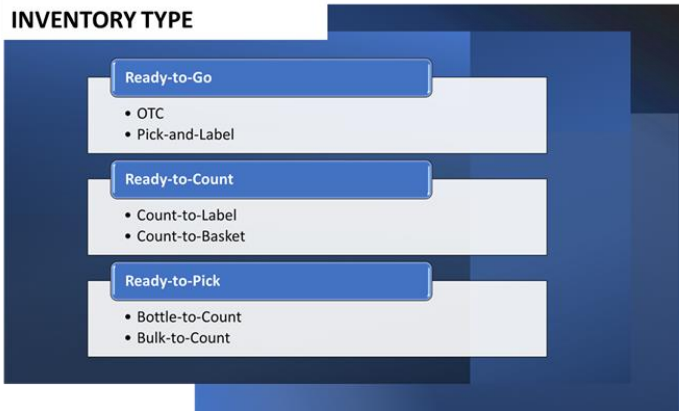
**ILLUSTRATION A**
**INVENTORY GOALS**

The *brand* goal is for a patient **to go directly home** with **all** medication and supplies necessary to begin recovery. This begins with *effective* marketing[4] and finishes with filling all the patient's drug orders. The outpatient pharmacy cannot partially fill prescribed drugs as chains often do. Patients must see and experience the value of changing their drug chain routine. This is especially true for *repeat patients* who are unlikely to use the brand again if they ultimately went to their local pharmacy following a previous discharge.

Most clients carried a fraction of the drugs required by patients despite access to prescribers and prescribing data. Intelligent, low-cost, user-friendly systems make use of electronic patient data to ensure all drugs are available on-demand.[5] We will touch on this later and in other articles. Rest assured that technicians can easily perform this inventory management function with the right system.

**Staging inventory mix** to maximize the pick-to-delivery rate is the second requirement of enhanced inventory. Drug chains and independents utilize (often unknowingly) limited staging methods. They may use a form of ABC stocking and/or quick shelf to place higher frequency drugs closer to workstations. Robotics improve on the ABC method by staging inventory upstream in a *ready-to-count* queue. Despite these steps, however, retail drug stores are still unable to effectively deliver on-demand … a key requirement for outpatient pharmacy.

**ILLUSTRATION B**
**INVENTORY TYPE**




The fastest type of inventory staging is the **Ready-to-*Go*** class in Illustration B. Counter-ready OTC and upsell items, boxed inventory, and finished goods (WIP) inventory ready for labeling are three examples of this class. There are some very good box inventory mechanics that support the first two examples. WIP inventory may require custom racking or other forms of enhanced shelving.

The **ready-to-*count*** class includes pre-staging inventory *in* mechanicals. Vendors offer a wide range of these machines from stocking only (RxSafe®) through the complete stock-to-capping (Parata Max®) cycle. As noted earlier, more is not necessarily better when it comes to mechanicals. Hospitals most carefully examine the tradeoffs as increased task automation is added to the more expensive mechanicals, the most significant of these is loss of flexibility and time.

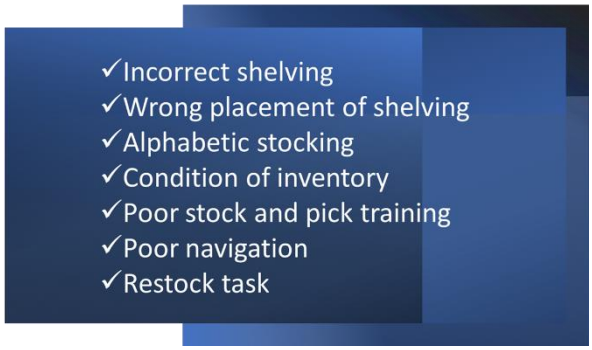
Unfortunately, vendors designed mechanicals specifically for pick-to-production systems of the retail drug market. These solutions only offer *sequential* processing. This is a shortcoming for outpatient pharmacy because it causes counter queues to rapidly outsize delivery capacity leading to balks, reneges, and *brand suicide*.

