Top 10 Health IT Safety Hazards and What to Do about Them

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Do you think your EHR or the way it’s used has been associated with adverse events in your organization?
Unintended Consequences: Wrong Patient Identification

- Nurse noticed patient's DOB was incorrect on wristband. With further investigation, discovered that patient's admission was tied to her deceased husband's account.
- Care summary showed history of past medical admissions that were not hers, but her deceased husband's.
- Labs were drawn, sent, and transfusion administered under erroneous account.

Why are we here?
The role of Patient Safety Organizations

- Protected space to share safety data
- Voluntary, confidential, non-discoverable
- Event investigation & analysis
- Proactive assessment & monitoring
- Identification and sharing of solutions and best practices
ECRI Institute

• Independent, not-for-profit applied research institute
• Leader in patient safety research across the continuum
• Mission: improving safety, quality, and cost effectiveness
• Evidence-based Practice Center
• Federally certified Patient Safety Organization
• 45-year history, 400 interdisciplinary person staff
• Over 1,000 PSO participants
Trivia Challenge #1

Explain this disruptive technology from an earlier era
Health IT can enhance care if...

• the technology is optimally designed by the system developer;
• thoughtfully implemented by the health care organization; and
• appropriately used by the organization’s staff.
Massive increase in EHR adoption

Figure 1. Adoption of EHRs among office-based physicians and non-federal acute care hospitals.

Increasing volume of IT issues

Software-related alerts from ECRI’s Health Devices

EHR-related events from PA Patient Safety Authority
Who is responsible?

EHR Developers: Safety in **design**

Developers & Providers: Safety in **implementation**

Providers & Users: Safety in **use**

**Shared responsibility**
Multi-stakeholder Partnership Convened in 2014
Partnership Goals

Making Health IT Safer Together by:

► Establishing a non-punitive environment for sharing and learning
► Testing a collaborative model for collecting and analyzing safety issues
► Achieving robust stakeholder engagement
► Sharing best practices and lessons learned
► Evaluating two reporting taxonomies
► Informing the national safety strategy for health IT
Expert Advisory Panel

- David W. Bates, MD, MSc, Brigham and Women’s Hospital
- Pascale Carayon, PhD, University of Wisconsin-Madison College of Engineering
- Tejal Gandhi, MD, MPH, National Patient Safety Foundation
- Terhilda Garrido, MPH, ELP, Kaiser Permanente
- Omar Hasan MBBS, MPH, MS, FACP, American Medical Association
- Chris Lehmann, MD, Monroe Carell Jr. Children’s Hospital at Vanderbilt University Medical Center
- Peter J. Pronovost, MD, PhD, The Johns Hopkins University School of Medicine
- Jeanie Scott, VHA Office of Informatics and Analytics/Health Informatics
- Patricia Sengstack, DNP, RN-BC, CPHIMS, Bon Secours Health System
- Hardeep Singh, MD, MPH, Michael E. DeBakey VA Medical Center
- Dean Sittig, PhD, The University of Texas Health Science Center at Houston, School of Biomedical Informatics
- Paul Tang, MD, MS, Palo Alto Medical Foundation, Sutter Health
A Multi-Stakeholder Collaboration

DATA
- Adverse events
- Near misses
- Hazards
- Common Formats
- Vendor Summary data
- Assessment data
- RCAs
- Evidence-based research
- MDR, other data

ANALYTICS
- Review data
- Aggregate across multiple data sets
- Identify contributing factors and trends
- Prioritize safety opportunities
- Select issues to work on
- Develop best practices and interventions on selected issues

LEVERAGED LEARNING
- Policymakers informed of challenges and barriers
- Associations, providers, and vendors adapt best practices and interventions for their constituents
- Clearinghouse for best practices
- Outreach, education, implementation, and spread

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Top 10 Health IT Hazards

1. Indiscriminate use of copy and paste
2. Patient misidentification
3. Errors in weight-based drug dosing
4. Poor data integrity
5. Handling of allergy data
6. Poor usability: leading contributing factor among HIT reports
7. Missing safeguards: leading factor in CDS events
8. Mismatched configuration & workflow
9. Mishandling of timed medication orders: duplicates & omissions
10. Truncation of information on display
Copy/Paste
How can copy/paste lead to patient safety risks?

