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Automation of the Medication-Use System – Assuring the 5 Rights


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Case History



Betsy Lehman

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Learning Objectives



- Discuss the medication use system, the causes of adverse drug events, and “5 rights.”
- Apply the diffusion of innovations model to understand the adoption of technologies used to improve medication use safety.
- Discuss trends in the adoption of different medication safety technologies over time.
- Describe factors that affect the speed of adoption of innovations.


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The Medication-Use System and the “5 Rights”

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Systemic use of medications



- Pharmacology
 - the properties and reactions to drugs especially with the relation to their therapeutic value
- Medication-use
 - the use of drugs within medical care systems especially with relation to value and safety to the group of patients being served

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System vs. Process



- System
 - a regularly interacting or interdependent group of items forming a unified whole; an organized or established procedure; harmonious pattern.
- Process
 - something going on; a natural phenomenon marked by gradual changes that lead toward a particular result; a series of actions conducting to an end.

Source: Webster's New Collegiate Dictionary

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Medication Use System

- Procurement
- Administration
- Prescribing
- Monitoring
- Transcription
- Patient education
- Preparation
- Wellness
- Dispensing

The "Five Rights"

- Right medication
- Right dose
- Right time
- Right route of administration
- Right patient

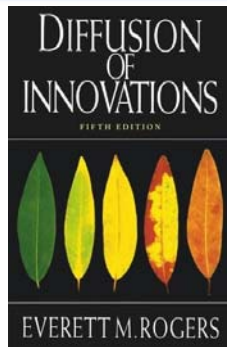
How often does this happen (or not...)?

Place where the system fails

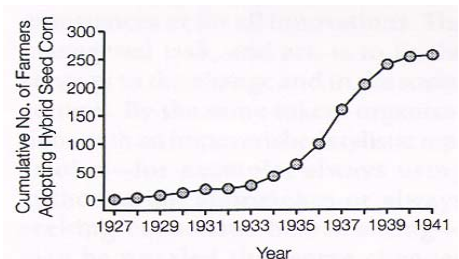
- Prescribing - 39%
- Transcription - 12%
- Dispensing - 11%
- Administration - 38%

Source: Leape et al. *JAMA*. 1995;274:35-43

Diffusion of Innovations Model for Adoption of Change



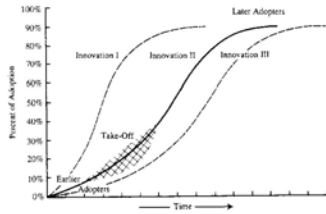
Diffusion of Innovations – The Case of Hybrid Seed Corn in Iowa



Rogers EM. *Diffusion of Innovations*

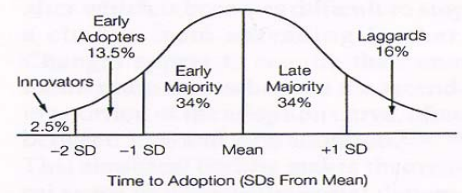
Diffusion of Innovations Curve

Figure 1-1. Diffusion Is the Process by Which (1) an Innovation (2) Is Communicated Through Certain Channels (3) Over Time (4) Among the Members of a Social System



Rogers EM. *Diffusion of Innovations*

Adopter Categorization



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Rogers EM. *Diffusion of Innovations*

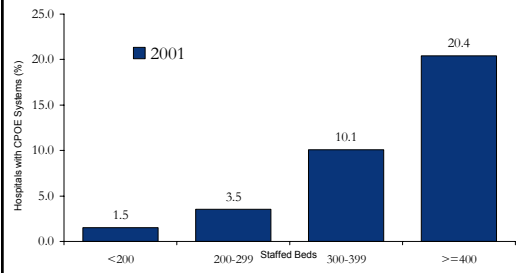
The Application of this Model to Medication-Use Systems to Assure the "5 Rights"

Prescribing and Transcribing

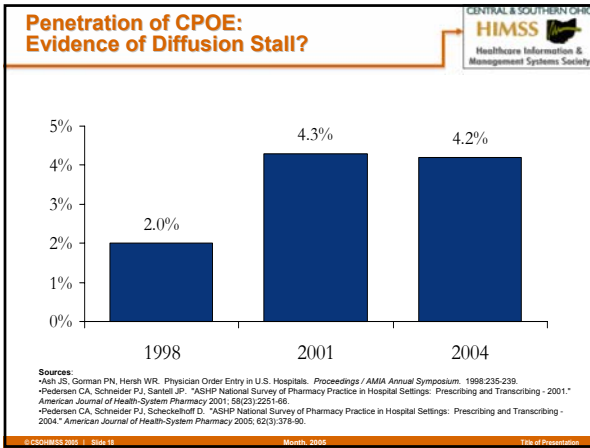
Innovations for Prescribing and Transcribing

