Update on Reducing the Risks of Medication Errors Related to Electronic Medication Systems

Laura Finn CGP, FASCP, RPh
Consultant Pharmacist
Adjunct Associate Professor of Pharmacy Practice
Philadelphia College of Pharmacy

August 9, 2013
Objectives

- Discuss ways prescribers can be alert to systems-based sources of error related electronic medication systems

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

- Develop an awareness for potential sources of medication errors in prescribing, processing and administering medication orders with electronic systems
Reducing the Risk of Medication Errors

Electronic Medication Systems – Benefits

- Standardization of electronic health record and transfer of information between care sites
- E-prescribing (elimination of pharmacists’ need to read illegible handwriting)
- Prescribing alerts and warnings – Decision support software
- Quicker access to medication adherence data
- Reporting of adverse events
- And more....
Reducing the Risk of Medication Errors

- As prescribers and pharmacists we are educated to always be aware of both risks and benefits.

- Are we sure our Electronic systems do not contribute to medication errors and negative outcomes?

- Expectation is that electronic prescribing, medication order processing, administration, and monitoring will reduce medication errors.
Scenario 1:

Telephone order Friday afternoon from prescriber to SNF to request lidocaine injection be available for a Monday morning procedure.

- Order Entry Template requires nurse to input unavailable information.

  Medication:   Lidocaine HCl Injection 1%
  Dosage:       1
  Quantity Type: Milliliter
  Route:        IM
  Frequency:    Special 6am

No specific instructions, No diagnosis; Order is filled by pharmacy

- Only warning – “lidocaine effects may be increased by atenolol”

Appeared on electronic MAR to be administered IM daily 6am
Reducing the Risk of Medication Errors

- Are prescribers and other health care professionals fully aware of the risks?
  - Role of electronic order entry in contributing to medication choice errors
  - Warning fatigue, excessive warnings
  - Medication reconciliation discrepancies, duplication
  - Lack of accuracy in med lists for consulting disciplines
  - 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  - Decisions based on inaccurate, incomplete, outdated electronic health information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
Reducing the Risk of Medication Errors

Are prescribers and other health care professionals fully aware of the risks?

- **Scenario 2:** Are you using the current medication list with correct dosing upon admission to acute care? Or do you start with the medication orders from most recent hospitalization? (pre-populated orders)
  - Warfarin dose from prior hospital discharge used as “home warfarin dose” upon readmission
  - Jan 11 discharge 4.5 mg TTSS & 3 mg MWF (27mg/wk)
  - Adjusted over 3 weeks to therapeutic goal at SNF
  - Dose Feb 8 = 2 mg TTSS & 3 mg MWF (17mg/wk)
  - Hosp lists “home meds” warfarin 4.5 mg TTSS & 3 mg MWF
  - Discharge with that dose on Feb 14 elevated INR on Feb 15 = 4.2
How safe are our electronic systems?

National Patient Safety Goals in relation to EHRs

- Discussion of EHR safety goals with rationale and means to meet the goal
  - Increase in EHR 2008-2012: 60 to 1000+ vendors
  - Lack of clear guidance to support patient safety

Divide Goals:

- 1. Unique to technology
- 2. Associated with deficiency in way technology is used
- 3. Use for monitoring to improve patient safety

Reducing the Risk of Medication Errors

Lack of Safety Data:

- Be proactive in identifying types of errors caused by electronic systems. Question: As we install electronic medical technology are we measuring this we would any other intervention?

- EHR Usability Task force: requesting clinicians, academics, vendors and policy-makers need to assess EHR technology for poor design and meaningful use with measures

- “Some (user errors) may not even be apparent to the user, analyzed by hospital or clinic review boards, or reported to the vendor”

Middleton B et al. Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA J Am Med Inform Assoc 10.1136 http://jamia.bmj.com/content/early/2013/01/24/amiajnl-2012-001458.full.pdf+html accessed May 2013
Reducing the Risk of Medication Errors

Are prescribers and other health care professionals fully aware of the risks?

Scenario 3: Are you correctly interpreting the current medication list with correct dosing upon admission to acute care?

Resident admitted from SNF to ER with mental status changes:

Earlier in week had started mirtazapine 15mg (0.5 tab) hs but dose held previous 2 days in SNF.

Upon hospital admission, mirtazapine is ordered as 15mg hs. Evening admission results in first dose given at 0240 am next morning and again given 1800 that day and next day = 45mg in 42 hours

Discharge diagnosis = serotonin syndrome
Data base search -3099 patient safety reports from June 2004 - May 2012 confirmed to be related to electronic systems 2006 – 135 2011-1162

Majority related to medication errors with most involving human data entry, entering incorrect data, failure to enter data, technical failures of system

89% were determined to be an event but no adverse outcome

Format / taxonomy:

*Magrabi - HIT-specific taxonomy for classifications which included:
  data input, transfer, output, general technical issues, contributing factors*

+ PA applied 4 new categories: unit errors in wrong data fields, data entered into wrong fields, misreading or misinterpreting displayed information, default values in system configuration

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3240763/ Accessed June 2013
Errors result from combination of factors:

Units error is problematic: Entry patient weight as lb instead of kg

Entering insulin dose as mL instead of units, incorrect dosing of mg/kg/hr instead of mg/hr

Lack of reaction to default units or template

Interface: ex. meq/kg prescriber template but pharmacy input is meq/day

AHRQ formats for risk reporting not utilized since required more details than collected to apply to categories.

