

Carousels – The Next Step in
Closed Loop Inventory Control
The McKesson Experience

John Falkenholm Pharm.D.
Pharmacy Manager
Advocate Lutheran General Hospital

The speaker has no conflict of interest to disclose.

Advocate Lutheran General Hospital

- 645 bed community teaching hospital
 - Level one trauma
 - Level III NICU
 - Bone marrow transplant
 - Full range of cardiac, surgical and neuro services
- Average daily census 425



ALGH Pharmacy Services

- Operations
 - 24/7/365
 - Centralized distribution
 - 1 satellite services OR and ED 16 hours/day Monday to Friday
 - 24 hour unit dose cart exchange
 - 1st doses dispensed from central pharmacy
 - UBC for controlled substances, prn's and emergency care medications
 - ~ 240,000 doses dispensed/month

ALGH Pharmacy Services

- Medication Order entry system
 - Electronic Orders
 - Pharmacist order entry/verification
 - Cerner PharmNet Millennium
 - Physician order entry and clinical documentation
 - Cerner Powerchart
 - 55% CPOE
 - Written Orders
 - Utilize MedComm fax imaging system

ALGH Pharmacy Services

- Automation Infrastructure
 - Linear Robotic Dispensing System
 - ~ 120,000 doses/month
 - 3 days online; 4 days offline inventory
 - ~ 425 line items
 - Dedicated Onsite Packaging
 - PacMed - Automated robot ready packager
 - Over-wrap packager
 - Tabletop solid dose packager

ALGH Pharmacy Services

- Automation Infrastructure
 - Three Carousels
 - 2 - 8 foot and 1 - 12 foot
 - ~ 40,000 doses/month
 - ~ 1,100 line items
 - Utilization
 - UBC restock (non controlled substances)
 - Non-robot first doses
 - Storage of drug products used for compounding in clean room
 - Limited refrigerated products using MedShelf functionality

ALGH Pharmacy Services

- Automation Infrastructure
 - Common software backbone
 - Connect-Rx Version 7.0 (beta)
 - Fulfill-Rx Ordering software
 - Wholesaler
 - McKesson
 - GPO
 - Broadlane

Timeline of McKesson Automation Products

- Robot 2/1/2000
- MedComm 12/2/2002
- MedCarousel 5/1/2004
- Fulfill-Rx 7/1/2004
- PacMed 5/30/2006

Prior to MedCarousel

- Several techs filling UBC requests from paper reports
- Buyer walking shelves
- Frequent stock outs
- Manual process for exp dates
- Increased picking and restocking errors
- Unable to easily quantify current inventory

After MedCarousel

- 1 tech for UBC replenishment
- Buyer only has to look at ~30% of inventory
- Fewer stock outs
- Track exp dates in software
- Reduced picking errors



Why get MedCarousel?

- Increased patient safety (LASA, barcode driven, pick to light)
- Improved inventory control – auto calc
- Simplified UBC restocking (any vendor)
- Better use of limited space
- Use of Fulfill-Rx to automate ordering and receipt of medications
- Integrated products from same vendor results in fewer databases and interfaces to maintain and simplifies training of technicians

Obstacles

- Minimizing disruption during implementation
- Planning location size/number of bins for each medication
- Time needed to load inventory into MedCarousel
- Where to store excess inventory obtained due to increased usage or drug shortage
- Enforcing that all inventory movement be done via software so counts are correct

Questions?

John Falkenholm Pharm.D.

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Post test question

John Falkenholm

09-033

Question:

Which vendor offers the Fulfill-Rx software to automate the ordering and receipt of medications?

