IV Compounding Automation

Jeff Brittain, PharmD, BCPS
Clinical Pharmacist, Medication Policy & Informatics
Medical University of South Carolina

Objectives

- Identify steps in the IV compounding process than can be improved by automation
- Describe and differentiate automated IV workflow technologies
- Describe and differentiate IV compounding robotics
- List benefits and challenges related to the implementation of IV workflow technology

What is Automation?

The technique, method, or system of operating or controlling a process by electronic devices, thereby reducing human intervention

- Reproducibility
- Efficiency

Disclosure

• No financial relationships with companies contained in this presentation

Why Automate?

Benefits of unit dose packaging systems include:

- Decreased medication errors
- Improved patient safety
- Increased efficiency
- Reduced waste

Why Automate?

Unit Dose Packaging Systems

Unit Dose Packaging Trends

- 2010: 20%
- 2011: 25%
- 2012: 30%
- 2013: 35%
- 2014: 40%

- The adoption of unit dose packaging has increased significantly over the past few years, with a projected growth rate of 5% per year.
- Hospitals with higher adoption rates have reported significant reductions in medication errors and improved patient outcomes.
- The use of automated systems in the compounding process has led to increased efficiency and reduced labor costs.

Why Automate?

- streamlines operations
- reduces errors
- ensures consistency
- improves patient safety
**Use Bar Codes in the IV Room**

- ASHP Statement on the utilization of barcode technology and IV preparation
  
  “The American Society of Health-System Pharmacists encourages hospital and health-system pharmacies to incorporate bar-code scanning into inventory management, dose preparation and packaging, and dispensing of medications.”


**Current State**

- 2011 ASHP Survey
  - 50% of hospitals use bar code assisted medication administration
  - 12% of hospitals prepping IV medications using bar coding technology
- 2012 Pharmacy Purchasing & Products Survey
  - 59% of hospitals using bar code assisted medication administration


**Current State**

**IV Workflow Automation**

**IV Workflow Automation Offers**

- Workload prioritization
- Preparation guidance for user
  - Drug
  - Concentration
  - Amount
- Remote verification
- Intelligent labeling
- Track preparations through delivery
- Analyze trends
- Historical reference

**How It Works**

- Input via print-stream or HL7 interface
- Routing based on order characteristics
- Match presented products against input
- Provide ingredient-specific guidance
- Control progress of doses
- Present steps in logical order for verification
- Timestamp each step
How It Works

- **Qualitative** analysis of ingredients
  - Scanning a bar code
  - Image recognition

- **Quantitative** measure of components
  - Image/video capture
  - Gravimetric measurement

- Progression restricted until parameters satisfied

Gravimetrics

- **Advantages:**
  - Highest level of precision
  - Completes loop of verification

- **Challenges:**
  - Clinically significant precision
  - Conflict with device markings
  - Additional equipment in the hood
  - Additional time to weigh
  - Obtaining gravimetric information

Video Demo

**IV Workflow Automation Demonstration**

Workflow Prioritization

Guided Preparation
Real-Time System Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Time (HH:MM)</th>
<th>User 1</th>
<th>User 2</th>
<th>...</th>
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<tr>
<td>Ready</td>
<td>12:34 PM</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Tracking a Dose

<table>
<thead>
<tr>
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<th>User</th>
<th>Date/Time</th>
<th>Location</th>
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<tbody>
<tr>
<td>.....</td>
<td>.....</td>
<td>12/31/2012</td>
<td>Fridge</td>
</tr>
<tr>
<td>.....</td>
<td>.....</td>
<td>01/01/2013</td>
<td>Workstation</td>
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</table>

IV Workflow Automation Options

- DoseEdge® (Baxter)  
- ChemoCato® (ChemoCato)  
  - [http://www.chemocato.com](http://www.chemocato.com)
- Pharm-Q® In The Hood (Envision Telepharmacy)  
- IV Soft® (Health Robotics)  
- ScriptPro® TelePharmacy (ScriptPro)  
  - [http://www.scriptpro.com/Products/Telepharmacy](http://www.scriptpro.com/Products/Telepharmacy)

