Preventing Medication Errors Related to Electronic Medication Systems

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Objectives

- Discuss ways prescribers can be alert to potential sources of error in using electronic medication systems

- Describe areas in medication reconciliation where electronic health records are prone to medication error risks
Objectives

- Identify the role of the prescriber in the prevention of medication errors, improving therapy adherence and achievement of positive outcomes.

- Develop an awareness for potential sources of medication errors in prescribing, processing and administering medication orders with electronic systems.
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Electronic Medication Systems – Benefits

- Standardization of electronic health record
- E-prescribing (elimination of pharmacists’ need to read illegible handwriting)
- Prescribing alerts and warnings – Decision support software
- Reporting of adverse events
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Electronic Medication Systems – Benefits

- Transfer of health information between care sites
- Bar-coding technology in our dispensing systems
- Ease of medication administration and documentation in our institutional practice
- Better address medication adherence outcomes
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- **What are the medication safety Risks with electronic medication systems?**

  As prescribers and pharmacists, we are educated to always be aware of both risks and benefits.
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- Expectation is that electronic prescribing, medication order processing, administration, and monitoring will reduce medication errors.

- Benefits are readily apparent but unsuspecting health care professionals may be less aware of the risks.
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Could electronic systems contribute to medication errors and negative outcomes?

- Role of electronic order entry in contributing to medication choice errors
- Warning fatigue, excessive warnings
- Medication reconciliation concerns
- Lack of accuracy in med lists for consulting disciplines
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Could electronic systems contribute to medication errors and negative outcomes?

- Role of electronic records in unnecessary medication use
- Decisions based on inaccurate, incomplete, outdated electronic health information
- New technology “learning curve” and alterations to workflow
Patient Scenario #1

- **Warfarin – high risk medication**

  Telephone order by attending MD on Thursday: “to hold warfarin dose today and then decrease warfarin by 0.5mg daily and recheck INR in 1 week”

  Original order was warfarin 3.5mg PO daily.

  What happened next?
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Discussion:

How could this error be prevented?

- Prescriber
- Releasing Pharmacist
- Med Nurse
- Charge Nurse
- Dispensing Pharmacist
- Electronic Med System
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Why should prescribers get involved in identifying these risks?

Positive outcomes from medication use will only occur if the best choice of therapeutic option is followed by proper dispensing, safe administration and appropriate monitoring regardless of whether self-administered at home or administered in an institution.
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- Need to acknowledge that a potential exists for medication errors throughout that process.
- By recognizing the potential for medication errors, prescribers can identify their own role in preventing them as well as educate other disciplines on their role in preventing medication errors.
- Why be concerned with electronic technology?
Professional Core Objectives for Medicare and Medicaid Incentives:

1. Include Use of **CPOE**
2. Implement **Drug-Drug and Drug-Allergy interaction** checks
3. Maintain an up-to-date problem list of current and active diagnoses
4. Generate and transmit permissible **prescriptions electronically**
5. Maintain an **active medications** list
6. Maintain an active **medications allergy** list
7. Record demographics
8. Record vital signs and chart changes
Professional Core Objectives Required for Medicare and Medicaid Incentives:

9. Record smoking status
10. Report ambulatory clinical quality measures
11. Implement **clinical decision support** rules
12. Provide patients with an **electronic copy of their health information**
13. Provide clinical summaries for patients for each office visit
14. Capability to exchange key clinical information electronically including **medication list** among care providers
15. Protect electronic health information by use of certified technology
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- Study, published in JAMA, identified where adverse drug events traditionally occur:
  - Prescribing - 39%
  - Administration - 38%
  - Dispensing - 12%
  -Transcribing - 11%

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Determine ways to identify potential problems:

- Analysis of Medication Errors and Near Misses
- Root Cause Analysis
- Failure Mode and Effects Analysis
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Medication Errors are often Multifactorial!

Multiple opportunities to prevent!
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Questions to ask ourselves:

- What types of problems can occur with e-prescribing / computerized medication order entry?
- How do we identify potential problems and create systems to prevent them?
- How do we safely utilize electronic medication administration systems in our institutional practice settings?
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Questions to ask ourselves:

- Do electronic systems label medications in a manner most easily understood by our outpatients?
- Do electronic medication administration systems track medication use in a meaningful way?
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IOM report - Hazards of technology - 2011

Urged greater oversight by gov and private sector over HIT

Difficulty technology – leading to mistakes

Incessant warnings on drug interactions can lead to “alert fatigue” in prescribers

Med admin scanners – nurses may not be using their eyes to identify meds and patients
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Potential risks of HIT:
Software vendors “nondisclosure clauses” may decrease sharing of error-prone software issues
Hold harmless clauses force risk on the customer not software vendor

Source: Nov. 2011 Institute of Medicine (IOM) report - Health IT and Patient Safety: Building Safer Systems for Better Care”
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Prescribing issues – Decision Support

Although prescriber decision support software may assist in appropriate medication choice, the software needs input of accurate information.

