Printing Technology White Paper

Thermal Printing Improves Pharmacy Workflow

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Abstract

Higher demand, a pharmacist shortage, and limited space have pharmacies looking for more efficient ways to generate prescriptions and better serve their customers.

Most pharmacies use a centrally located laser printer to generate fulfillment documentation that follows a prescription as it is processed and filled. A single print station means retrieving the order document from the printer, and using it as a prescription's tracking document. However, a single station does not adapt well to interruptions, changes, and cancellations.

Higher demand means pharmacy workers must process more prescriptions while keeping error to a minimum. This is where utilizing barcode printers and scanners in the workflow process become important. Barcoding technology drastically reduces errors and increases workflow capacity. Cognitive's C Series Rx thermal printers quickly produce barcoded prescription labels and documents.

The pharmacist shortage can be addressed by changing workflow so the appropriate personnel are assigned to specific tasks at designated stations. A station may consist of a networked terminal, bar code scanner, weight scale, and a barcode printer. A station may not need a terminal if a network is set up for the printer and scanners. The C Series Rx printer is network-ready and supports input devices such as scanners, keyboards, and numeric keypads.

Limited space is easily addressed with the small footprint C Series Rx printers. They are roughly a quarter of the size of a laser printer and are network-ready. C Series Rx printers allow pharmacies to print what they want, where they want, when they want it, and without waste.

Some pharmacies have started adopting thermal printers specifically for printing prescription labels, but none have taken full advantage of thermal printing for all their needs. The C Series printers are PCL5 compatible, which allows for easy integration and expansion into all a pharmacy's printing needs.

Pharmacy Workflow

Pharmacy workflow is complex and will vary between pharmacies. The basic steps of a prescription filling process are outlined below with an emphasis on the function and printing requirements for each step.