- 77 year old woman w/remote history of pulmonary embolus, admitted for diarrhea/dehydration after chemotherapy

Admission plan specified heparin for venous thromboembolism prophylaxis, but heparin never ordered

Transferred to another service, plan copy/pasted for 4 days; heparin never administered

2 days after discharge, patient re-hospitalized with pulmonary embolism


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Risks and Benefits of Copy and Paste

Patient Safety Risks

- “Note bloat”
- Compromised data integrity
- Challenging for EHR users to identify relevant clinical information
- Impaired effective communication
- Potential diagnostic bias
- Regulatory concerns

Benefits

- Time saving
- Efficient capture of complicated data
- Improved tracking of multiple problems on highly complex patients
- Continuity of medical decision-making
- Completeness of encounter documentation
- Reduced transcription error

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Evidence Review

Systematic review of all literature from Jan 2010 to Jan 2015, bibliographies reviewed to identify articles published prior to 2010

Full report available at: https://www.ecri.org/resource-center/Pages/HITPartnership.aspx
Evidence Review:
How often does copy/paste occur?

Self Reported Use

- 66% of Northwestern medical students copied their own notes frequently or nearly always (Heiman et al. 2014)
- 90% of physicians use to write daily inpatient notes; 78% use always or most of the time (O’Donnell et al. 2008)
- 81% of copy/paste users frequently copy notes from other physicians or prior admissions (O’Donnell et al. 2008)

Chart Based Studies

- 10.8% of outpatient primary care, cardiology and endocrinology notes contained copy/pasted material (Edwards et al. 2014)
- Roughly 5% of diet, exercise and weight loss counseling statements were copied from prior notes by the same author (Turchin et al. 2011)
Evidence Review: Does copy/paste cause adverse patient events?

Review of 212,165 office visits over 1 year

- Revealed 190 diagnostic errors resulting in unplanned urgent care within 2 weeks
- In patient documentation around these errors, 7.4% of notes contained copy/pasting and in ~36% of these copy/pasted notes, copy/paste mistakes contributed to the diagnostic error

Evidence Review: Consequences of inappropriate copy/pasting for the EHR

- Note bloat
- Internal inconsistencies
- Propagation of errors
- Erroneous copying between patient charts
- Decreased Time for Clinical Synthesis
Evidence Review: Author Responsibilities

- Accuracy
- Source attribution
- Author Responsibilities
- Brevity

Use copy/paste only in appropriate contexts

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Evidence Review: Organizational Responsibilities

Only 24% of hospitals have a copy/paste policy in place

- 2013 Office of the Inspector General

Develop professional standards

Specify consequences for violation

Provide ongoing education and feedback
Safe Practice Recommendations for Copy and Paste

- Provide a mechanism to make copy and paste material easily identifiable
- Ensure that the provenance of copy and paste material is readily available
- Ensure adequate staff training and education regarding the appropriate and safe use of copy and paste
- Ensure that copy and paste practices are regularly monitored, measured, and assessed

- Safe Practices
- Evidence Review
- Tools
- Resources

- Educational Handouts
- Checklists
- Policy Development Tool
- Audit Tracking Tool

https://www.ecri.org/resource-center/Pages/HITPartnership.aspx

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Second Work Group & Deep Dive

► Process of correctly matching a patient to appropriately intended interventions and communicating information about the patient’s identity accurately and reliably throughout the continuum of care

► Scope focuses on breakdowns or gaps in that process

► Definition adapted from Australian Commission on Safety and Quality in Healthcare
Methods

► Keyword search* of PSO database identified potential events
  ■ (n = 10,915)
► Manual review of events for verification of patient identification issues
  ■ (n = 7,613)
► Event dates: January 2013 through August 2015
► Classified utilizing patient identification taxonomy by patient safety analysts

*Keywords: same name, last name, first name, patient name, pt name, pt. name, patient’s name, pts’ name, no name, name corrected, else’s name, elses name, exact name, name band, wrong patient, wrong pt, to another patient, to another pt, incorrect patient, incorrect pt, one patient, one pt, patients identification, patient’s id, patient sticker, pt sticker, patient label, pt label, wrong person, identification band, Identification bracelet, patients id, identity, identifier, identifying patient, identifying pt, ID band, ID bracelet, ID number, date of birth, DOB, social security, SSN, incorrect mr, wrong mr, wrong paperwork, wrong paper work, wrong medical, arm band, armband
Patient Identification Process Map

Registration, Scheduling

Intake

Diagnostics
- Labs
- Pathology
- Imaging

Treatment
- Meds
- Procedures
- Transfusion

Visit completion, discharge, transport, transition

Monitoring

Documentation

Physical Identification

Encounter

Technology

Post-Encounter

HIE

eRx

Referrals/Consults

Patient portals

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Patient Identification Process Map

Percentage of Issues during the phases of care

- **Registration, Scheduling**
  - 12.6%

- **Intake**
  - 87.2%

- **Diagnostics**
  - Labs
  - Pathology
  - Imaging

- **Treatment**
  - Meds
  - Procedures
  - Transfusion

- **Visit completion, discharge, transport, transition**

- **Monitoring**

- **Documentation**

- **Physical Identification**

- **Encounter**

- **Post-Encounter**
  - HIE
  - eRx
  - Referrals/Consults
  - Patient portals

- **Technology**

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Solutions: Duplicate Records and Overlay

