

INSIGHTS

CONTINUING EDUCATION ACTIVITY

Efficiency Advantages of Automation in Pharmacy

RELEASE DATE: MAY 2003
EXPIRATION DATE: MAY 31, 2004

Learning Objectives

After completing this activity, the participant should be able to do the following:

- Assess the current retail pharmacy environment, focusing on factors contributing to increasing pharmacist workloads.
- Discuss factors driving the need for pharmacy automation.
- Describe features of specific pharmacy automation products and software appropriate for use in the small independent pharmacy.
- Identify automation products appropriate for large chain pharmacies, including robotic products and central-fill.

Target Audience

This activity is designed to meet the educational needs of retail pharmacists.

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Disclosure

Dr. Sorrentino, Mr. Croce, and Dr. Pacitti have indicated that this activity does not include the discussion of unlabeled uses of commercial products or products that have not yet been approved by the FDA for use in the United States for any purpose.

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Dr. Pacitti is an employee of CoMed Communications, Inc.

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Activity Instructions

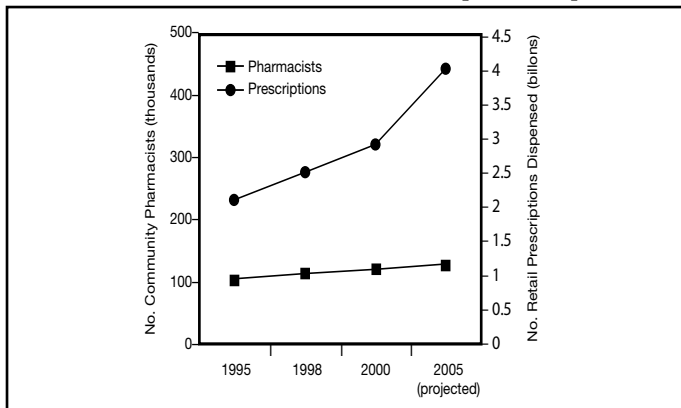
Participants will read the entire article including all tables, figures, and references. Participants will then complete the post-test and registration for credit evaluation forms, which follow the activity. To receive a statement of credit, a score of at least 70% on the post-test must be achieved. The post-test and registration for credit/evaluation form must be completed and returned no later than May 31, 2004. It should take approximately 1 hour to complete this activity as designed. Statements of credit will be mailed within 3 to 4 weeks of receipt of the post-test. There is no registration fee for this activity.

Introduction

It is estimated that from 2000 to 2005, prescription volume will increase by 28% to 4 billion prescriptions per year, but, during that time, the number of pharmacists will only increase by 7% (Fig. 1).^{1,5} (It is important to note, however, that, at present, it cannot be predicted how many of the four billion estimated prescriptions will be diverted to mail-order pharmacies.) In addition to handling increasing prescription volumes, pharmacists are also expected to carry additional

responsibilities, such as resolving rejected claims and meeting OBRA '90 requirements at a time when reimbursement for prescription medications and dispensing fees have been reduced. The environment of high prescription volume, low pharmacist supply, and low profitability makes it necessary for pharmacists to work faster, longer, and harder to serve their patients, increasing the risk for financial losses, prescription errors, and noncompliance with the duty to offer medication counseling. Some pharmacies chose not to practice under those conditions and, understandably, closed their doors. Others took up the challenge and sought the changes necessary to make their pharmacies more efficient to keep their practices viable and to better serve their communities. For many, the answer has been pharmacy automation: a unique array of products and services specifically designed to help pharmacies meet these challenges.

Figure 1. Trends in Community Pharmacy: Number of Pharmacists vs Number of Prescriptions Dispensed



The need for increased efficiency is driving the shift toward a more automated dispensing environment. The addition of rapid refill systems, automated or robotic dispensing technologies, and automated inventory technologies can allow a pharmacy to better accommodate increasing prescription volumes, often without needing to hire additional staff, who tend to be in short supply. As a result of the pharmacist shortage, pharmacist salaries and sign-on bonuses have escalated sharply in recent years. The fixed cost of machinery may be substantially less than the cost of providing training, wages, and employee benefits to a newly hired pharmacist or even pharmacy technician. ScriptPro™, a vendor of pharmacy robotics, claims that "for \$10 to \$14 dollars per hour, a pharmacy can keep up with growing prescription volumes without increasing staff and allow pharmacists to focus on what is most important: operational efficiency and service to patients."⁶ Given the current pharmacist shortage, the transfer of nonclinical skills from pharmacists to machines optimizes this scarce resource.