- Felt tip pens?
- Computer Prescriber Order Entry systems
 - Supported by Leapfrog and IOM
 - Expensive
 - Hard to create decision support
 - Shifts entry to prescribers
 - Interfaces are important
 - Often linked with EMR (E-MAR)

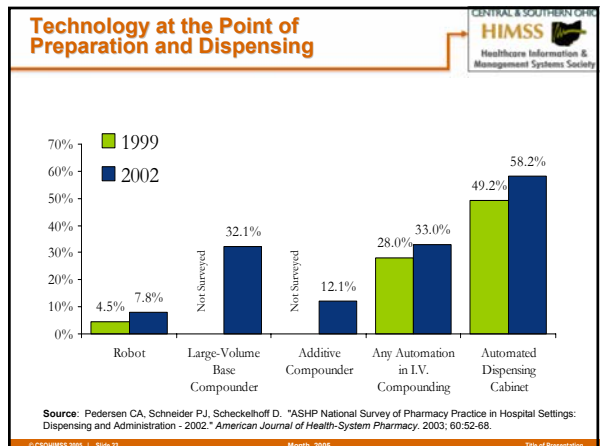
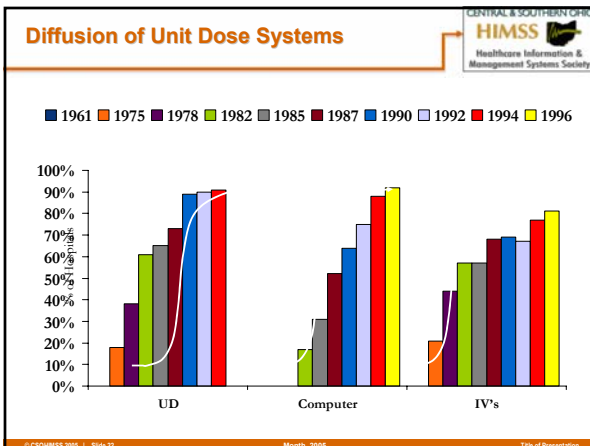
CPOE Penetration Varies by Hospital Size (x VA facilities)