The third and slowest general class of inventory is **ready-to-*pick***. Most retail drug store inventory falls into this class and is the least desirable for a pick-to-delivery model owing to the potential for significant leakage. Drug chains get away with using standard 'dumb' pharmacy shelving because they pass any leakage on to the patient. This type of retail drug shelving is not an option for a successful outpatient pharmacy under any circumstances.[6]

*A word about leakage …*

Leakage is the loss of value by non-productive use of labor or machines resulting from *avoidable* delays in a process or task. Eliminating leakage is one the primary goals for back-end pharmacy design. Avoidable leakage contributes to staff stress, lower production rates, diminished revenues, and pressure to reduce staff. It also leads to bad investment decisions which potentially reduce revenue. Diagram B lists some of the most common causes of inventory born leakage.

**DIAGRAM B**
**INVENTORY LEAKAGE**



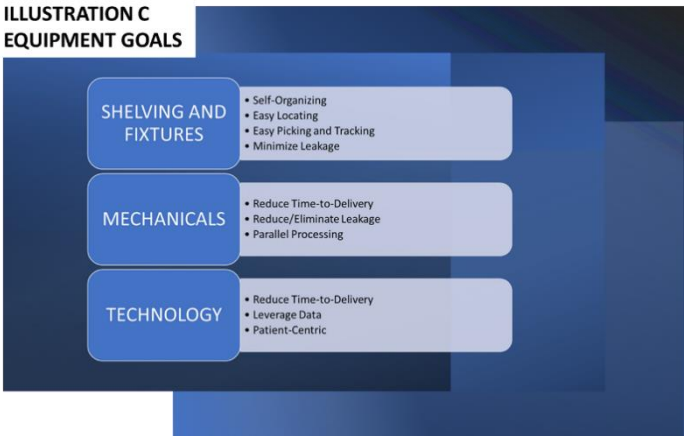
*A Word About Staff versus Technology …*

We need to talk about the gorilla in the room before we move on to inventory goals for mechanicals. Drug chains use mechanicals to reduce *dependency on pharmacists and technicians*.[7] The goal for mechanicals is to reduce cost per scrip. In this context, retail drug stores favor mechanicals *over* staff. Again, this is possible because drug retailers are '*the only game in town*'. Consumers must adapt to the retail delivery models (long wait, come back later, come back another day, order ahead, etc.), or go without medication as a frequently quoted 25% of patients do.

Outpatient pharmacy models must *favor staff* to technology. This does not mean these pharmacies cannot avail themselves of mechanicals and technology. It means the focus for mechanicals and technology must be to ***generate revenue.***[8] The successful patient-centric pharmacy relies on staff to deliver better patient benefits and experience at the right time and place.

***Inventory Goals for Equipment***

Equipment must improve the rate at which inventory moves to the patient. Unfortunately, outpatient pharmacies must use the same storage mechanicals and fixtures designed for retail stores and *innovate* to enhance inventory. This innovation changes *how* and *where* the pharmacy uses equipment. Illustration C identifies some key goals for equipment.




**Shelving** can perform two functions, storage and staging. Retail drug store basic pharmacy shelving function as storage. Its sole purpose is to *hold* inventory in the least expensive manner possible. Outpatient pharmacy pick-to-delivery models require enhanced shelving and fixtures to *stage* inventory and maximize delivery rate. A subtle but important difference.