One of the best things about automation is that the end result is not limited to increased efficiency but also addresses an issue near and dear to all pharmacists: reducing medication errors. The Institute of Medicine Report has drawn attention to medication errors as a serious problem. In 2000, the Pharmacists Mutual Insurance Company reported that 75% of liability claims were for the wrong drug or dispensation of the wrong strength.⁷ In an observational study of 50 chain, outpatient health system, and independent pharmacies, the rate of dispensing accuracy was determined to be 98.3%; however, this represents four errors per 250 prescriptions.⁸ On a national level, this represents an estimated 51 million errors among the three billion prescriptions filled annually. Errors occurred most frequently during several steps of the filling process, including inspection and product retrieval. Many of the medication errors reported through Med-Watch and other voluntary reporting systems involve dispensing

of the wrong medication, which often is due to confusion over products with similar sounding names; for example:

- Accolate®, Accutane®, Accupril®
- Serzone®, Seroquel®
- Lamictal®, Lamisil®
- Vioxx®, Zyvox™

Some forms of automation, in which the computer and machine interface to dispense the prescribed drug, eliminate the step of having a human retrieve the medication and, therefore, the potential for human error at that stage of the process. An additional advantage is that these systems free the pharmacist from time-consuming, repetitive tasks while still allowing the pharmacist to verify appropriate dispensing. Many of these automated systems assist the pharmacist in product verification through the use of frequently updated pill images and bar-code technology.

Failure to warn about side effects experienced by the patient is also a growing trend in lawsuits against pharmacists. Automation frees the pharmacist to perform cognitive services, such as medication counseling, and may assist by providing automated drug regimen screening, drug utilization review (DUR) warnings, and patient-information leaflets.

The development of automated pharmacy technology is driven by the need to reduce inefficiency, function despite pharmacist shortages, and reduce medication errors. These needs are common among all pharmacy practice settings, but specific automation solutions must be designed with the end-user in mind, whether that is a small independent community pharmacy or a large pharmacy chain.

Automation Solutions for the Small Independent Pharmacy

According to the National Community Pharmacists Association (NCPA), the once steady decline in the number of independent pharmacies has come to a halt.⁹ Their number has remained close to 25,000 for the past 3 years. These pharmacies fill approximately 1.32 billion prescriptions per year: 44% of retail prescriptions.

Although it may be thought that the independent community pharmacy would consider the cost of automation prohibitive, this is not always the case. Most of the automated dispensing systems can be integrated into existing pharmacy computer management systems. In addition, at the December 2002 NCPA Convention, a survey revealed that 30% of independent pharmacists already use automated dispensing systems.¹⁰ In fact, the first pharmacy automation product available can be found on countertops in just about every community pharmacy today: the Kirby Lester Tablet Counter, first introduced in 1971 (Table 1). Tablets and capsules are poured into a hopper that directs them to pass through a light beam. Each time the beam is interrupted by a falling tablet the count in the display area is increased by one. The Kirby Lester machines make it unnecessary for pharmacists to count tablets manually and mentally. New photosensing technology makes these machines fast and accurate, claiming only two counting errors in every 10,000 tablets counted. Kirby Lester machines are still popular today and are workhorses in smaller pharmacies, filling 100 to 200 prescriptions per day.¹¹ Newer models offer scanning and electronic filing of prescription information. The software in the KL16ipc™ models identifies and registers the pharmacy staff member who filled the prescription. The software is capable of scanning the patient label and container. This scanned information then links to a database (updatable from CD-ROM) that displays tablet images to verify accurate filling. Kirby Lester offers a stand-alone version that stores prescription information as well as a model that interfaces with a pharmacy's management software to add new prescription information to patient information that is stored within the pharmacy's computer system.

