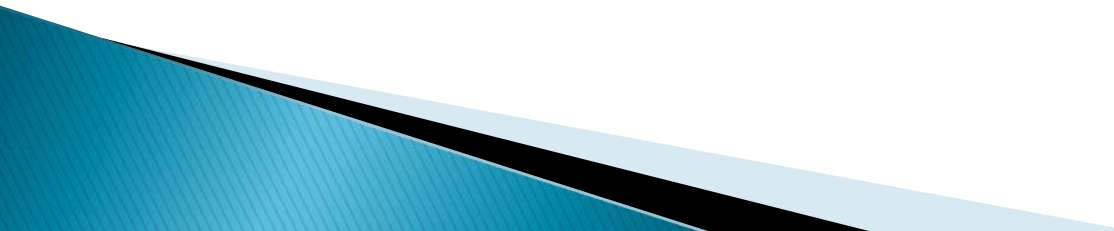


Application of User-Centered Design (UCD) to Improve the Security of Health IT Systems



Agenda

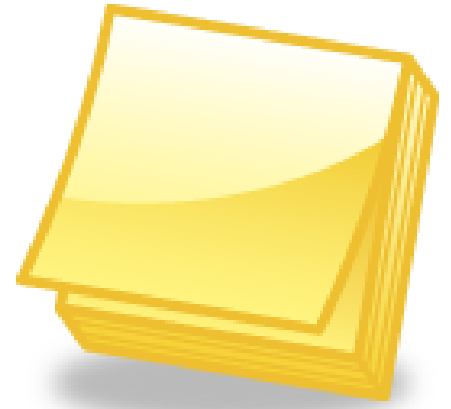
- ▶ Framing the Issue
 - ▶ What are Usability and UCD?
 - ▶ What do they have to do with Security?
 - ▶ Current State of Usability in EHRs
 - ▶ Role and Activities of NIST in Usability
 - ▶ So What Can We Do?
- 

Why do people use sticky notes?

▶ Is it because system users are:

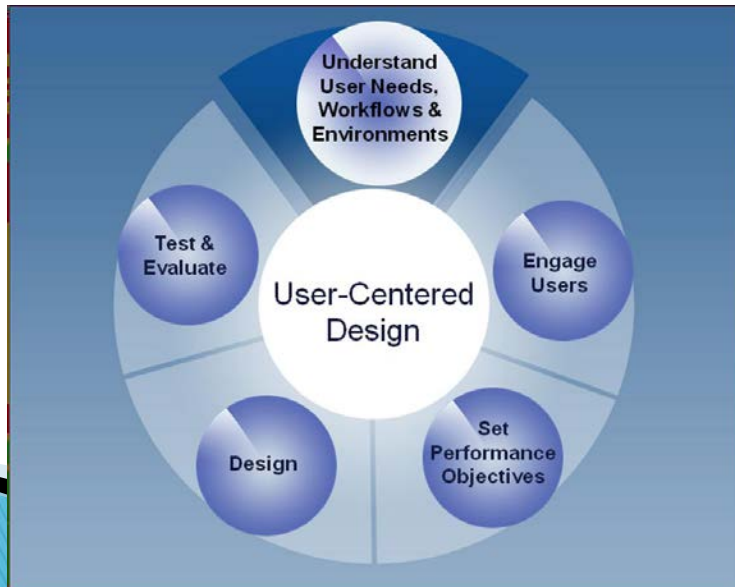
A) Careless and Ignorant, or

B) Frustrated and Overwhelmed



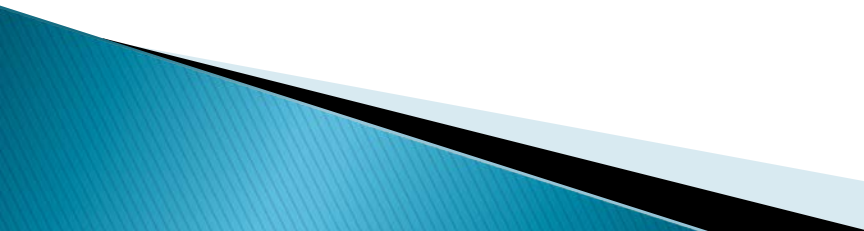
What is Usability?

Usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"



– ISO9241

First Tenet: Know thy User

- ▶ Who are the end-users of EHRs?
 - A) Policy Makers
 - B) Security Organizations
 - C) Doctors, nurses, Front office staff, scribes, etc., etc.
- 

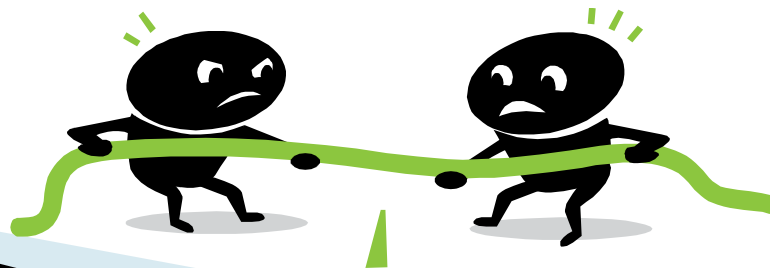
Designing Policies and Systems to Support End–User Goals

End–User

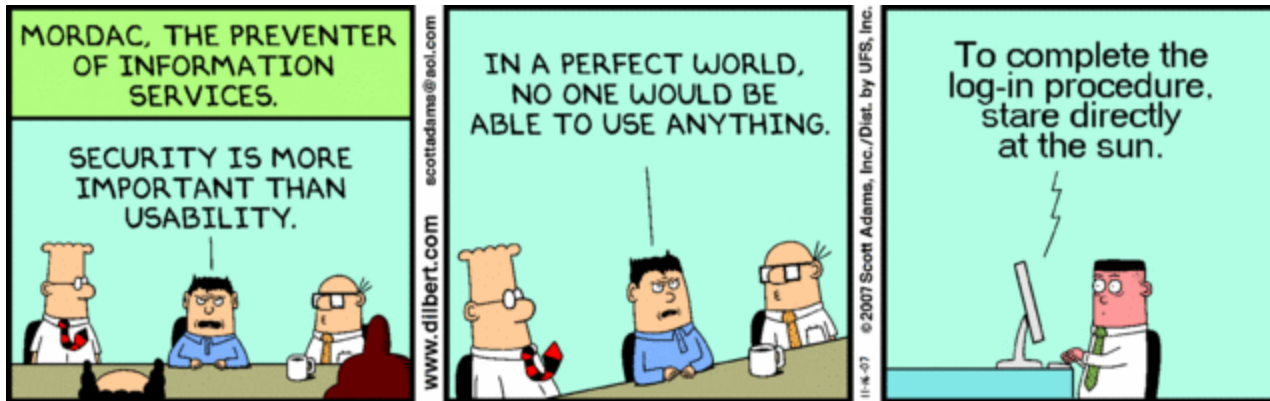
- ▶ Task orientation (i.e. taking care of patients)
- ▶ Performance metrics: efficiency, effectiveness, safety
- ▶ Healthcare organization's mission relies on end–user task performance

Security Organization

- ▶ Security is the production task
- ▶ Performance metric: How secure?
- ▶ Mission is Security...but how does it relate to overall mission of org?



Who Usually Wins the Tug of War?



- “Command and Control” approach
- Policies constructed top-down, enforced through sanctions
- Compliance monitored by checklists
- One size fits all

Adopting UCD Best Practices: A Broader Challenge for Health IT

- ▶ Use of user-centered design processes, and specific resource personnel with expertise in usability engineering not common
- ▶ Specific best practices and standards of design, testing, and monitoring not readily available
- ▶ Usability and accessibility of systems not currently addressed in certification
 - Although MU2 NPRM references “safety-enhanced design”
 - NISTIR 7741, 7742, 7804 (EUP)
- ▶ Critical shortcoming: Lack of diversity in end users involved in the testing and evaluation process (NISTIR 7769)

McDonnell C, Werner K, Wendel L. Electronic Health Record Usability: Vendor Practices and Perspectives. AHRQ Publication No. 09(10)-0091-3-EF. Rockville, MD: Agency for Healthcare Research and Quality. May 2010.

