Health IT Safety Webinar Series

The Role of e-Prescribing in Health IT Safety: Challenges and Solutions

January 30, 2015
1:00-2:30pm EST
Housekeeping

- For any technical questions, please type your question into the Questions or Chat panels at lower right.
- All telephone lines are muted. Due to the number of attendees, please use the Questions panel to ask any questions during the webinar.
- Q&A will take place at the end of each presentation. Slides and a copy of the recording of this session will be posted by February 13th at www.healthitsafety.org
- For general questions about the webinar series, please contact healthitsafety@rti.org
This series of 10 webinars focused on health IT and patient safety issues will occur monthly through September 2015.

These webinars are funded by the Office of the National Coordinator for Health Information Technology (ONC) and are being conducted by RTI International, a non-profit research organization, as part of a year-long project to develop a Road map for a Health IT Safety Center for the ONC (contract HHSP23320095651WC).

Additional information is available at: www.healthitsafety.org
e-Prescribing and Patient Safety

“Thats what it says: ‘one tablespoonful, 300 times a day.’”
Tejal Gandhi, MD, MPH, CPPS, President and CEO of the National Patient Safety Foundation: Ambulatory Medication Safety: Risks and Opportunities

Erika Abramson, MD, MS, Assistant Professor at Weil Cornell Medical College: E-prescribing Challenges and Lessons Learned over Time

Ajit Dhavle, PharmD, MBA, Vice President of Clinical Quality at Surescripts: Electronic Prescribing Enhancements: What needs to happen next?
Ambulatory Medication Safety: Risks and Opportunities

Tejal Gandhi, MD MPH CPPS

President & CEO, National Patient Safety Foundation
Associate Professor of Medicine,
Harvard Medical School
Ambulatory Safety - What is “Ambulatory”?

- Most studies done in primary care setting
- But we can’t forget...
  - Specialty practices
  - Ambulatory surgical centers
  - Dialysis centers
  - Nursing homes
  - Rehabs
  - Care in the home (including large variety of devices)
  - And many others...
What is Different About Ambulatory Care?

- Long feedback loops
- Episodic (from provider perspective)
- Signal to noise ratio is low
- Widely distributed
- Limited resources, redundancy
- Patients and providers have many degrees of freedom
The Primary Care Encounter

- Average encounter 12 minutes
- Average time to first interruption--18 seconds
- 75% of patients leave with unanswered questions
- Little time to do all that needs to be done
Patient Perceptions of Mistakes in Ambulatory Care

- 15% of primary care patients reported that a physician has made a mistake
- 13% reported a wrong diagnosis
- 13% reported a wrong treatment
- 14% changed physicians because of a mistake

Kistler C. Arch Intern Med 2010
What do we know about medication safety in the ambulatory setting?
How Many Outpatient Adverse Drug Events (ADEs)?

- 8 million ADEs in U.S. per year
  - > 3 million preventable
  - > 500,000 life-threatening
- During this hour...
  - > 1,000 ADE occurred nationally
  - 92 people hospitalized for ADE
Adverse Drug Events

• 25% (162/661) primary care patients had an adverse drug event (ADE)
  • 13% (24) serious
  • 11% (20) preventable
  • 28% (51) ameliorable
  • 6% (n=13) both serious and preventable or ameliorable

Gandhi TK, et al. NEJM April 2003
Cooperation
Outpatient Prescribing Errors

- 1879 prescriptions reviewed from 4 academic practices
  - Med error rate ~8%
  - More advanced computer prescribing checks with decision support would have prevented 95% of potential ADEs
  - Majority of prevention from complete prescriptions, drug-dose, and drug-frequency checking

- Study of community practices found error rate of 37%
  - Legibility issues very common

*Abramson et al. JAMIA 2012*
Drug allergy

Drug Allergy/Sensitivity Warning

You are ordering PENICILLIN V. POTASSIUM. The patient has a documented allergy to Penicillins (reaction: Mental Status Change)
E-prescribing impact

- Two recent studies
- 15 providers before and after implementation of e-prescribing
  - Error rates reduced from 42/100 prescriptions to 6/100 prescriptions

- Pre-post study
  - Prescription errors decreased from 18% to 8%
    - Largest reductions:
      - Illegibility
      - Inappropriate abbreviations
      - Missing information

