RFID in Health Care

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Embassy Suites Lakefront, Chicago, ILL.
RFID in Pharmacy Inventory Management

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Outline

• About Sharp Memorial Hospital
• Overview Of The Medication Use Process
• Evolution Of Dispensing/Distribution
• Our Experience (Phase 1 Trial)
• The Future
Sharp Memorial Hospital (SMH)

- 330 Licensed Acute Care Beds
- San Diego’s Largest Emergency And Trauma Center
- Cardiac Surgery
- Multi-organ Transplantation
- Oncology
- Ranked Most Beautiful Hospital, June 2010 By Soliant Health
SMH Pharmacy Numbers (+/-)

- $22 million annual Drug Spend
- $2 million inventory
- ~2000 Various Drugs or Stock Keeping Units (SKU’s) On Formulary
- >60 Full Time Equiv Pharmacy Staff ($6.8 million)
The Role Of The Hospital Pharmacist

• What Goes On In A Hospital Pharmacy?
• What Do Hospital Pharmacists Do?
• Myths
  – Lick
  – Stick
  – Count
  – Pour
What Pharmacists do?

• Drug Therapy In Hospitals
  – Increasingly More Complex
  – And Expensive
• Staffed By Pharmacists And Pharmacy Technicians
• The Fundamentals
  – Review physician medication orders
  – Review medications loaded into automated dispensing cabinets (ADC’s)
  – Provide the nursing Medication Administration Record (MAR)
  – Preparing Drugs for Distribution

Source: Pharmacy Purchasing & Products, State of Pharmacy Automation, August 2011
What Pharmacists do?

• Prevents Medication Errors
• Minimizes The Risk Of Adverse Drug Events, For Example
• These Interventions Have Shown To Improve The Overall Quality Of Patient Care And Decrease Healthcare Costs
• Examples of Clinical Services
  – Medication Regimen Optimization
  – Rounding On An Interdisciplinary Team With Physicians, Nurses, Dieticians, Etc.
  – Role Of A Drug Expert
  – Consult Services (E.G. Pain, Renal, Pharmacokinetics, Diabetes, Etc.)
  – Drug Information Services
The introduction of technology has freed up pharmacists from a large amount of their dispensing/distribution duties, allowing more time to be spent for clinical services and direct patient care.
Dispensing Touch Points

- Per Year (Estimates)
  - Orders processed: 1.8 million
  - Total Doses: 4.6 million
  - ADC vends: 2.6 million

Each touch point is a POTENTIAL failure point
Overview of the Medication Use Process
**Med Use Process:**

*The 50,000 Foot View*

**USP**

**THE MEDICATION USE PROCESS**

1. **PRESCRIBING**
   - Evaluate patient
   - Establish need for medicine
   - Select right medicine
   - Determine interactions and allergies
   - Prescribe medicine

2. **TRANSCRIBING/DOCUMENTING**
   - Transcribe prescription/order
   - Transmit to pharmacy

3. **DISPENSING**
   - Review prescription order
   - Confirm transcription
   - Contact prescriber for discrepancies
   - Prepare medicine
   - Distribute medicine

4. **ADMINISTERING**
   - Review prescription order
   - Confirm transcription
   - Review warnings, interactions, and allergies
   - Evaluate patient
   - Administer medicine

5. **MONITORING**
   - Assess patient’s response to medicine
   - Report and document results

*Copyright: USP (U.S. Pharmacopeia), 2004*
## Med Use Process: The 10,000 Foot View

<table>
<thead>
<tr>
<th>The Joint Commission</th>
<th>California Department of Public Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering/Transcribing</td>
<td>Prescribing</td>
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<tr>
<td>/</td>
<td>Prescription / Communication</td>
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<tr>
<td>Preparation/Dispensing</td>
<td>Product Labeling</td>
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<tr>
<td>Selection/ Procurement</td>
<td>Packaging / Nomenclature</td>
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<tr>
<td>Preparation/ Dispensing</td>
<td>Compounding</td>
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<tr>
<td>/</td>
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<tr>
<td>Storage</td>
<td>Distribution</td>
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<tr>
<td>Administration</td>
<td>Administration</td>
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<td>/</td>
<td>Education</td>
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<tr>
<td>Monitoring</td>
<td>Monitoring</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Use</td>
</tr>
</tbody>
</table>
Where Can Medication Errors Occur?

- According to the National Coordinating Council for Medication Error Reporting and Prevention

Medication errors can occur ANYWHERE in the process.

