



Carousel Technology: Managing the Supply Chain Aspect of Pharmacy Technology

Brian Cohen PharmD, MS
Director of Pharmacy Services
Baylor University Medical Center
Dallas, Texas

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 on of the 100 most wired hospitals for 6th consecutive year**
- **Ranked in the US News and World Report for the 14th consecutive year**

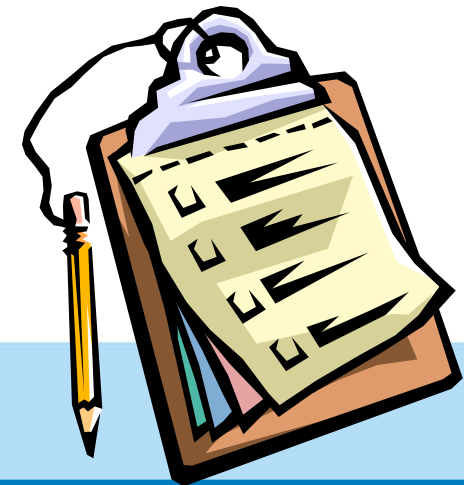
- 24/7 Pharmacy Services
- 154 Budgeted FTEs
 - Central operations
 - Satellite dispensing services
 - Decentralized pharmacists
 - Clinical pharmacists
 - Purchasing, finance and inventory technicians
- Residency Program
- Drug information center
- Drug Budget - \$40 million

- **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.

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

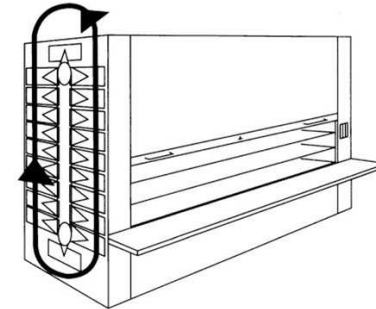
Overview of Process



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

- **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

PharmacyCentral Pick Engine - Microsoft Internet Explorer

Address: http://workflowx/Picking/Pickman.aspx?Mode=1

CPH

Clindamycin 900mg INJ/ADV
02961 Trans: 1457921 Qty: 25

Enter Hold Reprint Re-Pos **DEMAND PICK**

CAR3-1:14.27.1 PLEASE SCAN DRUG/LOCATION.

Pick

Status	L	G
DEMAND PICK	2	3
STAT	2	8
NEW ORDER	1	8
Processing	1	1
Processing	0	1

Stock

Status	L	G
Man. Stock	17	17

Sort

Trans Priority Item ID Item Location Smart Sort

Filter

TRANS Priority Item Id Item Location

All Priorities All Zones Clear

QTY	Trans # QOH/IR	ITEM ID ~ Priority ITEM	ZONE LOCATION	DATE TIME
Hold 50	1457924 114.0	03151 ~ DEMAND PICK Heparin (Pork) 10,000un INJ/MDV 1ML	CAR3-2 001.014.05.01	8/21 09:13.09
Hold 10	1457926 30.0	00384 ~ DEMAND PICK Oxacillin 2gm INJ/VL	CAR3-1 001.018.05.01	8/21 09:13.42
Hold 2	1457928 123.0	04195 ~ STAT Lisinopril 20mg TAB/UD	CAR3-1 001.020.37.01	8/21 09:14.15
Hold 1	1457922 179.0	05041 ~ STAT Sulfameth/Trim 800mg-160mg TAB/UD	CAR3-1 001.020.53.01	8/21 09:13.00
Hold 1	1457927 179.0	05041 ~ NEW ORDER Sulfameth/Trim 800mg-160mg TAB/UD	CAR3-1 001.020.53.01	8/21 09:14.04

Done Local intranet 9:16 AM

of Transactions



Cart Fill	11.7%
DEMAND PICK	0.5%
Inventory Adjust	0.1%
NEW ORDER	19.0%
STAT	8.7%
UBC BATCH	30.3%
UBC STOCKOUT	29.7%
Total:	100.0%

8/19/2007 3:53:15PM

TRANSACTION SUMMARY REPORT

7/1/2007

TO 8/2/2007

HOSPITAL: BUMC

DEPARTMENT: CPH

ZONE: EXCP

Transaction Type	# of Transactions	Total QTY
Cart Fill	302	548.00
DEMAND PICK	13	229.00
Inventory Adjust	2	9,055.00
NEW ORDER	488	1,177.00
STAT	225	715.00
UBC BATCH	779	58,024.00
UBC STOCKOUT	763	17,202.00
Grand Total:	2,672	86,950.00

- **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



- **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



- **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**

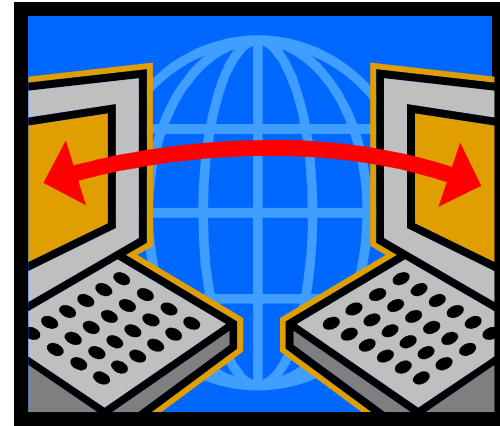
- **Detailed history of transactions**
 - Investigation of medication errors

Inventory Enhancements

- **Product Management**
 - Remote Item locations
 - Management of unit-dose packaging
- **Maintains perpetual inventory**
- **Automated inventory of loaded items**
- **Increased inventory turns**



- **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



- **Costs Include**
 - Carousel
 - Software to Operate Carousel
 - Maintenance
 - Installation
 - Facility Renovation
 - Totes/Bins



■ 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)

Sample ROI

Savings Estimates With Carousel (based on a 5-year period)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
<u>MedCarousel Investment</u>						
Hardware & Software (3 Carousels)	\$240,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$240,000.00
Maintenance Service Fee	\$75,000.00	\$75,000.00	\$75,000.00	\$75,000.00	\$75,000.00	\$375,000.00
Installation, Server, Interface Fee	\$10,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$10,000.00
Facilities Renovation (estimated)	\$15,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$15,000.00
Totes & Dividers (estimated)	\$5,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$5,000.00
<u>Total Investment</u>						\$645,000.00
<u>Potential Financial Savings</u>						
Inventory Reduction	\$100,000.00	\$6,000.00	\$6,000.00	\$6,000.00	\$6,000.00	\$124,000.00
Product Shrinkage	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$25,000.00
Improved Accuracy / Error Reduction	\$300,000.00	\$300,000.00	\$300,000.00	\$300,000.00	\$300,000.00	\$1,500,000.00
<u>Total Savings</u>						\$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**

- 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?