Pharmacy’s Role in Integrating Technologies to Improve Medication Use

John Manzo, PharmD, FASHP
Director, Clinical Applications/Pharmacy Medical Center Information Technology
NYU Langone Medical Center
New York, New York
Saturday, April 30, 2011

Learning Objectives

- Explain the importance of emphasizing process redesign and clinical transformation when implementing new technologies
- Describe strategies to minimize medication error risk associated with clinical decision support and alert fatigue
- Review medication error risk at all phases of the medication use process
- Review pharmacy filling and dispensing errors
- Describe how medication error risk may be increased by technology and automation
- Describe how medication error risk may be minimized by technology and automation
- Define the barriers associated with implementing the FDA barcode regulations
- Contrast the value of pharmacy leaders, clinical pharmacists, IT pharmacists, and IT pharmacy specialists in the various stages of medication technology project methodology
- Summarize what pharmacists can do regarding safe and efficient technology implementation

NOTE: No Conflicts of Interest to report
### Overview

- Leadership/Planning
  - Design/Implementation
  - Clinical Transformation
  - Support/Monitoring/CQI
- Clinical Decision Support
- Medication Safety
- The Players
  - Pharmacy Leadership
  - Clinical Pharmacist
  - IT Pharmacist
  - IT Pharmacy Specialist

### Why do HealthCare IT Projects Fail?

- Lack of Clinical input in system planning, design, and implementation
- Lack of Clinician (physician) support, participation and buy-in
- Inadequate network capacity to support 24/7 system access and processing speed
- More emphasis on Software Implementation than Process Re-design and Clinical Transformation
- Lack of true partnership with software vendors
Why do Healthcare IT Projects Succeed?

- Deliberate clinical strategy ENABLED by Information Technology
- Executive and clinical leadership COMMITMENT
- CLINICIAN ADOPTION roadmap, particularly for physicians
- Organized, resourced project STRUCTURE
- Major enterprise-wide CHANGE MANAGEMENT
- Significant PROCESS REDESIGN
- Extensive user SUPPORT
- Metrics in place to measure
- VALUE AND SUCCESS

Leadership
## Pharmacy Leader as Project Manager

- Pharmacy/medication components of the project
  - Strategy, Design, Implementation, Support and Optimization
- Pharmacy-specific process re-design
- Coordination with Pharmacy strategy
- Liaison Role is important
  - Project Leadership
  - Medical and Nursing Staff
  - IT Staff
  - Pharmacy Staff

## Managing Clinical Transformation

- Change Management
  - Managing the Resistance to Change
- Workforce Transformation
  - Proactive approach to integrate process redesign into new technology or innovation
The Degree of Workforce Transformation is a Function of the Degree of Process and Technological Change Required

Proposed Changes to Organization and People

Proposed Changes to People and Processes

Process

Transformation Management

Process Centric Organization Design

Enabled Processes

Business Context

Organization & People

Info Driven Organization

Proposed New Technology

Keys to Clinical and Workforce Transformation

- Patient safety is the primary driver
- Visible and sustained leadership commitment
- Identification of clinical transformation champions
- Teamwork and trust among all involved individuals and departments
- Buy in from key clinician groups
- Well defined communication strategy
- Skills & training program
- Overcoming resistance to change
- Performance management & process metrics needed to “prove” value
- Creative compensation & incentives
Managing Clinical Transformation

- Clinical transformation tools
  - Readiness Assessment
  - Current State/Future State Gap Analysis
    - Functionality gaps
    - Process gaps
- Mitigation plan
- Explicit Ownership is vital
  - IT
  - Vendor
  - Facility
  - Consultants

Managing Clinical Transformation

- Current State
  - Where are we now?
  - What works?
  - What doesn’t work?
  - What keeps you up at night?