- A. Amerisource Bergen
- B. McKesson
- C. Omnicell
- D. Talyst

Carousels – The Next Step in Closed Loop Inventory Control Omnicell

Mary Fruin, MBA, MSIS
Pharmacy Information Systems Coordinator
University of Illinois Medical Center

The speaker has no conflict of interest to disclose

University of Illinois Medical Center

- Tertiary care, academic, state hospital, 465 beds
- Outpatient Care Center
- Approximately 675 residents, 750 attendings
- Pharmacies
 - Hospital
 - Central pharmacy (24/7)
 - 4 satellites – 7th floor (adult), 6th floor (critical care), 5th floor (pediatrics), OR
 - Seven outpatient pharmacies – 2 off campus (MS, UVP)
- Colleges of Medicine, Pharmacy, Dentistry, Nursing, Public Health, Allied Health

WorkflowRX System

- Two carousels
- 240 canister packager
- 12 remote zones

Omnicell Carousel




Omnicell Packager




Carousel Schedule

- 5:30AM – 6,7,8th floor medication cabinet critical low restock
– 15 minutes
- 6AM – 2,3,4,5th floor medication cabinet restock
– 30 minutes
- 8AM – Stock carousel
– 90 minutes
- 11:30AM – 6,7,8th floor medication cabinet restock
– 90 minutes




Carousel schedule (cont)

- 3PM – Cart fill
– 2 hours
- 6PM – Hospital wide medication cabinet
critical low restock
– 30 minutes
- 8:45PM – Cart fill update
– 30 minutes
- When satellites are closed – new orders
not stocked in cabinets




Interfaces

- New orders
- Cabinet restock/stockout
- Cartfill
- Purchase order – to wholesaler
- Invoice – from wholesaler




Features – Personal Favorites

- Return items by scanning package
barcode
- Filtering options while picking
- Multiple vendors
- Prepack batching
- Workflow statistics always on screen




Features (cont.)

- Application can be installed on other workstations
- Web functionality
- Automatic deactivation of expired items in packager



Challenges/Minor Annoyances

- Limited reporting capability
- Confusing packager loading process
- Cannot check inventory on hand over the web
- Permissions are too broad
- Receiving process is two steps



Lessons Learned

- Understand your current process
- Have a good understanding of what you want your process to be when you are finished
- You don't necessarily need everything the sales group tries to sell you
- Make friends with the help desk
- Test, test, test

Lessons Learned (cont.)

- Don't load the carousel alphabetically
- The system is only as good as the information put into it
- Ongoing monitoring and maintenance is critical Keep your users involved and informed
- Take advantage of vendor training
- You can never have too many super-users

Future Plans

- Track inventory of remote zones
- Dynamic ordering rules



Carousel Technology – AutoMed at Froedtert Hospital

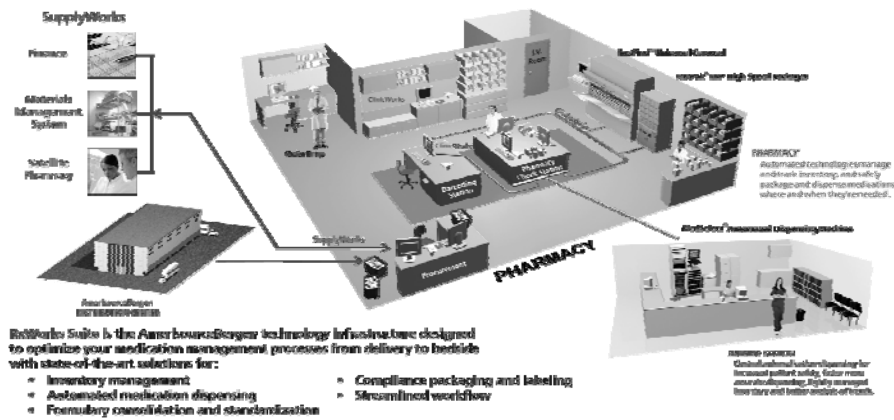
Todd Karpinski, PharmD, MS
Director of Pharmacy
Froedtert Hospital