Kaushal, R. et al. JGIM 2010

Devine, E et al. JAMIA 2010
Electronic Prescribing

- Electronic prescribing with decision support has high potential for reducing serious medication errors
- Need to improve current decision support
  - Streamlined knowledge bases and tiered alerting have higher acceptance rates
  - What is our ideal acceptance rate?? Sensitivity/specificity? Best way to display?
- More work needs to be done to maximize the clinical benefits
Overall Alerting Issues

- How best to display the messages
  - Need to learn from other industries (industrial engineering and human factors)

- Need more studies to maximize effectiveness of alerts/ minimize over-alerting
Drug-Pregnancy Level 1
Current Order:

NAFCILLIN  IV

Warning(s):

<table>
<thead>
<tr>
<th>Status</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Allergy to: Penicillins  Reaction: Anaphylaxis</td>
</tr>
</tbody>
</table>

Message:

Reaction: Anaphylaxis. The patient has a DEFINITE sensitivity to NAFCILLIN.
Strategies to Improve Over-Alerting

- Creation of streamlined knowledge bases
  - Only essential content
  - Balance between sensitivity and specificity

- Tiering of alerts is also a possibility
  - Hard stop
  - Interruptive
  - Non-interruptive

- Minimizing interruptions
Impact of Reduced Alerting on Override Rates

- Study in the ambulatory setting
- Decision support included
  - Duplicate drug
  - Drug-disease
  - Drug-drug
  - Drug-lab
  - Drug-pregnancy
Knowledge base streamlining

- Expert panel
  - Physicians, pharmacists, informaticians

- Reviewed sources
  - Vendor knowledge-bases, pre-existing locally created KBs, literature
  - Removed certain alerts and tiered the rest
Alert tiers

- **Level 1** – Potentially life-threatening
  - E.g., erythromycin - diltiazem -> V-fib
  - “Hard stop” – couldn’t proceed
- **Level 2** – Potential for serious injury
  - Rizatriptan - linezolid -> serotonin syndrome
  - Interruptive, required a reason
- **Level 3** – Use w/ caution
  - Warfarin – levofloxacin -> increased PT
  - Noninterruptive
<table>
<thead>
<tr>
<th>Alert Message</th>
<th>Keep New Order - select reason(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient is currently on: CARDIZEM (DILTIAZEM) 120MG PO QD</td>
<td></td>
</tr>
<tr>
<td>Patient is on a Macrolide Antibiotic and Diltiazem - May result in prolonged QT interval and Fatal Cardiotoxicity - Concurrent use is contraindicated, Discontinue one of these drugs.</td>
<td>Will D/C pre-existing drug</td>
</tr>
</tbody>
</table>

- Continue New Order
- Cancel
## Warning

### You are ordering: DIAZEPAM

#### Therapeutic Duplication Intervention

<table>
<thead>
<tr>
<th>Alert Message</th>
<th>Keep New Order - select reason(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient is currently on ATIVAN (LORAZEPAM) 1MG PO QPM. Both drugs are Benzodiazepines and should not be used together.</td>
<td></td>
</tr>
</tbody>
</table>
  - Will D/C pre-existing drug  
  - Pt on long term therapy with combination  
  - Transitioning from 1 drug to the other  
  - New evidence supports duplicate therapy of this type  
  - Advice from a consultant  
  - Other |

[Continue New Order]  [Cancel]
Results

- Final knowledge base
  - 2% level 1 63% level 2, 35% level 3
- 18,115 alerts
  - 12,933 non-interruptive (71%)
  - 5,182 interruptive (29%)
- Of 5,182 interruptive alerts
  - 3475 (67%) accepted

Shah N et al. JAMIA 2006
Summary of Reduced Alerting

- Can reduce alert burden by streamlining and tiering the knowledge base
  - 67% of alerts accepted vs 20% from most studies

- Still need more research on what is optimal level of alerting
  - “Are we missing things” is always the worry
Unintended Consequences

- Every new technology introduces new errors
- Study showed that 10% of electronic prescriptions had errors
  - 1/3 with potential for harm
  - Most frequent were omission errors
  - Significant variation across different vendor systems
- Forcing functions, decision support, and calculators could reduce these errors
- Always a continuous improvement opportunity

Nanji, et al. JAMIA 2011
Non-Adherence

- Estimates that 125,000 Americans die annually due to poor medication adherence
  
  McCarthy, R. Bus Health 1998

- Poor medication adherence results in roughly 33 to 69% of medication related hospital admissions, as a cost of roughly $100 billion per year
  
