Safety of Health Information Technology (HIT): Identifying and Mitigating Risks

supported by
EFMI Working Group Human
and Organizational Factors of Medical Informatics

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Marie-Catherine Beusc​art-Zéphir, Christian Nøhr
Agenda

1. Introduction + presentations (30 min)
   – Towards safe systems: Jos Aarts
   – Using incident reports to identify HIT problems: Farah Magrabi
   – User centered design: Marie-Catherine Beuscart-Zéphir, Christian Nøhr

2. Group work (50 min)
   – Question 1: Identify national and international initiatives to improve the safety of HIT?
   – Question 2: What should be reported about a HIT incident?

3. Summary and next steps
Towards safe systems

Dr Jos Aarts
Erasmus University Rotterdam
Oslo, MIE2011
IT as a complex sociotechnical system

Harrison, Koppel, Bar-Lev, 2007
Unintended consequences of HIT: a temporal analysis

- Implementation of CPOE at HUP
  - TDS (Eclipsys) 7000 system
  - Eclipsys SCM
- 2002-2003 study (Koppel et al, 2005)
- 2004 study (Koppel, unpublished)
- 2011 study (Kraaijenbrink, Koppel, Aarts)
Results

• 2002-2003: 22 sources of errors
• 2004: some addressed, some remained
• 2011: slight improvement, new sources emerged
  – Workload
  – Alert fatigue
  – Using filters
  – Reliance on pharmacy
Pulling findings and ideas together

Complex sociotechnical systems

- source of risks
  - organizational purpose (software) development errors
  - integration errors
  - implementation errors
  - human interaction errors

Barriers to safe systems
- lack of regulation
- poor oversight
- legal contracting
- proprietary software and standards
- lack of reporting
- lack of organizational learning

Mitigating risks
- human resilience
  - workarounds
  - organizational commitment
- training
- oversight
- reflective design and implementation methodologies
Using incident reports to monitor the safety of HIT

Dr Farah Magrabi
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Australian Institute for Health Innovation
University of New South Wales, Sydney, Australia
Identifying & mitigating HIT risks

- Identify hazards
- Analyse & prioritise hazards
- Mitigate risks
- Evaluate effectiveness of risk reduction
- Incident reporting
- Human centered design
Reports are useful to examine how & why HIT incidents occur

• **IT systems failed.** We rely heavily on IT systems to retrieve radiology, pathology results, ordering of tests and radiology. Hard copies of ultrasound scans not provided. Without functioning IT we could not access results.

• **CPOE system required users to scroll through 225 options** on a drop down menu. Options arranged in a counterintuitive alphabetical order, and resulted in a patient being **overdosed** with four times more digoxin than required
Analyses of incidents

- Incidents of a common nature are grouped
- **WHO International Classification for Patient Safety (ICPS)**
  
  
  - 13 Healthcare Incident Types
  - e.g. “clinical process/procedure”, “medication/IV fluid”

- Existing classifications, including ICPS, fall short with respect to HIT incidents.
## Analyses of HIT incidents

<table>
<thead>
<tr>
<th></th>
<th>Advanced incident management system (AIMS)</th>
<th>US FDA MAUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporters</td>
<td>Health professionals</td>
<td>Users, vendors</td>
</tr>
<tr>
<td>No. of reports</td>
<td>43,000</td>
<td>900,000</td>
</tr>
<tr>
<td>Timeframe</td>
<td>24 months</td>
<td>30 months</td>
</tr>
<tr>
<td>Years</td>
<td>2003-05</td>
<td>2008-10</td>
</tr>
<tr>
<td>IT incidents</td>
<td>99 (0.2%)</td>
<td>436 (0.1%)</td>
</tr>
</tbody>
</table>

Magrabi et al. JAMIA 2010
Magrabi et al. JAMIA (accepted)
Classification: 34 HIT problems grouped into 5 types

1. Information Input
2. Information Transfer
3. Information Output
4. General technical
5. Contributing factors

Magrabi et al. JAMIA 2010
Magrabi et al. JAMIA (accepted)
Type of HIT problems

<table>
<thead>
<tr>
<th>Category</th>
<th>MAUDE (n=712)</th>
<th>AIMS (n=117)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information input</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>Information transfer</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Information output</td>
<td>29</td>
<td>20</td>
</tr>
<tr>
<td>General technical</td>
<td>60</td>
<td>24</td>
</tr>
<tr>
<td>Contributing factors</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>
Consequences of HIT incidents

- Harm to patient: MAUDE (n=432) = 11, AIMS (n=68) = 3
- Near miss: MAUDE (n=432) = 1, AIMS (n=68) = 4
- Noticeable consequence, no harm: MAUDE (n=432) = 10, AIMS (n=68) = 38
- No noticeable consequence: MAUDE (n=432) = 32, AIMS (n=68) = 34
- Hazard: MAUDE (n=432) = 46, AIMS (n=68) = 13
- Complaint: MAUDE (n=432) = 6, AIMS (n=68) = 1
- Loss: MAUDE (n=432) = 1, AIMS (n=68) = 1
AIMS: impact on clinical work

Machine

- 55% of problems-machine related.
- Delays in patient care tasks, a major consequence (70%).

Human

- 45% of problems related to human-computer interaction.
- Rework a major consequence (78%).
FDA: Four types of software problems

1. Functionality
   – task/workflow fit
   – usability, interactions

2. Local configuration (e.g. rules for decision support)

3. Interface with devices (e.g. PACS with imaging device)

4. Network configuration (e.g. local network settings)
Question 1: Identify national & international initiatives to improve HIT safety? What more to be done?

- Certification
- Health IT Policy Committee
- NHS
- Regulation
- Design standards
- CCHIT
- Nehta
- Systems safety engineering
Question 2: What should be reported about a HIT incident?

• Key information required?

• Free text or fixed fields or both?

• How to elicit usability problems? Poor fit to tasks?
Summary & next steps

• Status paper summarising workshop

• Catalog of HIT safety initiatives

• Improve reporting of HIT incidents
  – Categories basis for a new incident type in the WHO ICPS

• Improve methods for analysis
  – manual
  – automated

• To participate
  – email Farah Magrabi f.magrabi@unsw.edu.au