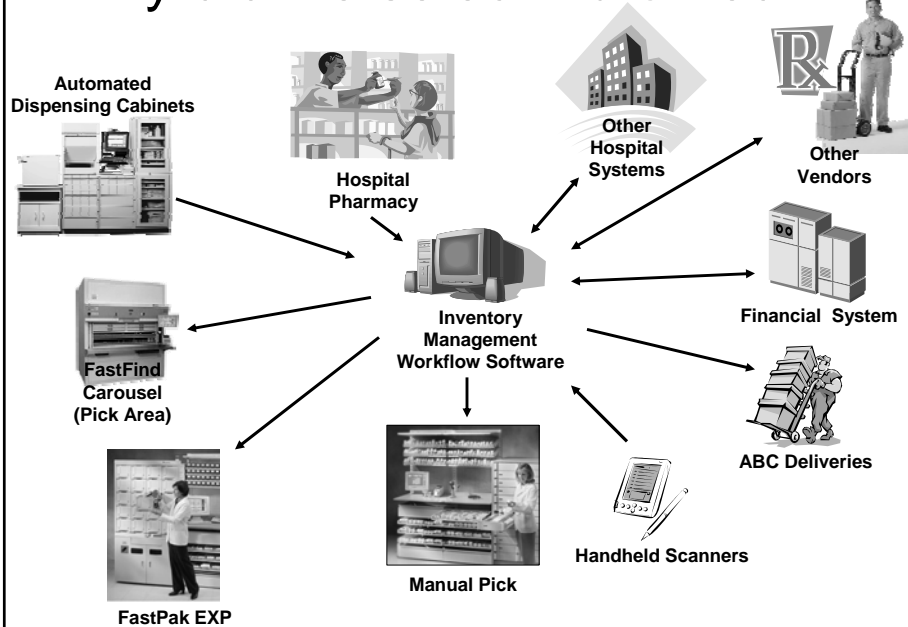
Disclosures

- The speaker has no conflicts of interest to disclose.

The ideal picture of technology at Froedtert Hospital



Why did we select AutoMed?





Carousel Technology at Froedtert

- Long history of McKesson Robot
 - Reliability issues
 - Packaging time
 - Noise
 - 40% of cartfill
- 2007 – technology paradigm change
 - Goals –
 - Barcode scanning at all points in supply chain
 - Fill 90% of cart
 - Perpetual inventory
 - Inventory reduction



Expansion of Technology

- FastPak EXP
 - 40% of cartfill
 - Automated dispensing cabinet replenishment
- Installation of 2 supply carousels
 - Service >40 onsite clinics
 - Maintain product security of >100 Investigational studies





Benefits from ABC/AutoMed

- Integrated pharmacy, purchasing, dispensing cabinets, packager and finance systems
- Manages 340B inventory and replenishment
- Inventory reduction (15%)
- Perpetual inventory
- Barcode verification on dispensing
 - ASHP 2015 initiative
 - Reduction in reported dispensing errors
- Workload efficiencies



Lessons learned / on-going struggles

- Perpetual inventory
 - Be careful what you wish for
- Hardware and software failures
 - Problematic when all meds in carousel
- Training of staff
 - MUST have more than one super, super user

Future Plans

- Implement tech-check-tech program
- Expand technology to cancer center
- Dynamic inventory ordering
- Real-time integration to financial system



Carousels—The Next Step in Closed Loop Inventory Control

Sara McEnaney, PharmD, MBA
PGY2 Health-System Pharmacy Practice
Administration Resident

Disclosure

- Speaker has nothing to disclose

What is a Carousel?



Learning Objectives

- Describe the use of carousel technology
- Describe the benefits and lessons learned from carousel technology

Issues Facing Central Pharmacy

- Medication safety
 - Barcode on dispense
- Inventory management
 - Closed loop system
- Space
- Regulatory
 - Expiration dating
 - Medication security

Factors Driving Pharmacy Automation

- Pharmacist and technician labor shortage
- Barcode medication distribution / administration
- Managing inventory costs
- Increasing patient volumes
- Customer satisfaction and service levels

What is a Carousel?

- Used in auto industry
- Vertical or horizontal storage
- Automates medication dispensing
- Improves space utilization

What is a Carousel?



Carousel Technology

- Carousels guide users to the correct medication storage location
 - Rotating shelves
 - Pick-to-light technology
 - Barcode scanning technologies

Carousel Benefits


- Medication Safety
 - Brings product to user
 - Barcode technology

Manual Pick Shelves




Barcode Technology

- Scan all products into the carousel
- All products are scanned out of the carousel
 - Scan the actual product, not the barcode on the storage bin
- All products ready for barcode medication administration



Carousel Benefits

- Inventory management
 - Closed loop
 - Perpetual inventory



Closed Loop Inventory

- Analyze demand → optimize inventory → reorder inventory → track inventory
- Barcode scanning at each step of the process



