Objectives

- Introduction to pharmacy operations
- General overview of carousel technology
- Impact dispensing carousels have on pharmacy operations
- Financial justification for carousels
- 997-bed Tertiary-care center
- Four additional hospitals on campus, including specialty, rehab, children’s, and heart
- ~75,000 ED visits
- Level 1 Trauma Center
- 51,000 Admissions
- 315,000 Patient Days

- Magnet Award for Nursing Excellence
- Named one of the 100 most wired hospitals for 6th consecutive year
- Ranked in the US News and World Report for the 14th consecutive year
24/7 Pharmacy Services
154 Budgeted FTEs
- Central operations
- Satellite dispensing services
- Decentralized pharmacists
- Clinical pharmacists
- Purchasing, finance and inventory technicians

Residency Program
Drug information center
Drug Budget - $40 million
Current Automation

- **Centralized Robotic Cartfill**
  - 4000 Doses per day
  - 350 Different Medications
  - 80-95% of all schedule, routine, non-narcotic meds

- **Automated Dispensing Machines**
  - 92 Different Locations (Inpatient and Outpatient)
  - PRN, narcotics and commonly used meds

- **Central Carousel Technology**
Automation Survey

- Spending on automation will increase in the next 3-5 years for 77% of the respondents.

- Survey results included:
  - 55% report a centralized dispensing process.
  - 31% report a hybrid dispensing process.
  - 79% utilize automated dispensing cabinets.
  - 30% utilize automated drug storage and retrieval systems:
    - Carousels 48%
    - Robot 30%
Types of Carousels

Horizontal Carousel

- Different length
  - 15 - 60 ft.
- Weight capacity
  - 600 – 2000 lbs.

Vertical Carousel

- Different heights
  - 6 - 12 ft.
- Weight capacity
  - 600 – 1500 lbs.
Benefits of Carousel Technology

- Improved efficiency of dispensing workflow
- Reduction in medication picking errors
- Data repository for dispensing activity
- Significantly decreased medication storage space
- Inventory management improvements
Overview of Process

- Stat meds
- New Orders
- Patient Specific Batch Meds
- ADM Refills
- ADM Stockouts
- Remote Items
- Wholesaler
Central Pharmacy Carousel Technology

- Three carousels
- More than 2000 items
Dispensing Workflow

- Prioritization of medications
  - Stats
  - New Orders
  - Missing doses
  - Patient-Specific batching of orders
  - Automated dispensing cabinet stock-outs and refills
  - Demand picks/IV room compounding
### Sample Prioritization

#### Drug Details

**Drug:** Clindamycin 900mg INJ/ADV 02961
**Transaction:** 1457921  02 25

#### Note

- **DEMAND PICK**
- **CAR3-1:14.27.1**
  - **PLEASE SCAN DRUG/LOCATION.**

#### Drug List

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<th>Status</th>
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<th>Status</th>
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## Transaction Summary Report

**Period:** 7/1/2007 to 8/2/2007

**Hospital:** BUMC  
**Department:** CPH  
**Zone:** EXCP

### Transaction Types

<table>
<thead>
<tr>
<th>Transaction Type</th>
<th># of Transactions</th>
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<tr>
<td>Cart Fill</td>
<td>302</td>
<td>548.00</td>
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<tr>
<td>DEMAND PICK</td>
<td>13</td>
<td>229.00</td>
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<tr>
<td>Inventory Adjust</td>
<td>2</td>
<td>9,055.00</td>
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<td>NEW ORDER</td>
<td>486</td>
<td>1,177.00</td>
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<td>STAT</td>
<td>225</td>
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<td>UBC BATCH</td>
<td>779</td>
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<td>UBC STOCKOUT</td>
<td>763</td>
<td>17,202.00</td>
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<td><strong>Grand Total:</strong></td>
<td><strong>2,672</strong></td>
<td><strong>86,850.00</strong></td>
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Current Carousel Staffing

- Currently have 3 batches
  - 2100 Patient-specific meds
  - 0500 Automated Dispensing Cabinet refill 1
  - 1430 Automated Dispensing Cabinet refill 2

- Technician Staffing
  - 2 day shift
  - 2 evening shift
  - ½ night shift
Safety Enhancements

- Pick-to-light technology
- Barcode scanning
- Separation of Look-Alike/Sound-Alike meds
- Limited access to shelf
- Detailed history of all transactions
Light and Scanning

- **Pick-to-light**
  - Carousel spins to appropriate shelf
  - Light on work surface under correct bin

- **Barcode scanning**
  - Scan of label
  - Required scan of product or bin
**Additional Safety**

- **Look-Alike/Sound-Alike Meds**
  - Meds not stored in alphabetical order
  - No strengths of the same med together
  - Meds that look alike stored apart

- **Access to only necessary shelves**

- **Detailed history of transactions**
  - Investigation of medication errors
Inventory Enhancements

- Product Management
  - Remote Item locations
  - Management of unit-dose packaging

- Maintains perpetual inventory

- Automated inventory of loaded items

- Increased inventory turns
Procurement Benefits

- Supplier Interface
  - Automatic order transmittal
  - Verification of meds invoiced

- Tracking of expiration dates

- Historical product purchasing
Challenges to Carousel Technology

- Workflow
  - Returns/Credits

- Downtime

- Inaccurate Inventory

- Addition of new NDCs
Financial Consideration

- Costs Include
  - Carousel
  - Software to Operate Carousel
  - Maintenance
  - Installation
  - Facility Renovation
  - Totes/Bins
Financial Consideration, cont

### Potential Savings

- **Inventory Reduction**
  - 15% for year 1
  - 6% annually for years 2-5

- **Product loss due to shrinkage**
  - 0.5% annually

- **Improved Accuracy/Error Reduction**
  - 30% error reduction due to picking errors
  - Average cost per med error is approximately $2,013*

*(Classen et. al. JAMA 1997;277(4):301-306)*
## Savings Estimates With Carousel (based on a 5-year period)

<table>
<thead>
<tr>
<th>MedCarousel Investment</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Total</th>
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<tbody>
<tr>
<td>Hardware &amp; Software (3 Carousels)</td>
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<tr>
<td>Facilities Renovation (estimated)</td>
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<td>Totes &amp; Dividers (estimated)</td>
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**Total Investment** $645,000.00

<table>
<thead>
<tr>
<th>Potential Financial Savings</th>
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<td>Improved Accuracy / Error Reduction</td>
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</table>

**Total Savings** $1,649,000.00

**Potential Net Savings** $1,004,000.00

**Return on Investment** 156%
Future Advantages

- Integration with vendor offerings
  - Automated dispensing cabinets

- Interfacing with other technologies
  - Hospital information system/eMAR

- Preparation for barcode bedside scanning
Summary

- Significant benefits to carousel technology
- Cost justified based on inventory reduction and error reduction
- Proven technology, new use
Questions?
Assessment Questions

1. What types of carousels are available?
2. What are the benefits of carousel technology?
3. Describe the safety enhancements seen with carousels.
4. What factors can be used for justifying the expenses associated with carousel technology?
5. What are some future benefits?