An Overview of Technology, Automation & Robotics in the Hospital Pharmacy Setting

Presented by:
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Technology drives safety and innovation for retail pharmacy
By Reid Paul

A growing number of retail pharmacies are looking to automation technology as they expand their businesses beyond lick, stick, and pour.
Volume versus Pharmacists

<table>
<thead>
<tr>
<th>1.5 billion</th>
<th>1992</th>
<th>2004</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td></td>
<td></td>
<td>4.1</td>
</tr>
<tr>
<td>3.0 billion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0 billion</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NACDS and IMS
Medication Dispensing Errors

Allan EL
Relationships Among Facility Design Variables and Medication Errors in a Pharmacy
Article addresses:

- Automated Counting Systems
- Robotics
- Automated Workflow
- Telepharmacy
- Self Checkout Systems

Community and Outpatient
Add to that:

- IVR
- Internet
- E-prescribing
  and
- Unit Dose Packaging
- Hospital Dispensing
- Hospital Robotics
Hospital Inpatient Pharmacy

Unit Dose Dispensing and Robotics
Medication that is dispensed in a package that is ready to administer, directly, to the patient.

Medication/Products currently being unit dose packaged and bar coded:

1. Solid dose pouches
2. Power fill pouches
3. Strip packs
4. Oral dose syringe fill
5. Sterile Injectable syringe fill
6. Liquid unit dose
Unit-dose dispensing was developed in the 1960s to support nurses in medication administration and to reduce waste.

The direct observation of how unit dose dispensing impacted medication administration errors was first described and reported by Dr. Ken Barker in 1962.

Centralization versus Decentralization
Hospital Inpatient Pharmacy

Pyxis (Cardinal Health)
It is no longer a question of “do we centralize or decentralize” since many hospitals have and are going to a mixture of both with centralized storing and packaging and decentralized distribution.
Today there are numerous companies that will convert your bulk medications and products into unit dose packages…
...and there are numerous fast and efficient automated unit dose or blister/strip packaging systems that can be installed and operated in the pharmacy.
Technology, Automation & Robotics

Hospital Inpatient Pharmacy

AmerisourceBergen, OmniCell, Parata and others
Technology, Automation & Robotics

Hospital Inpatient Pharmacy

Pyxis (Cardinal Health)
Technology, Automation & Robotics

Hospital Inpatient Pharmacy

McKesson
In an effort to reduce the effect of human error Loyola University Hospital (Chicago) installed a robotic system that stores, packages and distributes 3,200 medications, including tablets, capsules, vials, ampules and suppositories, 24 hours per day.

SwissLog
Hospital Inpatient Pharmacy

HelpMate (Cardinal Health)
Prescription Medication, for patient self administration, that is dispensed in multi dose format, generally in a vial, bottle or unit of use package, with labeling that includes:

- Patient’s name
- Physician’s name
- Name and strength
- Quantity or Volume
- Usage Instructions
- Warnings
- Bar code
Community and Outpatient Pharmacy

Automated Counting Systems and Robotics
The Drug Topics article only mentions two robotic systems.

There are many other dispensing and robotic systems.
Kirby Lester
Technology, Automation & Robotics

AutoMed
An AmerisourceBergen Company
Technology, Automation & Robotics

Innovation Associates
Parata Systems
(Formerly McKesson APS)
Technology, Automation & Robotics

ScriptPro USA
AutoMed and Sintek
Community and Outpatient Pharmacy

Automated Workflow
Workflow Systems

order entry  adjudication  labeling  filling
verification  quality assurance  storing and billing  delivery validation
Community and Outpatient Pharmacy

Telepharmacy and Self Checkout Systems
Telehealth (telemedicine) generally meant two way communication by way of telephone, e-mail, fax, radio, television, computers, videoconference and of course the Internet.