Inventory control

- Par level is set for all medications
 - Inventory software can determine par levels based on usage
- Increase inventory turns
- Decrease on hand inventory

Perpetual Inventory Management

- Reduce excess stock and stock outs
- Reduce staff time spent on purchasing and inventory management
- Optimize number of orders and deliveries
- Monitor and increase inventory turns
- Know the value of inventory at any point in time for all stock locations

Carousel Benefits

- Maximize space utilizing vertical storage
- Track expiration dates
- Medication security

Additional Benefits

- Decrease picking and restocking errors
- Cut unit-based cabinet restocking time compared to a manual process
- Reduce technician training time
- Reduce time to create daily orders
- Reduce the number of expedited orders

Carousel Integration with Existing Technology


- Automated dispensing cabinets
 - Carousels for restocking: safer / more efficient
- Robot
 - Storage of non-robot medications
 - Storage of robot medications that need packaging

Carousel Integration with Existing Technology

- Packager
 - Storage of medications to be repackaged
- Barcode Medication Administration
 - Medications being administered have already been verified by one barcode check
- No existing technology for dispensing


Disadvantages

- Barcode distribution not complete
- Expensive capital
- Facility Issues
- Space
- Implementation time / resources
- Unable to put away order and fill medications simultaneously




Return on Investment

- Carousel ROI example



Implementation Obstacles/Lessons learned

- Ensure involvement of all stakeholders
- Larger carousels allow for expansion
- Carousels impact entire workflow
- Time required for database management



Implementation Obstacles/Lessons learned

- Have alternative process in place for software or hardware breakdown
- Process to manage volume of returns
- Planning location and size of medication bins

Questions?



Post-Test Questions

- T / F Carousels increase the training time for technicians
- T / F Perpetual inventory, barcode dispensing and space utilization are all advantages to carousel technology

References

- Classen et. al. JAMA 1997;277(4):301-306
- Oswald S, Caldwell R. Dispensing error rate after implementation of an automated pharmacy carousel system. *Am J Health-Syst Pharm.* 2007; 64:1427-31.

**Savings Realized With Carousel
(based on a 5 year period)**

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
<u>Carousel Investment</u>						
Hardware (5 Carousels) Software	\$421,256.00	\$0.00	\$0.00	\$0.00	\$0.00	\$421,256.00
Maintenance Service Fee	\$78,300.00	\$78,300.00	\$78,300.00	\$78,300.00	\$78,300.00	\$391,500.00
Installation, Connect-Rx, Interface Fee Waived	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Facilities Renovation (estimated)	\$10,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$10,000.00
Totes & Dividers (estimated)	\$5,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$5,000.00
<u>Total Investment</u>						<u>\$827,756.00</u>
<u>Potential Financial Savings</u>						
Inventory Reduction (1)	\$242,700.00	\$14,562.00	\$14,562.00	\$14,562.00	\$14,562.00	\$300,948.00
Product Shrinkage (2)	\$8,090.00	\$8,090.00	\$8,090.00	\$8,090.00	\$8,090.00	\$40,450.00
Improved Quality and Accuracy / Error Reduction (3)	\$200,000.00	\$200,000.00	\$200,000.00	\$200,000.00	\$200,000.00	\$1,000,000.00
Total Savings						<u>\$1,341,398.00</u>
Potential Net Savings						\$513,642.00
Return on Investment						62%

- 1 Inventory reduction - this savings represents a 15% one time reduction of on-hand Pharmacy for Year 1 and an annual savings of 6% in carrying costs in the following years (years 2-5).
- 2 Product shrinkage - represents a savings of 0.5% of the on-hand inventory per year of product that is pulled but never makes its way to the cabinet. Automating the inventory will allow tracking, access, and usage; therefore, decreasing the potential for inventory diversion.
- 3 Improved Quality and Accuracy / Error Reduction - Currently Pharmacy Dept. has an estimated 0.5% error rate. Total daily doses dispensed of 16,460 will result in 82 picking errors/day. Assuming a conservative estimate of a 30% impact due to Carousel will result in 25 picking errors/day less. This equates to 9,125 less medication dispensing errors/year. Assuming a conservative estimate of 2% of these picking errors make it "through the system", and result in patient adverse events, this equates to 183 ADEs avoided per/year. Average cost to the institution is approximately \$2,013 per ADE. (Classen et. al.JAMA 1997;277(4):301-306). Therefore, \$368,369 saved per year.