Is patient specific information current?
- Accurate med, list diagnoses, conditions, allergies, intolerances, height, weight, lab values, use of PRN meds, updated drug references
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Prescribing and order entry issues

What does CPOE stand for?

- Computerized **Physician** Order Entry ........
  Became

- Computerized **Prescriber** Order Entry ........
  which has become

- Computerized **Provider** Order Entry
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Prescribing and order entry issues

- In institutional setting, prescriber may order verbally, by telephone or written orders
- Who interprets order and enters into computer? - often a nurse in Long Term Care setting
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Prescribing and order entry issues

- Risk: Order interpretation takes place at the nursing station and then nurse’s entry of Rx order is viewed by the releasing and/or dispensing pharmacist.
- Original paper order or transcription of the verbal order may not be viewed by the pharmacist at all.
Prescribing and order entry issues

Order entry may not be completed by prescriber or pharmacist who
- interpret the prescriber’s order
- choose product from drop down menu
- calculate dose
- complete directions for labeling & MAR and
- review/interpret computerized warnings.
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Prescribing and order entry issues

- Risk: If order entry or electronic prescription is not entered by prescriber and the pharmacist is not involved in the medication choice, is the health care professional sufficiently trained to choose correctly?
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Prescribing and order entry issues

- Product choice may result in wrong drug or duplicate therapy.
- Lack of awareness of dosage forms, concentrations, salts that are available may result in inappropriate choice.
- Lack of review of written/telephone orders and hospital discharge list by a pharmacist.
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Order entry issues

Example:

- Improper selection of medication product or dosing
- Wrong medication chosen from drop down menu:
  amoxicillin is chosen instead of amoxicillin clavulanate
- Prednisolone instead of prednisone (21st choice of drop down menu after pred was entered)
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Order entry issues

Example:

- **Lack of cross-reference** between brands, generic, drug classes in menu choice leads to poor drug choice:

- Bactrim® single strength is hand written order but nurse chooses SMX TMP DS administer 0.5 tab
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Order entry issues

Example:

- Choice of concentration: prescriber states order in mg but menu choice includes multiple concentrations
  
  order entry professional must choose concentration and then calculate mL for dosing amount

- ex. lorazepam topical gel
Order entry issues

Example:

- Difficulty in choosing among salts of medication, diluent, unfamiliarity with available doses
- Example: valproic acid formulations, doxycycline hyclate or doxycycline monohydrate
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Even simple non-prescription medications can appear confusing in a drop down menu choice:

- Mylanta Supreme® - calcium carbonate 400mg with Mg hydroxide 135mg / 5 mL
- Mintox® (substituted for Mylanta®) Aluminum hydroxide 200mg, Magnesium hydroxide 200mg, simethicone 20mg / 5mL
- Note 30mL Mylanta Supreme® = 2400mg Calcium carbonate
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KCl 10meq daily

Potassium CL CR Capsule Extended Release 10 MEQ
Potassium CL CR Tablet Extended Release 10 MEQ
Potassium Chloride Crys CR Oral Tablet Extended Release 10 MEQ
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Recommendations:

- Read before signing written or electronic orders
- Work with pharmacy to remove problematic menu choices
- Acknowledge the need for order entry staff to be educated on medication selection and verification procedures
- System needs more checks/balances
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Errors at transition of care

- Electronic Health Records may contribute to med reconciliation errors.
- Estimated greater than 50%+ medication errors occur at time of care transition –

Source: National Transitions of Care Coalition, Transitions of Care Measures, paper by the NTOCC Measures Work Group, 2008.
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Errors at transition of care

Two common unintended changes to regimen:

1. Omissions of preadmission meds
2. Previously discontinued meds reinitiated

Tam et al. 2005 “Frequency, Type and Clinical Importance of Medication History Errors at Admission to Hospital: A Systematic Review”
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Errors at transition of care

- Patients with several conditions (multiple medications prescribed by different physicians) – there is a vital need to reconcile the prescribed regimen with what a patient is actually taking and to understand why there is a difference between the two.
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Errors at transition of care

Optimizing and reconciling medications requires substantial investments of time along with electronic data sharing among practitioners — neither of which is widely available in today’s model

- Financial incentives - Reward providers for coordinating care
- “Meaningful use” of HIT that needs to cross locations of care - accurate data shared across settings
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Errors at transition of care

Patient Scenario #2: antidepressants
Resident transferred from independently living to hospital for 5 days then discharged to skilled nursing facility.

