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Demonstrating Usability and Safety

Ben-Tzion (Bentzi) Karsh, PhD
Professor
Industrial and Systems Engineering
Family Medicine
Systems Engineering Initiative for Patient Safety
University of Wisconsin-Madison

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Agenda

- What is the relationship between usability and safety?
- Safety framework from NISTIR 7804
- Critical usability issues that can affect safety

Who believes that there is a relationship between health IT/device usability and safety?

"Designed and applied inappropriately, ***health IT can add an additional layer of complexity*** *to the already complex delivery of health care,* ***which can lead to unintended adverse consequences****, for example dosing errors, failing to detect fatal illnesses, and delaying treatment due to* ***poor human–computer interactions*** *or loss of data."* - Institute of Medicine (2012) Health IT and Patient Safety: Building Safer Systems for Better Care

*"****Design-induced errors*** *in the use of medical devices* ***can lead to patient injuries and deaths****. A user's behavior is directly influenced by operating characteristics of the equipment; user interfaces that are misleading or illogical can induce errors by* ***even the most skilled users****."* - Center for Devices and Radiological Health, FDA, 1996

"…the current ***structure of health IT*** *systems makes it* ***difficult to extract the full value of the data*** *generated in the process of healthcare…This means that physicians can have* ***trouble finding the information they need****, and patients often wind up with poor access to their own health data and little ability to use it for their own purposes…"* - The President's Council of Advisors on Science and Technology in December of 2010

What about outside of healthcare?

"... Particularly in the field of aviation has the importance of human requirements in equipment design come to be recognized. There probably is no other engineering field in which the penalties for failure ***to suit the equipment to human requirements*** *are so great. With present equipment, flying is so difficult that many individuals cannot learn to pilot an aircraft safely... The point has been reached where addition of new instruments and devices . on the cockpit instrument panel actually tends to decrease the over-all effectiveness of the pilot by increasing the complexity of a task that already is near the threshold of human ability. As aircraft become more complex and attain higher speeds, the necessity for* ***designing the machine to suit the inherent characteristics of the human operators*** *becomes increasingly apparent."* -1947, Paul Fitts

Substitute 'clinician' for 'pilot' and 'health IT' for 'cockpit'

In Karsh et al. 2010 "Health information technology: fallacies and sober realities" JAMIA, 17: 617-623

What is the relationship between usability and safety?