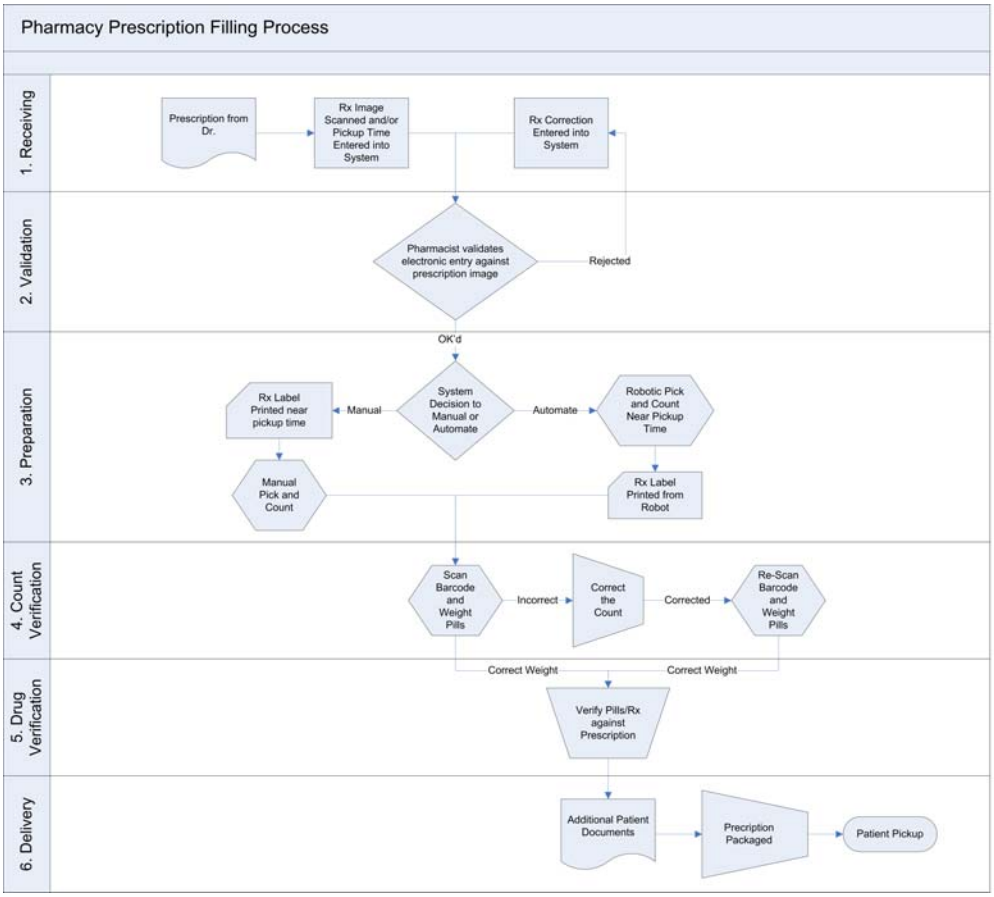


Figure A. Basic Prescription Filling Procedure

1. Receiving and Order Entry

The prescription and patient information is collected at the receiving station. Collection can be done in-person, transferred electronically, or called in or faxed from doctor. Prescription and patient data are entered in the system. If prescription imaging equipment is available, an image is scanned into the system. There is no immediate printing requirement during this step.

2. Validation

The registered pharmacist will then validate the data entered into the system against the written prescription. The system is updated to indicate the prescription is valid. There is no immediate printing requirement during this step.

3. Filling

The prescription document is printed when the prescription is filled. This document will be referenced during prescription fulfillment. The drug bottle label is removed from the form and applied to the prescription container. The prescription and document is then transferred to count verification and the system is updated.

4. Count Verification

Count and dosage of the filled prescription are then verified against the label and document. Status is then updated in the system. There is no printing requirement during this step.

5. Drug Verification

The drug is then verified by the registered pharmacist against the prescription and labeling. Additional labeling from the form or preprinted warning labels are attached to the prescription container.

6. Storing and Delivery

The completed prescription and remaining documents are packaged in a bag and stored waiting patient pickup. The log label is removed from the form and attached to a log book. The unused remaining labels are removed and discarded. The rest of the form includes the patient receipt, an education and drug information document that travels with the prescription to the packaging and storing station.

Upon patient arrival the packaged prescription is retrieved and delivered when the patient pays. The payment transaction is complete and an additional transaction receipt is printed. The patient receives the filled prescription, form receipt, patient education and drug information documents, and a transaction receipt.