Evolution of Dispensing/Distribution

Adoption Drivers for Technology
We’ve come a long way…

Courtesy: National Library of Medicine
## Historical Perspective
### Key Drivers

<table>
<thead>
<tr>
<th>The “Old”</th>
<th>The “New”</th>
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</thead>
<tbody>
<tr>
<td>Ward/floor stock</td>
<td>Unit dose packaging</td>
</tr>
<tr>
<td>Manual filling patient bins (24 hour med supply)</td>
<td>Profile based cabinets (controlled access to only what is ordered)</td>
</tr>
<tr>
<td>Open Access Drawers/Pockets</td>
<td>Controlled access (Smarter pockets)</td>
</tr>
<tr>
<td>Limited Regulations</td>
<td>Heavily Regulated and Increasing</td>
</tr>
<tr>
<td>Limited Inventory Control</td>
<td>Reduce Inventory Cost and Diversion</td>
</tr>
</tbody>
</table>

Drivers ➔ Reduce Costs, Increase Safety and Efficiency
Bottom Line Goal

When It Comes To Distribution

• Set The Nurse Up For Maximum Success With The 5 Rights of Medication Safety
  – The right medication
  – To the right patient
  – At the right time
  – Via the right route
  – With the right dose

• Make It Hard To Do the Wrong Thing (Ideally, We Could Make It Impossible)
Distribution/Dispensing

Common Types of Products
Examples of Distribution Types

Unit dose

Intravenous Infusion

Bulk
Barcoding

Understanding the Nuances
Use of Barcoding

• Barcode Medication Administration (BCMA) aka Bedside point of care (BPOC), is just one piece of the puzzle.
• Can Also Be Done At other Various Touch Points
  – *Pick* from storage
  – *Fill* an ADC
  – *Vend* from ADC
• Variable Adoption
• Trade offs
  – Barcording at each touch point might add safety, but reduces efficiency
Barcoding and Med Safety

18 YEARS 8 MONTHS AND 12 DAYS
FIXATING ON ACCIDENTS THAT OCCUR IN THE BLINK OF AN EYE

BUT WHO'S COUNTING?

WOULD YOU LIKE TO PREVENT FOUR DOSE ERRORS A DAY AND SAVE $18,000 A YEAR?

WE THOUGHT SO...
Reducing waste, eliminating errors and saving money — three objectives your pharmacy not only solves for, but depends on — every day.

The results speak for themselves:
- Decrease in average of last dose preparation error daily
- $17 per day through avoidance of dose destruction due to compounding errors
- Annualized total of approximately $18,000 per year in hard dollar cost savings

Source: Pharmacy Purchasing & Products, State of Pharmacy Automation, August 2011
Adoption of Bar Code Medication Administration (BCMA)

Adoption of bar code medication administration (BCMA) continues to intensify. Given that 60% of facilities without this technology are planning an implementation in the near future, this growth will persist.

Facilities with hybrid and point-of-care drug distribution models have been quick to adopt BCMA; half of those facilities have implemented BCMA while just 49% of hospitals using centralized and decentralized models have done so. As expected, facilities with a pharmacy informaticist on staff are more likely to have BCMA in place.

“Like any medication safety technology, including CPOE and smart pumps, BCMA, by itself, will not decrease errors; How it is incorporated into the institution's safety initiatives and medication-use processes, as well as thorough training and diligent management efforts post-implementation, will ultimately determine BCMA’s impact on patient safety.”

—Thomas Cooley, RPh, MBA
Director of Pharmacy Informatics and Support Services, Brigham and Women's Hospital

Source: Pharmacy Purchasing & Products, State of Pharmacy Automation, August 2011
Medication fill process

1. Medication picked by PaRX
   - 1a Refill
   - 1b Load

2. Medication checked by PaRX
   - 2a PaRx
   - 1b Assist

3. Medication filled by scan

4. Rxcheck
   - 4b Compare report
Medication fill process

1. Medication picked by PaRX
   - 1a. Refill: Wrong med in bin, Only one item scanned or shelf label, Manual barcode, Scanner does not work
   - 1b. Load: Screen shot; manual process, Not on scanning compliance report, Incorrect or missing scan code maintenance, New pocket can be assigned at console or pyxis machine, For nursing requests, on demand label must be printed

2. Medication checked by PaRX
   - 2a. PaRx: Scanning self-made barcode; false sense of security, Big label obstructs view; time to look at all meds, No designated pharmacist; multi-tasking, distractions, No designated area, Scan may not work, Scanned, but incorrect placement in matrix drawer or wrong scan code maintainence, Distractions, interruptions
   - 2b. Assist: Only one bag gets scanned, but multiple may be loaded

3. Medication filled by scan
   - Only one item scanned

4. Rxcheck
   - 4a. Delay: Once hit “accept” can’t see drug or pocket #, Only on for 24 hours
   - 4b. Compare report: Difficult to interpret
Errors Still Occur

Why?

