

Automation and Robotics – Practical Technology Solutions for the Pharmacy

a report by

Christopher J Thomsen

President, The Thomsen Group Inc.

Introduction

Often cited as one of the most trusted professions in the US, pharmacists are under immense pressure to find ways to efficiently fill more prescriptions and provide extended counseling and healthcare services for their patients.

The National Association of Chain Drug Stores (NACDS) reported that US pharmacies filled an estimated 3.14 billion prescriptions in 2002 and projected that the volume of dispensed prescriptions will balloon more than 46% by 2007. The projected increase in the number of available pharmacists over that same period of time will only be a modest 5.4%.

With the rate of growth for prescription volume being nearly 10 times the rate of growth for new pharmacists, the more important concern is that of patient safety. Since the 1960s, numerous studies have been conducted that provide irrefutable evidence that human beings do make mistakes with medication. The scope and magnitude of medication errors have been thoroughly recorded, analyzed, and published by leading research teams, and support the fact that medication errors happen every day in every healthcare institution.

Dispensing errors, as noted in a 1994 study by Betsy Allan, dramatically increase every half hour as the workload increases.¹ In 1999, the Institute of Medicine (IOM) released a shocking, yet important report to the public in “To Err is Human: Building a Safe Health System”,² and intensified the spotlight on the occurrence, clinical consequences, and cost of adverse drug events (ADEs) in hospitals. For the first time, the IOM report shared the intimate details of the US healthcare system and noted that medication errors account for one in 854 of in-patient deaths and one in 131 of out-patient deaths.

In 2003, an extensive Auburn University study of 50 community and out-patient pharmacies³ reported that dispensing errors, classified as everything from the wrong label to the wrong drug, occur at a rate of four errors per day in a pharmacy filling an average of 250 prescriptions per day. This means that at the current rate prescriptions are being filled, an estimated 51.5 million errors occur each year.

The Institute for Safe Medication Practices (ISMP) notes that medication errors are seldom the result of a single, isolated human error and suggests that they result from multiple small breakdowns in the many systems that handle the drugs.⁴ Such systems cross all professional boundaries and include patients themselves. For example, a medication error occurs when a patient neglects to tell their care-giver, physician, or pharmacist about all of the medications they take, including herbal remedies, over-the-counter drugs and nutritional supplements.

Humans Versus Automation

“While automation does not necessarily reduce the process costs, automation is likely to be the key to many future improvements”, notes David Watkinson of Watkinson Pharma Consultancy in the November 2003 issue of *The Pharmaceutical Journal*. If pharmacy does turn to automation and robotics for help then at least two very important questions must be asked:

- Where do we begin?
- Can technology help to reduce medication errors?

Basic Technology

First of all, it must be considered that even the simplest technology can yield significantly positive results for prescription dispensing accuracy. A 1991 study⁵ on the



Christopher J Thomsen is Senior Consultant and Co-founder of MedAccuracy LLC. He is also President of the Thomsen Group Inc. Last year, Mr Thomsen co-founded ACM Medical Technologies LLC. For nine years he was the North American Director of Sales and Marketing for Trigon Packaging Systems, New Zealand, Ltd. Before this, Mr Thomsen was Executive Director of CH20 Inc., during which time he co-founded this company. He has a BA in chemistry and a BSc in biology from St Martin's College, Olympia, Washington.

1. Allan E L, “Relationships Among Facility Design Variables and Medication Errors in a Pharmacy”, PhD Dissertation, Auburn University, AL. 1994.
2. Institute of Medicine, “To Err is Human: Building a Safer Health System”, Washington, DC: National Academy Press; 1999.
3. Flynn E A, Barker K N, Pepper G A, Bates D W and Mikeal R L, “National Observational Study of Prescription Dispensing Accuracy and Safety in 50 Pharmacies”, *Journal of the American Pharmaceutical Association*, March/April 2003, 43: 2, pp. 191–200.
4. Institute for Safe Medication Practices. ISMP's Focus on Cooperation, Single-page handout, ISMP's informational packet, (2003).

