

The Impact of CPOE and CDS on the Medication Use Process and Pharmacist Workflow

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MSOP 15, CDS Spring Meeting 2013, Pathways to Patient Care

Conflict of Interest Disclosure

The speaker has no real or apparent conflicts of interest to report.

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Learning Objectives

- Discuss the evidence supporting improved medication safety and quality with CPOE and CDS.
- List 2-3 unintended consequences of CPOE implementation.

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Learning Objectives

- Describe the pros and cons of an incremental CPOE implementation.
- Identify a potential pitfall of the cognitive change necessary for pharmacists to transition from order entry or transcription to order verification.

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My main job responsibility is:

- Pharmacy Director
- Pharmacy Manager
- Informatics Pharmacist
- Staff/Clinical Pharmacist
- Pharmacy Technician

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My organization's progress with the EHR / CPOE is:

- Fully implemented EHR and CPOE
- Partial EHR, including CPOE
- Partial EHR, excluding CPOE
- Planning stages
- No plans to implement

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Overview

- Evidence of improved medication use with CPOE and CDS
- EHR and CPOE rollout strategies
- Unintended consequences
- Implications for pharmacist workflow
- Clinical Decision Support (CDS) challenges
- Conclusions

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Impact of MMIT on the Medication Use Process

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AHRQ MMIT Whitepaper

- Thorough review of literature on medication management information technology (MMIT)
- Seven key questions
 - Within and across phases of medication management, what evidence exists that technology is effective?
 - What Randomized Controlled Trials exist to support improved quality and safety with CPOE +/- CDS

McKibbin KA, et al. Enabling Medication Management Through Health Information Technology: Evidence Report/Technology Assessment No. 2013(1):1-111.

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Technology Studied by Phase

Health IT	Prescribing	Order Communication/Dispense	Administration	Monitoring
CDS	177	12	5	63
CPOE	90	17	9	11
e-Prescribing	31	13	4	2
Barcode Medication Administration	1	2	20	0
eMAR	2	4	14	0

Healthcare Process Outcomes

- 379 studies
 - 225 (60%) studied process changes
 - Considered a 'positive' outcome if at least 50% of outcomes studied were positively impacted by MMIT

Phase	Process Outcome	Setting	Percent Positive
Prescribing	Patient Safety Related	Hospital	87%
		Ambulatory	68%
	Guideline Adherence	Hospital	83%
		Ambulatory	64%

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There is strong evidence that CPOE and Clinical Decision Support improve outcomes.

- A. True
- B. False

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Randomized Controlled Trials

- 77 RCTs – primarily CDS
 - Prescribing – 71%
 - Monitoring – 29%
- Poor to mediocre study quality
- 67% (24/36) had positive process outcomes
- 15% (5/34) had positive clinical outcomes

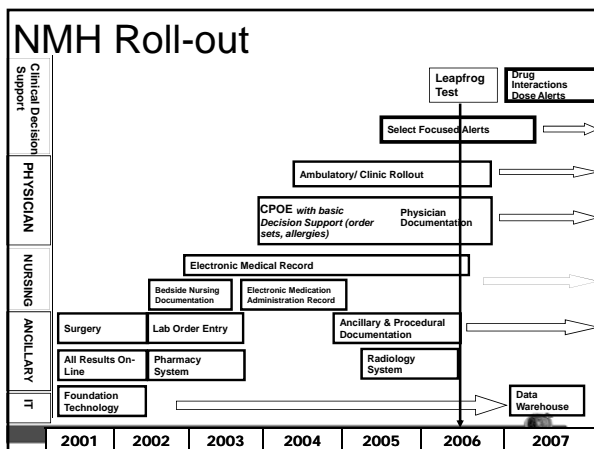
Clinical Outcomes and Conclusions

- 76 studies measured clinical outcomes or ADEs
 - 34% reported significant benefits
- Most trials were conducted at institutions with a strong history of MMIT (Partners, Kaiser)
- ‘Highly targeted interventions appear to be more effective than more diffusely focused systems such as CPOE and CDS.’
- Challenges of studying patient outcomes

Where to start? Big Bang vs. Incremental

If you had the power to make the choice (EHR + CPOE), would you choose Big Bang or incremental for a single hospital implementation?