Success Is predicated on a human being doing the right thing in the midst of barriers
Why Do Errors Still Occur With Barcode Scanning?

• False sense of security & over-reliance on barcode system
• “Good beep” only means it’s the right label or a successful scan, **it doesn’t always mean it’s the right drug**.
  – Each vs. Many (item level scanning)
• Scan failures occur
In my smart people can read this.

I couldn't believe that I could actually use that word when I was reading. The phonemnopal power of the human mind, in a research at Cambridge University,

it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be in the right place.
The rest can be a total mess and you can still read it without a problem.

This is because the human mind does not read every letter by itself, but the word as a whole. Amazing huh? yeah and I always forget spelling was important! if you can read this pass it on!!

Humans Make Visual Mistakes

<table>
<thead>
<tr>
<th>Diflucan</th>
<th>Diprivan</th>
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</thead>
<tbody>
<tr>
<td>Durasal</td>
<td>Durezol</td>
</tr>
<tr>
<td>Microzide</td>
<td>Maxzide</td>
</tr>
<tr>
<td>Percocet</td>
<td>Procet</td>
</tr>
<tr>
<td>Viagra</td>
<td>Allegra</td>
</tr>
</tbody>
</table>

Humans Make Visual Mistakes

YELLOW  BLUE  ORANGE
BLACK  RED  GREEN
PURPLE  YELLOW  RED
ORANGE  GREEN  BLACK
BLUE  RED  PURPLE
GREEN  BLUE  ORANGE
Barriers To Effective Barcoding

- Labor Intensive, Ongoing Maintenance & Upkeep
- Time Pressures & Distractions
- Training & Competency
- Human Nature - “Drift”
Barcoding

- Expend Significant Resources To Perform Reasonably Effective Barcoding
- Generally Works Well Most Of The Time
- Success Depends On Human-Technology Interface (information is available AND scanning is performed accurately)
The Barcode Loophole

...surely we can do better
Phase 1 Trial

Pharmacy Supply Chain Management
Pharmacy Supply Chain Management

- Contracting
- Reverse Distribution
- Purchasing
- Drugs and Supplies
- Accounts Payable
- Receipt of Supplies
- Distribution
Pharmacy Supply Chain Management

Contracting

Reverse Distribution

Purchasing

Drugs and Supplies

Accounts Payable

Receipt of Supplies

Distribution
Pharmacy Supply Chain Management

Contracting
Reverse Distribution
Purchasing
Drugs and Supplies
Accounts Payable
Distribution
Receipt of Supplies
Pharmacy Supply Chain Management

- Contracting
- Purchasing
- Reverse Distribution
- Drugs and Supplies
- Accounts Payable
- Receipt of Supplies
- Distribution
Current Methods

- Manual Min/Max, Reorder Process (Kanban Cards)
- BC Scanning Technology Is Available
- Systems Still Involve
  - Walking The Aisles
  - Counting Product
  - Data Entry

(Each Step Represents A potential Failure Point)
Phase 1 Trial – Pharmacy Supply Chain Management

RFID Tag High-Value, Slow-Mover Items For:

1. Optimize Stock Levels (Reduction In Inventory & Cost)
2. Reduce Stock Outs
3. Reduce Waste (Monitoring Expiration Dating, Preventing Slow Movers From Expiring Unused)
4. Reduce Time Needed (recalls, no more walking of the isles to review inventory levels and expiration dates)
Technical Aspects of Phase 1

- Vendor: MEPS Real-Time, Inc., Intelliguard® Medication Management System
- Phase 1: December, 2010
- Equipment:
  - (1) Automated Dispensing Cabinet (ADC): 4 Ambient Drawers
  - (1) Pharmacy Reader
- Location: Central Pharmacy
- Drugs: 10 SKU’s (Ambient Only)
- Tags/Labels: Provided by Vendor, EPC Gen2 UHF

SKU’s – Phase 1

<table>
<thead>
<tr>
<th>SKU's – Phase 1 Ambient</th>
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<tbody>
<tr>
<td>Abraxane</td>
</tr>
<tr>
<td>Clolar</td>
</tr>
<tr>
<td>Floxuridine- (2 Vendors)</td>
</tr>
<tr>
<td>Halaven</td>
</tr>
<tr>
<td>Jevtana</td>
</tr>
<tr>
<td>Merrem</td>
</tr>
<tr>
<td>Methotrexate (2 Vendors)</td>
</tr>
<tr>
<td>Totect</td>
</tr>
<tr>
<td>Treanda</td>
</tr>
<tr>
<td>Trisenox</td>
</tr>
</tbody>
</table>
Methodology: Stocking