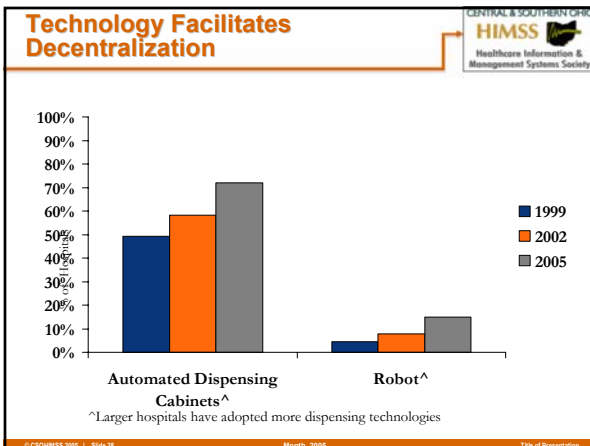
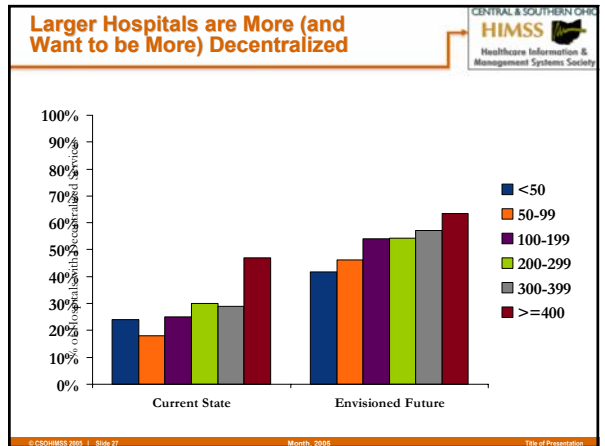
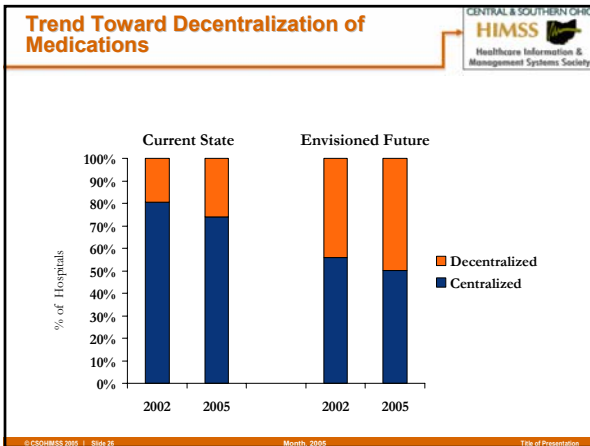
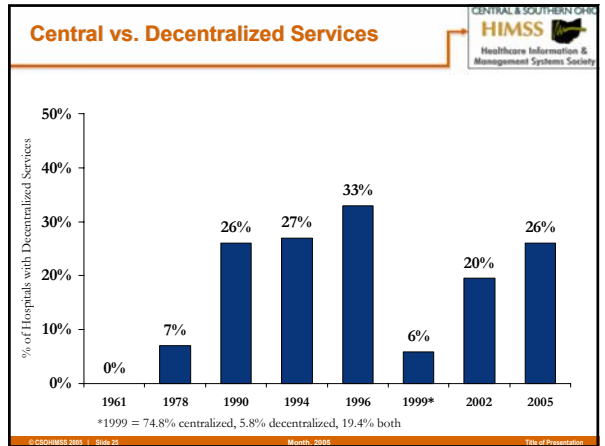
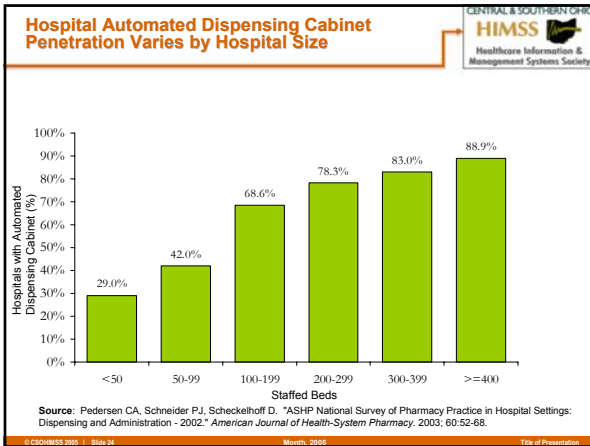


Pedersen CA, Schneider PJ, Santelli JP. "ASHP National Survey of Pharmacy Practice in Hospital Settings: Prescribing and Transcribing - 2001." *American Journal of Health-System Pharmacy* 2001; 58(23):2251-66.



- ### Innovations in Drug Distribution
- Unit Dose Drug Distribution Systems
 - Computers in the Pharmacy
 - IV Admixture Programs
 - Preparation and Dispensing Technologies
 - Robotic Distribution System
 - ▶ Assures accurate medication selection
 - ▶ Must bar code medications before loading
 - ▶ Expensive
 - Automated Compounding Devices
 - ▶ Large Volume (e.g., Automix)
 - ▶ Additive compounder (e.g., Micromix)
 - ▶ IntelliFill i.v.
 - Automated Dispensing Cabinets (e.g., Pyxis)
 - ▶ Medications at point of care
 - ▶ Shifts responsibility to nursing
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- ### Adoption of Technology - Preparation and Dispensing
- Primarily larger hospitals have chosen to adopt robotic dispensing technology
 - Adoption of robots is early and slow
 - Automated dispensing cabinets are now highly diffused
 - Linking ADCs to the pharmacy computer system (e.g., Pyxis Profile) diffused rapidly
 - In 1999, only 32%
 - In 2002, 72% of hospitals
 - In 2005, 89% of hospitals

