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<p>PHARMACY INFORMATICS AND MEDICATION SAFETY: AN INTEGRAL LINK IN THE INPATIENT SETTING</p>	<p>Rebecca Limauro, PharmD, MBA Clinical Informatics Pharmacist Exeter Hospital</p>
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<p>OBJECTIVES</p> <ul style="list-style-type: none">▪ Describe the major components of pharmacy informatics.▪ Recall the role that pharmacy informatics plays in medication safety.▪ Review examples of enhanced medication safety through pharmacy technology.▪ List all pharmacy team members that may play a role in pharmacy informatics.


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<p>DISCLOSURES</p> <ul style="list-style-type: none">▪ Rebecca Limauro has no financial relevant relationships to disclose in regards to this presentation.
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WHAT IS HEALTH INFORMATICS?

- Combining use of data, information and knowledge to improve health care
- Requires cross-training between:
 - Basic Informational Sciences
 - Application Domain
- Convergence of technology and health care science



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INSTITUTE OF MEDICINE REPORTS

- *To Err is Human: Building a Safer Health System (2000)*
 - Brought national awareness to the need for increased safety in healthcare
 - 98,000 deaths per year due to medical error
- *Crossing the Quality Chasm: A New Health System for the 21st Century (2001)*
 - Errors are common/costly
 - Systems cause errors
 - Can prevent errors
 - Med-related events = leading cause of harm

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NEEDS OF THE HEALTH CARE SYSTEM TO IMPROVE SAFETY CULTURE

- National health IT infrastructure
- Real-time access to patient information
- Clinical decision support
- Patient-safety data

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MEANINGFUL USE

- Health Information Technology for Economic and Clinical Health (HITECH) Act, 2009
- CMS incentive-based program to promote adoption/expansion of Electronic Health Record (EHR) use in hospitals
- Goals:
 - Improve safety, quality and efficiency
 - Involve patients/families
 - Enhance sharing across the continuum of care
 - Ensure privacy and security of patient data

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STAGES OF MEANINGFUL USE

- 1**
 - Data Capturing and Sharing
 - CPOE, Drug Interaction/Allergy Screening, 1 Clinical Decision Support Rule, Active Medication and Allergy List
- 2**
 - Advanced Clinical Processes
 - CPOE, E-Prescribing, Medication Reconciliation, Immunization Registries, More Clinical Decision Support Rules, Patient Portal
- 3**
 - Improved Outcomes
 - Coming in 2018
 - Focus on HIE, Public Health Reporting, expanding Stage 1 and 2

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EXPECTED OUTCOMES FROM COMPLIANCE WITH MEANINGFUL USE STAGES


- Improved clinical outcomes
- Stronger population health outcomes
- Increase in transparency and efficiency
- Empowered patients
- Better research data on health systems

Stages of Meaningful Use

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MEDICATION SAFETY DEFINITIONS

- **Adverse Drug Event =**
Injury resulting from a medication or lack of intended medication
Does not always mean an error occurred
- **Medication Error =**
Preventable event that can cause/lead to incorrect medication use or patient harm
Can occur at any step in the medication use process



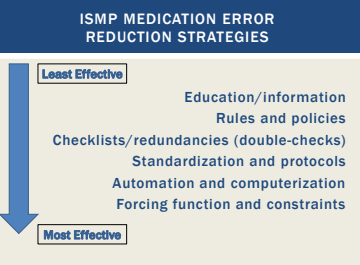
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GOALS FOR MEDICATION ERRORS

- Decrease or eliminate the possibility of errors occurring
- Make errors easier to identify
- Minimize the harm caused by an error
- Report/analyze errors to find ways to prevent
- Share errors externally