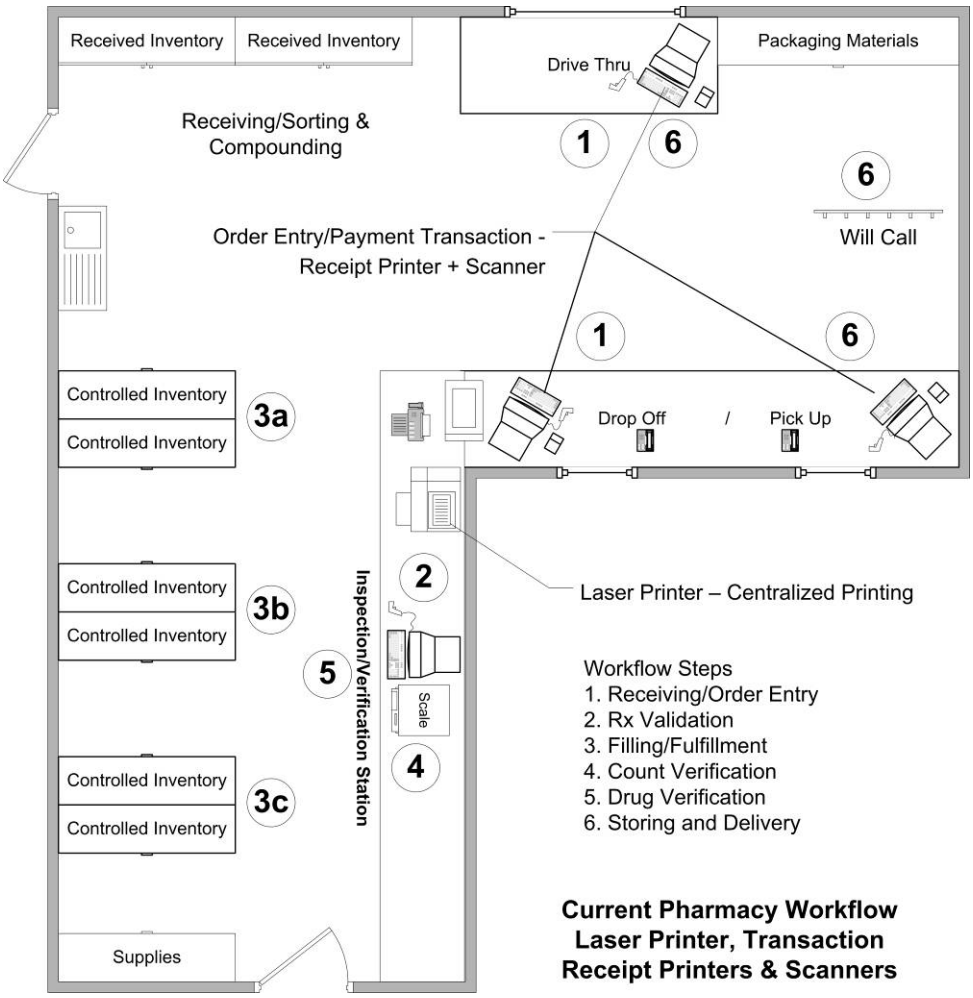


Figure B. Current Pharmacy Workflow

Pharmacy Printing Requirements

There are several documents that must be printed in the pharmacy workflow operation. Each of the required documents and their purpose are described below.

Prescription Label

The prescription label contains important information such as patient name, drug information, dosage, frequency, doctor's name, expiration date, number of refills, pharmacy information, prescription number, and warning information. The label is typically adhered to the outside of the prescription container.

Order Label

The order label is for the pharmacy to process and contains all the information above plus additional insurance information. The order label is kept with pharmacy records.

Patient Education Leaflet

The patient education leaflet contains drug information that the patient should be aware of while taking the medication. It is typically printed on standard paper and then folded and stapled to the filled prescription bag.

Transaction Receipt

The transaction receipt is a thermally printed purchase receipt given to the customer after they have paid for their prescription. This receipt is often overlooked in the pharmacy workflow because the point of sale system is usually not integrated with the pharmacy system.

Pharmacy Laser Printing

Most pharmacies use laser printers to print the prescription label, warning labels, archiving/tracking document, patient education documents, receipts, and essential information. Typically this is a single form split into a label portion and a bond paper portion. Printing is done in a centralized location.

Centralized Printing

As seen in Table 1, the laser printer is used as a central printing station for all prescriptions. Centralized printing requires the pharmacist to collect the form and use it throughout the workflow process. A single form with all the documents required to process a prescription does not lend itself well to interruptions, changes, or cancellations in the workflow.

Laser Printer Size

Laser printers typically have a footprint near 18″x18″ and stand around 18″ tall. The printer is relatively large for a space-sensitive environment like a pharmacy.

Cost of Ownership

The cost of ownership is comprised of the hardware purchase, materials, and maintenance of the hardware. Each must be considered when comparing the various technologies and looking for the best solution.

Printer

Simple black and white laser printers are usually not very expensive. However, most pharmacy printers require a network card and expanded memory that are not included in the base model price.

Materials

The materials needed for pharmacy laser printing include a two part (label + bond) form and special toner (no stick) cartridge. Both add cost to the printing operation.

Maintenance

The basic design of laser printers, a high heat fuser and hot imaging drum, do not work well with labels that ooze adhesive when heated. The adhesive finds its way to the laser mechanism and causes the label and backing to separate and get stuck in the printer. This results in shutting down the printer, removing the label and paper, and cleaning the components. Higher maintenance and downtime increase the cost of ownership and interrupt workflow.

Pharmacy Printer Combinations

There are basically three printing technology combinations that can be used in the pharmacy workflow environment. Each of the combinations and their usage are described in the table below.