Carousel Technology
Sarah McEnaney

Post-Test questions/answers:

1. Carousels increase the training time for technicians. True or False

2. Perpetual inventory, barcode dispensing and space utilization are all advantages to carousel technology. True or False



Carousels

The Next Step in Closed Loop Inventory Control

Peter Mui, Pharm.D.
Pharmacy Manager
NorthShore University
HealthSystem
Highland Park Hospital

The speaker has no conflict of interest to disclose



NorthShore University HealthSystem

- Recently changed corporate name due to change in teaching affiliation
- Previously Evanston Northwestern Healthcare





NorthShore University HealthSystem

- Teaching Hospitals
 - Evanston Hospital (389 beds)
 - Glenbrook Hospital (143 beds)
 - Highland Park Hospital (211 beds)
 - Skokie Hospital (265 beds)
- Employed Medical Group
- Home Care
- Research Institute



NorthShore University HealthSystem

- Teaching Hospitals
- Organized research function
- Integrated delivery network
 - Physician offices
 - Hospitals
 - Home care
- 50 sites of care in the suburbs north of Chicago



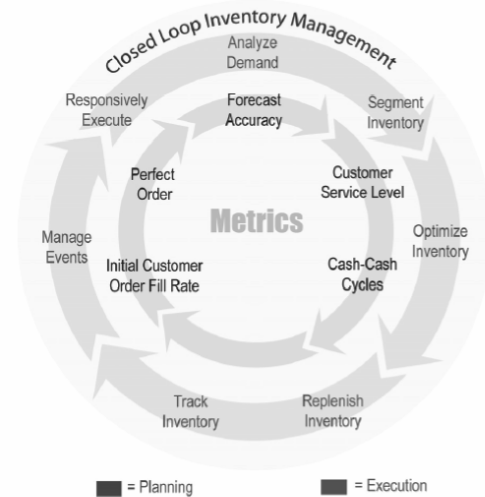
NorthShore University HealthSystem

History of pharmacy automation at NorthShore

- Pyxis profiled ADMs, 1998
- EMR & PhIS, 2003
- Bedside BarCode Med Administration, 2007
- Talyst AutoCarousel at Highland Park, 2009



Closed Loop Inventory Control



Source: Aberdeen Group, September 2008



Closed Loop Inventory Control

- Analyzing the demand
- Optimizing the inventory
- Replenishing the inventory
- Tracking the inventory
- Manage events



What's a Carousel?

A carousel is a medication storage and distribution device

- allows for perpetual inventory tracking
- automated order replenishment from the drug wholesaler
- tracking of medication distribution



What's it good for?

Beyond inventory management:

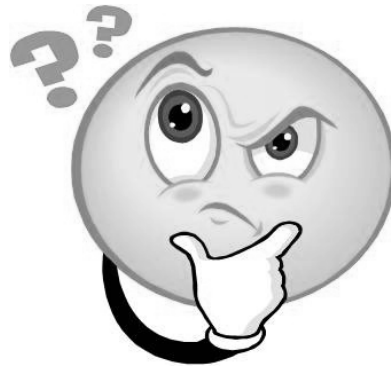
- Uses barcode technology to verify correct product is picked, i.e. safety!
- High-density storage unit that reduce space, improve security and safety, and optimize staff resources.



Highland Park Hospital Talyst Carousel



Questions?



Title: Carousels - The Next Step in Closed Loop Inventory Control

Faculty: Peter Mui, Pharm.D.

Post Test:

1. What are the vital steps in a closed loop inventory control system?
 - a) Analyzing the demand
 - b) Optimizing the inventory
 - c) Replenishing the Inventory
 - d) Tracking the Inventory
 - e) Manage Events
 - f) All of the above

2. Which is NOT a benefit of Carousel technology?
 - a) allows for perpetual inventory tracking
 - b) automated order replenishment from the drug wholesaler
 - c) tracking of medication distribution
 - d) performs actual counting of inventory
 - e) barcode scan confirmation of medication selection