• Inventory Is Received By Pharmaceutical Wholesaler
• Encoding
  – Drug Name, Manufacturer Name, Expiration Date and Lot # is manually entered
  – Inventory Is RFID Tagged And Encoded In The Pharmacy By Personnel
• Inventory Is Stocked into ADC
Methodology: Vending

- Pharmacy Personnel Logs Into ADC With Card Reader
- Inventory Is Removed
- Can prompt user to remove earliest to expire
- ADC Performs Inventory Of Drawer
- ADC Notifies If There Is Expiring/Expired Inventory
  - Expiring Inventory: 100 Days Prior To Expiration Date
  - ADC Sends Daily Reorder Report To Buyer
- ADC Notifies if The Wrong Drug is Removed From The Correct Drawer.
Phase 1: Equipment and Application

Intelliguard ADC and Pharmacy Reader

RFID Tag on Drug Package

Phase 1 Equipment Location
Phase 1 Results – Inventory

- 10 SKU’s represented inventory on hand ~$136K
- Implemented 12/2010; Results as of 8/2011
- One Time Inventory Reduction Of $33K (24.3%)
- RFID allows us greater “comfort” with running leaner inventory (except with drug shortages)
Phase 1 Results – Stock Outs

• Tracked “Loan/Borrows” As Surrogate Marker Representing Stock Outs.
• 24 Months Prior To Implementation, 23
• 8 Months Post Implementation, 0
Phase 1 Results – Waste Reduction

• Monitor Expiration Dating To Prevent (Expensive) Slow Movers From Expiring Unused

• 24 Months Prior To Implementation, # (Unable To Determine)

• 8 Months Post Implementation, 0 Expirations of Drug
Other Benefits We Saw

• Able To Setup Real Time Trigger Reports For Target Drug Usage (ie. Target Antibiotics)

• Able To Monitor Drug Use And Examine (Intelligently) If Par Levels Are Setup Correctly Or In Need Of Adjustment

• Lot Number Tracking Reduced Time and Effort Required For Recalls
The Future
Phase 2 Trial – Pharmacy Supply Chain Management

- Tag More High-value, Slow Mover Items
- Addition Of Cold Drawers That Have Real-time Temperature Monitoring
Technical Aspects of Phase 2

- **Vendor:** MEPS Real-Time, Inc., Intelliguard® Medication Management System
- **Phase 2:** September, 2011
- **Equipment:**
  - (2) Automated Dispensing Cabinet (ADC): 4 Ambient Drawers, **4 Cold Drawers**
  - (1) Pharmacy Reader
- **Location:** Central Pharmacy
- **Drugs:** **30 SKU’s (Ambient and Cold Storage)**
- **Tags/Labels:** Provided by Vendor, EPC Gen2 UHF

<table>
<thead>
<tr>
<th>SKU’s – Phase 1</th>
<th>Cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymoglobulin</td>
<td>Actemra 400 mg</td>
</tr>
<tr>
<td>Xigris 20 mg</td>
<td>Actemra 200 mg</td>
</tr>
<tr>
<td>Xigris 5 mg</td>
<td>Actemra 80 mg</td>
</tr>
<tr>
<td>Leukine 500 mg</td>
<td>HyperTET/SD</td>
</tr>
<tr>
<td>Leukine 250 mg</td>
<td>Rabies Immune - Imogam HT</td>
</tr>
<tr>
<td>Crofab</td>
<td>Rabies Vaccine - Imovax</td>
</tr>
<tr>
<td>Cubicin</td>
<td>Rabavert</td>
</tr>
<tr>
<td>Synercid IV</td>
<td>Depocyt</td>
</tr>
<tr>
<td>WinRho 1500 IU</td>
<td>Simulect</td>
</tr>
<tr>
<td>WinRho 15000 IU</td>
<td>Cytogam</td>
</tr>
</tbody>
</table>
Phase 2: Equipment and Application

Phase 2 Equipment Location

Intelliguard Pharmacy Reader

Intelliguard ADC Drawer
Potential for RFID in future

Will Some Day Improve Many Challenges That Exist Today

- Error prevention
- Loss & Diversion
- ePedigree – dealing with Counterfeit & Cold pedigree
- Expiration date (avoiding with FIFO and detecting real time)
- Managing Recalls & Shortages
- Track & Trace (supply chain)
Potential for RFID in future

The Holy Grail

Real time awareness of every facet of the drug product (at all stages of the medication use process) leading to heightened intelligence and quality improvements to promote the ability to provide medicines more efficiently, safely, and cost effectively.
THANK YOU

Email: sjjrxprn@pharmdmand.com