Workflow\ Printing Combo	Laser + Thermal Receipt	Laser + Thermal Label + Thermal Receipt	Thermal Label + Thermal Receipt
Receiving	Nothing printed	Nothing printed	Nothing printed
Validation	Nothing printed	Nothing printed	Nothing printed
Preparation	All documents except the transaction receipt are printed on a single form. Prescription labels applied to prescription container.	Thermal print prescription container label and barcoded order label at the appropriate filling station. Apply prescription label to the prescription container.	Thermal print prescription container label at the appropriate filling station. Apply prescription label to the prescription container.
Count Verification	Nothing printed	Nothing printed	Nothing printed
Drug Verification	Nothing printed	Nothing printed	Nothing printed
Packaging/ Storing	Patient education, duplicate receipt, and drug information documents are attached to the packaging. Additional preprinted or form labels applied. Log label applied to log. Discard extra labels.	Laser print patient education, order receipt, drug information, and all other forms. Apply bar-coded order label to order log.	Thermal print patient education information and all other necessary documents.
Dispensing/ Billing	Payment transaction receipt is printed.	Payment transaction receipt is thermal printed.	Payment transaction receipt is thermal printed.

Table 1. Pharmacy Printing Solution Combinations

Workflow Printing Effectiveness

The use of multiple printers and scanners to increase workflow has been used in the manufacturing industry for years. It has shown that scanning the tracking information and printing on demand at a specific location is a critical element of workflow efficiency. Now that the pharmacy market has noticed the benefits of increasing workflow efficiency, it is important to consider proven processes when determining a solution.

Improved Pharmacy Workflow

Many pharmacies have taken the basic steps of improving their prescription filling process by introducing thermal printers to print barcode labels. By integrating barcode technology and more reliable label printers, the workflow process has improved. The figure below shows a planned layout of an improved workflow using networked Cognitive C Series printers.

1. Receiving and Order Entry

The prescription and patient information is collected at the receiving station. Collection can be done in-person, transferred electronically, or called in or faxed from doctor. Prescription and patient data is entered in the system, and an image is scanned into the system if prescription imaging equipment is available. There is no immediate printing requirement at this step.

2. Validation

The registered pharmacist will then validate the data entered into the system against the written prescription. The system is updated to indicate the prescription is valid. There is no immediate printing requirement at this step.

3. Filling

The prescription labels are printed on the thermal printer ***when and where*** the prescription needs to be filled. The drug bottle label is applied to the filled prescription container. The prescription is then transferred to count verification and the system is updated.

4. Count Verification

The filled prescription count and dosage are then verified against the label and system. The status is then updated in the system. There is no printing requirement at this step.

5. Drug Verification

The drug is then verified by the registered pharmacist against the prescription and labeling. Additional preprinted warning labels are attached to the prescription container. The prescription is transferred to the storing and delivery station.

6. Storing and Delivery

The completed prescription and remaining documents are packaged in a bag and stored awaiting patient pickup. Additional documents are printed on the laser printer. Those documents include the patient receipt and patient education form.

Upon patient arrival the packaged prescription is retrieved and delivered to the patient when payment is made. The payment transaction is complete and an additional transaction receipt is printed. The patient receives the filled prescription, patient education documents, and a transaction receipt.