- In a nutshell…

Everything about the patient

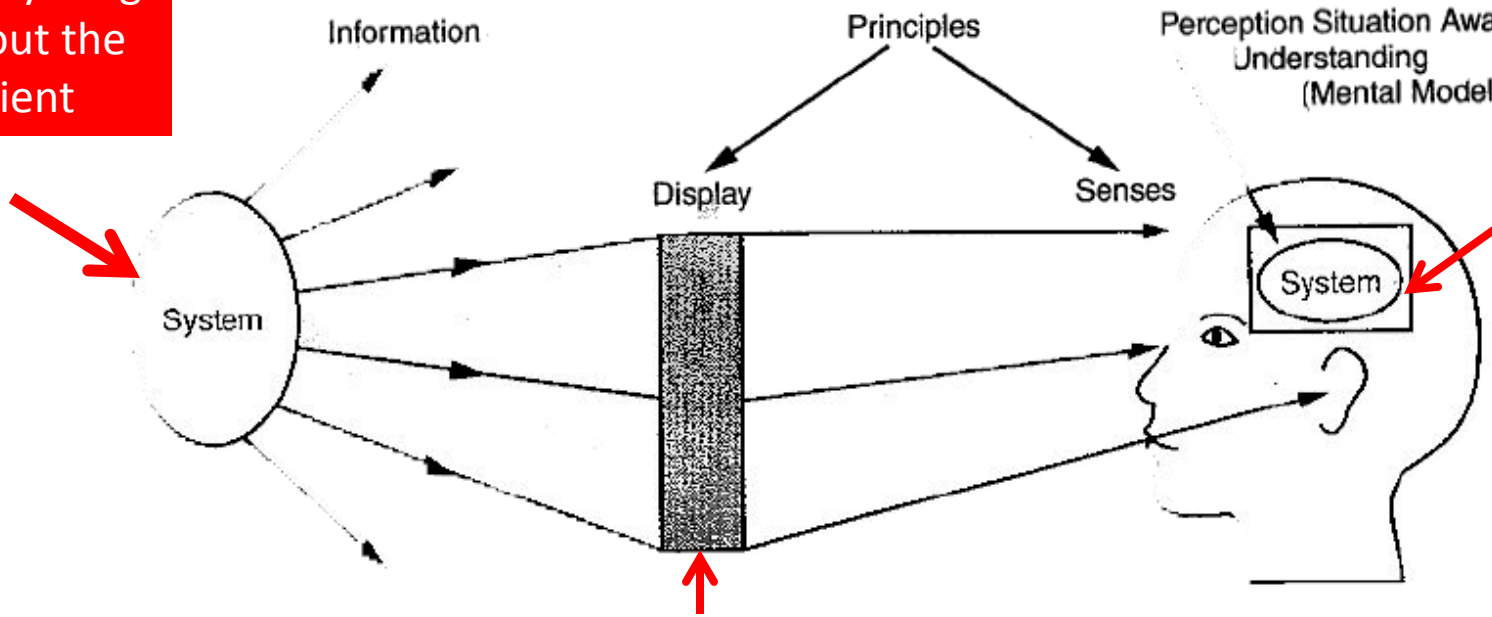

FIGURE 8.1

What the clinician sees

What the clinician understands / thinks
- Health IT
- Previous knowledge
- Patient interaction
- Expectations

Wickens et al. (2004) "Introduction to Human Factors Engineering" 2nd Edition

What is the relationship between usability and safety?

What you perceive affects what you think, which affects what you do

What a clinician perceives from the health IT affects what they think is going on with the patient, which influences diagnosis and treatment