Baker Cells™—introduced shortly after the Kirby Lester—are traditionally less common in the small independent pharmacy; however, some entrepreneurial pharmacists have invested in this technology and are pleased with the increased efficiency provided by these machines. Although Baker Cells™ are automatic counting machines, as the Kirby Lesters are, their application is vastly different. Each of the machine's cells (the number varies depending on need and space) is preloaded with a drug product. The pharmacist selects the cell that contains the needed medication and dials in the number of tablets needed for the prescription. The Baker Cell™ counts the tablets and deposits them in the container provided by the pharmacist. Similar in function to the standard Baker Cell™ is AutoMed's countertop FastFill™, which can hold up to 64 different medications, perform preset counting, and interface with other pharmacy software including inventory programs. FastFill™ is an ideal solution for busy independent pharmacies filling up to 400 prescriptions per day.

The personal computer is the most important piece of technology in the independent pharmacy. In the late 1970s the PC was introduced into the pharmacy and relieved the pharmacist of numerous repetitive tasks:

- Printing the prescription label
- Pricing the prescription and printing the receipt
- Creating a patient medication profile
- Screening for drug–drug interactions
- Maintaining an Accounts Receivable system with monthly invoices on demand

Considering that these tasks were once performed manually, it is not difficult to recognize what a huge technologic advancement the PC provided at that time. However, very soon the computer became the standard for community pharmacy operations, and these features became routine and unimpressive. Today, advanced software systems, such as T-Rex One—designed specifically for use in the small independent pharmacy—can perform varied functions ranging from automated inventory management, rapid fill processing, simultaneous processing of multiple refills, and organization of workload queues to balance staff workloads and expedite the dispensing process. Not only do these systems provide efficiency, they also offer an extra layer of protection against medication errors by automatically performing DURs and screening for drug–drug interactions, drug–allergy interactions, duplicate therapy, geriatric or pediatric prescribing issues, and dosage-range validation.

The ultimate in pharmacy technology is the robot: a blend of automated dispensing and labeling functions with computerized functions such as inventory management. Several robotic products, such as ScriptPro's SP100™ and SP200®, are compact models that may be appropriate for select independent pharmacies. Although few community pharmacies have been able to invest in this technology, those who have are pleased with the increased efficiency and profitability and decreased need for additional staff. Robotic technology will be discussed in greater detail below.

When making the decision to automate, the independent pharmacy's current human resources, prescription volume, physical space, and which products will be appropriate for its business need to be considered.

Automation for the Large Chain Pharmacy

Numerous automation products are available for the large chain pharmacies (Table 2). Individual stores within a chain pharmacy system may rely on some of the technologies used in the independent pharmacy such as the Kirby Lester, Baker Cells™, FastFill™, or the SP100™ or SP200®. Because such systems can be expensive—particularly those machines that perform functions beyond counting—some automation vendors offer the option of leasing these systems; however, whether the system is leased or purchased, the cost of expendable items, such as ink cartridges, ribbon, paper, label rolls, and totes, must be factored in to the