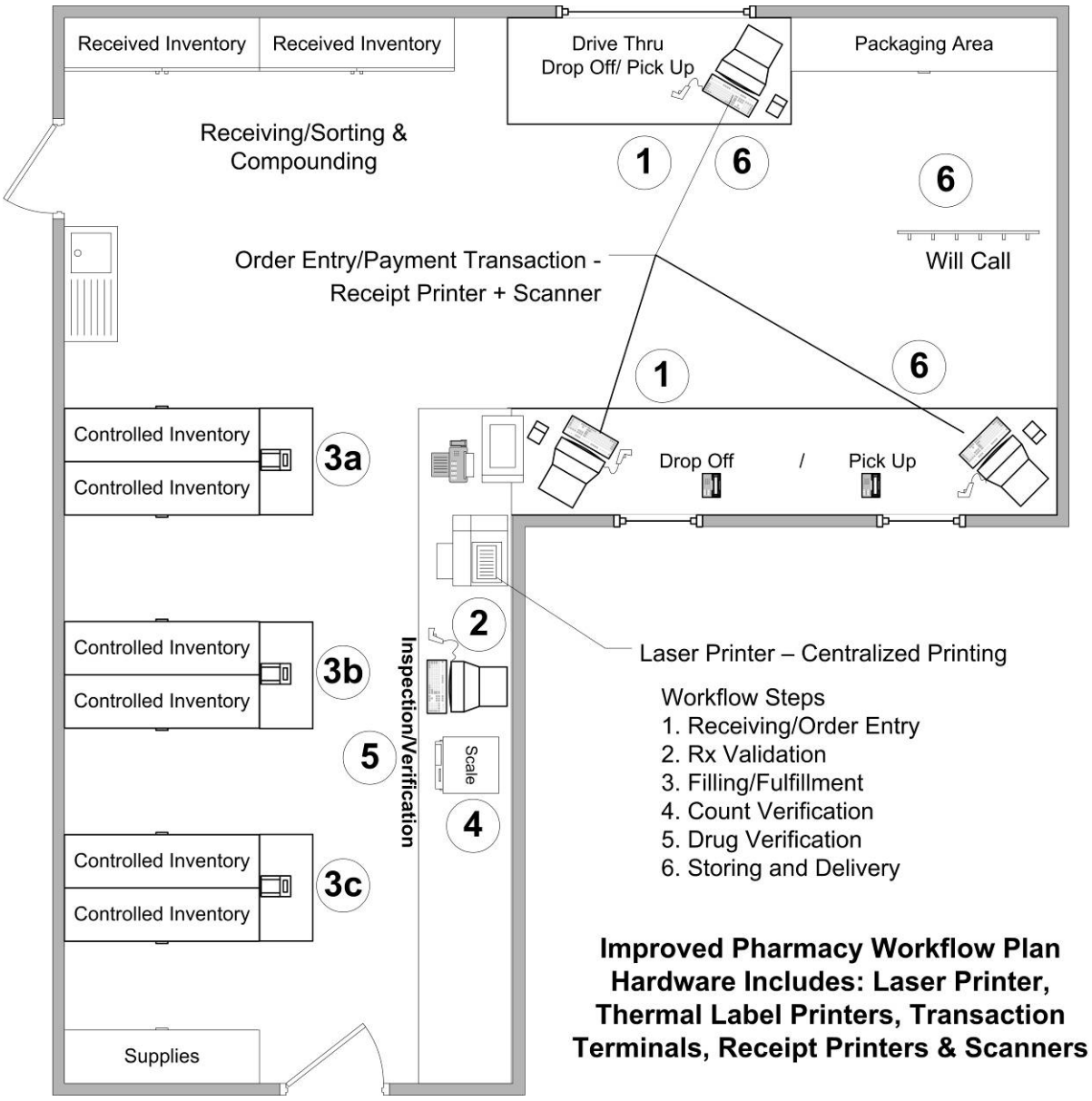


Figure C. Improved Pharmacy Workflow

Optimizing Pharmacy Workflow

The basic steps of an optimized prescription filling process are outlined below with an emphasis on the status update and the printing requirement for each step. Here the process is optimized and has the highest potential to be the most efficient of all pharmacy workflow procedures. It can be interrupted at any step of the process and is tracked and updated via barcodes.

The figure below shows a planned layout of and optimized workflow using networked Cognitive C Series printers and barcode scanners.

1. Receiving/Order Entry Station

Prescription and patient information is collected at the receiving station. Collection can be done in-person, transferred electronically, or phoned in or faxed from a doctor. The prescription and patient data is entered in the system and an image is scanned into the system if prescription imaging equipment is available. A prescription tracking number is generated, but there is no immediate printing requirement.

2. Validation

The registered pharmacist will then validate the data entered into the system against the written prescription. The system is updated to indicate the prescription is valid. There is no immediate printing requirement.

3. Filling/Fulfillment Station

The prescription label is printed ***when and where*** the prescription needs to be filled. If necessary, additional labels can be printed and referenced. The drug bottle label is removed from the form and applied to the filled prescription container. Once filled, the barcode on the label is scanned and the prescription is transferred to count verification. The system is automatically updated.

4. Count Verification Station

The filled prescription barcode is scanned and the system automatically brings up the information to verify count and dosage. It is then verified against the system. The status is then updated in the system and the prescription is transferred to drug verification. There is no printing requirement at this step.