illumination in pharmacy revealed that dispensing errors fell from a rate of 3.7% to 2.6% when illumination was increased from 102 foot-candles to 146 foot-candles. The 2003 Auburn University study found that bar code scanning and on-screen drug images could reduce dispensing errors by one full percentage point and that 66% of content errors are generally associated with tightly packed shelving.⁶

Wrigley's placed a bar code on a stick of Juicy Fruit gum in 1974 and 30 years later, the US Food and Drug Administration (FDA) proposed a rule that would require bar code labels on all human drugs and biologicals. Only recently has healthcare realized that this kind of technology allows for the tracking of all medications, from manufacturer to pharmacy to patient, and that it will positively impact the problem of medication errors.

Bar code scanning, a critical component in nearly every automated dispensing system, is now moving beyond the pharmacy and to the patient's bed. Bedside scanning, utilizing hand-held bar code scanning systems and bar-coded wrist bands, promises to ensure that the patient and medication are correctly identified before administration commences. While still in the early stages of deployment, acceptance by US hospitals is quite good and bedside scanning is moving forward at a rapid pace.

Electronic Prescribing

For nearly a decade, healthcare professionals have politely argued that the most critical point of the dispensing process is getting the prescription from the physician's office, correctly and legibly, to the pharmacy and, to accomplish this task, computerized physician order entry (CPOE) seemed to be the most logical solution. The only problem is that while it makes sense in terms of efficiency and safety, few doctors are prescribing electronically or using 'true e-prescribing solutions' because so many prescriptions they write on handhelds are not electronically transmitted to pharmacies. According to SureScripts Systems Inc., only 6% of physicians in the US are using e-prescribing, which accounts for less than 3% of the annually dispensed 3.14 billion prescriptions, and many still prefer to hand write or print and fax prescriptions directly to the pharmacy.⁷

CPOE, which makes sense in terms of patient safety, is not infallible. Designed to reduce errors due to poor handwriting, there are reports that new errors have been introduced because of physicians hitting the wrong key. Even so, handwriting-induced errors far outnumber the 'wrong key' errors.

Automated Counting Systems

In the past, hiring more pharmacists and technicians to handle increasing prescription volumes was one way to address these challenges. Today, however, this is simply not an option. Community and out-patient pharmacies are consistently turning to technology and automation as a natural solution. Whether they are chain or independent operators, pharmacy owners and managers are eager to employ technologies that will enable them to handle an ever-escalating number of prescriptions and demands for their time. Placing more people into already crowded pharmacy spaces not only raises concerns about decreased efficiency, it also raises important economical and patient safety questions. It is also important to understand that pharmacy automation is not just another term for robotics. Today's pharmacy automation is all about scalability and a variety of systems and solutions that meet the unique needs of each and every pharmacy.

Automated counting systems can provide very real and affordable (less than US\$12,000) solutions for pharmacies filling 150 to 400 prescriptions per day. A 2004 study by The Thomsen Group Inc.⁸ noted that automated counting systems can reduce prescription filling times by as much as 48%, and can increase prescription filling capacities by as much as 16%.

Efficiency is about utilizing the right technology for your operation and standardizing the workload and workflow process. Automated counting systems are a viable and important prescription-dispensing solution and should not be overlooked.

Robotics

In order to survive and remain competitive, today's pharmacist must be capable of navigating a maze of pharmacy benefits management (PBM) obstacles, understanding and complying with Health Insurance

5. Buchanan T L et al., "Illumination and errors in dispensing", *American Journal of Hospital Pharmacy*, (1991), 48: pp. 2,137-2,145.

6. Flynn E A, Barker K N, Pepper G A, Bates D W and Mikeal R L, "National Observational Study of Prescription Dispensing Accuracy and Safety in 50 Pharmacies", *Journal of the American Pharmaceutical Association March/April 2003*, 43: 2, pp. 191-200.

7. *Pharmacy One Source June 30, 2003*.