Table 1. Automation Products Appropriate for the Independent Pharmacy

AutoMed: www.automedrx.com
<ul style="list-style-type: none"> • Scalable, compact, countertop units • AutoScale: Counts medication according to average weight of individual tablets; bar-code scanner verifies accuracy • QuickFill™: Single-cell product for preset or continuous counting; stand-alone or interface with inventory; verifies number of medications • FastFill™: Holds up to 64 medications; bar-code system initiates counting and release of medication; manages inventory; up to 400 prescriptions/day
McKesson: www.bakeraps.com
<p>Baker Cells™</p> <ul style="list-style-type: none"> • Rapid preset counting • Scalable modular design to adapt to available space • Computer interface
<p>Baker Cassettes™</p> <ul style="list-style-type: none"> • Scalable and compact: 67 cassettes take up 2.2 square feet of space • Ensures accuracy with bar-code verification
Kirby Lester, Inc.: www.kirbylester.com
<p>Kirby Lester Tablet Counters</p> <ul style="list-style-type: none"> • Advanced photosensing can count clusters of tablets and exclude fragments from total count • Models have varying capabilities ranging from <ul style="list-style-type: none"> - Dispensing single fills - Automatic dispensing into the final container - All stages of dispensing downloaded to a database, including scanning of the patient label and container and recording of who filled the prescription - Displaying updated tablet images from a database that is updated from a CD
ScriptPro: www.scriptpro.com
<ul style="list-style-type: none"> • Products interface with pharmacy computer • Bar-code technology • Delivers filled, labeled, uncapped vials (100 prescriptions per hour) • SP100™: 100 universal dispensing cells; SP200®: 200 cells
TechRx: www.techrx.com
<p>T-Rex One</p> <ul style="list-style-type: none"> • Inventory management • Rapid refill processes; refill reminders • Automated queues to balance staff workload • Link family members' prescription/coverage information • Updated system maintains state formulary information • DUR: interaction checks automatically performed

cost of acquiring and using the technology. Often the pharmacy is restricted to using expendable items that are provided, at a cost, by the vendor, and the use of such items attained from another source invalidates the product warranty. The cost of a service plan or extended warranty also must be considered.

The total prescription volume filled in a large chain may allow the chain to take advantage of the pharmacy robot: the state of the art for pharmacy automation. The robot blends old and new technologies to provide scalable automation strategies that can accommodate from 40 to 40,000 prescriptions per day and can easily be modified to accommodate increasing prescription volumes. Some vendors that design robots for community, hospital outpatient, mail-order, or central-fill pharmacies are listed in Table 2. The basic configuration of the robot includes computer hardware and software, fixtures, and accessories integrated and arranged to provide a specific workflow design. The robot allows for the following:

- Hard-copy prescription scanning and tracking
- Bar coding
- Interfacing with automatic counting, dispensing, and labeling machines

Post-Test

Please select one answer per question, and place your answers on the post-test answer form.

- Recent data show that between 2000 and 2005, the number of community pharmacists can be expected to _____, whereas the number of prescriptions can be expected to _____.
 - decrease by 5%, increase by 10%
 - remain steady, increase by 18%
 - increase by 7%, increase by 28%
 - increase by 7%, increase by 38%
- According to ScriptPro, a pharmacy can implement automation and keep up with growing prescription volumes without increasing staff for less than \$15/hour.
 - True
 - False
- According to the Pharmacists' Mutual Insurance Company, which of the following represents the percent of liability claims that were for the wrong drug or dispensation of the wrong strength in 2000?
 - 25%
 - 49%
 - 65%
 - 75%
- An increasing trend in lawsuits against pharmacists is failure to warn about side effects.
 - True
 - False
- Which of the following brands of automation equipment uses photosensing technology to count pills?
 - Baker Cells™
 - Kirby Lester
 - AutoMed's FastFill™
 - RxCare Plus
- Which of the following robots are compact models that might be appropriate for independent pharmacies?
 - AutoMed Efficiency Suite™
 - ScriptPro's SP200®
 - OptiFill-II®
 - RxEXPRES®
- According to the results of a survey at the December 2002 NCPA Convention, which of the following represents the percent of independent pharmacists who use automated dispensing systems?
 - 10%
 - 20%
 - 30%
 - 40%
- Central-fill is appropriate for which of the following?
 - New prescriptions only
 - Tablets only
 - Refills only
 - None of the above
- Integrated robotics/software systems allow for which of the following?
 - Hard-copy prescription scanning and tracking
 - Minimizing human error during the process of retrieving the medication
 - Verifying appropriate dispensing
 - All the above
- Which of the following is (are) true regarding automated pharmacy products?
 - Some products automatically manage inventory.
 - They can free pharmacists from counting prescriptions and allow more time for patient counseling.
 - Errors may occur at places of machine-human interface.
 - All the above