- Probabilistic matching algorithms
- Standardizing attributes and data formats
- Quality assurance on registration data
- Unique patient identifier (UPI)
- Patient photographs and other biometrics
Technology

- Registration, Scheduling
- Intake
- Diagnosis
- Labs
- Pathology
- Imaging
- Encounter
- Physical Identification
- Post-Encounter

Events involving technology:
- POC Testing
- Barcoding
- CPOE/EMR
- Interfaced systems
- Monitors
- HIE
- ePrescribing
- Smart pumps
- RFID
- Patient Portals

Technology

15%
Encounters

- **Diagnostics**
  - Labs
  - Pathology
  - Imaging

- **Treatment**
  - Meds
  - Procedures
  - Transfusion

- **Visit completion, discharge, transport, transition**

- **Monitoring**
- **Documentation**
- **Physical Identification**

- **Encounter**

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Processes Where Breakdowns Frequently Occur

Patient ID Process

- Ordered: 40%
- Performed: 39%
- Results: 21%
Trivia Challenge #2

What does the planet Mars have in common with a piece of toast?
People have seen faces in them
Solutions: Orders on Wrong Patient

- Patient photographs
- Standardized display of identifiers
- Limit number of concurrent records open
- Indication-based orders
- Use of user credentials or RFID to constrain choices
- Unique naming conventions for newborns

SMITH, Walter Joseph III
Nov 9, 1961 (53 yo M)
MRN1348887

Errors in weight-based dosing

- Not new or endemic to EHRs
- Multifactorial causation:
  - Equipment: scales unavailable or non-metric
  - Culture: Use of estimated weights routine
  - Technology: Lack of safeguards against errors
  - People: Poor at guessing weights, inconsistent documentation
  - Communication/Workflow: Current weight not available to pharmacist
Involves many high-alert meds

Top Drugs Involved in Wrong-Weight Medication Errors (n=304)

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heparin sodium*</td>
<td>110</td>
</tr>
<tr>
<td>Enoxaparin (Lovenox®)*</td>
<td>84</td>
</tr>
<tr>
<td>Acetaminophen (Tylenol®)</td>
<td>20</td>
</tr>
<tr>
<td>Dobutamine*</td>
<td>17</td>
</tr>
<tr>
<td>Dopamine*</td>
<td>17</td>
</tr>
<tr>
<td>Gentamicin sulfate</td>
<td>17</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>14</td>
</tr>
<tr>
<td>Ibuprofen (Motrin®)</td>
<td>9</td>
</tr>
<tr>
<td>Nesiritide (Natrecor®)</td>
<td>8</td>
</tr>
<tr>
<td>Propofol (Diprivan®)*</td>
<td>8</td>
</tr>
</tbody>
</table>

* High-alert medications

PA Patient Safety Authority.
Solutions: Errors in weight-based dosing

- Prompts to enter or update weights
- Validation of entered values:
  - Anthropometric measures
  - Delta checks
- Optimizing data capture and display
- Import measurements directly from devices, with manual override
- Showing dates with measurements
- Do not let obsolete weight observations “copy forward”
- Most reliable/current source for pharmacy
Solutions: Errors in weight-based dosing

- Clear standards:
  - Timeliness of obtaining weights
  - Frequency of updates
  - Use of estimates, self-reported weights
- Transition to metric-only scales
- Eliminate pounds-only scales
- Lock dual scales in metric mode

Trivia challenge #3

How many other countries don’t use the metric system?
Countries that don’t use the metric system

Saving Patient Ryan

• What is the net effect of advanced EHRs on patient safety?
• Population: 163 PA acute care hospitals
• Primary data: Safety events from PA Patient Safety Authority 2005-12. Other: HIMSS, AHA, CMS, PHC4, AHRF
• Econometrics, difference-in-differences, fixed effects approach comparing each facility to itself

Results

• Advanced EMR leads to:
  • 27% decline in all (aggregated) events
  • 30% decline in medication errors
  • 25% decline in complications
• Robustness checks: falsification test, reverse-causality, spurious correlation
• Limitations: observational data, under-reporting events, “treatment” non-equivalence
• Similar results obtained from Appari, et al, using AHRQ Patient Safety Indicators*

Implications

• These data suggest Advanced EHRs are a net safety benefit
• These results are in the aggregate (YMMV)
• Unexpected problems are occurring and should be identified and addressed
• Clinicians’ concerns about usability are genuine and valid
• Implementation is never over
• Next phase: optimization
Resources

Thank You

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