Independent living orders:
- bupropion XL 100mg daily, escitalopram 10mg daily

In hospital orders:
- duloxetine 60mg daily and sertraline 25mg daily
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Errors at transition of care

- Discharged to skilled care with discharge orders for: duloxetine 60mg daily and sertraline 25mg daily

- On admission to skilled care unit, CRNP changed orders to bupropoin XL 100mg escitalopram 10mg

- What happened?
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Errors at transition of care

- Electronic Medication Records reviewed upon hospital admission began with most recently recorded medication list (March 2010)
- Paper orders sent upon transfer to hospital were not utilized to update hospital admission orders.
- Patient Scenario #3 lisinopril
Misinterpretation of Dose at Transition of care

Patient Scenario #4

- phenytoin 100mg bid at 9am and 6pm
- phenytoin 100mg 1pm as special instruction time
  - April labs therapeutic level = 13.8
- Upon hospital admission, order input as phenytoin 100mg bid. 5 days in hospital and 4 days at skilled care facility before pharmacist review detected change in dose. Level checked on morning of 10th day = 4.6
- How did electronic systems contribute to dose misinterpretation?
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- **Problem:** Order entry provider may have insufficient knowledge of the computer ordering process

- **Risk:**
  Incorrect start and stop times (medication order span) may lead to medication errors
Patient Scenario #5: warfarin 5mg daily

- INR called to physician’s office with return call at 5:50. Nurse is instructed to hold today’s 5mg dose and enters order at 6:01pm for a one-time dose of warfarin 10mg today and return to 5mg tomorrow.

However the next day, both 10mg and 5mg dose appear on the electronic med administration software resulting in dose of 15mg. What went wrong?
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Recommendations:

- Create system with redundancy in medication safety
- Require double checks and sufficient training of order entry professionals
- Emphasize pharmacists role in reviewing medication orders completely.
Patient Scenario #6 Levofloxacin

- IV levofloxacin 750mg upon admission day 1
- 750mg PO 0800 on day 2 but ordered changed to 1000 (due to potential fluoroquinolone time policy) Second dose given 1000 on day 2 (same nurse)
- Labs showed moderate Renal dysfunction – order changed to 750mg PO q 48 hours.
- Dose on day 3 and discharged to skilled with illegible written order above electronic order for 750mg PO q 48 hours x ds?
- Entered into computer to start next day since no date or time of last dose.
Potential for misinterpretation of warnings upon order entry:

Warnings and alerts are being interpreted at point of care which can be helpful if interpreted and acted on properly.

- Excessive warnings difficulty in interpreting warnings, improper response can result in medication errors.

- Role of warning fatigue
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Underuse of Dispensing Pharmacist Dose alerts

- Does your pharmacy system warn of:
  - wrong route of administration
  - contraindications based on patient’s disease
  - over-dosage based on patient’s weight?
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Underuse of Dispensing Pharmacist Dose alerts

ISMP computer survey of 182 pharmacy systems in both 1998 and 2005

- Compared to the similar study in 1998 – fewer systems in 2005 provided drug dosing alerts due to patient’s age, weight or body surface area

Drug allergy potential for error

- **Risks:** Does your hospital system maintain allergies from a past admission? For a readmission, is allergy verification required?

- **Problem:** New allergic reaction may have occurred since last admission and the allergies may need a prompt to be updated.
Drug allergy potential for adverse event

- Do pharmacy systems allow for documentation of type of allergic reaction and drug intolerances?

- Example: nitrofurantoin causing nausea or amoxicillin causing diarrhea documented as drug allergy
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- Potential for errors in medication administration by patient or home caregiver:

- **Problem**: Labels may be difficult to understand due to small print, mail order bottles /labels all looking alike, directions not easily interpreted.
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Potential for errors in medication administration by patient or home caregiver:

- **Risks**: Patient may be confused about how much medication to take.
  
  **Example**: “Take 0.5 tablet....”

- Data entered for medication order may be **user friendly** to prescriber and pharmacy but is it user friendly for the outpatient to understand?
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Potential for errors in administration by nurse or institutional caregiver:

- **Problem**: Nurse administers medications which are displayed on computer screen to be given during the time slot chosen for medication administration.

- This does not include the entire MAR and may decrease nurse’s awareness of entire medication regimen.
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Potential for errors in administration by nurse or institutional caregiver:

- Nurse may not be aware of PRN medications, medications given on other shifts, medication time changes, new orders.

Examples:

- PRN dose changed to routine
- Weekly med missed – Dose documented as not available
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Lack of Awareness of Recent Medication Changes:

Patient Scenario #7:

Patient with nausea, loss of appetite – Evening nurse called attending physician and spoke with on call provider

New order for promethazine suppositories

Recent order for: ?
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- Monitoring Systems:
  Does your electronic system track total daily dosing or medications with maximum dosing?

- Example: acetaminophen, dextromethorphan
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Takes a team and your input to reduce the risks for medication errors and increase the possibility of positive medication outcomes.

Questions and Discussion:

Thank you!
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References:


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Website of resources: www.ismp.org Institute for Safe Medication Practices

“The great aim of education is not knowledge but action.”                     H. Spencer

Thank You!

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