  Osterberg L, et al. NEJM 2005

- In one study of 195,000 newly prescribed e-prescriptions, only 72% were filled
  - Non-adherence was common for medications for chronic conditions such as hypertension, diabetes, hyperlipidemia

  Fischer M. et al. JGIM 2010
Non-Adherence and E-prescribing

- Much work needs to be done to determine best strategies for improving adherence
- Need to match intervention with specific patient’s needs
  - Pharmacist interventions
  - Patient portals
  - Pill monitoring technology
    - Electronic pill caps, smart blister packaging
  - Electronic monitors
    - Biometric monitors, activity monitors, digital scales
  - Mobile health
    - Text messaging, interactive voice response, smartphone apps
  - Feedback of adherence to ordering MD through technology

Zullig L, et al. JAMA 2013
Conclusions

- Adverse drug events and medication errors are a significant issue in the ambulatory setting.
- E-prescribing has great potential to reduce medication errors.
- Need to optimize its impact.
  - E.g. improved alerting, minimized unintended consequences, advanced functionality and decision support.
Electronic Prescribing: Challenges and Lessons Learned Over Time

Erika Abramson, MD, MS
Assistant Professor of Pediatrics and Public Health
Weill Cornell Medical College
The EHR Incentive Program

• Large national policy forces promoting adoption of EHRs
• 2 core requirements of meaningful use are CPOE and e-prescribing
• Goal is to improve quality, safety, and efficiency of healthcare delivery
Use of E-prescribing has increased dramatically

Surescripts, 2013 National Progress Report

7 in 10 physicians currently e-prescribe
Handwritten prescriptions are unsafe

**Rates of Prescribing Errors**

<table>
<thead>
<tr>
<th>Medication Errors</th>
<th>Rate of errors per 100 Prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>36.7</td>
</tr>
<tr>
<td>NY</td>
<td>34.1</td>
</tr>
<tr>
<td>MA</td>
<td>40.9</td>
</tr>
</tbody>
</table>

p-value = 0.39

Abramson et al, JAMIA, 2011
E-prescribing reduces errors

- **Stand-alone E-Rx**: 42.5 (85% decrease)
- **Integrated E-Rx**: 26 (39% decrease)
The Triangle Model

• Any quality or safety impact of health IT is the result of multiple interacting factors
  – not just technology, but also user and healthcare organization

• Rigorous evaluation must capture these factors to explain results
The Triangle Model

Technology

Organization-technology processes

Provider-technology processes

Patients

Organization-provider processes

Organization

Provider

Quality and safety outcomes

Ancker, Kern, Abramson, Kaushal, JAMIA 2011
Conclusions

- E-prescribing is effective in ambulatory setting
- To understand the full impact of health IT, we must understand the interplay between technology, providers, patients, and organizations
- Need to expand comparative effectiveness research beyond traditional focus on medications or interventions to include health IT
Part 2:
Studying safety effects over time
Transitions are challenging
Transitions are vulnerable times for patients

- Adjusted for patient age, gender & insurance

Abramson et al, JAMIA, 2013.
Implications

• Transitioning may pose important safety threats to patients
• May take time see anticipated safety benefits
• Organizations must monitor errors and make refinements to minimize safety threats
The Provider Perspective on Transitioning
Transitions are more difficult than expected

• Even experienced e-prescribers must readapt
• Perceived decreases in efficiency may last long after go-live
  – “I’m losing 3-7 minutes per patient and have a similar 15% reduction in productivity on a daily basis. After a year I am still behind”
Training requirements are extensive

• Initial requirements are significant
• Many providers not aware of system shortcuts or don’t have time to customize the system even after prolonged use
• Providers desire more advanced training once they have mastered the basics
  – “In training they did show me short cuts. The problem is they trained me on everything at the same time.”
System design greatly impacts provider satisfaction

• CPOE frustrating due to:
  • Too many medications on drop-down lists
  • Inflexible medication search engines
  • Too many mouse clicks
  • Alert fatigue

“When five alerts come up, and you’ve got to get the patients their prescriptions, it’s hard to sort through.”
Speed and efficiency are key

• Features providers love:
  – Direct transmission to pharmacies
  – Automatic refills*
  – Telephone refills*

• *Work often shifted from provider to staff members which may pose new safety threats
Conclusions