- Big Bang
- Phased per area or clinical unit
- Phased per EHR module



Incremental CPOE Adoption

- Less common as time goes by
 - Meaningful Use incentives
 - Significantly more implementation experience than 10 years ago
 - Vendors have improved their support
- Risks include
 - Moving too slowly may stop progress completely
 - Missed information when partial paper, partial EHR
 - Operational areas that have adopted will be ready for optimization, but IT resources will still be tied up in the implementation phase
- Challenge of Big Bang
 - Go-live resources needed

The #1 Design Consideration USABILITY

Pharmacist Involvement

- Critical to the success of CPOE for medications
 - Best understanding of the medication use process
 - Appreciation for the provider and the nurse responsibility within the medication use process
- Need both informatics pharmacist input and clinical pharmacist input
- Pharmacist should have 100% responsibility for medication orders sentence build
 - May be review of 3rd party content
- Pharmacist should review all order sets with medications

Order Build Guiding Principles

Order Sets

- Build orders from the physicians point of view
 - But recognize paradigm shift in the medication use process
- Standardized and build most common choices into CPOE
- Hardwire the safest path (easy to do the right thing)
 - Require all fields, no abbreviations
 - Side / site confusion
 - Lock-down fields when necessary
- If possible, keep responsibility with clinician best equipped to make the decision
 - Role of nurse and pharmacist

- Provide next level of CDS building blocks
- Group orders together with associated guidance
- Standardize evidence-based care protocols and implement across all order sets
- Evidence-based order sets - large impact on quality and reportable measures
- Convenience is highly valued by clinicians
- Present opportunities to enhance safe and effective care
 - Embedded notes and protocols
 - Prompts for required activities

Use of Order Sets for More Guidance

Evidence-based Clinical Care Protocols

Unintended Consequences

Which of the following would be considered an unintended consequence of CPOE implementation?

- Two doses of metoprolol 50mg PO BID scheduled within an hour of each other on the eMAR
- Missed TPN change
- Increase in duplicate order errors
- More pharmacist time available to spend on clinical activities
- All of the above

Unintended Consequences

- Eighteen studies (all except 2 involved CPOE)
- Categories
 - More work for clinicians
 - Unfavorable workflow issues
 - Never ending system demands
 - Problems related to paper persistence
 - Untoward changes in communication patterns and practices
 - Negative emotions
 - Generation of new kinds of errors
 - Changes in the power structure
 - Overdependence on the technology

McKibbin KA, et al. Enabling Medication Management Through Health Information Technology. Evidence Report/Technology Assessment No. 101. 2011.

Increased Errors despite CDS

- Metropolitan Hospital Center with CPOE and CDS for allergies, drug-drug interactions, drug duplication, dose range checking (Igboceli 2003)
 - Overall medication errors were reduced by more than 40%
 - Increase in therapeutic duplication problems
- Duplicate medication ordering errors increased after CPOE/CDS implementation (Wetterneck 2011)
 - 48 errors (2.6% total) pre to 167 errors (8.1% total) post $p < 0.0001$
 - Most post-implementation duplicate orders were for the same medication
 - Identical Order 15 to 69 ($p < 0.0001$)
 - Same Medication 13 to 75
 - Same therapeutic class 20 to 23

Implications for Pharmacist Workflow

The Good Things ...

- Decreased medication delays
 - Improved turn-around time from order to medication available to the nurse
 - No lost orders
- Decrease in pharmacist distractions / interruptions
 - Complete orders received (no missing information such as route of administration)
 - Fewer phone calls from providers (formulary questions, how do I order drug X)
 - Fewer calls from nurses (where is drug X)
 - Fewer calls to providers and nurses (clarifications)

The Good Things ...

- Significant reduction in time pharmacist spends entering / transcribing provider orders
- Transcription phase is removed leading to decreased processing mix-ups and transcription errors such as omissions
- Immediate access to patient notes and labs allowing more informed clinical decision making during order verification
- Easy to identify who wrote to order when clarification is necessary

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Which of the following can be considered a negative consequence of pharmacists moving from order transcription to order verification?

- A. Speed
- B. Ability to alert providers with medication CDS
- C. Auto-calculation of weight-based dosing
- D. None of the above
- E. All of the above

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The Bad Things ...

- Errors are much more difficult to identify
 - No longer a discrepancy between the chart order and the pharmacist order
 - Wrong patient and pick-list errors are easier to make
 - Errors can reach the patient quickly
 - Errors can spread easily (Med Rec)
 - Pharmacist intuition - paper orders occasionally had visual clues (incorrect units or misspelled drug) that a provider was not sure what they were ordering

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The Bad Things ...

- Providers are now responsible for decisions that pharmacists used to make
 - Medication start times (problem should not be under-estimated)
 - Product formulation (piggyback vs IV push)
 - Alert overrides – MD put in an override reason that makes sense, but how do I know if he really evaluated the alert?
- Pharmacists become the default Help Desk for CPOE and eMAR issues

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The Bad Things ...