1996 - $400 million of funding for health providers, libraries and schools in rural area

2005 – Reform efforts to address digital television, universal service and e-rates

2006 – Promote and expedite wireless broadband deployment in rural and other areas
Telehealth

Pioneered by ADDS in the early 1990s, telepharmacy started with the VA and DoD.
Telehealth

It is now offered by Cardinal, AmerisourceBergen, PRN Systems, ScriptPro so that pharmacy can extend its reach to serve everything from large understaffed hospitals to small rural hospitals and medical clinics.
Technology, Automation & Robotics

Self Check-out

Asteres and Parata
Self Check-out
Community and Outpatient Pharmacy

Interactive Voice Response
Technology, Automation & Robotics

IVR
Prescription Refills – A fully automated and digital interactive voice response system to assist with refills, questions for the pharmacist and physician approvals.
**Doctor Fax Authorization** – This type of application or module works every time a patient enters a refill that requires authorization.

**Prescription Pick-ups** – An application that helps the pharmacy control the prescriptions in the "will-call" bins. The module activates automated outbound reminder calls to patients to tell them that their prescription refill is ready.

**Internet Refills** - Allows a patient to request prescription refills via the pharmacy's Web site. The application confirms and notifies the patient whether or not refills are available and schedules a pickup time. The request is then posted to the pharmacy system work queue.
**Pharmacy Based** - a fast and convenient way for staff to enter a refill request. Instead of using a pharmacy terminal, the pharmacy staff use a small touch screen that can be used to securely submit a prescription refill directly to the pharmacy system.

**Kiosks** - is a self-service touch screen that can be placed on the counter or as a kiosk that gives patients the ability to place refill requests from any location that is connected to the pharmacy network.
Community and Outpatient Pharmacy

Internet
Technology, Automation & Robotics

Internet
Technology, Automation & Robotics

Internet

Welcome to LEESBURG PHARMACY

...is the neighbor you can trust for quality, value and service. We provide our patients with the finest in pharmaceutical care and home medical equipment.

The practice of pharmacy, along with the role of the community pharmacist, is continually improving to meet the society's health care needs. To ensure patients are receiving appropriate treatments, the pharmacist not only provides the medication but also monitors for potentially dangerous drug interactions and effectiveness of therapy.

Our pharmacy department combines apothecary-style compounding with the latest in computer technology to offer you the most up-to-date...
Technology, Automation & Robotics

www.mercksource.com
E-prescribing
Technology, Automation & Robotics

Electronic Prescribing
SureScripts Certifies” the connection to the pharmacy

**What the Physician Needs:**
1. Electronic Prescribing Software that has been certified by *SureScripts*
2. A high-speed Internet connection

**What the Pharmacy Needs:**
1. Pharmacy management software that has been certified by *SureScripts*
2. An Internet or Intranet connection
Incorporated August 2001
• Formed by associations representing nation’s 55,000 pharmacies
• Privately Owned by the Pharmacy Industry
  – Pharmacy membership organization
  – Operate like a not-for-profit
  – Two sources of operating capital
    • Fees from pharmacy transactions
    • Membership
  – No charge to physicians or their software vendors
  – Neutral entity
    • No advertising or commercial influence
    • Protect patient choice of pharmacy, physician choice of therapy
• Mission:
  – Improve the prescribing process through a focus on Safety, Efficiency and Quality

Over 90% of the nation’s pharmacies have completed the certification process required to connect to the SureScripts Electronic Prescribing Network™
Nationally, about 150,000 doctors have the capability to do electronic prescribing, but only about 80,000 actually are using it.

In 2007, Massachusetts led the nation, thanks to government programs and private partnerships, with 13 percent of all prescriptions done electronically.
Electronic Health Records (EHR)

Admission (20045000000)

New patient  Search  Archive  New person

:: Immunization

Admission Nr.: 20045000000
Title: Senor
Family name: Merlo
Given name: Banderas
Date of birth: 08/07/2004
Sex: male
Blood group: A8

Date: 08/07/2004
Type: Tetagam
Medicine: Anti-tetanus immunization
Dosage: 2 mg/dl
Titer: 345
Refresh date: 08/06/2006
Application type: Subcutaneous
Application by: admin
Notes:

Save
Admission data  Barcode labels  Make

Search :: Immunization (Immunization)

Please enter search keyword:

Search

Top 10 Quicklist
Immunization

Tetagam

Options for this patient:
Confirmation of inability to work
Charts folder
Diagnostic Results
Medocs
DRG (composite)
Prescriptions
Notes & Reports
Immunization
Electronic Health Records (EHR)

An individual patient's medical record in digital format.