Enhanced shelving must have features to make it easy to stock/restock, maintain separation between drugs and maintain orderly stock. It must also prepare stock for easy locating and picking. Pharmacies must stage inventory in its *most deliverable* form. *Complementary* items must be located (or even pre-packaged) adjacent to each other.[9]

There are ready-made shelving options available in the market that will satisfy some of the required staging functions. Keep in mind that shelving does not need to be expensive, but it needs to be functional. It must optimize the staging footprint and close (time or distance) to workstations or mechanicals. Examples would be:

- ✓ Metal shelving with movable channel dividers (expensive; lower cost alternatives exist)
- ✓ Adjustable engineered wood shelves combined and attachable channel dividers
- ✓ Pick-to-light shelving

It is important to keep in mind that fixtures and mechanicals must integrate with a designed workflow rather than requiring workflow to be designed around them. Fixtures such as carousels take up too much space and do not offer the same staging capacity as traditional shelves. These special use fixtures are difficult to effectively integrate with production workflow, especially high-rate pick-to-delivery models.

When it comes to **mechanicals**, it is important to start at the beginning … an *effective* and *efficient* manual process … and work your way up the mechanical ladder (if you will) when evaluating which mechanical best fits your required processes and workflow. At each rung of the ladder, you need to analyze if the new feature reduces time-to-delivery, reduces leakage without negatively affecting time to delivery, and allows for parallel processing. Your marginal analysis (financial and economic value) should always weigh in favor of leveraging staff to increase output and revenue.

Inventory mechanicals are available ranging from the simplest counter to elaborate machines capable of performing staff tasks from pill counting through capping in a *sequential* process. These machines stage inventory in canisters eliminating some of the shelf pick time and leakage. However, the offset is leakage and interrupts caused by regulated use of these canisters with respect to drug lots, manufacturers, etc. 90-day orders can quickly deplete canister inventory and cause increased pill and canister set-up frequency.

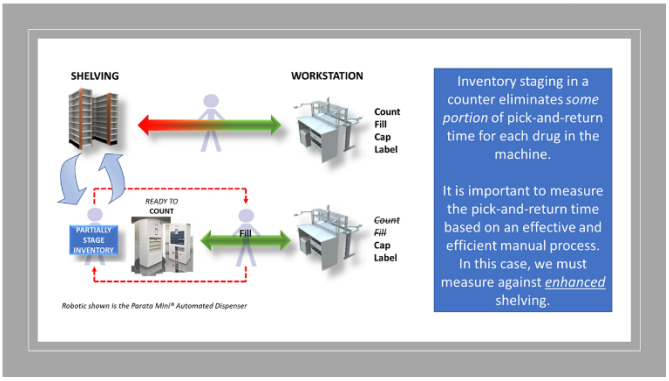
Hospitals need to innovate with existing machines to simulate the impact of *parallel-production* high-rate pick-to-delivery models. Manufacturers design these sequential inventory staging and processing machines for the pick-to-production retail market rather than a pick-to-delivery outpatient pharmacy. Vendors will tell you otherwise, so it is important to do your homework.

A good rule of thumb is that simpler machines are faster, more flexible, and integrate well with existing workflow. Larger machines *eliminate* technicians (although it is **not** a 1-to-1 tradeoff). These larger machines sacrifice speed and flexibility to automate tasks. For example, small (40-50 canister) counting machines have a reported output rate of three to five seconds to which nominal seconds are added for labeling and capping. Larger machines may perform all technician tasks but at a much slower sequential output rate, about 1 vial every 45 seconds.

Pick-to-delivery systems must ensure that mechanicals impact *total inventory* rather than a subset of 'highest' movers is another important guideline. A good example might be the higher-end fully auto sequential vial filling machines which vendors market for high frequency drugs. Inline use *might* make sense for retail drug stores because the goal is to reduce staff cost, not increase output rate. For outpatient pharmacy, these high-cost sequential processors have greater 'back-end' value for WIP, pre-order bedside production, mail order, etc. production cycles expanding the machine impact on total inventory.

