

# Improving Patient Safety Through Automation

By: Christopher Thomsen  
President of The ThomsenGroup Inc.  
Founder of MedAccuracy LLC

## Introduction

Since the 1960s numerous studies have been conducted and provide irrefutable evidence that human beings do make mistakes. 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.

In 1982, the American Journal of Hospital Pharmacy published a report measuring medication errors in nursing homes and small hospitals<sup>1</sup>. At that time, evidence gathered since the 1960's in hospitals in the U.S., the United Kingdom, and Canada depicted a medication error rate in hospitals at roughly one error per patient per day, excluding wrong-time errors.



Up to this point, almost none of the information gained about medical and medication errors was shared with the general public, but a 1996 Archive of Internal Medicine report indicated that the patient was concerned and was becoming increasingly aware of their right to obtain and review their healthcare records. The report noted that 98% of all patients want to know when even a minor error is committed.

In 1999 the Institute of Medicine (IOM) released the shocking, yet important report to the public, *"To Err is Human: Building a Safe Health System,"*<sup>2</sup> and intensified the spotlight on the occurrence, clinical consequences, and cost of ADEs in hospitals. For the first time, the IOM report shared the intimated details of our healthcare system and noted that medication errors account for one out of 854 inpatient deaths and one out of 131 outpatient deaths.

The Wall Street Journal brought additional attention to this matter when it published a 2002 research project that depicted a medication error rate of 19% in a study conducted at 36

---

<sup>1</sup> Barker KN, Mikeal RL, Pearson RE, Illig NA, Morse ML. *Medication Errors in Nursing Homes and Small Hospitals*. American Journal of Hospital Pharmacy; 39: 987-991 (June) 1982

<sup>2</sup> Institute of Medicine. *To Err is Human: Building a Safer Health System*. Washington, DC: National Academy Press; 1999.

hospitals and skilled-nursing facilities<sup>3</sup>. And, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), recently reported that of the 2,552 sentinel events reviewed by the commission since January 1995, medication errors (291 or 11.1% of the total) are in fourth place (out of 20) behind Patient suicide (382 events), Op/post-op complication (330), and Wrong-site surgery (310).

## Why and Where do Medication Errors Occur?

According to the Institute for Safe Medication Practices (ISMP), medication errors are seldom the result of a single, isolated human error<sup>4</sup> and noted that they result from multiple small breakdowns in the systems for handling drugs. Such systems cross all professional boundaries and include patients themselves. For example, medication errors occur when patients neglect to tell their caregiver about all of the medications they take, including herbal remedies, over-the-counter drugs and nutritional supplements.

In 1994, Betsy Allan Flynn noted that dispensing errors dramatically increase every half hour as workload increases.

A study led by Dr. Lucian Leape and published in 1995, reported that 61% of adverse drug events occurred after the prescription order was written, i.e. during the medication delivery and administration processes. Conversely, 39% of the ADE detected in the study were due to prescribing errors that occurred either in the pharmacy or in the physicians office.

This information tends to confirm the findings of the IOM 1999 report that called for systematic approaches to the prevention of medication errors and certainly compels one to suggest that technology and automation might help to address and reduce medication errors.

## Humans versus Automation

Every year, billions of prescriptions are dispensed to patients in our hospitals and from our community pharmacies and there is still no relief in sight in terms of the world wide shortage of pharmacists. But, if we agree with the premise that “to err is human” then adding more pharmacy staff is not necessarily the answer.

David Watkinson of Watkinson Pharma Consultancy noted in the November 2003 issue of *The Pharmaceutical Journal* that while automation does not necessarily reduce the process costs, automation is likely to be the key to many future improvements.

If pharmacy does turn to automation for help then we must ask at least two very important questions; “Where do we begin?” and “Can technology help to reduce medication errors?”

---

<sup>3</sup> Barker KN, Flynn EA, Pepper GA, Bates DW, Mikeal RL, *Medication errors observed in 36 Health Care Facilities*. American Medical Association, American Archives of Internal Medicine, Vol 162, Sep 9, 2002, pages 1897-1903.

<sup>4</sup> Institute for Safe Medication Practices. *ISMP's Focus on Cooperation...* Single-page handout. ISMP's informational packet; 2003.

<sup>5</sup> Leape LL, Bates DW, Cullen DJ et al. *Systems analysis of adverse drug events*. Journal of the American Medical Association, 1995; 274:35-43.

