Medication distribution systems: An interdisciplinary conundrum

Optimizing the Medication Use Process
April 8-10, 2008
Chicago, Illinois

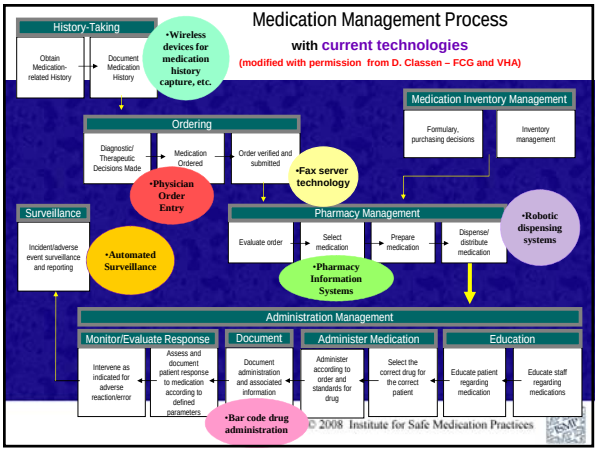
Susan Paparella, RN, MSN
Institute for Safe Medication Practices

Objectives

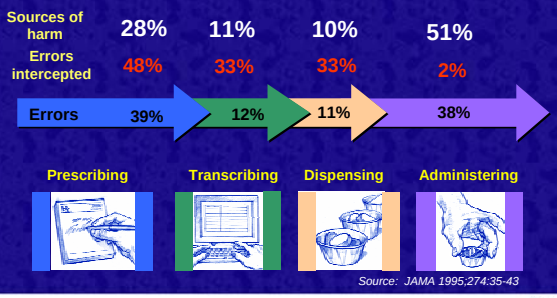
- Describe the primary medication distribution models used in acute care
- Discuss the advantages and disadvantages associated with centralized, decentralized, and hybrid models of medication distribution
- Identify the impact of medication distribution systems on nursing workflow

What is Drug Distribution?

- Manner in which medications are provided from the pharmacy to the clinical unit
- Includes the period of time from when the drug is "dispensed" until it is "administered"



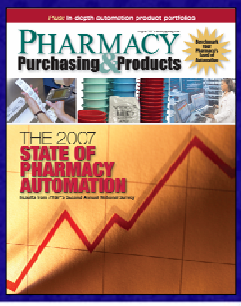
ERRORS IN THE MEDICATION USE PROCESS



Source: JAMA 1995;274:35-43

Pharmacy Purchasing & Products' State of Pharmacy Automation

- Random, nationwide sampling of health system directors of pharmacy
- Mail and email survey distribution
- 325 responses



Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

Medication Automation in 2007

Devices	Percent
Automated dispensing machines	79.1%
Medication carts	58.5%
Pneumatic tubes	36%
COWS	21.5%
In-room medication cabinets	12.9%
Computerized medication carts	8%

Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

Devices Used by Facility Size

Devices	0-100	101-200	201-300	301-400	401+
Medication carts	72%	66.6%	70.2%	40%	57.9%
In-room cabinets	13%	15%	19.1%	14.3%	7.9%
ADCs	66%	85%	80.9%	94.3%	94.7%

Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

Drug Distribution Models

Centralized

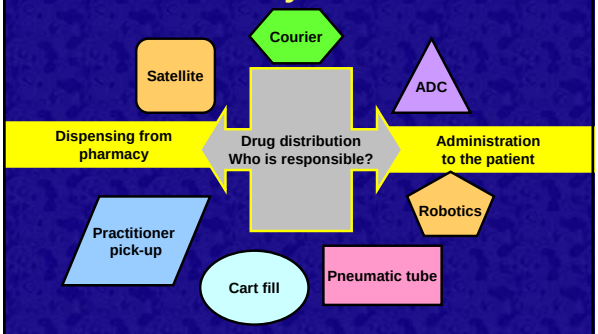
Floor Stock
Cart Fill
Nurse Servers

Decentralized

Satellite Services
Automated Dispensing Cabinets

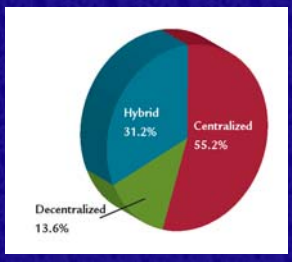
Hybrid

"Grey Area"



"Grey Area"