5. Drug Verification

The count verified drug barcode is scanned and the system brings up the critical data needed to verify the drug type. The registered pharmacist verifies it against the prescription and labeling and updates the system. Additional warning labels are automatically printed and attached to the prescription container. The prescription is then transferred to the storage and delivery station.

6. Storing and Delivery Station

The drug verified prescription barcode is scanned and the system updated. Remaining documents are printed and all are packaged in a bag and stored awaiting patient pickup. There are no unused or wasted labels. Additional documents include the prescription tracking number, patient education document, and possibly marketing materials. The prescription tracking number must be attached to the outside of the bag with the barcode visible.

Upon patient arrival the packaged prescription is retrieved and delivered to the patient when payment is made. The barcode is scanned to update the system status. The payment transaction is complete and an additional transaction receipt is printed. The patient receives the filled prescription, form receipt, patient education form, marketing materials, drug information documents, and a transaction receipt.

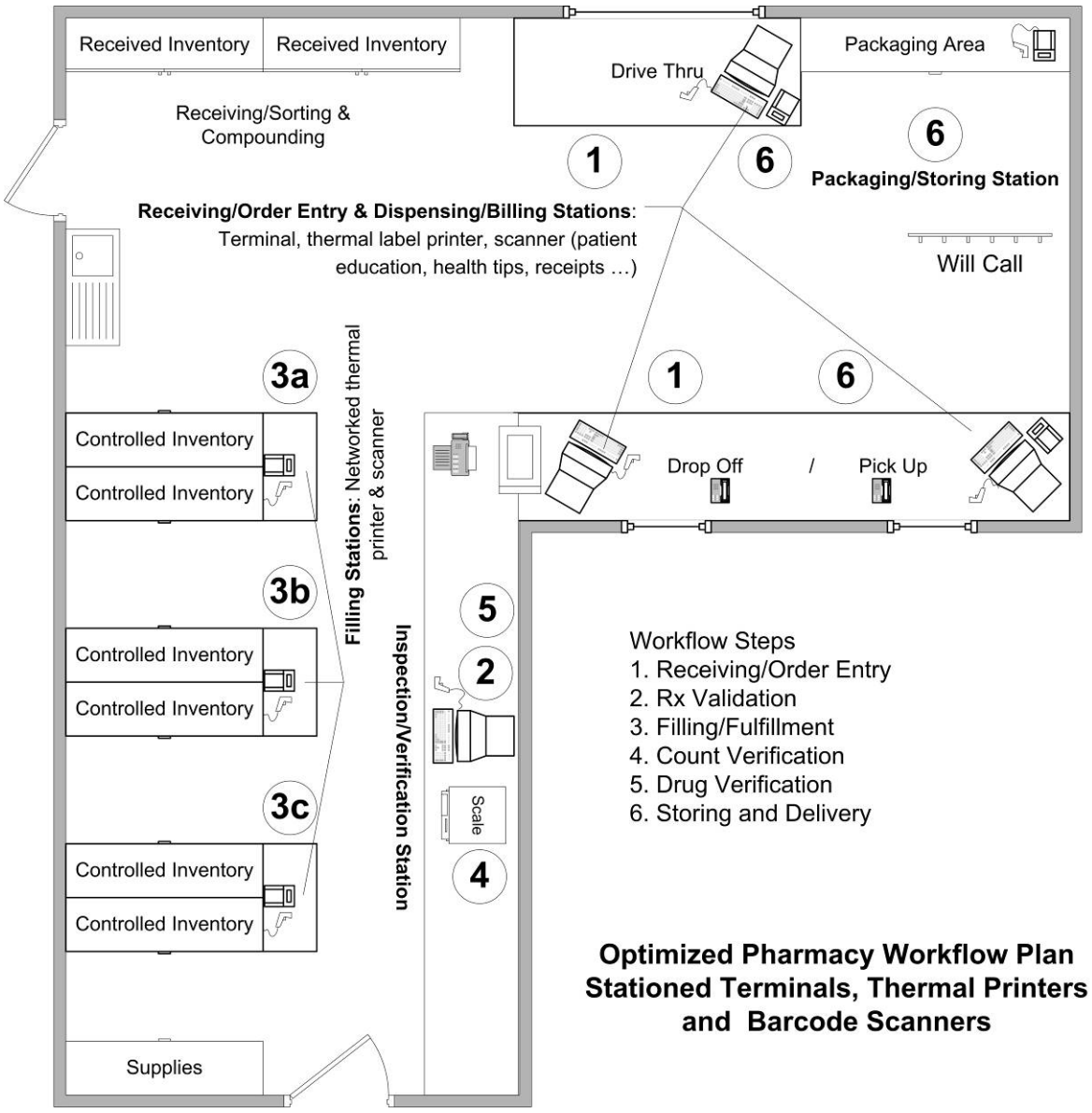


Figure D. Optimized Pharmacy Workflow Plan

Pharmacy Printer Combinations

There are three combinations of thermal and laser printing solutions for the pharmacy. Each combination's cost of ownership, integration, benefits, and challenges are described in the table below.

Workflow\ Printing Combo	Laser + Thermal Receipt	Laser + Thermal Label + Thermal Receipt	Thermal Label + Thermal Receipt
Workflow Type	Initial Adoption	Improved Workflow	Optimized Workflow
Description	Laser printer printing on two part (label/bond paper) forms and a thermal receipt printer printing on receipt paper.	Laser printer printing bond paper forms, thermal label printer printing on labels, and a thermal receipt printer printing on receipt paper.	Thermal label printer printing on labels and thermal label printer printing on receipt paper.
Cost of Ownership	Highest with expensive laser printer, expensive two part forms, toner cartridges, and maintenance.	High with an expensive laser printer and an additional thermal printer.	Best cost of ownership with one low maintenance thermal printer that uses low cost supplies.
Integration	Easy inefficient single station implementation with an independent point of sale solution.	Complex integration driving two types of printers and one point of sale system.	Integration is simplified to one printer type.