## Electronic Prescribing

For nearly a decade, we 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.



Recent figures indicate, however, that less than 10% of practicing US physicians write and transmit prescriptions electronically and that many prefer to print for the patient or fax directly to the pharmacy.

And, while CPOE also makes sense in terms of patient safety, it 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.

## Simple Technology

Also consider that even the simplest technology can yield significant results. A 1991 study<sup>6</sup> on the illumination in pharmacy revealed that dispensing errors fell from a rate of 3.7% to a rate to a 2.6% when illumination was increased from 102 foot-candles to 146 foot-candles. In addition, 66% of content errors are associated with tightly packed shelving

## Robotic Dispensing and Automated Workflow Systems

Robotic systems have been utilized extensively in both inpatient and outpatient pharmacies in the US and in Europe, to pick, count, label, and dispense unit-of-use (patient packs), bulk oral solids, boxes, bottles, injectables, etc. for more than a decade. And, while we continue to debate 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.



But, 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 very

---

<sup>6</sup> Buchanan TL et al. *Illumination and errors in dispensing*. American Journal of Hospital Pharmacy, Volume 48, 1991, pages 2137-45.

reason, hospital pharmacies are now looking to install automated workflow systems. By utilizing bar code scanning, onscreen drug images and even biometrics, automated workflow systems can track and manage every drug and every step of the way.



A 2003 Auburn University study<sup>7</sup> indicated that simple prescription technologies, like bar codes and onscreen drug images, can reduce medication errors by one full percentage point.

A November 2003 ThomsenGroup Market Research study revealed that 56 % of US hospital pharmacies were using some type of an automated workflow system. 65% of the respondents not using an automated workflow system noted that they planned to implement such a system within the next 2 years.

## Bar Codes and Scanning

Wrigley's placed a bar code on a stick of Juicy Fruit gum in 1974 and 30 years later, the US Food and Drug Agency (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. Bed side 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 bed side scanning is moving forward at a rapid pace.

## Conclusion

Nevertheless, according to Matt Grissinger, RPh, medication safety analyst at Huntingdon, Pa.-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 to be used.

---

<sup>7</sup> Flynn EA, Barker KN, Pepper GA, Bates DW, Mikeal RL, *National Observational Study of Prescription Dispensing Accuracy and Safety in 50 Pharmacies*. Journal of the American Pharmaceutical Association, Vol. 43, No. 2, March/April 2003 pages 191-200.

"People can work around technology," he said, 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," he explained. Using the technology this way, 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."

In the end, there is no one 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.

**END**

### Useful Organizations with Annual Meetings and Conferences:

#### **FDA - U. S. Food and Drug Administration**

MedWatch Office

RADM Mary Pat Couig, Associate Director

5600 Fishers Lane

Rockville MD 20857-0001

888.463.6332

[www.fda.gov](http://www.fda.gov)

#### **ISMP - Institute for Safe Medication Practices**

Michael R. Cohen, RPh, MS, ScD, President

Allen J. Vaida, PharmD, FASHP, Executive Director

1800 Byberry Road, Suite 810

Huntingdon Valley, PA19006

215.947.7797

[www.ismp.org](http://www.ismp.org)

#### **JCAHO - Joint Commission on Accreditation of Healthcare Organizations**

Dennis S. O'Leary, MD, President

One Renaissance Boulevard

Oakbrook Terrace, IL 60181

630.792.5000

[www.jcaho.org](http://www.jcaho.org)

#### **National Community Pharmacist's Association (NCPA)**

Bruce Roberts, Executive Director

205 Daingerfield Road  
Alexandria, VA 22314  
[www.ncpanet.org](http://www.ncpanet.org)

National Association of Chain Drug Stores (NACDS)  
Craig Fuller, President and CEO  
Deb Faucette, VP Pharmacy  
413 North Lee Street  
Alexandria, Virginia 22313-1480  
[www.nacds.org](http://www.nacds.org)

American Pharmacists Association (APhA)  
Commander Lisa L. Tonrey, USPHS  
2215 Constitution Avenue, N.W.  
Washington, DC 20037-2985  
[www.aphanet.org](http://www.aphanet.org)

American Society of Health-System Pharmacists (ASHP)  
Daniel Ashby, MS, FASHP, President  
7272 Wisconsin Avenue  
Bethesda, MD 20814  
[www.ashp.org](http://www.ashp.org)