Current Models for Medication Distribution

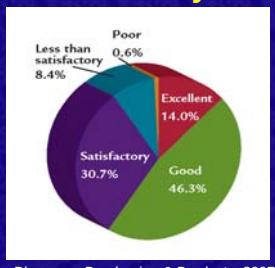


Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

Driving Forces

- Availability of new/enhanced technologies
- Less pharmacists and nurses in the workforce (aging workforce)
- Culture's "Need for Speed"
- Fiscal accountability- COST
- Regulatory Standards, National Patient Safety Goals, and other imperatives

Level of User Satisfaction with Current Medication Distribution System

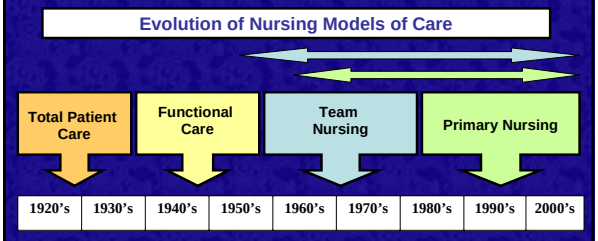


Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

What Does a Nurse Need?

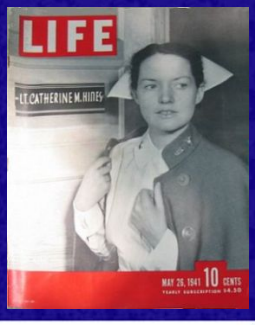
- Simplified process
  - Medications that are readily available when needed
  - Found in a single location, preferably as close as possible to the patient
- Patient-specific doses – medications do not require further manipulation to obtain the final dose
- A reliable, accurate, distribution process that supports patient safety

Evolution of Nursing Models of Care



Functional Nursing Care

- Emerged in 1940s
- Tasks assigned based on complexity and in terms of judgment and technical knowledge
- Task oriented and ritualistic



Functional Nursing Care

- Reliance on rules and regulations
- Hierarchical structure
- One nurse performs 1-2 tasks for all patients on the unit
- Evolution of the medication nurse

Team Nursing Care Delivery

- Emerged in 1950s
- Introduced to address problems with functional nursing
- Traditional and hierarchical
- Shared responsibility and accountability

Team Nursing Care Delivery

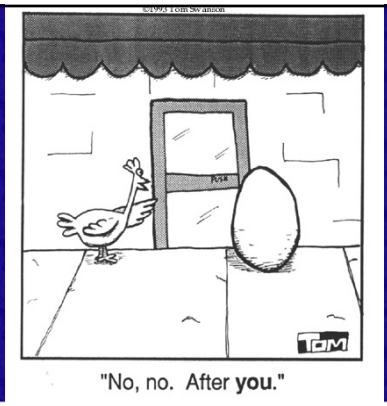
- Total care to a defined group of patients
- Team leader assigns and evaluates care
- Medication administration may be assigned to a specific team member

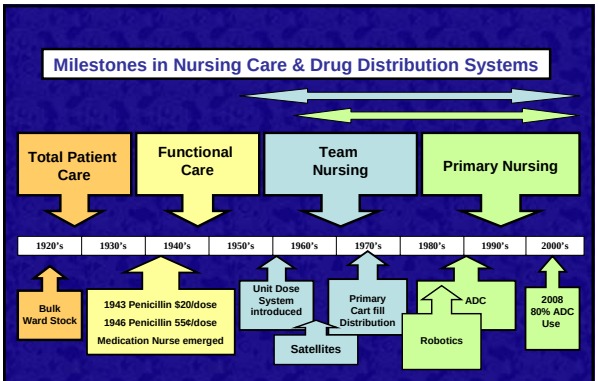
Primary Nursing Care Delivery

- Emerged in the 1960s
- One-to-one, patient-centered
- Primary nurse assumes 24-hour accountability
- Decentralized decision making

Primary Nursing Care Delivery

- Multiple nurses needing access to the medication cart
- Number of medication carts
- Portability of medication carts important





Centralized Distribution Model

Floor Stock
Medication Cart Fill
Nurse Servers

Floor Stock Medications

Floor Stock Medications

- Advantages
  - Delivered and stored in the same location
  - Medications immediately available
- Disadvantages
  - Bulk supplies
  - Potential for unsecured medications
  - Potential for expired medications
  - Difficult storage
  - Limited pharmacy input and oversight
  - Stashes prevalent