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ISMP MEDICATION ERROR REDUCTION STRATEGIES

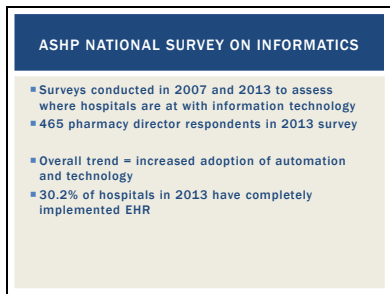


Least Effective

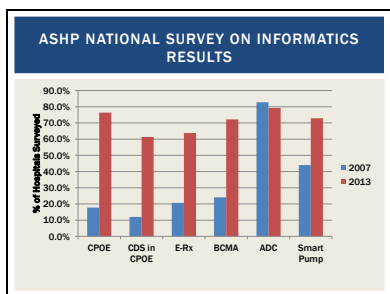
- Education/information
- Rules and policies
- Checklists/redundancies (double-checks)
- Standardization and protocols
- Automation and computerization
- Forcing function and constraints

Most Effective

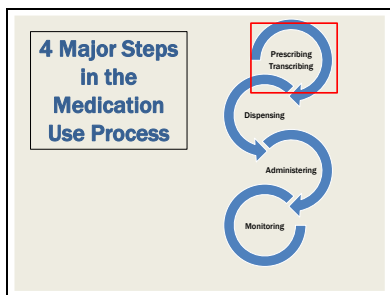
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STEP 1: PRESCRIBING/TRANSCRIBING

- Prescribing phase:
 - 56% of preventable ADEs
 - 49% of all ADEs originate in the prescribing phase
- 42% of serious ADEs are preventable
- Easier to intercept errors earlier rather than later in the medication use process

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PENNSYLVANIA PATIENT SAFETY AUTHORITY STUDY

- 2016 study that analyzed 811 serious error events from PA Patient Safety Reporting System database
- 25% of the serious prescribing errors were deemed to be preventable with CPOE and CDS
- Types of Errors:
 - Wrong dose/overdose (32.2%)
 - Med ordered despite documented allergy (14.5%)
 - Dose omissions (14.3%)
 - Orders entered on wrong patient (4.4%)
 - Other (34.5%)

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OTHER TYPES OF PRESCRIBING/TRANSCRIBING ERRORS

- Drug ordered despite clear contraindication
- Interacting drugs ordered
- Wrong administration instructions
- Wrong route of administration
- Wrong dosage form
- Illegible handwriting




Handwritten notes illustrating illegible handwriting:

- Handwritten text: "Handwritten illegible text" (blurred)
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CPOE

- Computerized provider order entry in EHR
 - Medications
 - Labs
 - Diagnostic tests
 - Procedures
- Structured format to facilitate accuracy, completeness and consistency when entering orders



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CLINICAL DECISION SUPPORT (CDS)

- Combining pertinent clinical knowledge with patient-specific data to provide real-time support to providers
- **Active** = in the form of an alert, reminder, recommendation or informational notification
- **Passive** = system designed to discreetly guide provider towards correct action
- Can be simple or based on a sophisticated algorithm

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EXAMPLES OF PASSIVE CDS

- Standard drug nomenclature
- Required fields for complete order
- Limiting choices for order components of specific medications
- Pre-built order strings with common dosing
- Only showing drugs to order in areas where appropriate
- Pre-building administration instructions
- Showing appropriate results or calculations when ordering specific drugs
- Standardized order sets

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EXAMPLES OF ACTIVE CDS

- Drug database vendor alerts
 - Drug interactions
 - Duplicate checking
 - Allergy checking
 - Dose checking
- Drug-food, Drug-disease checking
- Drug-pregnancy/lactation checking
- Clinical guidance
- Therapeutic alternatives
- Rules to trigger based on patient-specific information in relation to drug being ordered
- Cumulative dose alerts
- Restricted drug information
- Enforce procedural compliance


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5 RIGHTS OF CDS	
Information	Evidence-based guidance Response to clinical need
People	Care team Patient
Format	Alert Order Sets Reference info to answer clinical question Flowsheets Dashboards
Channel	EHR Patient Portal Mobile Device
Time	Point where decision or action needed

