Current Concepts in Pharmacy Automation

Mike Sanborn, MS, RPh, FASHP
Corporate Director of Pharmacy
Baylor Health Care System
Dallas, TX
Objectives

• Review automation options available for unit dose dispensing in acute care pharmacies
• Assess automation options for IV admixture compounding
• Discuss pros and cons of various automation choices
• Review a variety of other considerations and system issues
Typical Automation Goals

- Expand pharmacy services
- Redeploy pharmacy staff
- Improve medication turnaround time and pharmacy efficiency
- Reduce medication errors
- Improve charging/billing
- Increase formulary compliance
- Reduce cost of drug therapy for patients
- Improve Adverse Drug Reaction reporting
- Improve pharmacy image, morale, and pharmacist job satisfaction
- Take responsibility for medication use in all patients
Key Technology Drivers

- Profits and entrepreneurial spirit
- Cost Effectiveness
- Patient Safety
- Fewer pharmacists allured by dispensing, compounding, and other manual tasks
- Workforce shortages
- Inherent need for continuity of care
Incorporation of Technology

Am J Health-Syst Pharm. 2006; 63:327-45
KLAS, CPOE Digest 2007
Technology and Automation are Major Issues

Figure 6
PHARMACY INFORMATION TECHNOLOGY IMPLEMENTATION ACTIVITY

<table>
<thead>
<tr>
<th>Service</th>
<th>2004 Current</th>
<th>2009 Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy Data Analysis</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Online Formulary</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>Robotic Dispensing</td>
<td>42%</td>
<td>23%</td>
</tr>
<tr>
<td>Physician Prescribing Report Cards</td>
<td>48%</td>
<td>77%</td>
</tr>
<tr>
<td>Computerized Physician Order Entry</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>Online Prescribing</td>
<td>79%</td>
<td>96%</td>
</tr>
</tbody>
</table>

n=39 respondents.
Unit Dose Automation for Acute Care Hospitals
Automation Options

- Decentralized
  - Automated Dispensing Cabinets (ADC)
- Centralized
  - Inline Packagers
  - Carousels
  - Robots
What is the Future of Automated Dispensing?

• Currently 73.9% of hospitals have a centralized system versus 26.1% decentralized

• In the future, 50.1% envision a centralized system versus 50% decentralized

• The truth is likely dependent upon a variety of factors

Factors Affecting the Dispensing Model

- Philosophy (Rx and RN)
- Resources
- Logistics
- Patient Flow/Turnover
- Bed size

Distribution Model by Bedsize

<table>
<thead>
<tr>
<th>Bedsize</th>
<th>Centralized</th>
<th>Decentralized</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-99</td>
<td></td>
<td></td>
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<tr>
<td>100-199</td>
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<tr>
<td>200-299</td>
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<tr>
<td>300-399</td>
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<tr>
<td>&gt;400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Major Players in Decentralized Automation

Omnitcell

Pyxis

AcuDose
Nursing Battles
(Trying to fill cabinets while nurses are vending meds)
Maximize Restock Activities

Restock Activity for the Top 15 Units
Centralized Systems

- Inline Packagers
  - Multiple vendors of JVMedi
- Carousels
  - Multiple vendors
  - Software is key
- Robots
  - Swisslog
  - McKesson
Inline Packagers

- Essentially an oral solid packager
  - Similar concept to the original ATC-212
- Both canister and on demand
- Utilizes bar-codes
- Can include 100-500 line items
- Can fill patient-specific strips
- Allows for bulk drug utilization
- Canister calibration, returns, and incompatibilities
Carousels

• Great for inventory control
  • 2000-3000 line items
• Easily integrated to fill ADMs
• Can be used for first doses
• Integrated barcode capabilities
• Minimal training required
  • Lighted prompts are very helpful
• Handles virtually unlimited package sizes
• Returns and restocking a challenge
Centralized Dispensing Robotics