Importance of Usability

We submit that usability is one of the major factors—*possibly the most important factor—hindering widespread adoption of EMRs.*

Usability has a strong, often direct relationship with clinical productivity, error rate, user fatigue and user satisfaction—critical factors for EMR adoption.

- “Defining and Testing EMR Usability: Principles and Proposed Method of EMR Usability Evaluation and Rating” HIMSS Usability Taskforce, June 2009

http://www.himss.org/content/files/HIMSS_DefiningandTestingEMRUsability.pdf

PCAST Report

- ▶ “...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...
- ▶ market innovation has not yet adequately addressed these challenges to the usability of electronic health records.”

– President’s Council of Advisors on Science and Technology (PCAST), “Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward,” December 2010.

IOM: Health IT and Patient Safety: Building Safer Systems for Better Care

- ▶ “The current state of safety and health IT is not acceptable”
- ▶ “The committee expressed concerns that poor usability...is one of the single greatest threats to patient safety. On the other hand, once improved, it can be an effective promoter of patient safety.”
- ▶ “Usability is a Key Driver of Safety...Health IT products are needed that promote efficiency and ease of use while minimizing the likelihood of error.”
- ▶ “Evaluation of the impact of health IT on usability and on cognitive workload is important...”
- ▶ “Usability guidelines and principles focused on improving safety need to be put into practice.”

https://download.nap.edu/catalog.php?record_id=13269

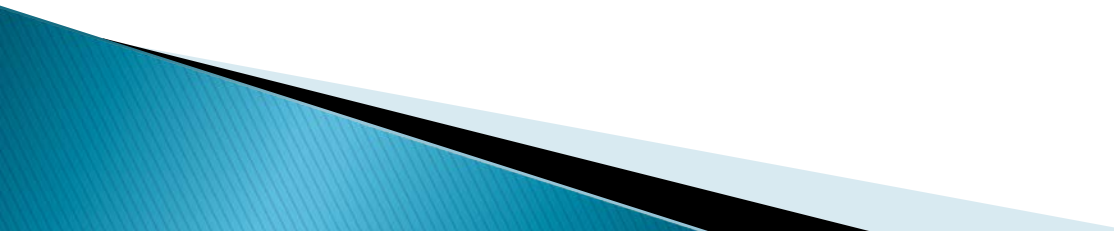


NIST Health IT Usability Initiative

Objective:

- ▶ Advancing measurement science to establishing a framework that defines and assesses health IT usability.

Goal:

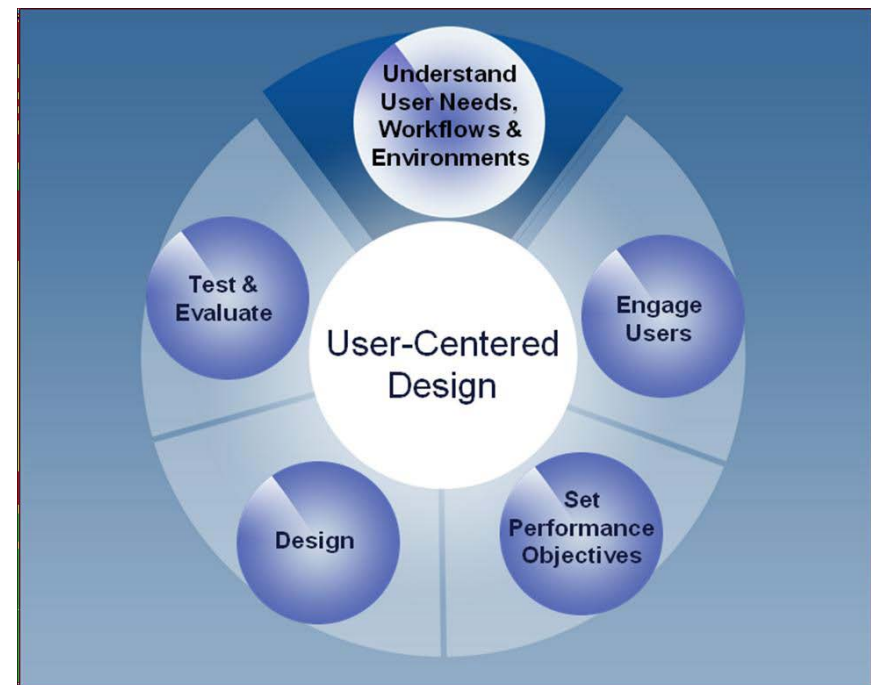
- ▶ Create a detailed specification of an objective, repeatable procedure for measuring and evaluating the usability of health IT systems.
- 