References

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- Pharmacist's viewing of electronic version of scanned prescription and pill images for final verification
- Automatic checking for drug–drug and drug–food interactions, geriatric and pediatric precautions, minimal–maximal dosing, allergies, and duplicate therapy
- Tracking of prescription status within the workflow

Efficiency is achieved through automated prescription filling and labeling. Not only can these machines save time, but the cost of automating 40% of dispensing activities is less than the cost of employing a pharmacy technician.¹² However, such products are not without their occasional problems, including software instability (particularly during peak filling times) isolated mechanical or bar-code scanner problems disabling an entire unit of cells, occasional inability to view scanned prescriptions at the time of refill, and lack of pill images for many generic products.

Safety mechanisms, such as on-screen viewing of the original prescription and updated pill images, allow the pharmacist to feel confident that the prescription was filled properly without handling the original prescription or the bulk medication containers. Although medication errors occur far less frequently with robot-filled prescriptions than human-filled prescriptions, errors can occur at the points of human-machine interface—such as filling of cells or cassettes, or verifying dispensing—particularly when humans become complacent in fulfilling their responsibilities.

To illustrate how robotics can be maximized in the large chain setting, consider the example of California-based Longs Drug Stores. In a joint venture with Amerisource-Bergen, Longs uses the AutoMed dispensing system to process refills for approximately 200 of its stores. The AutoMed machine is located in a licensed pharmacy within the AmerisourceBergen warehouse. The refills are processed overnight and delivered with regular wholesaler orders the next day. This is the concept of central-fill. On an average day, the Longs AutoMed machine processes 12,000 refills: 16,000 on a busy day.

Telephone technology—in the form of touch-tone or interactive voice-response systems—is also being used to improve pharmacy workflow and reduce the number of distractions. Pharmacies are able to gather refill information directly into a queue without having a staff member pulled away from dispensing or counseling. Patients also appreciate the feature, as it allows them to call in refills, even after hours.

The Future of Pharmacy Automation

The latest interest in pharmacy technology and automation is e-prescribing connectivity that will make it possible for physicians to send prescriptions electronically to the patient's pharmacy benefit manager (PBM) for approval, then on to the pharmacy for filling. Three companies are leading the way: SureScripts, RxHub, and PDX-NHIN. SureScripts, a joint venture of the National Association of Chain Drug Stores (NACDS) and NCPA, has the commitment of 16 chains representing 21,000 pharmacies.¹⁰ In a recent survey, 70% of pharmacists stated that e-prescribing connectivity is important software that they would like to have added to their systems.¹⁰ These and other pharmacy technologies of the future will be discussed in a follow-up article in an upcoming edition of *Insights*.

Summary

Automation in pharmacy has been evolving over the past 30 years. The level of automation varies by the size and the mission of the site. In all cases, automation is installed to increase productivity, efficiency, and accuracy of prescription filling; to reduce medication errors; and to have a positive effect on the work environment.¹³

Table 2. Automation Products Appropriate for the Large Chain Pharmacy

All automation products appropriate for the independent pharmacy (Table 1) also have a potential role in an individual store of a large pharmacy chain. Additional options for the large chain pharmacy include the following:

AmerisourceBergen: www.amerisourcebergen.com

iScan Bar-Code System

- Uses bar-code technology for fast and easy ordering and confirmation of receipt of medications

AmerisourceBergen/AutoMed: www.automedrx.com

AutoScript III

- Uses barcode technology to dispense and label up to 120 prescriptions per hour
- On-screen imaging of 3500 medications available when interfaced with Pharmacy 2000

OptiFill® System

- Can fill 4000 to 40,000 scripts/day
- Holds more than 1000 oral solid medications

OptiFill-II® System

- Can fill up to 4500 scripts/day
- Holds up to 300 oral solid medications

QuickScript® Plus System

- Labeling, counting, capping, order collation, inventory control, paperwork processing for tablets/capsules, and ready-to-label items (ointments, inhalers, and oral contraceptives)
- Interfaces with existing pharmacy computer systems