Illustration D examines the impact of staging inventory in ready-to-count machines. Increased mechanization of inventory staging by default reduces production

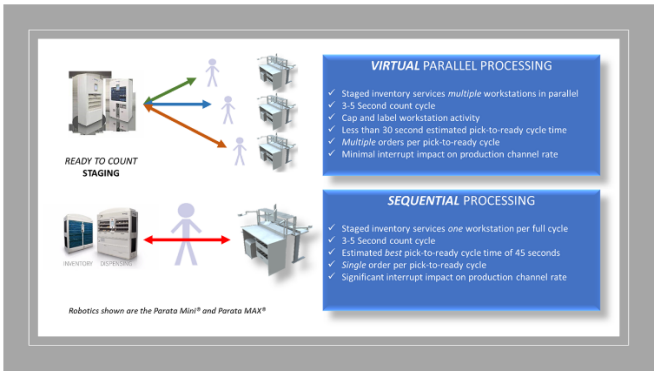
**ILLUSTRATION D**
**INVENTORY STAGING: Enhanced Shelving versus Ready-to-Count**




degrees of freedom from the less mechanized stage. In this instance, the degree of freedom lost is the flexibility of staging multiple lots on an enhanced shelf. This loss of freedom/flexibility can result not only in leakage, but a non-recoverable disruption of the production channel. Still, the 3-5 second count time is a significant cycle time reduction that can make limited leakage acceptable.

Illustration E examines how increased mechanization and reduction in degrees of freedom/flexibility can adversely impact the production channel output rate while making limited staff reductions/avoidance possible. Parallel processing, the capability to fulfill multiple orders simultaneously, is essential to outpatient pharmacy. But, as we have already discussed, adding machine tasks reduces the flexibility to process simultaneously.[10]

**ILLUSTRATION E**
**INVENTORY STAGING: Parallel versus Sequential Processing**




Ready-to-count inventory staging eliminates most of the pick-and-return tasks associated with enhanced shelving.[11] Since ready-to-count inventory staging has a 3-5 second cycle time, the machine ready-to-pick queue opens up every 5 seconds making for a *virtual* parallel processing system. This means that multiple technicians can make use of mechanically staged inventory almost simultaneously and benefit from the reduced pick-and-return time as well as a significant reduction in count time.

The more sophisticated mechanical systems are suitable for retail drug stores because they pass on the burden of a slower sequential output rate to the patient. The sequential machine ready-to-pick queue opens every 45-60 seconds which is roughly the same time required to fill one prescription with enhanced shelving. So, even if you had multiple technicians, each would have to wait their turn in the queue.

### Linking Staged Inventory with Production Channel

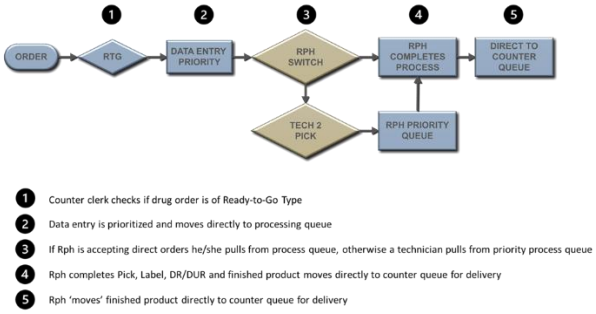
Production channels must be in-sync with the *delivery potential* of the staged inventory. There is nothing inviolate about the drug chain fill process and

outpatient pharmacies must adapt process and workflows based on how they stage inventory to maximize counter delivery rate. It does little good to stage inventory as *ready-to-go* if it queues to the same production channel as *ready-to-pick*.

Illustration F offers an example of a ready-to-go production channel in which the order moves directly from data entry to pick at either a technician or pharmacist station. It then moves with priority to the pharmacist for DR/DUR/FR and directly to the counter for express delivery.

**ILLUSTRATION F**

**Example: Syncing Production For Ready-to-Go Inventory**




1. Counter clerk checks if drug order is of Ready-to-Go Type
2. Data entry is prioritized and moves directly to processing queue
3. If Rph is accepting direct orders he/she pulls from process queue, otherwise a technician pulls from priority process queue
4. Rph completes Pick, Label, DR/DUR and finished product moves directly to counter queue for delivery
5. Rph 'moves' finished product directly to counter queue for delivery

How the pharmacy stages inventory and the number of drugs in an order determine the best delivery time. For example, if an order requires a ready-to-pick process, in addition to a ready-to-go drug, the best time-to-delivery is determined by the former process. However, how the order comes together could be a combination of channels. In our example, the ready-to-pick portion might move through the technician channel while all ready-to-go orders are filled through the pharmacist production channel.

