

# Usability: An Introduction

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# Defining Usability

- ▶ Usability has been studied in computer science and information technology for decades
  - HCI
- ▶ Usability is best defined as the ease of use of a system by humans
- ▶ Usability = Usable + Useful
  - Usability = Usable + Useful + Safe

# Usable Information Systems

- ▶ How easy it is to use?
- ▶ How efficient is it?
- ▶ How easy is it to learn?
- ▶ How enjoyable it is to use?

# Useful Information Systems

- ▶ Does it help you in your day?
- ▶ Physicians look for three things when using HIT:
  - Helps with my patients
  - Improves patient care (my patients)
  - Makes job easier
    - 1. Weiner M, Gress T, Thiemann DR, Jenckes M, Reel SL, Mandell SF, et al. Contrasting views of physicians and nurses about an inpatient computer- based provider order-entry system. J Am Med Inform Assoc. 1999;6(3):234-44.

# Usability, Satisfaction, and Efficiency: Kannry and Murff

- ▶ Using a standardized instrument, QUIS, assessed user satisfaction with two CPOE systems
- ▶ House staff were dissatisfied with the commercial system
  - mean score of 3.67 (95 percent confidence interval [95%CI], 3.37-3.97).
  - CPRS had a mean score of 7.21 (95% CI, 7.00-7.43)
    - House staff satisfied with the system

# Usability, Satisfaction, and Efficiency:

## Kannry and Murff

- ▶ “Satisfaction was most strongly correlated with the ability to perform tasks in a "straightforward" manner.”
  - Murff HJ, Kannry J. Physician satisfaction with two order entry systems. J Am Med Inform Assoc. 2001 Sep-Oct;8(5):499-509.
- ▶ Similarly noted
  - Sittig DF, Kuperman GJ, Fiskio J. Evaluating physician satisfaction regarding user interactions with an electronic medical record system. Proc AMIA Symp. 1999:400-4.

**Usability: A nice concept but...**

Why Does It Matter?

# Usability Matters

- ▶ Patient Safety
- ▶ User Satisfaction

# Usability and Patient Safety

# Usability: Recommended Or Required By

- ▶ Task force on EHR 2020 recommends focusing on Usability
  - Payne TH, Corley S, Cullen TA, Gandhi TK, Harrington L, Kuperman GJ, et al. Report of the AMIA EHR 2020 Task Force on the Status and Future Direction of EHRs. J Am Med Inform Assoc. 2015 May 28.
- ▶ Usability issues can result in unintended consequences and patient harm
  - Middleton B, Bloomrosen M, Dente MA, Hashmat B, Koppel R, Overhage JM, et al. Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. Journal of the American Medical Informatics Association. 2013;20(e1):e2-e8.

# Usability Causing Patient Harm

- ▶ Alphabetizing dosing choices for medication dosing
  - Eight, four, five, one, nine, six, seven, three, two
- ▶ No known allergy and no known drug allergy + multiple allergies
- ▶ No allergy button and there are known allergies
  - Kannry J, Kushniruk A, Koppel R. Meaningful Usability: Health Care Information Technology for the Rest of Us. In: Ong K, editor. Medical Informatics: An Executive Primer. 2nd ed. Chicago: HIMSS; 2011.

# Usability Recommended Or Required By

- ▶ NIST (National Institute of Standards and Technology)
  - Recommends EHRs should be tested for Usability
  - Uses Nielsen's 10 Heuristic Rules for Usability
    - Nielsen J. 10 Usability Heuristics for User Interface Design 1995 Available from:  
<http://www.nngroup.com/articles/ten-usability-heuristics/>

# Nielsen's 10 Heuristic Rules

- ▶ **Visibility of system status**
- ▶ **Match between system and the real world**
- ▶ **User control and freedom**
- ▶ **Consistency and standards**
- ▶ **Error prevention**

# Nielsen's 10 Heuristic Rules

- ▶ **Recognition rather than recall**
- ▶ **Flexibility and efficiency of use**
- ▶ **Aesthetic and minimalist design**
- ▶ **Help users recognize, diagnose, and recover from errors**
- ▶ **Help and documentation**
  - 10 Heuristics for User Interface Design: Article by Jakob Nielsen <http://www.nngroup.com/articles/ten-usability-heuristics/>

# Usability Recommended or Required By

- ▶ ONC(Office of the National Coordinator) for both Stage 2 and 3 Certification
- ▶ Stage 2 requires a User Centered Design (UCD) process and “Summative Usability” on Sections of Application
- ▶ Stage 3 requires testing for tasks
  - Effectiveness
  - Efficiency
  - Satisfaction

# Usability Recommended or Required By

## ▶ ONC Tasks

- 1. Computerized Provider Order Entry System (CPOE) (§ 170.314(a)(1));
- 2. Drug- drug, drug-allergy interaction checks (§ 170.314(a)(2));
- 3. Medication list (§ 170.314(a)(6));
- 4. Medication allergy list (§ 170.314(a)(7));
- 5. Clinical decision support (§ 170.314(a)(8));
- 6. Electronic medication administration record (§ 170.314(a)(16));
- 7. Electronic prescribing (§ 170.314(b)(3));
- 8. Clinical information reconciliation (§ 170.314(b)(4)).
  - <http://www.healthcareusability.com/article/170314g3-safety-enhanced-design-and-meaningful-use-stage-two-and-three>

# Usability: How Well Do the Vendors Do Today on UCD (User Centered Design)?

- ▶ 11 Vendors
- ▶ 3 Categories: Well-Developed, Basic, and Misconceptions
- ▶ Staff: 0 to >30

# Usability: How Well Do the Vendors Do Today on UCD (User Centered Design)?

- ▶ Challenges

- “Contextual workflow”

- Participants

- Vendor leadership

- Ratwani RM, Fairbanks RJ, Hettinger AZ, Benda NC. Electronic health record usability: analysis of the user-centered design processes of eleven electronic health record vendors. Journal of the American Medical Informatics Association : JAMIA. 2015 Jun 6.

# Usability and Use

- ▶ iCPR was a (RCT) (Randomized Control Trial) looking at the integration Clinical Prediction Rules in an EHR
- ▶ iCPR used multiple rounds of usability testing and iterative development
- ▶ Users adopted the intervention (57.4% of users) and accepted the recommendation (42.7% of users)
  - \***Kannry, J**, McCullagh L, Kusniruk, A, Mann, D, Edonyabo, DA Mcginn T. Framework for Usable and Effective Clinical Decision Support: Experience from the iCPR Randomized Clinical Trial. eGEMs. Vol. 3 (2015). Iss. 3

# Concluding Thoughts

- ▶ Usability = usable + useful
- ▶ Profound effect on user satisfaction and patient safety
- ▶ Recommended or required by 2 AMIA Task Forces, NIST, and ONC
- ▶ Every Enterprise should have a Usability Testing Laboratory

# Concluding Thoughts

- ▶ Vendor Testing variable
- ▶ Multiple papers point to a lack of standard scripts and workflows to test usability on
- ▶ All agree usability is critical for safe and continued used of EHRs.