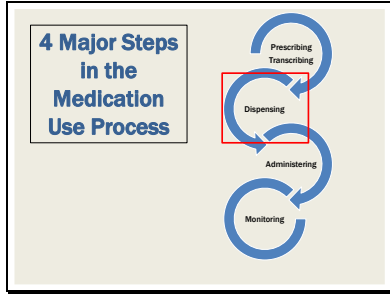
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E-PRESCRIBING

- Common errors in writing prescriptions:
 - Wrong drug, dose and or frequency
 - Illegible handwriting
- Benefits of E-Prescribing:
 - Alerting for allergies, interactions, duplicates
 - Dose alerts
 - Decreased clarification calls = less interruptions
 - Formulary verification



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STEP #2: DISPENSING

- Many steps involving in pharmacy dispensing
 - Stocking of inventory
 - Repackaging of oral medications
 - Compounding
 - Labeling
 - Dispensing
- Most common error = Wrong drug prepared/dispensed
- Most effective solution = bar code technology



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TECHNOLOGY TO DECREASE DISPENSING ERRORS

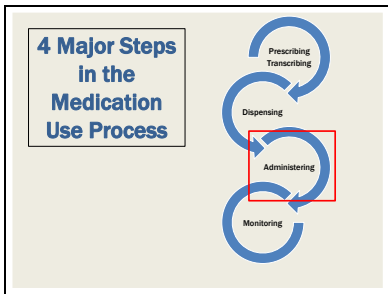
Stocking of Inventory	• Inventory management software with bar-code scanning
Repackaging of Oral Medications	• Software to produce bar codes
Compounding	• IV Room Software • Compounding Robotics
Dispensing	• Automated Dispensing Cabinets • Carousels, Dispensing Robots

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CHALLENGES WITH BAR CODE TECHNOLOGY IN PHARMACY DISPENSING

- Success dependent on accuracy of the software, hardware, and database that scanning is using
- Verification/validation of bar codes needed continually
 - Increased pharmacy workload/maintenance

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STEP #3: ADMINISTRATION

Types of Errors:	Technology to Decrease Risk:
▪ Omissions	▪ Electronic Medication Administration Record (eMAR)
▪ Given at wrong time	▪ BCMA (Bar-Code-Enabled Medication Administration)
▪ Wrong dose given	▪ Smart Pumps
▪ Given via wrong route	
▪ Drug infused at wrong rate	

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EMAR

- Visual cues for when medications are due to be given
- Build in comments/instructions to support safe medication administration
 - Easily view scales, protocols, etc.
- Alerts can be incorporated
- Document additional information regarding administration (co-sign, vitals/labs associated with med, etc.)

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BCMA


- Extra layer of safety added to eMAR
- Every drug and every patient needs a unique bar code – both are verified at administration
- All medications in use at facility must have a valid bar code
 - Need validation system in place to ensure everything is bar-coded appropriately
 - Pharmacy system must generate unique bar-code for compounded/multi-component products



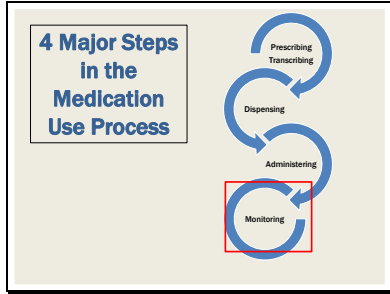
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SMART PUMPS

- Computerized pump that delivers medication to patient
- Contain a customized drug library, preferably managed by pharmacy
- Provide alerts when exceeding min/max settings for the drug
- Varying levels of sophistication/integration



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STEP #4: MONITORING

Types of Errors:

- ▀ Not monitoring correct labs or assessment data
- ▀ Failure to act on a test



Technology to Decrease Risk:

- ▀ Pharmacy surveillance
- ▀ Clinical documentation
- ▀ Order sets/standard protocols