- Change in pharmacist cognitive requirements when transitioning from order transcription to order verification
 - Verifying orders is much quicker, easier to miss a problem
 - Pharmacists must pay as much attention to system and order entry errors as clinical issues
 - Problem orders or clinical requests no longer have that paper visual cue
 - Can get missed altogether or 2 pharmacists may duplicate efforts
 - Possible over-reliance on alerts – MD saw the same alert so it must be OK

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Operations Opportunities / Considerations

- EXPAND PHARMACY SERVICES!
 - No longer tethered to the pharmacy
 - Pharmacists have more time
- Pharmacist order entry into CPOE vs the Pharmacy Information system
 - Verbal orders
 - Phone orders
 - Protocol orders (Pharmacist to Dose)
- Pharmacist double check
- Routing to MD for signature

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Clinical Decision Support

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Medication Clinical Decision Support Challenges with CPOE

- Override reasons
- Pharmacist responsibility if the physician overrides the alert
- Alert fatigue affects both physicians and pharmacists
- Alert overrides should be reviewed, but the number of overrides is not a perfect measure of 'success or failure'

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MD assessments of ePrescribing alerts

Benefits	
Improve quality of care	78%
Prevent medical errors	83%
Enhance patient satisfaction	71%
Enhance clinician efficiency	75%
Action in response to alert in past 30 days	
Modified a potentially dangerous prescription	35%
Action other than discontinue or modify prescription	63%
Problems	
Alerts triggered on discontinued medications	58%
Alerts failed to account for appropriate combinations	46%
Excessive volume of alerts	37%

MSDP 10.007 Spring Meeting 2013 Pathways to Patient Care
Weingart S et al. Arch Intern Med. 2009;169(17).

Conclusions

- EHRs and CPOE are here to stay
- Evidence that CPOE and CDS are effective in improving both process and clinical outcomes is growing
- These technologies are disruptive; we must adapt and change our practice with them
- Embrace the change and think creatively to improve your patients outcomes and engage your staff and peers in new ideas

MSDP 10.007 Spring Meeting 2013 Pathways to Patient Care

State of the EHR in the US



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Post-Test Questions

- 1) Which of the following Health information technologies related to the medication use process are the most studied?
 - A. CPOE (*Incorrect: This is the second most studied*)
 - B. E-Prescribing (*Incorrect, though some recent studies incorporate large numbers of physicians*)
 - C. Barcode Medication Administration (*This is the least studied*)
 - D. Clinical Decision Support (CDS)

- 1) There is strong evidence that CPOE and CDS improve process outcomes.
 - A. True
 - B. False (*Incorrect Answer: the majority of studies looking at process outcomes are positive*)

- 2) Order sets are a form of decision support that provide value in their ability to do all of the following except
 - A. Embed prompts for required activities (*Incorrect: Order sets are commonly used for admission and post op orders and provide a convenient way to prompt users to complete required work such as Med Rec or DVT assessment.*)
 - B. Standardize common care elements across different practices and clinicians (*Incorrect: Building CPOE order sets is a great time to standardize care across the organization by creating subsets of medications approved by P&T. Examples include guidelines for pain and post-op nausea and vomiting.*)
 - C. Force providers to do what they are supposed to do
 - D. Group orders together with associated guidance (*Incorrect: Order sets are a convenient way to remind users to order a PTT when starting a heparin infusion. This is a more acceptable way to deliver the decision support than an alert.*)
 - E. Improve quality (*Incorrect: Due to all of the above reasons, order sets are a common form of CDS used to improve quality and safety.*)

- 3) Which of the following are considered an unintended consequence of CPOE implementation?
 - A. More work for clinicians
 - B. Problems related to “paper persistence”
 - C. New kinds of errors
 - D. Pharmacists spend less time on order transcription
 - E. All of the above.

- 4) Drug duplication alerts work well for preventing therapeutic duplication errors in CPOE
 - A. True (*Incorrect: Though this makes intuitive sense, I am not aware of published literature showing that this is true.*)
 - B. False

- 5) Some of the workflow benefits of CPOE include all of the following except
- A. Improved medication turn-around time (Incorrect: This is an expected benefit of CPOE)
 - B. Complete orders (Incorrect: The separate fields in a medication order should be required, so pharmacists should receive complete orders)
 - C. More physician phone calls to pharmacists for clinical advice
 - D. Immediate access to more patient specific clinical information (Incorrect: This is more a benefit of an EHR, but
 - E. Easier to identify the provider writing the order
- 6) CPOE implementations that extend over 6-12 months have been shown to be more successful than “big bang” implementations.
- A. True
 - B. False
- 7) Identify a new type of risk associated with the change in pharmacist workflow that comes with CPOE.
- A. Orders entered on the wrong patient are easy to identify.
 - B. A prescribing error is more difficult to identify because there are fewer visual cues when verifying orders than when transcribing orders.
 - C. Pharmacists must make decisions regarding when to contact the prescriber about a potential medication issues, even if the prescriber saw the same alert that the pharmacist is seeing.
 - D. All of the above.