Human Factors Engineering: Tips and Tools for Medication Safety

Alissa L. Russ, PhD
Assistant Professor

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Outline

I. Overview of human factors
II. To train or not to train?
III. Human factors: practical tools
I. Human factors science...

- discovers and applies information about human capabilities, limitations, and other characteristics to design better technologies, tools, and systems (Gurses 2012, Russ 2013)

Goals of Human Factors

- Fit system design(s) to characteristics of people, rather than making people try and adapt.
  - ↑ performance
  - ↑ efficiency
  - ↑ satisfaction
  - ↑ safety

Systems Engineering to Improve Patient Safety (SEIPS) Model

Adapted and redrawn from SEIPS model, Carayon et al. 2006, Holden 2013
Systems Engineering to Improve Patient Safety (SEIPS) Model

Exercise #1: Think, Pair, Share (3 min)

1. Think/share about a patient safety incident at your organization.

2. What aspects of the work system might have contributed to that safety incident? (hint: “human error” is not an answer!)
II. To Train or Not to Train?

Audience Question
• Based on human factors, which one is TRUE?

a. Training is a strong defense against patient safety risks
b. Training is often an effective strategy to reduce errors that are occurring across multiple people
c. Training is very important for new employees and when new technologies are introduced

Train when...
• System aspects already considered and modified
• Goal is to gain familiarity with new technologies, processes
• Testing procedures via realistic scenarios – e.g., computer downtimes/back-up plan

Adapted from Russ, BMJQS 2013
Training is often ineffective when...

- other aspects of system not considered first
- errors are occurring across many people
- already trained and problem persists
- ‘stop using it in the wrong way’
- ‘be more vigilant’

➤ Indicates system design does not support human characteristics
  modify system design, policies, produces, layout

Adapted from Russ, BMJQS 2013

III. Practical Tools

A. Hazard control hierarchy

B. Strategies to deepen root cause analysis

Hazard Control Hierarchy

<table>
<thead>
<tr>
<th>Safety Strategy</th>
<th>Risk Reduction Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliminate</td>
<td>design out the source of the hazard to remove the risk</td>
</tr>
<tr>
<td>Safeguard</td>
<td>add a barrier or change the pathway to harm to reduce risk</td>
</tr>
<tr>
<td>Warn or Train</td>
<td>educate individuals about the risk</td>
</tr>
<tr>
<td>Legislation</td>
<td>develop policies or procedures that describe how to avoid the risks</td>
</tr>
<tr>
<td>Accept Risk</td>
<td>do nothing</td>
</tr>
</tbody>
</table>

Adapted from Wickens 2004
Example

Risk: Bear attack at campsite

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Example</th>
</tr>
</thead>
</table>
| **Eliminate:** | • Camp in a region where no bears exist  
|            | • Stay in a hotel |
| **Safeguard:** | • Hang all food in a tree at least 100 yards from tent (change path of bear) |
| **Warn or Train:** | • Add signs around the campsite to warn about bears  
|            | • Educate the public about bears |
| **Legislation:** | Develop a policy that states all campers must follow precautions |
| **Accept Risk:** | Do nothing |

Exercise #2:

Risk: Ordering inappropriate look-alike drug via CPOE

<table>
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Deepening Root Cause Analysis

Methods

- Adapted one type of cognitive task analysis
  - Critical decision method (CDM)

- CDM interview steps:
  - 2 min overview + “3 sweeps”
  - construct timeline w/ about 5 steps
  - go back through timeline, ask Qs to fill in details
  - go back through again; ‘what if’ questions
EHR-Stimulated Recall

Timeline/event reconstruction
• Memory aid for participant
• Medication dose
• EHR documentation
• Orders started/stopped
• Pt age, lab values, history

Example Qs
Focus on “What?” questions (not “How?”)

1. What made this patient case tricky? Challenging?
2. What factors influenced your choice of [this medication]?
3. What information, if anything, did you want for this patient but did not have?
4. What were your thoughts when you learned ________?
5. What, if any, information in the EHR was confusing?
Exercise #3: Think, Pair, Share (2 min)

Recall your patient safety incident from exercise #1 and share one new “what” question you to ask in your organization to uncover more about the safety incident.

Deepening RCA: Significance

- Methods may be useful for:
  - investigating ‘common’ safety events
  - less ‘memorable’ incidents
- Integrating EHR into incident interviews may yield more accurate, rich information
- Incorporating cognitive task analysis methods in healthcare may strengthen patient safety efforts

Summary

- Human factors adapts systems to people!
- Training is important, but rarely a strong, ‘first-line’ safety mechanism. (Russ, BMJQS 2013)
- Human factors: practical tools
  - Hazard control hierarchy
  - Methods to inform RCA (Russ, JPS 2017)
References


Questions?

aruss@purdue.edu