- Future State
  - Where are we going?
  - How will it work?
  - What won’t work?
  - What keeps you up at night?
**Pharmacy Leadership is Essential**

- Interdisciplinary collaboration through all stages of the project lifecycle and beyond transforms clinical culture
- Maintaining a patient centered focus in automating the medication management process will forge improved clinical relationships and mutual respect
- The project does not end with successful activation
  - Foundation for ongoing optimization and further interdisciplinary technology initiatives
  - Removing unnecessary handoffs and inherent miscommunications allows for a renewed focus on practice issues

---

**Place Adequate Emphasis on Process Redesign and Clinical Transformation**

- New Technologies require New Workflows and Processes
- 90% Process Re-design and 10% Technology Implementation
- Common Process Redesign Associated Mistakes
  - Ignoring the Process changes associated with technology changes
  - Customizing technology to facilitate an error-prone practice or cumbersome workflow
  - Assuming that all clinicians have a similar baseline competency around technology
  - Inadequate Readiness Assessment to determine competing priorities, resources and challenges
  - Rushing to implementation without adequately testing the application AND the re-designed workflows
  - Incomplete or inadequate downtime processes and disaster recovery plans
ASSESSMENT QUESTION #1

All of the following can be considered keys to Clinical and Workforce transformation EXCEPT:

a) Patient safety is the primary driver
b) Lack of a true partnership with software vendor
c) Visible and sustained leadership commitment
d) Buy-in from key clinical groups

Clinical Decision Support

Emergency Department

⚠️ You have just made a serious medication error.

uh - oh!
## Clinical Decision Support Content

- **Custom Content**
  - Requires solid operational and clinical standardization
  - Significant organizational resource commitment from Subject Matter Experts to develop and maintain
  - Dynamic - constant review and update
  - Liability

- **Proprietary Content**
  - Subscription based vendor provided content can be a useful way to reduce implementation timelines
  - Best practices incorporated into vendor supplied sets can assist in meeting patient safety and regulatory requirements

- **Significant organizational resource**
- **Insure content matches clinical practice & operational workflows**
- **Utilize clinical and operational Subject Matter Experts and existing organizational governance bodies**

## Clinical Decision Support Systems for Prescribing and Transcribing

- **Basic Clinical Decision Support Reminders and Warnings**
  - Medication Allergy Checking
  - Interaction Checking
  - Duplicate Checking
  - Food/Drug Interaction Checking
  - Dose Range Checking
Clinical Decision Support Systems for Prescribing and Transcribing

- Advanced Clinical Decision Support
  - Content: Proprietary vs Customized
  - Up front in the prescribing process, where the information is required for clinical decision making
  - Recommended Substitutions
  - Best Practice Guidelines
  - Regulatory Standards
  - Utilization of “hard” vs “soft” stops

Clinical Medication Ordering Alerts

- Meaningful Use Requirements
- During Key Steps in the Automated Workflow
- Intrusive vs Non-Intrusive
- Smarter Alerting Strategies
- Cancel vs Modify vs Override

- Alert Fatigue
Alert Fatigue

- A state in which the user becomes less responsive to alerts possibly leading to missing vital alerts and potentially increasing the overall risk of an ADE and negatively impacting patient safety
- Current literature: 49 – 96% of Alerts are overridden by EMR users

Strategies to Minimize Risk associated with Alert Fatigue

- Filter out clinically insignificant alerts
  - Severity of Alerts
  - Alert Types
  - Intrusive vs Non-Intrusive Alerts
- Incorporation of patient or medication specific information within the alerting algorithms
- Is there a documented connection between Alert Fatigue and Error Risk?
ASSESSMENT QUESTION #2

All of the following statements regarding Alert Fatigue are true EXCEPT:

a) Alert Fatigue has the potential to increase ADE risk and negatively impact patient safety
b) Reports indicate that 49 – 96% of alerts are overriden by EMR users
c) The literature documenting a true cause & effect relationship between alert fatigue and dangerous medication outcomes is plentiful
d) To minimize the effects of Alert Fatigue one could filter out nuisance alerts by severity

Medication Safety
Technology and Medication Safety
Where do Potential Medication Errors Occur?