*Finished Inventory Staging and Delivery*

Delivery-on-demand finished inventory will ideally by-pass will-call staging and move directly to the patient delivery queue at the counter. Nevertheless, the effectiveness of by-passing will-call depends on how well the counter delivers staged will-call finished inventory. Drug chains like Walgreens and CVS opt for simple alphabetic bin staging. Drug chains pass the burden of time lost looking for a prescription order on to the next patients. We will look at the impact of queue delays in another article.

Pick-to-light will-call, sign-in/scan-in kiosk, and production tracking save critical seconds and minutes in the outpatient pharmacy's window of opportunity. Again, pharmacies need balance the final delivery queue for on-demand and will call rates. Interrupts or leakage in the final delivery of the will-call queue will significantly impact the counter queue size and pick-to-delivery queue.

**Technologies** that track, cost, and forecast inventory demand and movement are critical to the success of pick-to-delivery models. Drugs must *always* be in-stock. Drugs must be staged for on-demand delivery, count, WIP, or bedside production. The more complex a hospital market, the greater the need for these inventory systems.

We will look at technology more in-depth in upcoming articles.

**A final note ….**

This overview covered a lot of territory. This discussion makes one thing perfectly clear … managing outpatient pharmacy inventory is more involved that managing drug store inventory. Outpatient pharmacies will require inventory monitoring systems ranging from who prescribes what and when, to how workflow changes based on inventory stage. Systems monitor WIP inventory and production runs. Lead pharmacists must always have production channel insight to ensure delivery rates are maintained, identify problems, and execute solutions.

Footnote

[1] Vince Lombardi. "Football is a game of inches and inches make the champion."
[2] Pick-to-production models focus on the movement and cost of inventory to the production channel only. This is the drug chain retail model.
[3] Staging refers to increasing the patient value of inventory by moving it closer to the point of delivery by means of pre-processing, enhanced fixtures, mechanicals, and technology.
[4] Hospitals generally do a very poor job of marketing their outpatient pharmacy. Patients are foremost customers. And, unlike hospital procedures, where they get their prescriptions filled is a choice.
[5] Pharmacy operations must work with prescribers routinely to discuss inventory preferences and requirements.
[6] Outpatient pharmacies must begin marginal analysis based on the 'current' use of enhanced shelving.
[7] It is a good bet that much of the technician issues retailers face is caused by the fact that these investments do not produce a 1:1 reduction in cost.
[8] This is an important distinction for hospitals to keep in mind when talking with potential consulting companies. They prefer reducing staff because the results are immediate, and they are not accountable for the negative impact on the pharmacy. Despite my best effort to convince a major consulting company that the issue was how staff was used rather than too much, they chose the easy path and eliminated staff.
[9] Understanding how, what, and when prescribers order to treat conditions or disease states is a key part of inventory management. This allows pharmacies to better organize and enhance inventory.
[10] Filling a second prescription manually while one is processed via a machine is not the same since each has a different pick-to-ready cycle time.
[11] Keep in mind that enhanced shelving already significantly reduced/eliminated pick leakage.

## *About the Author*

Sabrina Hannigan is a retired Walgreen executive with over three decades experience in labor, location, layout, and operations. She consulted HURON Healthcare and clients on outpatient pharmacies.

Sabrina recognizes retail models are not transferable to the complex hospital markets. She created outpatient pharmacy business models incorporating methods and processes experienced over 50 years in manufacturing retail, and consulting.

Sabrina envisions hospital-centric solutions improving therapeutic outcome and population health. Towards this end, she continues to develop new processes and methods for outpatient pharmacies.