Unit Dose Drug Packaging

1960's

Packaged in a ready-to-use form or purchased as bulk and repackaged

Reduction in drug waste for pharmacy

Cart fill Distribution

Nurse Server

- Unit-dose model
- Similar to cart fill
- Locked cabinets at each patient room
- Stored medications as well as other supplies
- Closer to the patient

Advantages of Centralized Distribution

- Actively involved pharmacists in process
- Capability to provide patient-specific medications
- Capability to provide labeled patient cassettes
- Potential to be closer to the point-of-care
- Limited the amount of medication available (reducing waste and error potential)

Disadvantages of Centralized Distribution

- Issues with drug turnaround time
- Getting "new medications" to the unit and to the right cassette drawer
- "Missing medications" (borrowed?)
- Lack of medication segregation
- Not all medications can be stored in the cart (refrigerated; large volume IVs)
- Patient drawer size

Disadvantages of Centralized Distribution

- Nurse's need to "share" access
- Discontinued medications were still available for administration (led to "stashes")
- Lessened drug security
- Resource-intense process for pharmacy
- Pharmacists needed to "credit doses"
- Accessed by other practitioners

Decentralized Distribution Model

Satellites

Automated Dispensing Cabinets

Pharmacy Satellite



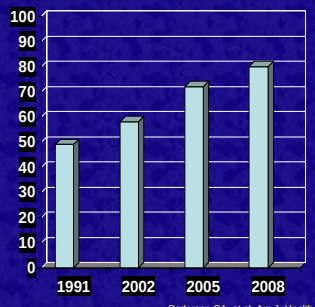
Use of Automated Dispensing Cabinets: ISMP Surveys

Medication Choices	1999 n = 453	2006 n =508
Narcotics only	7%	2%
Narcotics and stock/prn medications	49%	15%
Narcotics, stock/prn and 1st dose medications	32%	17%
ADCs are primary medication distribution system	20%	47%
We don't use ADCs	22%	19%

ISMP ADC Survey 2007

- 800+ respondents
  - *ISMP Medication Safety Alert!*
  - *Nurse Advise-ERR*
- *94% utilizing ADCs*
- *56% as the primary means of drug distribution*
- *More safeguards in place than in 1999*

Use of ADCs: ASHP Surveys

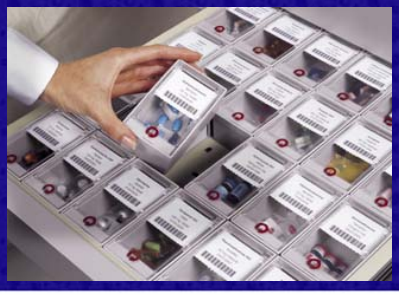


Pedersen CA, et al. Am J. Health-Syst Pharm 2006;63:327-45
And 2008 ASHP survey at *HIMSS*, Orlando, FL

Evolution of ADCs

- Automated "floor stock"
- Profile systems
  - Pharmacist check
- Replacing cart exchange system
- Expanded technology
  - Alerts, clinical questions, reminders, usage reports, bar coding, robotic fill

Single Drug Access



Advantages of Decentralized Distribution

- Reducing turnaround time
- Charge capture
- Automatic inventory control (ADC)
- Potential for pharmacist review
- Potential to limit access
- Less "missing medications"
- Discontinued medications less available

Advantages of Decentralized Distribution

- Primary ADC distribution:
  - Improved drug security
  - Potential for segregation of product
  - Less resource intensive for pharmacy
  - Less need to credit doses
  - Can be configured so other practitioners can have secure access
  - Borrowing less prevalent

Disadvantages of Decentralized Distribution

- Satellite distribution:
  - Resource intensive
  - Cost
  - Need for duplicate inventories

Disadvantages of Decentralized Distribution

- Primary ADC distribution:
  - Less ability to provide patient-specific doses
  - Many practitioners needing access to the same cabinet
  - Need for multiple cabinets in some locations
  - Less than ideal environmental conditions
  - Cost
  - Need for duplicate inventories

Disadvantages of Decentralized Distribution

- Primary ADC distribution:
  - Not all medications can be stored in the cabinet (refrigerated; large volume IVs); selection
  - Potential drawer configuration
  - Confirmation bias drug selection supported by technology
  - Less integrated into nursing workflow

Hybrid Distribution Model

Advantages and Disadvantages of a Hybrid Distribution Model

- Dependent on the degree to which the hybrid has occurred and how technology has been utilized to impact the system
- Could have the BEST (or worst) of both worlds