Electronic health record systems coordinate the storage and retrieval of individual records and they are accessed on a computer, often over a network.

A variety of types of healthcare-related information may be stored and accessed in this way.

Linked directly to e-prescribing and SureScript’s efforts.

Key word – “interoperability”
Technology, Automation & Robotics

Pharmacy Management System

Automated Workflow Systems

Automated Counting & Robotics

Self Check-out

Integration of Systems

IVR

Internet

E-prescribing
Community and Outpatient Pharmacy

Layout and Other Minor Details
Technology, Automation & Robotics

Pharmacy Layout and Fixtures
Technology, Automation & Robotics

Community Pharmacy
Technology, Automation & Robotics

Community Pharmacy
Technology, Automation & Robotics

Nursing Home Administration

Inventory Shelving

Work Top

Wheeled Storage Cart

Heat Press

Automated Counting Device

Inventory Shelving

Filling Area

Automated Counting Device

Will Call Area

Inventory Shelving

End Cap

End Cap

OTC/Product Shelving

Checking Area

Printer (under counter)

Checking Area

C/R

Drop-off

Drive-up Window

Pick-up

3'6"

2'6"

3'6"

3'6"

4'0"

5'0"

4'0"

7'0"

7'0"
Community and Outpatient Pharmacy

Outpatient Pharmacy
County of Riverside, CA
Rubidoux Clinic Pharmacy
(proposed layout)
County of Riverside, CA
Rubidoux Clinic Pharmacy
(proposed layout)
Community and Outpatient Pharmacy

Lighting
Fixtures
Storage
73% of the content errors occurred in pharmacies with a lighting level below 94 foot candles in the inspection area.

EA Flynn et al
Journal of the American Pharmaceutical Association
Vol. 43, No. 2
March/April 2003
Tightly Packed Shelving

Flexible and Adjustable Systems

66% of content errors associated with tight spacing.
<table>
<thead>
<tr>
<th>RANK</th>
<th>DESCRIPTION</th>
<th>PROD. CODE</th>
<th>KG NO.</th>
<th>SUPPLIER</th>
<th>DOLLAR PRICE</th>
<th>UNIT</th>
<th># OF UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GLYCOLIC DOZZER</td>
<td>520 GM</td>
<td>611175048231</td>
<td>98.75</td>
<td>206.78</td>
<td>21.2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PROP 3350/ELECTROLYTE GLOM KU</td>
<td>400 ML</td>
<td>611175046654</td>
<td>22.09</td>
<td>10.00</td>
<td>500</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>HYDROCOODR/ARAB SOLUTION BLT</td>
<td>480 ML</td>
<td>611175058547</td>
<td>97.35</td>
<td>16.00</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>HYDROCODONE/AFAR 5/500 TAN WAP</td>
<td>500 TA</td>
<td>611159034945</td>
<td>91.80</td>
<td>7.80</td>
<td>7.4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CHLOROQUINE 0.3% KREID TIV</td>
<td>480 ML</td>
<td>611156034356</td>
<td>8.38</td>
<td>1.40</td>
<td>587</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>HYDROCODONE/AFAR 7.5/750 TIV</td>
<td>550 TA</td>
<td>611159038716</td>
<td>20.87</td>
<td>1.00</td>
<td>79.6</td>
<td>3.6</td>
</tr>
<tr>
<td>7</td>
<td>KIVITINE HC STROOP BTH</td>
<td>480 ML</td>
<td>61170287717</td>
<td>99.45</td>
<td>20.40</td>
<td>45</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>PROPONT/ARAB 100-450 TAB MCK</td>
<td>500 TA</td>
<td>611156272125</td>
<td>91.90</td>
<td>8.00</td>
<td>6033</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>PHRIXCO 50/50 GM 500 TAB</td>
<td>500 TA</td>
<td>611156272515</td>
<td>91.00</td>
<td>8.00</td>
<td>6033</td>
<td>30</td>
</tr>
</tbody>
</table>