Conclusions:

Much of the concern is at the Human-Computer Interface!

Pa Patient Saf Adv 2012 Dec;9(4):113-121
How can we improve medication outcomes and prevent medication errors with electronic systems?

- Increase **YOUR** awareness of the potential for medication errors.
- IOM’s 1999 report “To Err is Human – Building a Safer Health System” 7000 deaths annually from medication errors

Recognize that medication errors are multi-factorial with multiple opportunities to prevent!
Nov. 2011 Institute of Medicine (IOM) report – ”Health IT and Patient Safety: Building Safer Systems for Better Care”

Recognized a lack of hazard and risk reporting data

- 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
- Software vendors “nondisclosure clauses” may decrease sharing of error-prone software issues
- Hold harmless clauses force risk on the customer not software vendor
Increase YOUR awareness of the potential risks for medication errors.

Care Transition – Presents a Great Opportunity for Recognizing Risk - Starting at admission to acute care site

Question: Are you using the current medication list with correct dosing upon admission?

- Recent order changes – New or recent d/c orders, dosage change
- Status or duration of current order
- If SNF MAR is provided – current paper or electronic copy with discontinuations recognized?
- Complete dose with actual amount to be administered (0.5 tab) or volume
- PRN order – were doses administered recently?
- Update from last hospitalization
Care Transition Scenarios

Misinterpretation of SNF home medication list:
- Earlier mid-month, citalopram d/c with start of sertraline. Hospital admission lists both medications as current and later discharges resident on both SSRIs

Misinterpretation of electronic order:
- O.25 tab and 0.5 tab frequently misinterpreted mirtazapine 15mg but missing the 0.5 tab in dose

Misinterpretation of PRN orders as routine:
- Often with psychotropics, analgesics, antihistamines, nebulizer
- Ex. lorazepam 0.5mg tid PRN anxiety
Care Transition Scenarios

Discharge from Acute to Post-Acute

Need for accurate and complete orders (without duplication); need for stop dates and duration for orders with titration / tapering schedules and followup lab orders

Lack of volume in dosing of liquid medications:
- Lack of actual mg or mL dosage for liquids
- Keppra 100 mg/mL q 12 hours listed on hospital discharge
  Transcribed upon admission to SNF as 1 mL q 12 hours when actual inpatient dose was 7.5 mL (750mg) q 12 hours
- Enoxaparin 100mg/mL with frequency but no dose
- Remember who is inputting CPOE orders at SNFs?
- Who gets the call from SNF to approve admission orders?
Care Transition Scenarios

Discharge from Acute to Post-Acute

Need for accurate and complete orders (without duplication); need for stop dates and duration for orders with titration / tapering schedules and followup lab orders

Hospital addition of interacting medication without dosage adjustments or providing monitoring orders
- Resident stabilized on digoxin with new amiodarone ordered in hospital setting then discharged to SNF
- RPh requests check dig level > 4
  (No acknowledgement that amiodarone was a new addition to the medication regimen)
Discharge from Acute to Post-Acute

Need for accurate and complete orders:

Use of Combination products prior to admission;
change to separate drugs in acute setting but discharged orders include both combination AND individual medications
- Ex: Jalyn
- lisinopril / hydrochlorthiazide

Duplication of pharmacologic class or medication:
- metoprolol and carvediol
- tiotropium and routine + PRN ipatropium
- latanoprost and Xalatan
Discharge from Acute to Post-Acute

Need for accurate and complete orders:

Formulary Change in Orders:
- Simvastatin 40mg changed to pravastatin in hospital;
  New order for amiodarone during acute care.
  Discharge orders changed pravastatin back to simvastatin 40mg
  but This 40mg dose is above FDA maximum recommendation
  for use with amiodarone

Error upon Discharge:
- Faxed discharge orders for cephalexin 1000mg q 6 hours (no
diagnosis). Resident was NOT receiving antibiotic in hospital.
eGFR~30, Allergy to Penicillin, Resident also on warfarin
- Paper discharge orders – cephalexin was scribbled out
Incomplete Medication Order on Discharge:

- Metoprolol – sustained release (succinate) or tartrate?
- Diltiazem ER vs CD vs immediate release
- Niacin Sustained Release 1000mg hs independent living.
- Transferred to acute then d/c to SNF with order for niacin 1000mg daily which was not listed in drop down menu. Nurse chose Niacin 500mg Two tablets hs. Not a sustained release med
- Prandin tid ac in home med list but hospital discharge reads just Prandin ac – SNF order listed as once daily ac.
Care Transition Scenarios

Assisted living - loratadine 10 mg HS PRN itching (not using)
- home medication listed as routine loratadine 10mg hs.
- Changed to loratadine 10mg q 48 hours (renal dosing) in acute.
  Discharge orders: loratadine 10mg hs routine.