NIST Health IT Usability Activities

Applying the Science

- ▶ NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records (NISTIR 7741)
- ▶ Customized Common Industry Format Template for Electronic Health Record Usability Testing (NISTIR 7742)

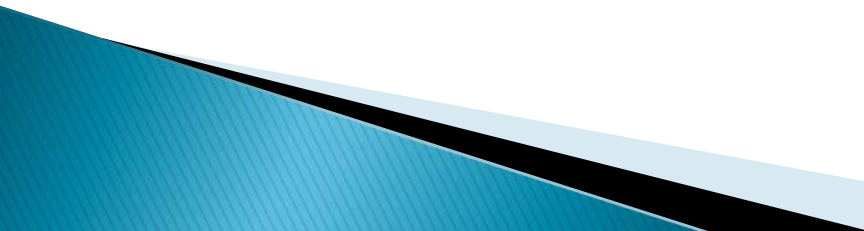
www.nist.gov/healthcare/usability



NIST Health IT Usability Activities

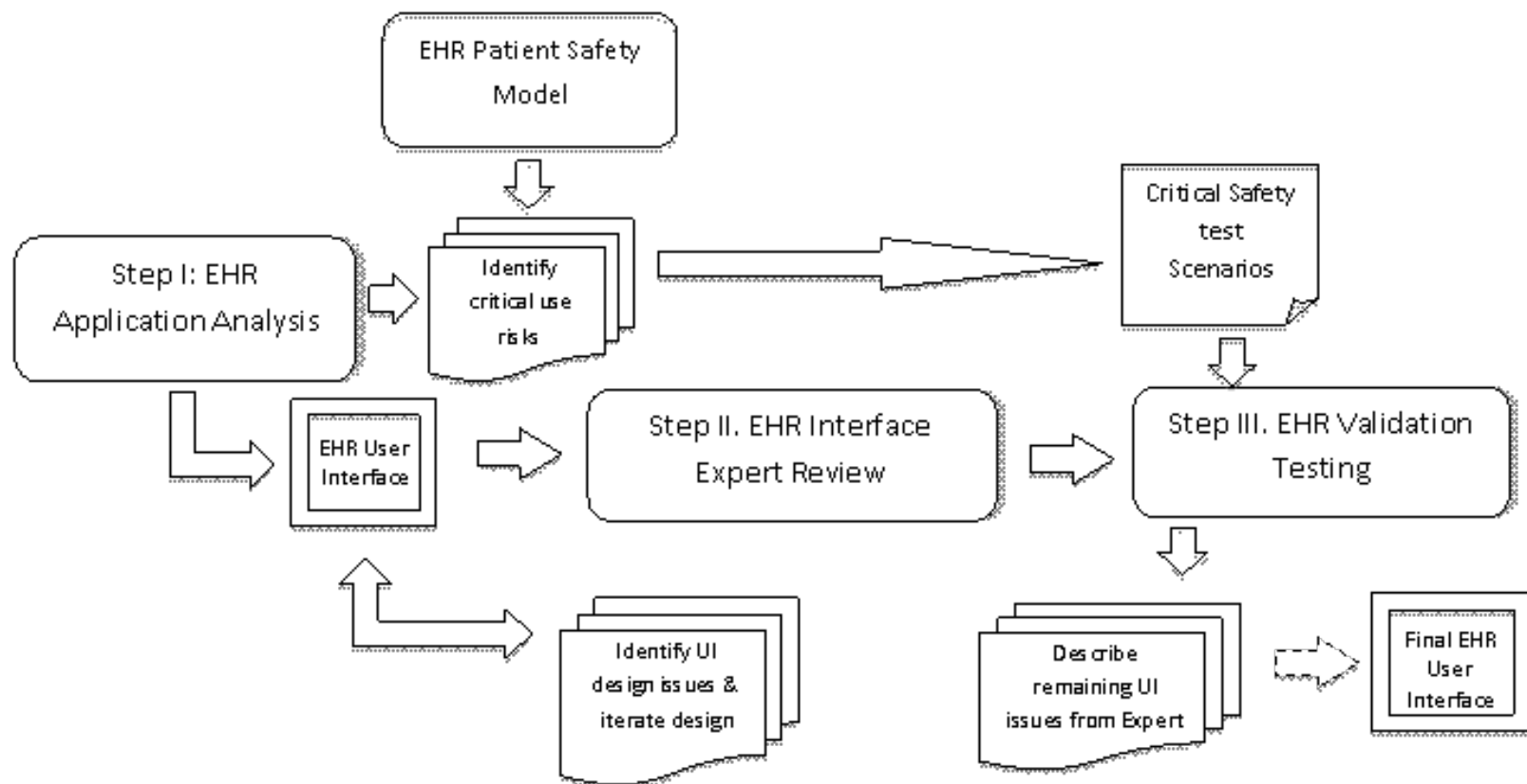
Establishing the Metrology

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

- ▶ 3 Step protocol for demonstrating that EHRs are free from critical “use error”
 - ▶ Use of CIF (Common Industry Format) for Reporting Results of Validation Testing
 - ▶ www.nist.gov/healthcare/usability
- 

NISTIR 7804 – EUP Process

Figure 1. EUP Three-Step Process



NIST Technical Guidance

- ▶ NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records (NISTIR 7741)
- ▶ Customized Common Industry Format Template for Electronic Health Record Usability Testing (NISTIR 7742)
- ▶ Human Factors Guidance to Prevent Healthcare Disparities with the Adoption of EHRs (NISTIR 7769)
- ▶ “Technical Evaluation, Testing and Validation of the Usability of Electronic Health Records” (NISTIR 7804)

www.nist.gov/healthcare/usability



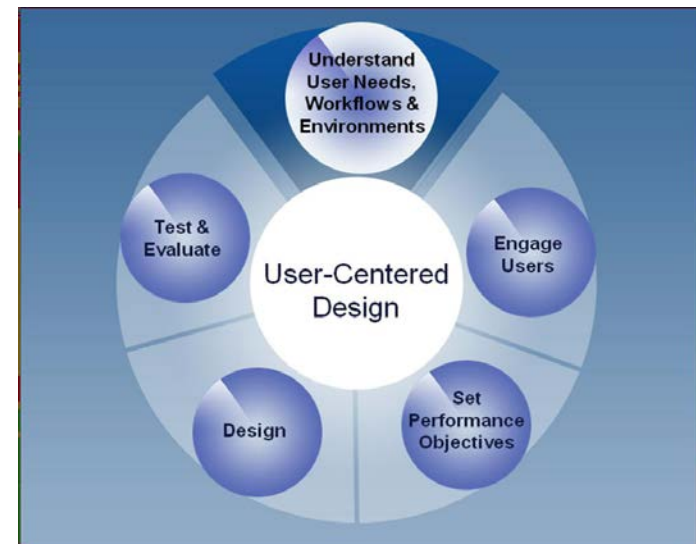
Back to the IOM Report

- ▶ “The National Institute of Standards and Technology (NIST) has been developing guidelines and standards for usability design and evaluation ...Usability guidelines and principles focused on improving safety need to be put into practice.”
- ▶ – *Institute of Medicine, “Health IT and Patient Safety: Building Safer Systems for Better Care”, 2012*



So what can we do?

- ▶ Integrate security with usability and accessibility
- ▶ Integrate usability into software development processes
- ▶ Apply user-centered design (UCD)



www.nist.gov/healthcare/usability

- ▶ NIST Technical Guidance
- ▶ NIST EHR Usability Wiki
 - Available from the above address

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EHR Accessibility

David Baquis

U.S. Access Board

What is the Access Board?



U.S. Access Board

- Independent Federal agency
- Promulgates guidelines and standards for accessible design
- Provides technical assistance and training

With regard to technology, the Access Board promulgated:

- Accessibility Guidelines for Section 255 of the Telecommunications Act
- Accessibility Standards for Section 508 of the Rehabilitation Act
- Assists Election Assistance Commission in development of voting systems guidelines

What is Accessibility?