**Technology, Automation & Robotics**
Tightly Packed Will Call Areas
Workflow Organizers
Pharmacy Vial Usage

- 30.58% 6 dram
- 23.75% 8 dram
- 18.65% 10 dram
- 9.16% 13 dram
- 5.51% 16 dram
- 5.44% 18 dram
- 2.39% 20 dram
- 1.35% 23 dram
- 0.87% 26 dram
- 0.75% 29 dram
- 0.16% 32 dram
- 0.12% 36 dram
- 0.08% 40 dram
- 0.06% 46 dram
- 0.05% 60 dram
Summary
Automatically handle calls and refill requests
Seamlessly prompt pick-up and/or compliance
Eliminate manual labor from the filling process
Store and dispense some or all prescriptions
Automate vial retrieval & labeling
Automatically track and manage, prescriptions
Standardize the prescription filling process
Track, manage and/or deliver completed prescriptions
<table>
<thead>
<tr>
<th>Average Daily Volume</th>
<th>Dispensing Technology</th>
<th>Automated Workflow</th>
<th>Automated Will Call</th>
<th>Interactive Voice Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 1000</td>
<td>Automated counting and robotics</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>800 to 1000</td>
<td>Automated counting and robotics</td>
<td>Yes</td>
<td>Consider</td>
<td>Yes</td>
</tr>
<tr>
<td>600 to 800</td>
<td>Automated counting and robotics</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>400 to 600</td>
<td>Automated counting and robotics</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>300 to 400</td>
<td>Automated counting and maybe robotics</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>200 to 300</td>
<td>Automated, table top counting</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>100 to 200</td>
<td>Automated, table top counting</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Less than 100</td>
<td>Automated, table top counting</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Technology, Automation & Robotics

Review Costs

Simple Face Lift - $5,000 to $50,000
Adding New Fixtures/Shelving - $5,000 to $100,000

Automated Workflow - $5,000 to $200,000
Automated Dispensing - $6,000 to $70,000
Robotics - $100,000 to 225,000
Self Checkout - $80,000

Will Call - $200 to $50,000
IVR - $5,000 to $20,000

Upgrade Lighting - $500 to $5,000
Workflow Baskets - $50 to $200
Know Your Pharmacy

- Daily/weekly prescription volume
- Ratio of oral solid prescriptions vs. pre-packs, other
- Prescription volume & revenue growth/decline rates
- Hours of operation
- Size and availability of staff
- Wages and benefits for every staff member
- Daily and annual labor costs
- Current cost (labor included) to fill a prescription
- Size and layout of pharmacy/dispensing area
“Conduct a thorough financial analyses to make sure that there is a valid return on your investment (ROI)”
<table>
<thead>
<tr>
<th>Pharmacy Data</th>
<th>Currently</th>
<th>Next 12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pharmacy Operating Data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescriptions per week</td>
<td>1400</td>
<td>1600</td>
</tr>
<tr>
<td>Avg. prescriptions per day</td>
<td>200</td>
<td>229</td>
</tr>
<tr>
<td>Monday- Friday hours of operation</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Saturday hours of operation</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Sunday hours of operation</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total hours of operation</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td><strong>Pharmacy Staff</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Pharmacists (40hr wk.)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>No. of Technicians (40hr wk.)</td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Total No. FTE's</td>
<td>6.0</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>Pharmacist Labor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmacist Salary per year</td>
<td>$80,000.00</td>
<td>$80,000.00</td>
</tr>
<tr>
<td>Pharmacist wage per hour</td>
<td>$38.46</td>
<td>$38.46</td>
</tr>
<tr>
<td><strong>Technician Labor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technician wage per hour</td>
<td>$10.89</td>
<td>$10.89</td>
</tr>
<tr>
<td><strong>Tax and Benefit Rates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax and Benefits Percentage</td>
<td>28%</td>
<td>28%</td>
</tr>
<tr>
<td>Pharmacist Tax and Benefits per Hour</td>
<td>$10.77</td>
<td>$10.77</td>
</tr>
<tr>
<td>Technician Tax and Benefits per Hour</td>
<td>$3.05</td>
<td>$3.05</td>
</tr>
<tr>
<td><strong>Total Wages and Benefits per hour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmacist</td>
<td>$49.23</td>
<td>$49.23</td>
</tr>
<tr>
<td>Technician</td>
<td>$13.94</td>
<td>$13.94</td>
</tr>
</tbody>
</table>
### Technology, Automation & Robotics