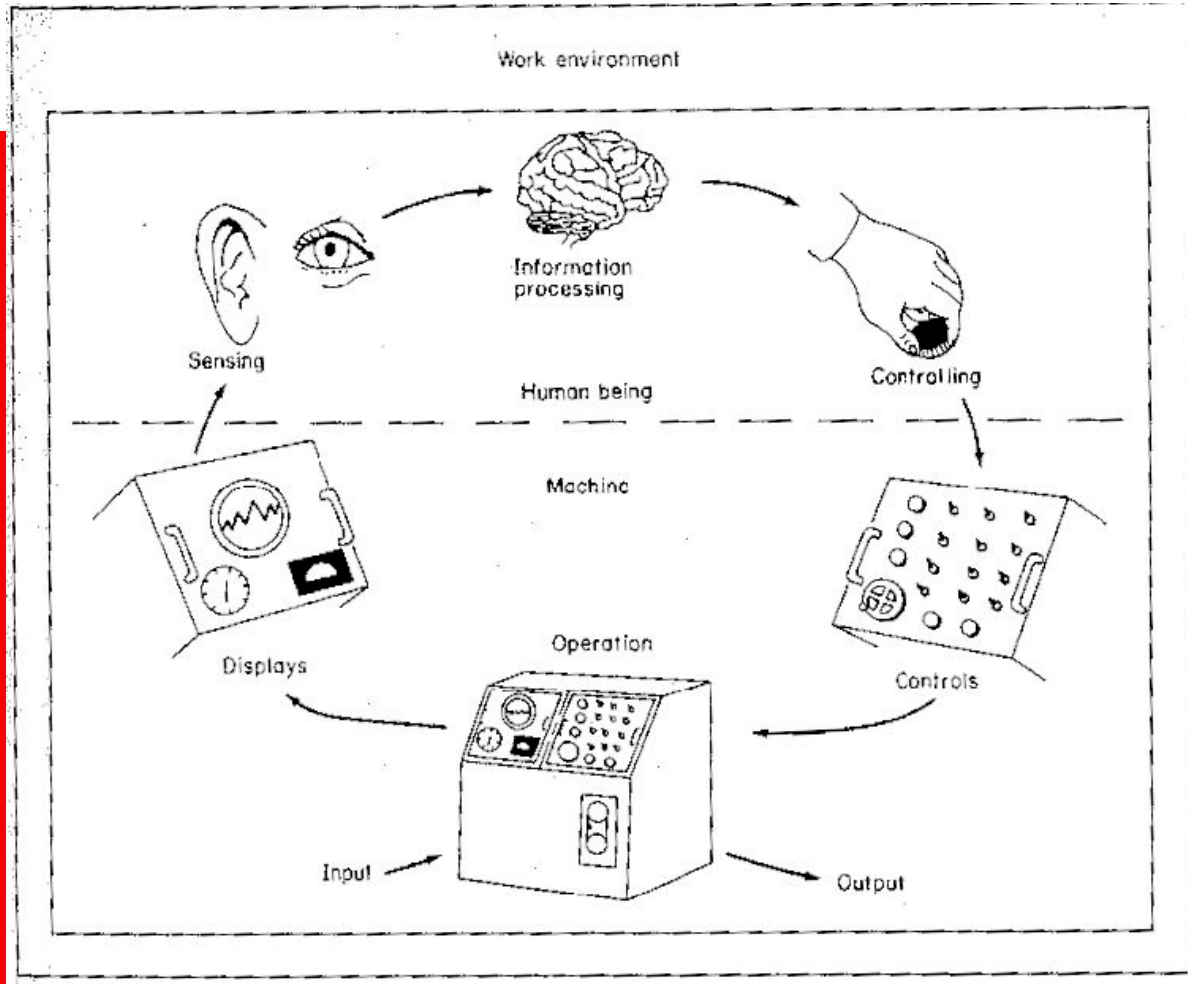

FIGURE 1-
Schematic representation of a human-machine system. (*Source: Chapanis, 1976, p. 70.*) *Used by permission of Houghton Mifflin Company.*

In safety critical environments, usability can have safety consequences Period.

For health IT, it can also mean slower adoption

Who else believes in the relationship between usability and safety?

- This is believed by the FAA, DoD, NASA, Nuclear Regulatory Commission.
- This is not (or should be less) controversial

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Implications

METRIC
MIL-STD-1472G
11 January 2012
SUPERSEDING
MIL-STD-1472F
23 August 1999

DEPARTMENT OF DEFENSE
DESIGN CRITERIA STANDARD
HUMAN ENGINEERING

AMSC N/A AREA HFAC

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NUREG–0700
Rev. 2

Human-System Interface Design Review Guidelines

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Washington, DC 20555-0001

659 pages long

Excerpts

1.1-2 Display Conventions
Consistent interface design conventions should be evident for all display features (such as labels).
Additional Information: Consistent structure for data and labels should be used within and across displays. Even minor inconsistencies can distract a user and delay comprehension as the user wonders momentarily whether some apparent difference represents a real difference. Both the items on display and the displays themselves should be standardized. Although standardization is desirable, it should not take precedence over the grouping principles of frequency, sequence, locations, and importance.[5908]

1.1-29 Spatial Proximity for Related Information
Information that must be compared or mentally integrated should be presented in the close spatial proximity.

1.1-33 Display Information in Directly Usable Form
Information should be displayed to users in directly usable form consistent with the task requirements.
Additional Information: Users should not have to convert displayed data into another form to make it useful to the ongoing task. A user should not have to transpose, compute, interpolate, or translate displayed data into other units, or refer to documentation to determine the meaning of displayed data.[5908, 0700]

1.1-44 Highlighting Text Displays
When critical text merits emphasis to set it apart from other text, that text should be highlighted by bolding/brightening or color coding or by some auxiliary annotation.
Additional Information: Use of capitalization as a coding technique should be limited since it reduces readability. A single word might be capitalized for emphasis, but capitalizing an extended passage should not be used for coding.[5908]

Still don't believe in the relationship?

So even things that would seem to a designer or user to ***obviously*** be usable,
may not be,
once examined in context.