DoseEdge®

ChemoCato®

Pharm-Q® In The Hood
### Side-By-Side Comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>ChemoCat</th>
<th>DoseEdge</th>
<th>i.v. SOFT</th>
<th>ScriptPro</th>
<th>Pharm-Q</th>
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<tbody>
<tr>
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<td>No</td>
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<tr>
<td>Bar code recognition</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Image recognition</td>
<td>No</td>
<td>No</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Still image capture / storage</td>
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<td>Yes</td>
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<tr>
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<td>Yes</td>
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<td>Non-hazardous prep support</td>
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<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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</table>

### Consider Your Options

- What types of doses am I targeting?
- What can it offer outside of dose preparation?
- Can I support additional software/hardware?
  - New Interface
  - Separate medication database
  - Training & maintenance
- Fee structure
- How will I handle a downtime?
- Is gravimetric measurement important?

### Benefits of Automation

- Redistribution of pharmacists
  - No longer required in the clean room
  - Perform 2nd RPh check at remote sites

- BUD specific to drug + concentration + storage
  - Over 2,400 re-used doses at MUSC

- Overall dose turnaround time about the same

### Broadly Applicable

- Close to 400,000 doses since Sep 2011 at MUSC
- >97% of doses that leave an IV hood
**Intercepted Errors (First 6 months)**

**Generate Better Products**
- RPh rejection rates cut from 4% to 0.7%

**Missing Dose Reduction (1st Year)**

**Cost-Effective?**
- Random 7-day sample avoidance:
  - 135 preparation errors
  - $2,328.59 in pharmacy acquisition costs
  - = $332 per day savings

**Robotic IV Automation Options**
- IntelliFill® (Baxter)
- I.V. Station® (Health Robotics)
- RIVA® (Intelligent Hospital Systems)
  - [http://www.intelligenthospitals.com](http://www.intelligenthospitals.com)

**IV Robotics**
IntelliFill®
- Non-hazardous syringes only
- Output
  - Over 600 syringes/hr
- Accomodates
  - Specific 12mL syringe
  - Bandoleer-fed
  - Min vol = 0.5mL
  - Max vol = 11.5mL

I.V. Station®
- Output:
  - Up to 60 syringes or 24 bags/hr
- Accomodates:
  - 28 vials (1 to 100mL)
  - 25 IV bags (50 to 1000mL)
  - 42 syringes (1 to 60mL)
  - Min vol = 0.5mL
- I.V. Station® Onco for hazards

RIVA®
- Hazards or non-hazards
- Output (per run):
  - Up to 400 x10mL syringes
  - Up to 140 x 150mL bags
- Accomodates:
  - Bags from 25mL - 1000mL
  - Syringes from 1mL - 60mL
  - Min volume = 0.3mL in 1mL syringe
  - Min volume = 1.8mL in bag

Should I Consider IV Robotics?
- Advantages:
  - INsource
  - High-degree of accuracy
  - USP 797 compliant
  - Employee safety
  - Reduce waste
  - Reallocation of staff
  - Return on investment

Should I Consider IV Robotics?
- Challenges:
  - Significant startup costs
  - Supply tolerance
  - Match production capability to workflow
  - Need BUD to make production worthwhile
  - Fragmented workflow
  - Robot is not independent
  - Different operator skill set
Economics of IV Robotics

- IntelliFill® – Brigham and Women’s Hospital
  - $210,000/yr savings on INsources
  - $80,000/yr savings on high-use OR syringes

- RIVA® – Children’s Hospital of Orange County
  - Payback period of 3.1 yrs

Should I Really Consider IV Robotics?

- Scope?
- Space?
- Staff?
- Stability of vendor?
- Startup funding? Continued funding?
- Supplies?
- Support?

What Happens When...

What’s Next for IV Automation

- Factory to injection site tracking
  - Track-and-trace

- Better barcodes

What’s Next for IV Automation

- Radio Frequency Identification (RFID)
  - Wireless
  - Passive
  - No line-of-sight restriction
  - Simultaneous
  - Draft chapter of USP-NF <1083> mentions 2D bar codes and RFID technologies

Questions?