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NEW ERRORS INTRODUCED BY TECHNOLOGY

<ul style="list-style-type: none">▀ Prescribing<ul style="list-style-type: none">▀ Incorrect string selection▀ Incorrect supporting data for order▀ Alert fatigue▀ Orders on wrong patient▀ Dispensing<ul style="list-style-type: none">▀ Discrepancies between CPOE and PHA systems	<ul style="list-style-type: none">▀ Administering<ul style="list-style-type: none">▀ Too much information on the eMAR▀ Confusing display of information (i.e. comments and special instructions)▀ Monitoring<ul style="list-style-type: none">▀ Hard to know if viewing most recent info▀ More information available than needed
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ROLE OF A PHARMACIST IN INFORMATICS

- Troubleshoot technical and safety issues related to medications
- Continually evaluate medication-use systems for improved workflow and safety
- Lead and manage change in collaboration with IT and other health professionals
- Maintain knowledge of new technologies available to improve medication safety

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ROLE OF A PHARMACY TECHNICIAN IN INFORMATICS

- Work closely with Informatics Pharmacist to expand role of pharmacy informatics
- Management of automation systems
- Troubleshooting
- Implementation of new technology/processes
- End-user training/education
- Auditing/reporting

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PHARMACY INFORMATICS TRAINING

- ASHP Informatics Certificate
- Certified Professional in Health Information and Management Systems (CPHIMS) Certification
- PGY2 Informatics Residency
- Health Informatics Programs
- On-the-job training

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ASHP PHARMACY FORECAST 2017

- True system-wide integration
- Increased interoperability
- Medical device advancements
- Improved patient care plans
- Provider report cards
- Ensuring security of patient information



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SUMMARY

- Pharmacy informatics supports the technology used in every step of the medication use process
- Technology and automation can be leveraged to improve medication safety
 - Through technologies such as CPOE, CDS, BCMA, Smart Pumps, Surveillance, we can improve medication safety
- We all play a role in the safe use of technology to improve medication safety in our institutions

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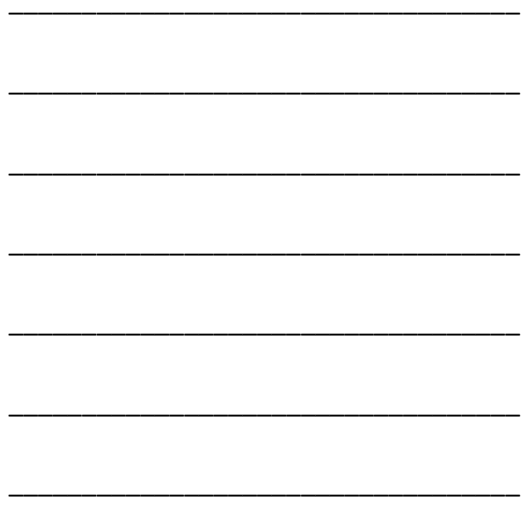
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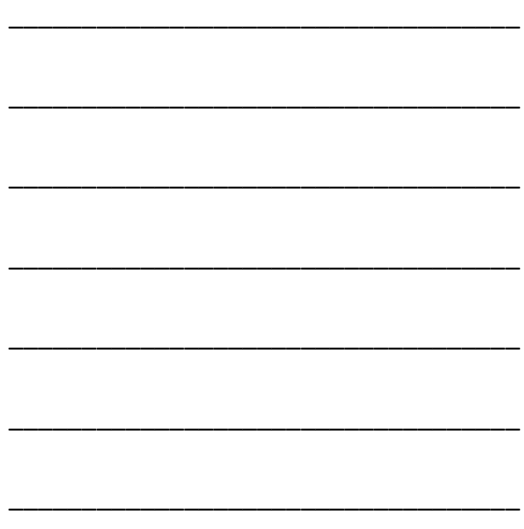
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QUESTIONS?

Thank you