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NISTIR 7804: Technical Evaluation, Testing, and Validation of the Usability of Electronic Health Records

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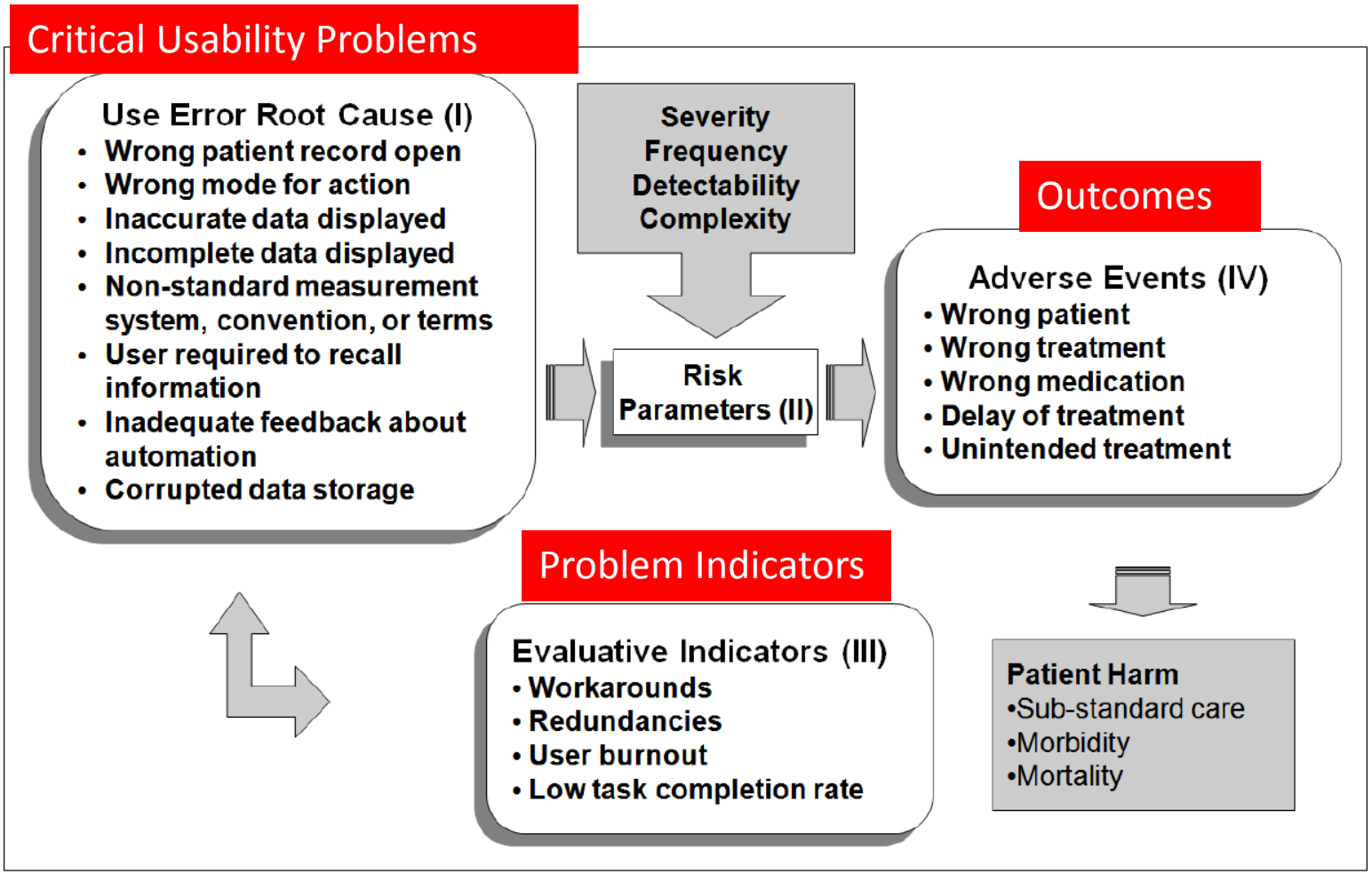

Figure 3. A model for analysis and understanding of use-related risks of EHR systems.

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Thank you. Questions?

Ben-Tzion (Bentzi) Karsh, Ph.D.
Professor
Department of Industrial & Systems Engineering
University of Wisconsin

Contact Information
Industrial & Systems Engineering
University of Wisconsin-Madison
1513 University Avenue, Room 3218
Madison, WI 53706
Tel: 608-262-3002
Fax: 608-262-8454
E-mail: bkarsh@engr.wisc.edu
www.engr.wisc.edu/mesh