Benefits	Well established solution.	Improved workflow efficiency.	Workflow optimized to print what you want, where you want, when you want it, with no waste.
Challenges	Keeping up with increased workflow demands.	Update software from the standardized laser printing solution. Keeping up with increased workflow demands. Workflow is still not optimized.	Update software from the standardized laser printing solution.
Important Notes	Does not lend itself well to workflow improvement.	Commonly viewed as the thermal solution, but does not take full advantage of thermal printing solutions.	Same printer can be used for all printing operations. Thermal printers are often overlooked as document printers.

Table 2. Pharmacy Printer Combinations Evaluation

The C- Series Thermal Rx Label Printer

Cognitive's C Series printers are the perfect solution for pharmacies to optimize their workflow and make the transition from laser to thermal. C Series printers address all the problem areas that plague laser printers in workflow efficiency and reliability. Additionally, C Series printers with full PCL5 compatibility are easy to integrate and can be used to print all pharmacy documents.

Price

Thermal printers typically cost half of what a laser printer costs, making funding a transition much more feasible.

Size

Measuring at only 6.5″ wide and 10.5″ deep C Series thermal printers are about a quarter of the size of a laser printer allowing it to placed as needed in the workflow environment.

Performance

C Series printers require no warm up time and can print a 6″ label in less than a second expediting the printing process even more.

Reliability

The C Series printers are designed to print labels. The simplicity of the design and thermal printhead used are the reason the C Series printers can print millions of inches without failure.

Print Quality

The C Series Rx printers are equipped with 300dpi printheads that give great resolution for fine graphics, text, and barcodes.

Connectivity

The C Series printers include serial, parallel, USB-A, USB-B, and Ethernet connectivity is built right into every printer.

Compatibility – PCL5

The C Series Rx printers are fully PCL5 compliant making the transition from laser to thermal even easier. Because the installed base of pharmacy printers are primarily laser, the programming resources and tools are PCL fluent, making it even more critical to be PCL compatible for easy integration.