• Even for experienced e-prescribers, resource and training needs are extensive and ongoing
  • Expectation management is key
• Complex user interfaces and functions need to be simplified to better fit physician workflow
• Important to configure CDS to meet user needs to achieve potential safety gains
  – Focus alerts on high frequency or high severity errors
Thank you!
Improving E-Prescription Quality

Ajit Dhavle
VP, Clinical Quality
Surescripts Quality Management Program

Surescripts Continuous Quality Improvement Initiative

- Provides EHRs quarterly transaction quality report
- Data samples collected quarterly and reviewed against established Quality Guidelines
- Screen for defects using proprietary methodology and Quality Related Events (QRE) terminology
- Regular engagement with e-prescribing vendors

White Coat of Quality Program

- Recognizes vendors who have made significant improvements in technology or process toward the goal of “zero errors”
- White Coat Quality awardees perform better than their peers

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E-Prescribing Quality Improvements: Observed Behaviors and Solutions
Improving E-Prescription Quality

Sending an accurate and complete prescription drug description

- **Observed Behavior:**
  - Selecting a placeholder drug description and then including clarifying information in the Notes field
  - Free texting of the drug description

- **Solution:**
  - Regular drug database updates at the practice site and/or by the EHR vendor
  - Limit ability to free text drug descriptions
  - Standardize drug descriptions across the electronic prescribing industry

Proper use of patient direction (Sig) builder tool

- **Observed Behavior:**
  - Abbreviated and / or incomplete Sig information is received at the pharmacy
  - Supplementary or conflicting Sig information is populated in the free text Notes field

- **Solution:**
  - Adoption of Structured Codified Sig Standard
  - Ability to append free text Sig to the structured Sig generated by the Sig Builder tool and NOT in the Notes field
Improving E-Prescription Quality

Appropriate selection of quantity and quantity qualifier (QQ) values

- **Observed Behavior:**
  - Receipt of generic and/or non-metric QQ value at the pharmacy

- **Solution:**
  - Display available commercial package sizes along with corresponding metric Quantity / QQ to the end user; send the selected metric QQ value in the outbound message
  - Accurate mapping of proprietary drug database codes to NCPDP QQ code list
  - Example:
    - Drug Description Name: Amoxicillin 250/5 mg/ml Suspension
    - Quantity = “1”, QQ = “EA” (Each) should be sent as Quantity = “100” and QQ = “mL”
Improving E-Prescription Quality

Contradicting days supply and quantity information

- **Observed Behavior:**
  - Conflicting information (Quantity: 30, Days Supply: 45, Sig: Take 1 tab daily everyday)
  - Default values in Days Supply – “0”, “365”

- **Solution:**
  - Days Supply is an optional field that does not have to be sent
  - Should include “length of therapy per Rx fill” and not include default values
  - Vendors must conduct clinical decision support checks and alert their prescribers

Clinical or conflicting information sent in the free-text pharmacist notes field

- **Observed Behavior:**
  - Often times Sig (conflicting or supplementary), Quantity, Days Supply is sent

- **Solution:**
  - Appropriate labeling of the Notes field and end user training
  - Codification of the Notes field
Improving E-Prescription Quality

Consistent use of final prescription summary screen

- **Observed Behavior:**
  - Receipt of incomplete and ambiguous prescriptions at the pharmacy resulting in call backs

- **Solution:**
  - Enforcing the use of the summary screen will enable prescribers to view prescription content as received by the pharmacy

Enabling electronic prescribing of controlled substances (EPCS)

- **Observed Behavior:**
  - Dual prescription writing workflows results in inefficiencies and thus decreased productivity
  - Inability to track controlled substance prescriptions

- **Solution:**
  - Adoption and implementation of EPCS by the vendors and end users
Improve E-Prescription Quality

Implementation of NCPDP CANCELRx and RxCHANGE messages

- **Observed Behavior:**
  - Prescriber’s inability to cancel prescriptions on file or existing prescription therapy at the pharmacy
  - Practice workflow disruptions due to pharmacy’s inability to send electronic therapy change requests

- **Solution:**
  - Industry-wide adoption and implementation of CANCELRx and RxCHANGE message types
Questions and Wrap Up

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Upcoming Webinars
- February 19, 2015
- Advancing Health IT Safety and Quality through Interoperability
  - Please visit www.healthitsafety.org or contact healthitsafety@rti.org for more information