8. Thomsen C J, "An Efficiency Analysis of the Kirby Lester KL16df Automatic Tablet and Capsule Counting System", *Retail Pharmacy Management November/December 2004*.

TRUE Scalability CLEAR Migration

A single pharmacy automation technology platform that addresses the wide-ranging volumes of all your pharmacies.

Now there's an automation strategy that makes sense.

PharmASSIST's fully integrated suite of automated dispensing and workflow management solutions delivers true scalability and a clear migration path. You don't have to worry about over- or under-automating, or how you're going to handle your ever-increasing prescription volumes.

With PharmASSIST's common software platform and dispensing technology, you can seamlessly upgrade a pharmacy's capacity and even migrate your existing system to the next level of automation.

How's that for guaranteeing your all-important capital investment and providing peace of mind?



Symphony Software

Workflow Management,
Rx Tracking and
Quality Control

SmartCabinet

Plug-n-Play, Counting
Only Technology



Enterprise System

End-to-End Automated
Dispensing and
Workflow Management



Robotics

Fully Integrated
Suite of Dispensers,
Robotics and
Workflow
Management



For more information on PharmASSIST's scalable solutions, call 607.798.9376, email sales@innovat.com, or go to www.innovat.com.

PharmASSIST[®]

SmartCabinet[®] • Enterprise System
Symphony[®] • Robotic Systems

Innovation Associates

627 Field Street • Johnson City, New York 13790

Portability and Accountability Act (HIPAA) regulations, and recognizing how the Medicare drug benefit bill will impact his or her business. As the business of pharmacy continues to grow and evolve, it has also become much more complex to understand and operate. Sometimes, there is a good reason to move beyond an automated counting system and step up the level of investment in automation.

Robotic systems have been utilized extensively in both in-patient and out-patient pharmacies in the US and Europe since 1997, to pick, count, label, and dispense unit-of-use packages (patient packs), bulk oral solids, boxes, bottles, injectables, etc., for more than a decade. While the debate continues over which business model is the best (centralized or decentralized), there really is no right or wrong answer so long as the technology helps to reduce labor and increase efficiency. Today, The Thomsen Group Inc. estimates that there are approximately 3,000 robotic dispensing systems in community and out-patient pharmacies in the US.

Since the average US out-patient or community pharmacy dispenses about 82% of its daily prescription volume from bulk tablets and capsules, and the other 18% in the form of unit-of-use packages, this means that a robotic system with 200 or more cells is capable of handling 45% or more of the total daily volume. With bar code scanning and on-screen drug image verification as part of most robotic systems, this is certainly a big step towards addressing a larger portion of the dispensing process and providing controls to ensure patient safety.

With the average list price for a robotic system at around US\$200,000, the benefits provided by these systems, at the appropriate volume, can generally justify the price. The fact that the average hourly wage in the US is US\$65 for a pharmacist and about US\$15 for a technician helps to validate the financial justification for a robotic system that performs several manual functions – selecting the vial, storing, selecting and counting the medication, and labeling the vial – in a span of 30 to 40 seconds per prescription.

However, whether the pharmacy is selecting, preparing, and transporting medications to the nurse's station, ward, or bedside cabinet, or to the patient at the pharmacy window, the most important feature of any automated system must be dispensing accuracy. For this reason, hospital pharmacies are now looking to install automated workflow systems. By utilizing bar code scanning, on-screen drug images and even biometrics, automated workflow systems can track and manage every drug, every step of the way.

Automated Workflow Systems

A November 2003 study⁹ revealed that 56% of US hospital pharmacies were using some type of automated workflow system. Of the respondents not using an automated workflow system, 65% noted that they planned to implement such a system within the next two years.

Pharmacy owners and operators are increasingly anxious to choose the right pharmacy automation systems that will handle the order entry, the adjudication, and billing, as well as the counting, labeling, and capping of their prescriptions. While some note that they are a little overwhelmed by the choices available, many are now asking what technology and automation can handle the entire prescription dispensing process.