Distribution Model Selections are Complicated by…

- Legacy information systems
- High cost to change "midstream"
- Staffing shortages
- Other competing demands on industry
- Lack of research to inform our decisions
- Silo thinking between practitioner groups about what is the "best way"

What we know…

- Nurses spend 26.9% of their time on the critical task of medication administration
  (Keohane, Bane, etal, JONA 2008)

"Most significant amount of time spent on obtaining and verifying medications"

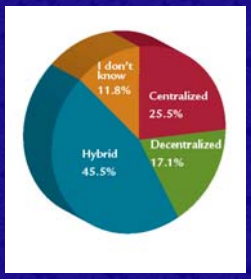
7.44% "Obtaining and Verifying Medications"
6.7% "Medication Delivery"
0.17% Time in "inefficient waiting"

"Simplify" Adding Complexity to Systems

	Success of Each Element		
	0.98	0.99	0.999
No. Elements			
1	0.98	0.99	0.999
15	0.74	0.86	0.99
20	0.67	0.82	0.98
30	0.55	0.74	0.97
40	0.45	0.67	0.96

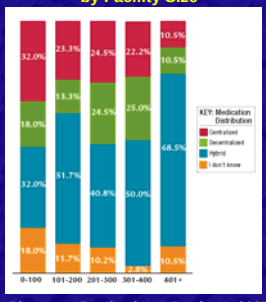
Where do we go from here?

Five-Year Forecast
for Medication Distribution Models



Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

Five-Year Forecast
by Facility Size

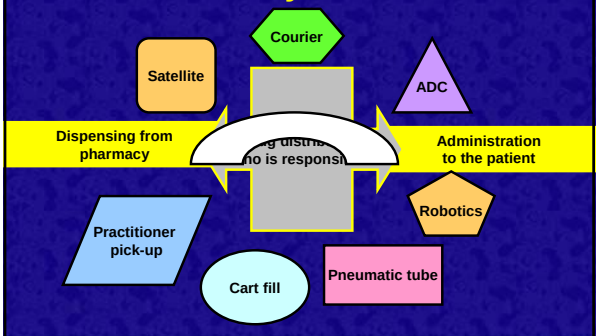


Adapted from *Pharmacy Purchasing & Products*. 2007; Vol 4 Issue 8

Crossing the Quality Chasm: A New Health System for the 21st Century (2001)

Adapted from Joint Commission on Quality and Patient Safety (2007) 3(11).

"Grey Area"



Strategic Planning Considerations

- Will bedside bar coding be the future of drug administration?
- Does one distribution model support this process better? If so, which one(s)?
- Will the same model also meet the needs for efficiency, safety, and effective pharmaceutical care? How about nursing care?

Concluding Thoughts

- One size does not fit all
- Patient-specific dosing is essential
- Minimize the number of locations where medications are stored
- Accuracy and reliability is key
- Must incorporate nursing care delivery models into decisions regarding pharmacy distribution

References

- Grissinger M, Cohen H, Vaida AJ. Using technology to prevent medication errors. In: Cohen M, ed. *Medication Errors.* 2nd ed. Washington DC: American Pharmacists Association; 2007:413.
- Halvorsen, D. (2007). Survey results: The growth of automation adoption. Pharmacy purchasing & products August, pp 4-45.
- Henriksen, K, Isaacon, S, Sadler, BL, and Zimring, CM (2007) The role of the physical environment in crossing the quality chasm. JCJ Quality and Safety. 33(11) pp 68-80.
- Keohane, CA, Bane, AD, Featherstone, E, Hayes, J, Woolf, S, Hurley, A., et.al. (2008). Quantifying Nursing Workflow in Medication Administration. JONA 38(1) pp 19-26.
- The Joint Commission Medication Management Standard MM.5.01.0 page. The Joint Commission Web site. Available at: http://www.jointcommission.org/NR/rdonlyres/A29E4577-6290-4B95-A097-0FDAFA1A7EAA/0/cah_sii_mm_revised_chapter.pdf. Accessed February 6, 2008.
- Smetzer J, Cohen M. (2007) Preventing administration errors. In: Cohen M, ed. *Medication Errors.* 2nd ed. Washington DC: American Pharmacists Association; 2007:235.
- Tiedeman, ME and Lookinland, S. (2004). Traditional Models of Care Delivery" What have we learned? JONA , 34(6) pp 291-297.

© 2008 Institute for Safe Medication Practices