- Prescribing: 39%
- Transcribing: 12%
- Dispensing: 11%
- Administering: 38%


Role of Technology in Safe Medication Use

- Perform repetitive tasks with consistency and accuracy
- Provide fast access to information from multiple locations to multiple individuals in “real” time
- Monitor information to auto-identify conditions requiring intervention
- Assist with communication between caregivers
- Assist with the accurate and efficient capture of clinical data
- Support safe and efficient workflows
- Requires comprehensive clinical and operational standardization
### Clinical Standardization

- Enhanced Medication Safety
- Naming Conventions, Abbreviations, High Risk Medications
- Optimal and Evidence-Based Medication Prescribing and Monitoring
- Compliance with Organizational and Regulatory Requirements
- Customized Content versus 3rd Party Content
- Foundations for Advanced Functionality
- Fundamental Components to Achieve Clinical Transformation

### Operational Standardization

- Optimal Workflows and Process Efficiencies to support Safe Medication systems
- Policies and Procedures
- Potential for Cost Containment
- Foundation for Advanced Functionality
- Compliance with Organizational and Regulatory Requirements
- Fundamental Components to Achieve Clinical Transformation
How does CPOE minimize medication error risk?

- Combined use of CDSS or “expert” logic and CPOE improves medication outcomes compared to when CPOE without CDSS is used
- Elimination of illegible handwriting
- Standardized, defaulted order content
- Minimize confusion over dosage strengths, dosage forms, routes, leading zeros, decimal points, brand/generic conversions
- Pharmacist verification of every med order
- On-line prescribing info for all users at key points in the Medication Use Process
Mobile Point of Care Device Solutions

ADMINISTRATION

Point of Care Scanning

ADMINISTRATION
“Intelligent” or “Smart” Pumps

FDA Imposed Bar-Code Applications for Medication Safety

- February 25, 2004, the U.S. Food and Drug Administration (FDA) issued a Bar Code Rule
  - Requires drug manufacturers, re-packers, and re-labelers to apply unit-of-use bar codes containing National Drug Code (NDC) numbers to the immediate package of most prescription drug products and biologicals
  - Deadline: February, 2006
- No Bar code standards were defined
- Imposes no requirements on hospitals, but encourages compliance
- The FDA estimates:
  - 500,000 fewer adverse events over the next twenty years
  - Reduction in medical errors by 50 percent
  - $93 billion savings by reducing healthcare costs, patient pain and suffering, and the lost work time due to adverse events
- Slow start - significant stalling by drug manufacturers
- Negative outcome - less unit of use packaging
- Difficulties in scanning small packages and various symbologies
- Still requires significant repackaging and re-labeling
## Common Barcode Symbologies

**UCC/EAN 128**

- Standard shipping barcode label

**Code 128**

- This high-density code is widely used in many industries. It is alphanumeric, can be of variable length and is scanned bi-directionally

**Code 39**

- Encodes alphanumeric data in any length. It works with the greatest selection of printers and scanners

### 2 Dimensional Bar Codes

- Allows for significant amount of data in a very small, compact space

**GS-1 Databar (Reduced Space Symbology)**

- A new barcode that may become the industry standard

## Radio Frequency Identification (RFI)

- Wireless identification technology that communicates data by radio waves
- Data is encoded in a chip, which is integrated with an antenna and packaged into a finished “tag”
  - Passive
  - Active (small battery to allow continuous monitoring)
- RFID labels can hold more data than bar codes, and can be read automatically without any user intervention
- Current hospital application is modest, primarily due to cost issues
  - Scanners
  - Tags
  - Wireless Network Required
Medication Error Risk can be increased by technology and automation

- Mismatches between workflow and automation will create “work-arounds”
- Inadequate Training and Support
- Inadequate Maintenance, Stocking and Monitoring of technology and devices
- Incorrect or outdated data table configuration
- Minimal or non-validated CDSS and guidance at order entry
- Poor Reliability (speed, downtime)
- Inadequate use of “Forcing Functions” to maintain safety checks and balances
- Placing an overabundance of trust in the technology