Example Integration/Transition

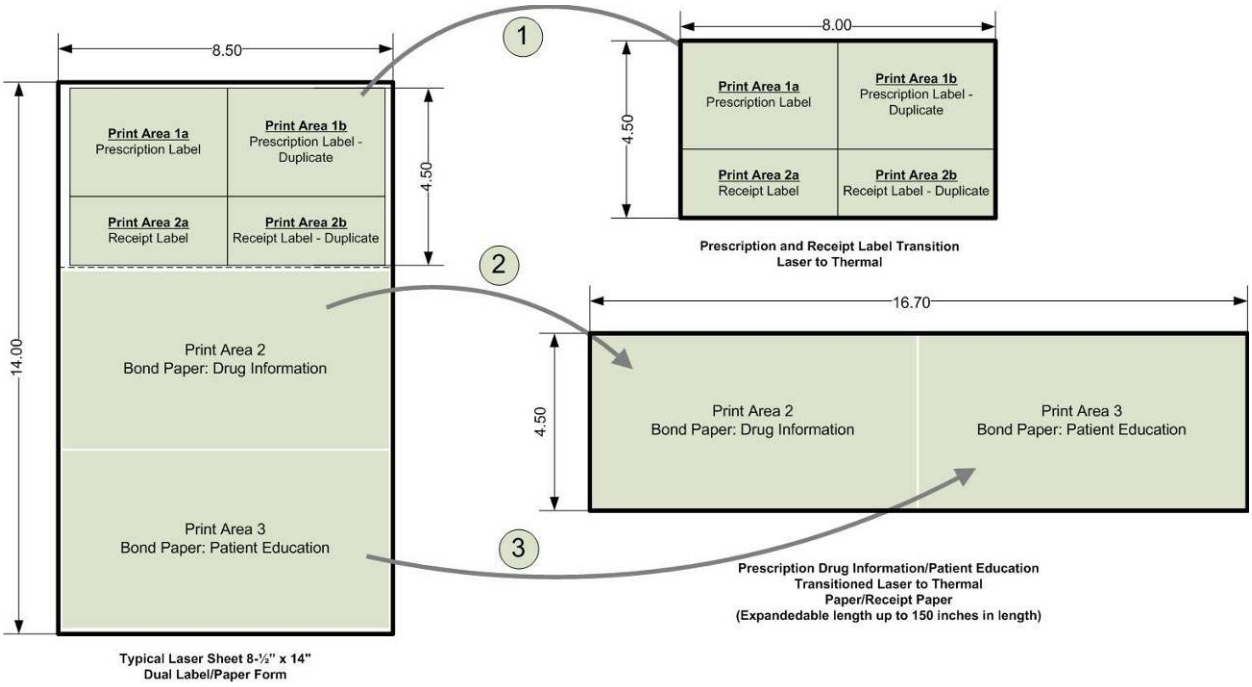
Integration of thermal printers requires transitioning the areas that were printed on the laser printer to a thermal printer. Because thermal printers have a narrower print width than laser printers, the printed areas of the laser form must be separated. The illustration below is an example of how three printed areas of a laser printed pharmacy form would be separated and then printed on a thermal printer.

Prescription/Receipt Labels

The top portion of the form consists of four labels (Print Areas 1a&b, and 2a&b), two prescription labels, and two receipt labels. This whole label section would be separated and printed as shown in transition arrow❶. The transition requires no change in size or content.

Drug Information and Patient Education Documents

Print areas 2 and 3 consist of the drug information and patient education documents. As shown with transition arrows ❷ and ❸, these two documents can be combined and printed side by side without changing content or size. C Series thermal printers allow the expansion of the print area, allowing growth in content and/or font size.



Sample Pharmacy Printed Format Transition
Laser to Thermal

Figure E. Sample Laser to Thermal Page Format Transition

Conclusion

- When evaluating your pharmacy application, look at improving workflow to help keep up with higher demands and improve quality.
- Utilizing barcodes by implementing stations equipped with networked terminals, C Series Rx printers, and scanners improves workflow and addresses increased demand, pharmacist shortages, and space limitations.
- Implementing all thermal printing in the pharmacy is the most effective way to increase and optimize workflow efficiency and reduce operational costs.
- Cognitive's C Series Rx thermal printer with PCL5 makes the adoption of another printer command language unnecessary when making transition from laser to thermal printing.