Hospital Dispensing Technologies:
Automated Dispensing Cabinets, Robotics, Controlled Substance Vault Technology

David Webster, RPh, MSBA
University of Rochester Medical Center
Department of Pharmacy
Associate Director of Operations
Director, PGY1 Residency Program

I have no conflicts of interest to declare

Introduction
1. Integrating technology and technician support into the practice model for pharmacists
2. Overview of dispensing models and technology
3. Automated inventory management systems and software
4. Robotic dispensing and unit dose packaging systems
5. Automated Dispensing Cabinets and vault technology
6. Integrated system and opportunities

Supporting a Clinical Practice Model Technology in the Medication Distribution System

Error rate of technician fill ~4%
Pharmacists only intercept ~80% of errors
Strategies to improve system may include robotic dispensing and extended use of bar code verification

University of Rochester Medical Center Dispensing Models

• Automated Storage and Retrieval
• Robotics for Central Fill
• ADCs for Decentralized Inventory
• IV Robotics
• TPN Compounder

• Automated Storage and Retrieval
• ADCs for Decentralized Inventory
• Automated UD Packaging

• Hybrid
• Decentralized
For those who utilize automated inventory technology only...

QUESTION:
For refilling ADCs (non-patient specific), what is the involvement of pharmacists in your standard process?

1 – Pharmacists refill cabinets
2 – Pharmacists check all products pulled (including from automated systems) and technicians restock
3 – No routine pharmacist check of automated system selections but pharmacists check any manual picks – technicians deliver to the cabinet.
4 – No pharmacist involved in restacking ADCs
**Inventory Management Technology**

**Inventory Management Technology**

**Inventory Management Technology**

**Inventory Management Technology**

**Inventory Management Software**

**QUESTION:**
For non-controlled substances, does your facility utilize inventory management software to track perpetual inventory (capturing inventory quantities and value in real time), automatically create orders for wholesaler, and electronically receive/queue orders for stock replenishment for ADCs?

1 – YES to ALL
2 – YES to SOME components
3 – NO
Pros
• Program customized to meet pharmacy needs
• Ability to dispense according to variety of priorities (location, expiration date, etc.)
• Frequent automatic price file updates through interface w/ wholesaler
• Closed loop ordering-receiving process; able to handle multiple suppliers
• Automated interface for ADC replenishment
• Real time inventory valuation
• Auditing for inventory access

Cons
• Still rely on human counting
• User interface not intuitive
• Client-based
• Report generation limited
• Limited multi-site capabilities
# Unit Dose Packaging Technology

<table>
<thead>
<tr>
<th>UD Packaging On Site</th>
<th>Bar Code Integration</th>
<th>Confirmation of source medication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Confirmation of packaging accessories</td>
</tr>
<tr>
<td>Safeguards to Ensure UD</td>
<td>System to reject empty packages</td>
<td></td>
</tr>
<tr>
<td>Pharmacist Verification</td>
<td>Bar Code Verification of source medication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System to prevent double packages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional verification checks (e.g. Lot/Exp)</td>
<td></td>
</tr>
<tr>
<td>Failsafe Process</td>
<td>Rejection of incorrect products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rejection of unverified units</td>
<td></td>
</tr>
</tbody>
</table>

---

## Bulk to Unit Dose Packaging at SMH

---

## Perfect Packaging?

---

## Bulk to Unit Dose Packaging at HH

### ATP Packager
**Manufacturer:** TCGRx

**Pros**
- Integration w/ IMS for real time repacking for ADC replenishment
- Bio ID access
- Intuitive user interface w/ touch screen
- Intuitive, easy-to-use tray (non-canister) repacking option
- High speed, quiet
- Easily configured for other applications (multi-dose repacking, patient-specific)

**Cons**
- Canister configuration is specific to NDC and physical properties of dosage form (complicated to convert canisters from one NDC to another)
- Routine PM required to keep device operating at high level
- Depending on packaging sequence and label design, can experience waste related to consumables (i.e. packaging material)
Robotic Dispensing

Doses dispensed at SMH by Swisslog PillPick System since 2008
- No Dispensing Errors (wrong drug package selected) to date

Robotic Dispensing

UCSF Automated Pharmacy Wins 2011 Popular Science "Best of What's New" Award

Robotic Dispensing

12,339,233

Doses dispensed at SMH by Swisslog PillPick System since 2008
- No Dispensing Errors (wrong drug package selected) to date

Robotic Dispensing

FOR UNIT DOSE DISPENSING FROM MAIN PHARMACY
82% OF CENTRAL FILL DOSES
68% OF FIRST DOSES
(FEBRUARY 2014)

Automated Dispensing Cabinets
QUESTION – What percentage of US hospitals >100 beds utilize Automated Dispensing Cabinets?

1) <70%
2) 70%-89%
3) >90%

The real question is not IF you are using them, but in how you are using them:

• Refilling Process
  • Do you have bar code scanning integration?

• Access
  • Do you use Bio-ID user authentication?

• Returns
  • Do you allow nurses to return medications?

• Drug Database
  • Do you have direct integration to PIS or e- record?

• User Database
  • Do you have direct integration to network logins?

• Medication Alerts
  • Are you balancing key alerts and alert fatigue?
  • What is your lead and lag times for removal?

• Discrepancy Resolution
  • Are discrepancies resolved in a timely manner?

• Refrigerated Medications
  • Do you use secured access through ADC efficiently?

• Waste Process
  • How do you handle controlled substance waste in the OR?
### Controlled Substance/Vault Technology

<table>
<thead>
<tr>
<th>Vault Perpetual Inventory</th>
<th>Bar Code Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Usage Data/Ordering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Link to ADCs and Non-ADC Areas</th>
<th>Tracking of CS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Form Creation for CDARs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diversion Monitoring</th>
<th>Reporting Tools/Auditing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Focused Historical Reporting</td>
</tr>
</tbody>
</table>

### Reports – How do we use them?

**What are we looking for?**
- High frequency of Cancelled Removes
- High frequency of Returns
- Removals that don’t match orders
- Waste transactions >1 hour after removal
- Unassigned patients
- Removal under temporary/discharged patients
- Discrepancies with questionable resolution
- Undocumented administration (remove-admin report)

**Answer – Review/Audit any individual at +2 SD From the Mean**

### Pharmacist Time and Sources of Error

**Cart Fill and First Dose Dispensing**
- Currently use Robotic Repackaging and Dispensing (~82% with a goal >90%)
- Future is bar code verification of non-robotic dispensing to reach 100% prior to dispensing

**ADC Refilling**
- Use Automated Storage and Retrieval System with bar code scan verification (currently ~91% with a goal of 100%)
- Future is forced bar code scanning of manufacturer’s bar code at point of refill

### Integration of Technology

- **Decentralized** ~90%
- **Centralized** ~82%

### Questions