“Modern technology has now reached a point where improved safety can only be achieved through a better understanding of human error mechanisms. In its treatment of major accidents, the book spans the disciplinary gulf between psychological theory and those concerned with maintaining the reliability of hazardous technologies. Much of the theoretical structure is new and original, and of particular importance is the identification of cognitive processes common to a wide variety of error types”. 
<table>
<thead>
<tr>
<th>Technology/Medication Error Suggested Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexpected increased mortality after implementation of a commercially sold CPOE system. Han YY et al, Pediatrics. 2005;116:1506-12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology/Medication Error Suggested Readings</th>
</tr>
</thead>
</table>
ASSESSMENT QUESTION #3

Technology associated medication error risk can be INCREASED by:

a) Incomplete or outdated data table configuration
b) Eliminating illegible handwriting of medication orders
c) Pharmacist verification of electronic medication orders
d) Standardized, defaulted order content

Who are the Players?
Required Pharmacy Resources

Subject Matter Experts (SME)
- Strategists and Decision Makers
- Operational SMEs
- Clinical SMEs
- Automation/Technology SMEs
- External IT Consultants
- How Many?
  - Scope/Size of the Project
  - Timeline of the Project
  - Financial Constraints
### Pharmacy Leaders and Managers

- Clinical and Operational Standardization
- Reorganization of the Department
- Alignment with Organizational and IS/IT Strategy
- Resource Planning
  - Design vs Implementation vs Maintenance vs Optimization
- Intellectual Property/Skill Set
- Size and resources of department, institution and project

### IT Pharmacists

- Bridge between the Clinical & Operational Department Needs and the IT Project Needs
- System and Automation Expertise
- Oversight of IT Specialists
- Alignment with IS/IT
  - Do resources stay in Pharmacy?
  - Do resources stay in IT?
  - Relationship with CIO
  - Symbiotic relationship
## IT Pharmacy Specialists

- Bridge between the Operations and Automation Needs and the IT Project Needs
- Automation Expertise
- Essential to Automation Operations
- Stocking/Restocking functions
- Routine physical maintenance functions
- Skill Set and Training
- Quality Checks and Balances
- Do resources stay in Pharmacy?

## Clinical Pharmacists

- Intimate Knowledge of Current Clinical Processes & Pitfalls
- Clinical Standardization
- Align Clinical Workflows with application functionality
- Content development, validation, testing and optimization
- Report definition and management
- Enhanced perspective on Patient and Medication Safety
- Integration of Clinical Activities within the EMR
- Medication Technology Champions - Capitalize on relationships with Medical Staff
### External IT Pharmacist Consultants

- Staff Augmentation Consultants
- Strategy Consultants
- Vendor Selection Consultants
- Project Management Consultants
- Implementation Consultants
- Support/Maintenance Consultants
- Optimization Consultants

### Job Descriptions – ASHP Resource Center

- Pharmacist Practitioner IT
- Pharmacist Manager IT
- Clinical Applications Manager
- Manager - Pharmacy Technology
- Manager, Informatics & Automation Enhancement
- Pharmacy Information Systems Technical Specialist
What Can Healthsystem Pharmacy Departments Do?

- Take a Leadership Role
- Become experts in the benefits and shortcomings of the available medication process technologies
- Lead the strategy/design/implementation/support of medication-related technologies and system redesign
- Accept and integrate the concepts of human error mechanisms into technology project lifecycles - NO AUTOMATED SYSTEM IS COMPLETELY ERROR PROOF

- Redeploy Intellectual Resources - Clinical experts are still needed at all steps in the medication use process to insure that dangerous medication errors don’t get through technology configuration safety-nets
- Create a culture where all disciplines understand the shortcomings of medication-related technologies and the need for diligence at every step of the med use process
- Develop monitoring systems to insure the effectiveness and ongoing improvement and optimization of these new technologies within the medication use process
**ASSESSMENT QUESTION #4**

What can Healthsystem Pharmacy do to safely and effectively integrate technologies to improve medication use?

a) Redeploy intellectual resources to enhance technology configured safety nets  
b) Monitor the effectiveness of new technologies with an eye on optimization and improvement  
c) Accept and integrate human error mechanisms into the technology project lifecycle  
d) All of the above
Say the reflective ??? from the previous slide and use this as the visual/humor piece
NFawthrop, 5/4/2004