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Administration

Innovations for Drug Administration

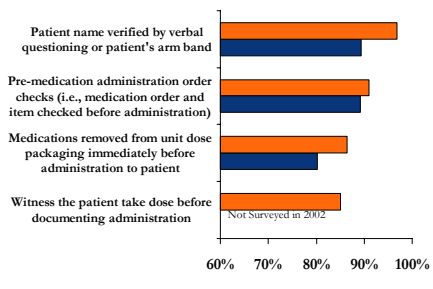
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- Bar Code Medication Administration (BCMA)
 - Last step
 - FDA mandating bar codes on unit-dose
 - Expensive
 - Work arounds/side effects of technology issue
- Electronic Medication Administration Record (e MAR)
 - Handwriting problems/readability
 - Transcription errors
- Automated Infusion Devices (Smart Pumps)
 - IV errors have greatest opportunity for adverse events
 - Nurses value assistance with calculations

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Increases in Safe Medication Administration Practices

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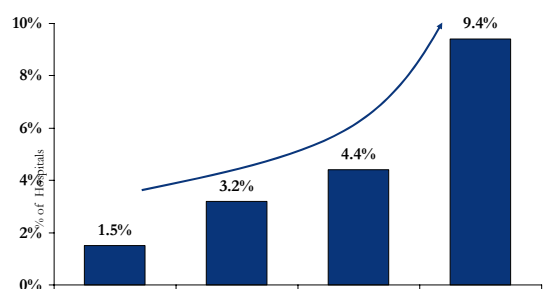
Practice	2002 (%)	2005 (%)
Patient name verified by verbal questioning or patient's arm band	~85	~95
Pre-medication administration order checks (i.e., medication order and item checked before administration)	~85	~90
Medications removed from unit dose packaging immediately before administration to patient	~75	~85
Witness the patient take dose before documenting administration	Not Surveied in 2002	~85

Hospitals with Safe Medication Administration Practice (%)

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Rapid Adoption of Bar Code Medication Administration (BCMA)

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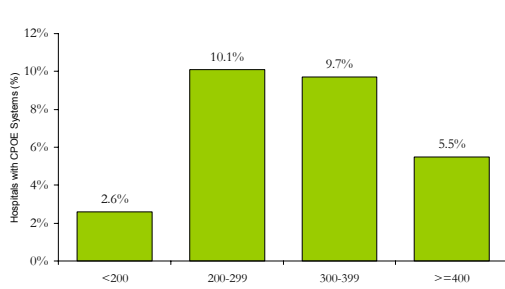


Year	% of Hospitals
2002	1.5%
2003	3.2%
2004	4.4%
2005	9.4%

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Hospital BCMA Penetration Varies by Hospital Size

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Staffed Beds	Hospitals with CPOE Systems (%)
<200	2.6%
200-299	10.1%
300-399	9.7%
>=400	5.5%

Source: Pedersen CA, Schneider PJ, Scheckelhoff DJ. Unpublished data (2004), presented at ASHP Mid-year Clinical Meeting, 2004.