In other words, can it be guaranteed that all of the prescriptions in my pharmacy are being filled correctly, being verified against a database with on-screen images of medications and being delivered to the right patient? The goal of an automated workflow system is to standardize the entire prescription dispensing process, eliminate the possibility of skipping critical quality control steps, and verify that the right prescription has been dispensed to the right patient.

The term 'automated workflow system' is generally defined as software modules or products that can improve productivity and efficiency by automating and dividing tasks of the prescription-dispensing process into separate steps so that they can be consistently performed by one or more people. In other words, an automated workflow system provides a standardized process or protocol that is observed and utilized by everyone using the system. In the case of pharmacy, every person filling, labeling, verifying, collating, and storing a prescription with an automated workflow system follows the same set of rules and instructions. There are no exceptions.

Automated workflow systems are provided by either the pharmacy management or the automation system vendors. There is also a wide range of functionality and pricing and no one automated workflow system looks or operates like the next.

Several pharmacy management system vendors provide an automated workflow system as part of their existing operation. While these systems provide for the orderly processing, verification, and delivery of a prescription, they do not provide any automated prescription filing component or functionality and are the least expensive (less than US\$10,000) options in this technology category.

9. Thomsen C J, "Market Survey of Pharmacy Technology and Automation in Retail and Outpatient Pharmacy", Retail Pharmacy Management, November/December 2003, pp. 1 and 22.

Automation and Robotics – Practical Technology Solutions for the Pharmacy

Nearly all of the pharmacy automation vendors provide automated workflow systems, and the functionality of these systems is quite different. First of all, these systems require tight integration with the pharmacy management system in order to operate and provide complete functionality. Second, the goal of these systems is to track and manage – from order entry to filling, verification, collation, patient pick-up, and verification – 100% of a pharmacy's prescriptions.

Automated workflow systems provided by the pharmacy automation vendors also vary in price, from US\$40,000 to well over US\$300,000, but the benefits are real and justifiable. Just consider the fact that lost or misplaced prescriptions, costing an average pharmacy around US\$60 to US\$100 per day in labor, could be dramatically reduced or eliminated. Because of the very nature of an automated workflow system, it is also inferred that they can reduce the chaos in a busy pharmacy and increase efficiency, productivity, and dispensing safety.

At the community and out-patient level of pharmacy we must continue to be aware of the fact that, even with the best technology, things can and will go wrong. As important as it is to have and use the right technology, it is even more important to have pharmacists and technicians who buy and want to do the right thing with

that technology. All pharmacy automation and technology should, at one point or another, focus on helping pharmacists perform inspections more frequently and accurately. Nevertheless, according to Matt Grissinger, medication safety analyst at the Huntingdon-based Institute for Safe Medication Practices, the technology can only be accurate when it is used correctly. The biggest impediment to maximizing the usefulness of technology is the human being that tries to outsmart the technology – or use the system in a way in which it was not intended.

“People can work around technology”, says Grissinger, offering an example from the hospital side: “Rather than scan patient bar codes one at a time when administering medications, some time-pressed nurses could remove armbands from 10 patients for scanning. Using the technology this way,” he continues, “the opportunity for error reverts almost to pre-technology days. As important as having the right technology is having the pharmacists and technicians buy in and want to do the right thing.”

Ultimately, there is no single perfect technology solution. There is, however, a logical sequence of technology and automation that, when properly integrated, can provide operational improvements and increased patient safety. ■

COUNTER INTELLIGENCE

As a pharmacist, your time is critical and limited. The **HISPAC III** automatic prescription counter:

- Gives you more time to do the things that really matter...like serving your customers.
- Reduces the personnel time, errors and expense associated with filling prescriptions.
- Handles single or multiple counts, inventory and prepackaging.
- Simply load and walk away.
- The economical choice for **accurate, reliable, high-speed** prescription counting equipment. Compare the price and features for yourself!



What is your time worth? Call Toll-Free:

1-800-766-8311

R Rx Count Corporation
An Investment you can count on everyday.

www.rxcount.com