**Total Time Savings (Hours)**

<table>
<thead>
<tr>
<th>Time Saved per Day with New System</th>
<th>2.53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Time Saved per Week</td>
<td>17.73</td>
</tr>
<tr>
<td>Total Time Saved per Year</td>
<td>922.13</td>
</tr>
</tbody>
</table>

**Total Labor Savings**

<table>
<thead>
<tr>
<th>Labor Saved per Day with New System</th>
<th>$179.63</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Labor Saved per Week</td>
<td>$1,257.38</td>
</tr>
<tr>
<td>Total Labor Saved per Year</td>
<td>$65,383.85</td>
</tr>
</tbody>
</table>

**Return on Investment for the New System**

<table>
<thead>
<tr>
<th>Total Costs over five (5) years</th>
<th>$5,795.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Days to Realize an ROI Based on Labor Savings</td>
<td>32.26</td>
</tr>
<tr>
<td>Average Annual Costs Savings of Accurately Counted Oral Solids</td>
<td>$8,543.92</td>
</tr>
</tbody>
</table>
Know Your Vendor

- Cost of equipment (lease/purchase)
- Space, power and data line requirements
- Upgrade/expandability costs
- Costs for software licenses
- Remodeling requirements
- Costs for interfaces, installation and training
- Ongoing maintenance requirements
- Costs for service and support
- Performance guarantees
Technology, Automation & Robotics

Project Timeline
Technology, Automation & Robotics

Develop a Team

A Team Leader
A Financial Expert
A Contractor
A Champion
A Change Manager

“Constantly monitor and manage the changes and new systems so that they become normal habits and accepted parts of your operation”
Technology drives safety and innovation for retail pharmacy
By Reid Paul

A growing number of retail pharmacies are looking to automation technology as they expand their businesses beyond lick, stick, and pour.
More than 60% of refills can be processed with an IVR system and the ROI is generally less than 6 months.
## Use of Technology to Drive Productivity

<table>
<thead>
<tr>
<th>The Children’s Hospital Outpatient Pharmacy</th>
<th>Before installing the KL16df</th>
<th>After installing the KL16df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total average time to complete and dispense a prescription - in minutes</td>
<td>8.620</td>
<td>8.367</td>
</tr>
<tr>
<td>Prescription Filling Capacity - in prescriptions</td>
<td>55.684 Rx per person, per day</td>
<td>57.368 Rx per person, per day</td>
</tr>
</tbody>
</table>

- **Additional Prescription Filling Capacity per person - in prescriptions**: +1.684 Rx per day
- **Additional Prescription Filling Capacity per person - percentage**: +2.9%

Simple dispensing systems reduce filling times and increase capacity.

CJ Thomsen et al
The Thomsen Group and the University of Cincinnati
Retail Pharmacy Management
November 2005
“Utilization of simple prescription technologies, like bar codes and onscreen drug images, can reduce medication dispensing errors by one full percentage point.”

KN Barker et al
Journal of the American Pharmaceutical Association
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March/April 2003
Questions?
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