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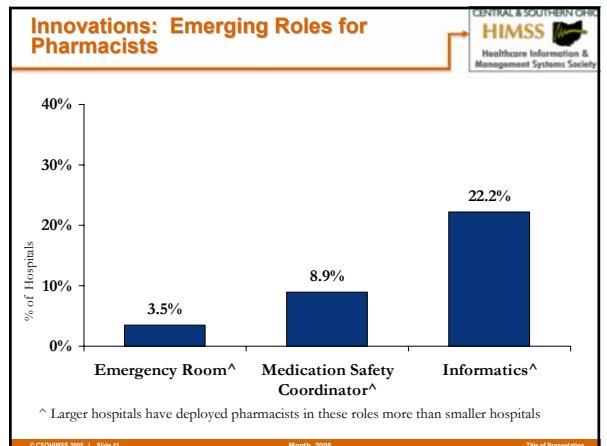
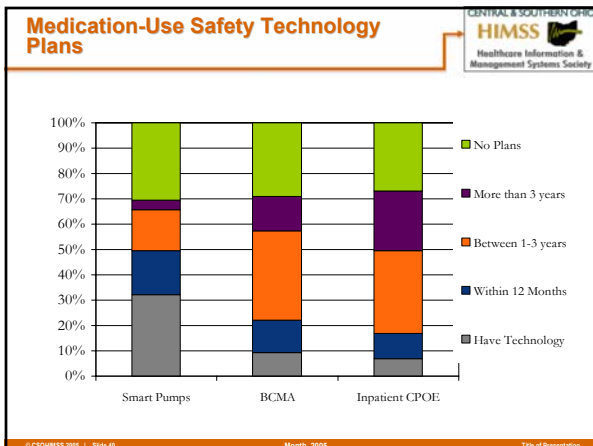
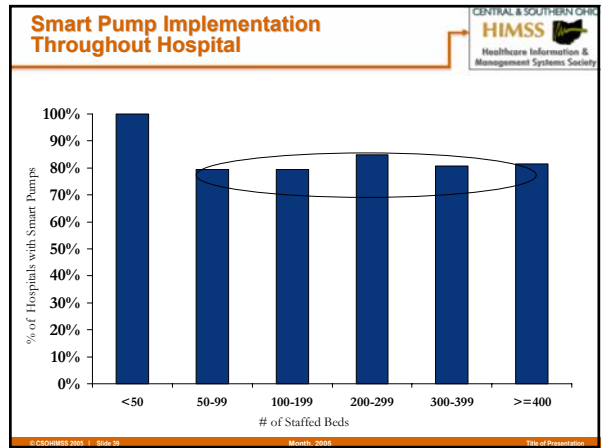
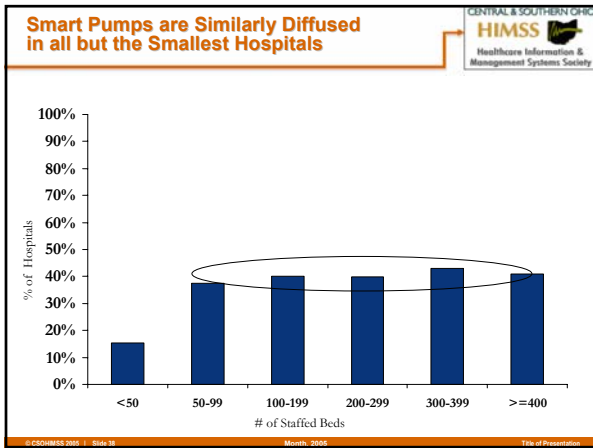
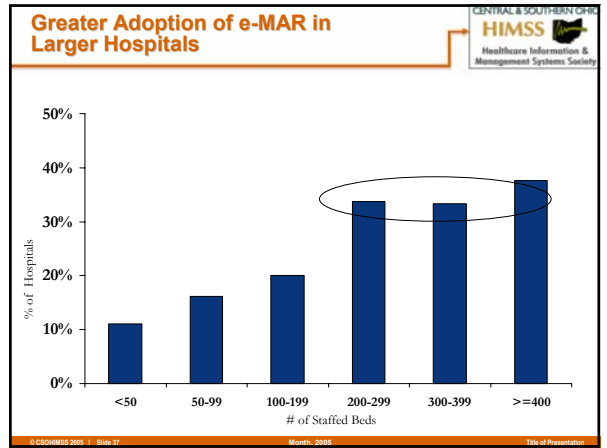
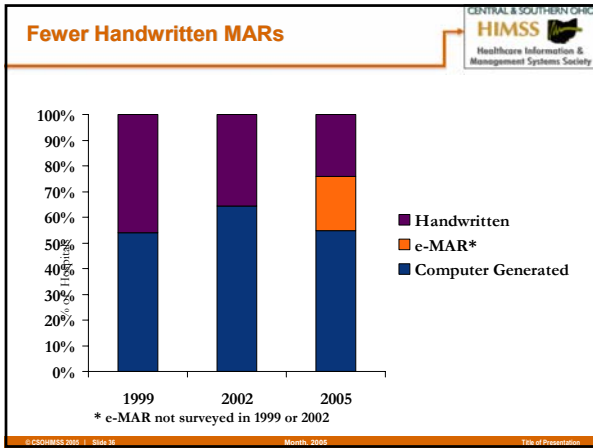
Adoption of Technology – BCMA

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- Late in early adoption phase (very close to early majority)
- Appears to be rapidly diffusing
- Organizations are placing BCMA ahead of other patient safety technology applications (e.g. CPOE)
- BCMA may make nurses too reliant on technology
- Budget justification is still very difficult (addressing multiple constituents helps)
- Hospitals advertising medication administration safety

Source: Bussard B, McAlearney AS, Pedersen CA, Schneider PJ. "A qualitative study examining the innovation process for adoption of medication safety-related technological innovations in health care organizations." In Press: *Journal of Patient Safety* (2005).

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Summary

- Technology is in the early stages of being adopted to improve patient safety
 - Some technologies are diffusing faster
 - Smart pumps>BCMA>CPOE
 - Beware of the “side effects” of technology
 - Current State to Envisioned future
- “Size matters” to “Size does not matter”**