AutoMed Efficiency Suite™

- Automates entire pharmacy using AutoMed components: FastFill™ System, QuickPik System, QuickFill™ and QuickFill™ Plus, and Space Setter™, which provides access to more than 1500 items
- Allows management of complete formulary

Innovation Associates: www.innovat.com

PharmASSIST Solutions SmartCabinet System

- 48 dispensers, scaleable; bar-code technology
- 800-cc capacity reduces frequency of replenishment
- Dispensers maintain content history to prevent cross-contamination

McKesson: www.bakeraps.com

Baker Universal 2010

- Weighs up to 800 tablets in 10 seconds
- Rx Check feature scans and verifies prescriptions
- Medication is dispensed directly into prescription vial

Productivity Station®

- Counts and dispenses up to 600 pills per minute using Baker Cell™ and Baker Cassette™ technology; would enable two staff members to fill, check, and verify 90 60-count prescriptions per hour
- Software requires no interface, additional programming, or customization

Pharmacy 2000®

- Breaks filling prescriptions into a sequence of imaging/data entry, filling, and verification, enabling faster and more accurate fulfillment
- Interactive system incorporating workflow software and McKesson Automated Prescription Services (APS) to manage inventory and workflow

ScriptPro: www.scriptpro.com

SP Central®

- Links automatic dispensing systems, directs pharmacy workflow

Systems Xcellence, Inc: www.sxc.com

RxEXPRESS®

- Online patient order refills, drug utilization reviews, electronic prescribing/prescriber refill authorization

Efficiency Advantages of Automation in Pharmacy

Release Date: May 2003

Registration for Credit

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210 West Washington Square
8th Floor
Philadelphia, PA 19106
FAX: 215-592-9085

Please print clearly.

Name Degree

Title/Position

Affiliation (University or Hospital)

Address

City State ZIP

Telephone Fax

E-Mail Address

Your statement of credit will be mailed within 3 to 4 weeks of receipt of your post-test.

I certify that I have participated in this educational activity as designed.

Signature Date

TO RECEIVE CREDIT, YOU MUST COMPLETE THIS ACTIVITY BY MAY 31, 2004.

EVALUATION

Please evaluate the achievement of the activity objectives using a scale of 1 to 5 (1 = not met, 3 = partially met, 5 = completely met).

OBJECTIVES

At the conclusion of this activity, participants should be able to do the following:

- | | | | | | |
|---|---|---|---|---|---|
| 1. Assess the current retail pharmacy environment, focusing on factors contributing to increasing pharmacist workloads. | 1 | 2 | 3 | 4 | 5 |
| 2. Discuss factors driving the need for pharmacy automation. | 1 | 2 | 3 | 4 | 5 |
| 3. Describe features of specific pharmacy automation products and software appropriate for use in the small independent pharmacy. | 1 | 2 | 3 | 4 | 5 |
| 4. Identify automation products appropriate for large chain pharmacies, including robotic products and central-fill. | 1 | 2 | 3 | 4 | 5 |

Please indicate the extent to which you agree or disagree with the following statements. (1 = strongly disagree, 3 = not sure, 5 = strongly agree)

- | | | | | | |
|--|---|---|---|---|---|
| 5. The information presented in this activity was pertinent to my educational needs. | 1 | 2 | 3 | 4 | 5 |
| 6. The information presented was examined with scientific rigor and was up to date. | 1 | 2 | 3 | 4 | 5 |
| 7. The activity medium was conducive to learning. | 1 | 2 | 3 | 4 | 5 |
| 8. This material was presented in a fair and balanced manner. | 1 | 2 | 3 | 4 | 5 |

General Comments and Suggestions:

Post-Test Answer Sheet

Please circle one answer per question.
A score of at least 70% on the post-test is required.

- | | | | | |
|-----|---|---|---|---|
| 1. | a | b | c | d |
| 2. | a | b | | |
| 3. | a | b | c | d |
| 4. | a | b | | |
| 5. | a | b | c | d |
| 6. | a | b | c | d |
| 7. | a | b | c | d |
| 8. | a | b | c | d |
| 9. | a | b | c | d |
| 10. | a | b | c | d |