Sociology Department and the Center for Clinical epidemiology and Biostatistics (School of Medicine) University of Pennsylvania
Co-PI, AHRQ’s *Guide to Reducing Unintended Consequences of HIT*
Co-PI, NSF Project on Cyber Communication (Univ of Penn)
Internal Evaluator, Harvard Medical School’s SHARP project on creating a new HIT architecture
Chair, Evaluation Working Gp, & Usability TF member, AMIA
Reviewer, IOM panel on HIT and patient safety
rkoppel@sas.upenn.edu
Usability Present
What two industries call their customers users?
Example 1: A seemingly straightforward measure in an EHR
There are 40 legitimate ways of recording bp in standard EHRs.

Legit Blood Pressure Reporting Entries

125 75

Left Foot

Labile

Too High

Treated

Under control

OK

125/75

75

125

2 pages later

Jan, 2011
Standing…

High

Meds too low

Non-compliant

Improved

After exercise

w/o meds

Right Foot

More Legit Blood Pressure Reporting Entries

Seated, Systolic pre-Injection

Variations in EMRs

125

18

4 pages later

125

75

75

more
Another example:
Ordering Warfarin: Lag, Prediction, Trends

Only today’s INR is visible on screen
<table>
<thead>
<tr>
<th>Navigator</th>
<th>ICU Physician View</th>
<th>Flowsheet: ICU Physician View</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 Hr All</td>
<td>水平: ICU Physician View</td>
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<tr>
<td></td>
<td>24 Hr Overview</td>
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<td>Phys SF</td>
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<tr>
<td>Chemistry-General</td>
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<tr>
<td>Sodium Level</td>
<td>133</td>
<td>6/18/2009 15:00 CDT</td>
</tr>
<tr>
<td>Potassium Level</td>
<td>3.7</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>Chloride Level</td>
<td>101</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>Carbon Dioxide Level</td>
<td>28</td>
<td>6/18/2009 15:00 CDT</td>
</tr>
<tr>
<td>Hematology/Anticoagulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC Count</td>
<td>6.8</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>Hemoglobin</td>
<td>10.3</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>Hematocrit</td>
<td>30</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>INR Therapeutic</td>
<td>* 2.6</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>Prothrombin Time (PT)</td>
<td>27.3</td>
<td>6/18/2009 15:00 CDT</td>
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<tr>
<td>Platelet Count</td>
<td>146</td>
<td>6/18/2009 15:00 CDT</td>
</tr>
<tr>
<td>Pain Assessment</td>
<td>warfarin</td>
<td>* * 2 mi</td>
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<tr>
<td>Line #1 Assessment</td>
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<tr>
<td>Start Date</td>
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<tr>
<td>Start Time</td>
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<tr>
<td>Therapy</td>
<td>Assess</td>
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</tbody>
</table>

June 11, 2009 16:22 CDT - June 20, 2009 16:22 CDT (Clinical Range)
This pop up would seem to indicate that the patient received 2 mg of warfarin.
### Mouse Magic

#### ICU Physician View

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#### Hematology/Anticoagulation

| WBC Count         | 6.8                   | 6.8                   | 6.8                   | 6.8                   | 6.8                   | 6.8                   | 6.8                   | 6.8                   | 6.8                   |
| Hemoglobin        | 10.3                  | 10.3                  | 10.3                  | 10.3                  | 10.3                  | 10.3                  | 10.3                  | 10.3                  | 10.3                  |
| Hematocrit        | 30                    | 30                    | 30                    | 30                    | 30                    | 30                    | 30                    | 30                    | 30                    |
| INR Therapeutic   | **2.6**               | **2.6**               | **2.6**               | **2.6**               | **2.6**               | **2.6**               | **2.6**               | **2.6**               | **2.6**               |
| Prothrombin Time (PT) Therapeutic | 27.3                  | 27.3                  | 27.3                  | 27.3                  | 27.3                  | 27.3                  | 27.3                  | 27.3                  | 27.3                  |
| Platelet Count    | 146                   | 146                   | 146                   | 146                   | 146                   | 146                   | 146                   | 146                   | 146                   |

**Note:** Warfarin dosage is marked as **2 mg, 5 mg**.
Why are usability problems not solved?
False Beliefs

- Usability vs. Innovation
  - Nonsense

- Usability Not Measurable
  - Nonsense

- Usability Too Theoretic
  - Nonsense

- Usability must await MU work
  - Absurd but no comment
Current Responses to Usability Problems
Responses to Usability Problems
Responses to Usability Problems

PRIORITIES
Responses to Usability Problems
Responses to Usability Problems
Responses to Usability Problems
Responses to Usability Problems
Responses to Usability Problems
Responses to Usability Problems
Responses to Usability Problems
Enough

To.... Solutions....
Substitutable Medical Apps, reusable technologies: SMART

Harvard Medical School, Children’s Hospital of Boston, and friends

Think smart phone with apps.
A platform with substitutable apps constructed around core services

A modular EHR:

- Fosters competition
- Supports standards evolution
- Works with differing care workflows
- Reduces healthcare costs
- Accelerates innovation
Gender: male
Age: 5 years
Height: 112 cm
BP: 110/69 mmHg
“Let’s build an app for that!”

Use cases defined by clinicians (Children’s Boston)

– One stop, no lookup tables
– Longitudinal view with integrated EMR data
– At-a-glance assessment
– Drill-down for details, filters

SMART App API (http://smartplatforms.org)
Run via SMART API on Cerner Millennium at CHB
Another Solution

Instant and Frictionless reporting of problems

• Clinicians effortlessly report problems, which are then sent to experts... Reports are saved, and can’t be ignored nor negated.

• I’ve...

But let’s move on...
Another Example of a Solution: Electronic Shadowing of Users

It’s like Google Analytics™ for EHR usage.

Firm name and logo intentionally obscured
Example of Firm Name capabilities: Quantifying unused shortcuts.

Shortcut

WARNING: ADVERTISEMENT

Long Way

Wasted Effort, More Errors

WARNING: ADVERTISEMENT
Example: The “carpal-tunnel metric”.

Mouse Moves per Window by Physician: “Enter New Order” form

- Physician A: 4.83
- Physician B: 2.80
- Physician C: 1.33
Looking and asking still needed
Conclusion

Usability *can* be ignored...

But with great loss of patient safety & clinician efficiency

Usability can be defined as indefinable

And yet it exists (and is measurable)

Usability problems can be fixed

But only if we know about them...

and want to fix them
Thank you

Questions

Ross Koppel, Ph.D
rkoppel@sas.upenn.edu