- Picks patient-specific meds to envelope, ring, or bin
- Bar-coded individual doses
- Very good inventory control
- Generally error free
- Simple crediting and restock process
- Limited pharmacist check
- Will likely reduce technician labor
- Space considerations and packaging
The Trade Off

Pharmacy Convenience

Robots

Hybrid

ADMs

Nursing Convenience
The Hybrid Option

**PROS**
- Can take advantage of different technologies
- Synergies do exist
- Especially effective for larger hospitals (>200 beds) and IDN’s
- Flexibility of dispensing methodology, based on the drug
- Can maximize the benefits of each type of automation

**CONS**
- More equipment to justify
- More equipment to manage
- Interfaces
- Integration can initially be time consuming
Patient Safety Concerns

- Decentralized Automation
  - Misfills
  - LASA
  - Stockout delays
  - Matrix drawers
  - Overrides (errors have been reported as high as 11.7%, with 1.7% resulting in actual patient errors)

- Centralized Automation
  - LASA
  - Bar-coding errors
  - Return/Discontinue accuracy
  - Bin restocking with Carousels

* Kester Ket al. *Hosp Pharm.* 2006;41:535-537.
Anesthesia Workstations

• Automated medication documentation
  • Some incorporate bar-code scanning
• Can improve documentation and charge capture
• Mixed provider feedback, but generally positive
• Can be configured with most stereo systems and iPods
Additional Considerations

• Automation integration with
  • CPOE
  • “Smart” Infusion Devices
  • BCMA
• Bedside scanning and ADMs may not be the best mix
  • Nurse servers are somewhat attractive again
• Inventory space requirements (due to barcoded meds) may increase
• Company’s have experienced consolidation, and this will likely continue
  • Multiple solutions from one vendor
  • Still opportunities for price negotiation
IV Admixture Robotics for Acute Care Hospitals
Robotic Systems

- Historically limited to TPN compounders
- Intellifill was first to market with syringe filling robotics
- Cytocare available in the US in November for chemotherapy compounding
  - Currently functioning in Italy and the UK
- Riva is soon to be available for standard admixtures or chemotherapy
Major Players for IV Robotics

IntelliFill  Cytocare  Riva
Robotic Admixture Systems

**PROS**
- Can automate very complex tasks and manipulations
- Precision is significantly greater than human capabilities
- Very high throughput
- Employee exposure reduction
- Reduced opportunities for contamination
- Enhanced 797 compliance

**CONS**
- IntelliFill requires adoption of syringe program
- Can be costly, although ROIs are generally good
- Space considerations and potential construction
- More equipment to manage (downtime, interfaces, etc.)
- Riva and Cytocare are not tested in the U.S.
Additional Automation Considerations
Single Vendor Advantage?

- Many vendors are leveraging their multiple technologies to improve integration
  - Omnilink to Omnicell ADM Example
  - McKesson Robot, Carousel, and Cabinet Example
- Some have argued that best of breed is a better solution
- Advantages and Disadvantages
Vendor Selection Considerations

- Functionality
  - Is an ADM an ADM?
- Total Product Offering
- Ongoing Product Development
- Service and Support
- Market Penetration and Growth
- Facility and System Considerations
- Cost and Value
Return on Investment

- Vendors can assist with calculations, but they should always be validated internally
- Business plans are helpful
- Many installations will have a reasonable ROI
  - Personnel
  - Tangible
  - Intangible
- Mixed results in the literature
  - Depends on implementation effectiveness
Pharmacy Automation

- Continued automation of manual tasks performed by pharmacists and/or technicians.
- Refinement of existing technologies
- Automation outsourcing
  - Packaging facilities, compounding facilities, etc.
  - Health-system initiatives and co-ops
Conclusion

• Important to understand advantages and disadvantages of each type of automation

• Health-systems should develop an overall automation plan based on current and future automation needs

• Optimization is critical to the success of the department and improvement of the medication use process.

• A positive experience is dependent upon lots of work and lots of data analysis (and lots of time)