Accessible Design

- Accessibility is design criteria which removes barriers that make it difficult or impossible for some people with disabilities to use HIT
- It's rooted in civil rights with the intention to provide an assurance of technological non-discrimination

Standards and Guidelines

Web Content Accessibility Guidelines (2008)
(WCAG 2.0: <http://www.w3.org/TR/WCAG/>)

Section 508 Standards (2000)
www.section508.gov

Stakeholders

Who Benefits?

Disabilities:

- Hearing
- Vision
- Speech
- Mobility
- Dexterity
- Cognitive

User groups:

- Patient/clients
- Guests/customers
- Clinicians
- Caregivers/families
- Students/instructors
- Admin personnel
- Payers/insurance reps
- Analysts, researchers

Accessibility Examples

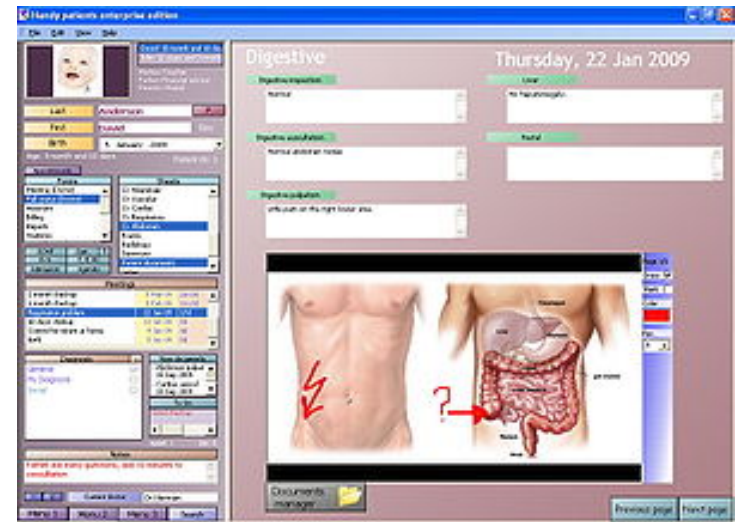
Internet Sites

- Are text equivalents provided for non-text elements?
- Are multimedia videos captioned?
- Are row and column headers identified in data tables?



PHR Development Software

- Non mouse use: Can I create and update a PHR using only a keyboard?
- Do electronic forms allow assistive technology to access the information and functionality necessary for completion and submission of the forms?
- Alternative means of identifying elements, for people who are color blind?



Handheld Devices



Health Information Kiosks

- Touchscreens: Tactilely discernible keys needed
- Audio jack needed for privacy of speech output
- Timed responses provide an alert and means of extending time



Information Assurance

- There is no need for accessibility to result in less IT security
- However, sometimes security can interfere with IT accessibility.
 - Example: identity authentication

CAPTCHA accessibility



- **Audio** CAPTCHAs help visually impaired individuals navigate the web.
- The CAPTCHA Project is a project of the School of Computer Science at Carnegie Mellon University: <http://captcha.net>
- Introduction to “Inaccessibility of CAPTCHA”
<http://w3.org/wai/intro/captcha>

Fingerprint Biometrics



ICT Refresh includes:

- Proposal to harmonize with Web Content Accessibility Guidelines (WCAG)
- Provision for preservation of accessibility information
- Provisions supporting video communication (sign language)

HHS EHR Challenge Grant

- Design, test, implement a module prototype application that is not only compatible and consistent with certified EHR system, but ensures accessibility and easy interaction by people with disabilities.

**Focus on
CONSUMER**

How to Reach the U.S. Access Board

- **Telephone (voice):**
 - **202-272-0013 (direct to David Baquis)**
 - **800-872-2253 (toll-free in U.S.)**
- **E-mail: 508@access-board.gov**
- **Internet: <http://www.access-board.gov>**

Q&As

- What requirements do states have for IT accessibility?
- How to evaluate websites for accessibility conformance?
- What barriers exist in e-learning and online collaboration?
- Does providing accessibility pose an undue burden?