Same resident in assisted living:
Iron sulfate 325mg bid (no iron given while in hospital) but on
Discharge order reads iron sulfate 325mg tid

Confusing orders on discharge:
- “Resume Xarelto dose” – What dose?
- “Start fentanyl 25mcg 1 patch q 72H PRN Pain”

Discharge diagnosis of chronic disease but no medication
- Glaucoma
- hypothyroidism
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

  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
Prescribing and order entry issues

- 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 pharmacist who:

- interprets the prescriber’s order
- chooses product from drop down menu
- calculates dose
- completes directions for labeling & MAR and
- reviews/interprets computerized warnings.

Question: 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?
Computerized Data Entry

Drug Allergy Scenario:

- Resident with significant reaction to ampicillin

Electronic Chart reads – Allergy to Penicillamine

- Resident with allergy to Cymbalta recorded as Celebrex in electronic record.

Error with human / software interface

If wrong medication / drug class chosen from drop down menu will the error can be transferred to other electronic health records?

Risk: How much HIT is “cut and pasted”?


Reducing the Risk of Medication Errors

Issues with Prescribing and Order processing

Information on Diagnosis is being overlooked?

- On call prescriber orders “vancomycin 250mg TID PO x 7 days for dx UTI” (computer displayed diagnosis with order)
  
  Urine culture – 10,000 not 100,000 bacteria and was started by PA for Augmentin, changed to tetracycline and then vancomycin
  
  (Change the way sensitivity is reported IV vancomycin?)

- Prednisolone eye suspension – dx glaucoma
- Patanol eye drops – dx glaucoma

-LASA: Telephone order for vancomycin 250mg four x daily c dif. Misinterpreted by RN & entered as Vantin 200mg four x daily cdif
Reducing the Risk of Medication Errors

Order entry issues

- Prescriber may request holding parameters for cardiovascular medications. Must be entered as separate order to appear on eMAR.

- Difficulty entering order for temazepam 7.5mg hs; may give additional dose if not asleep in 4 hours.

- Entered as temazepam 7.5mg hs routine and separate order for temazepam 7.5mg q 4 hours PRN insomnia

- Holding doses of minerals while on levofloxacin, cipro Prescriber added to the antibiotic order to hold calcium, iron but that does not change the electronic MAR for minerals
Reducing the Risk of Medication Errors

Lack of response to Warnings:
- Resident taking donepezil 23mg daily; Visits neurologist who prescribes rivastigmine patch. Takes both for 2 weeks before discontinuation of both.
- Warnings on duplicative medication or therapeutic class?
- Methotrexate 2.5mg 10 tabs entered instead of 10mg for weekly RA dose Dosage warning?

Computer Default settings:
- memantine titration resulted in both 5mg and 10mg bid doses overlapping on MARs
- Warnings on duplication for differing doses of memantine
Reducing the Risk of Medication Errors

Question: Are there gaps in the communication of information between prescriber and pharmacy software?

- Routing multiple electronic orders to different releasing pharmacists
- Completeness of faxed or electronic orders
- Undetected data translation inconsistencies
- Order management scanning systems (OMSS) scan a digital image from paper orders. Potential for pages to “stick” together or be pulled through the scanner together with only single page of orders then processed by pharmacy.

Resulting in missed orders!

Grissinger M Scanning Too many Orders at Once; P&T.2013;(38) 67-68
Reducing the Risk of Medication Errors

Question: How safe are electronic order entry and Med Administration Systems?

On call prescriber orders Visine eye drops q 4 hours for conjunctivitis PRN but order entry neglects to check PRN box. Order continues around the clock every 4 hours x 7 days until consultant pharmacist questions it.

Still need “critical thinking” in addition to electronics!
Reducing the Risk of Medication Errors

Questions to ask ourselves:

How do we report incidents related to electronic systems?

Can an individual detect the majority of errors? Is it difficult considering the complexity of systems and hidden data transfer?

- Prescriber orders specific med from pharmacy.
- Does the prescriber know what the RPh sees as being ordered?
- Does the RPh know this is what the prescriber wanted?
- Order transmits to robotic/automated, bar-coded packaging; does RPh know if it’s filled properly?
- Nurse receives order; Is nurse certain this is medication that was ordered by prescriber and verified by RPh and scanned properly to administer?
Reducing the Risk of Medication Errors

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!
References


References

   http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2012/Dec;9%284%29/Pages/home.aspx accessed June 2013


7. Grissinger M Scanning Too many Orders at Once; P&T.2013;(38) 67-68
Reducing the Risks of Medications

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!

l.finn@uscience.edu