Improving People's Lives Through Innovations in Personalized Health Care

You've Left the Hospital. What Medications are You Taking?

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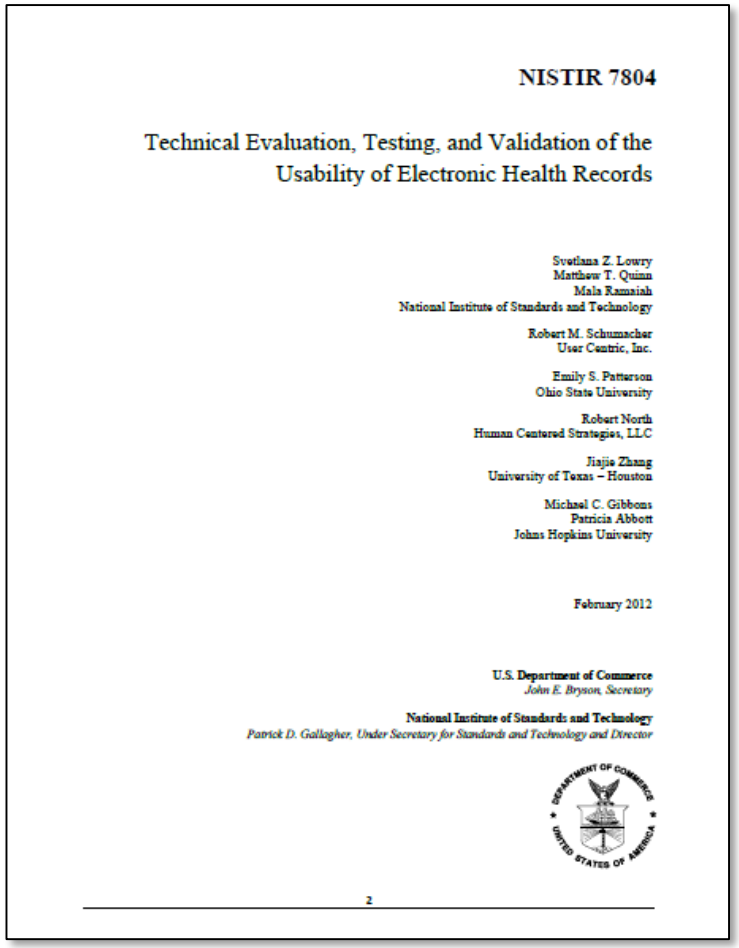
The views expressed do not necessarily represent NIST.

Human Factors Engineering

Applies systems thinking to enable **experts** in specialized roles to **effectively and easily use** complex **technology**

NISTIR 7804 Guidance

- Identify critical use risks:
  - Causes of failures
  - Task difficulties
- Mitigation plan:
  - Interface modification
  - Augment software



NISTIR 7804

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

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Medication Reconciliation*

- **Task:** Prescriber reconciles medications post-discharge in outpatient visit

- **Failure:** Prescriber verifies duplicate orders

  Lipitor 80 mg
  Atorvastatin 40 mg

- **Risk:** Patient mortality

***Fictional Example**

Task Difficulties

- Generic and brand names are confusing, particularly with changes in response to formulary/insurance/cost considerations
- Confusing whether primary care and specialist care is responsible for medication
- Complex elderly patient with damaged liver on 14 medications with frequent dose changes
- Initial dose increased over time

  Provider1 Lip10+At10+(Lip40+Lip20) mg

  Provider2+3 At20+At20 mg

Environmental Difficulties

- Time pressure
- Multiple interleaved tasks (‘stacking’)
- Patient communication directs attention
- Interruptions for orders for immediate tests and nurse/radiologist/others’ need for provider decisions on other patients
- Barriers to intended actions from ‘third party’
- Multiple software applications with logins
- Redundant data entry/extra steps due to interoperability gaps

Mitigation Plan Possibilities

- Augment: ‘At-a-glance’ grouped medication display
  - Group and add doses from the same provider
  - Cluster order changes (including discontinued)
  - Group medications by body system
- Augment: 3 levels of verification per medication
  - Fully verified
  - Likely not correct, but not certain
  - Not under scope of care responsibility
- Modify: Design of alerts
  - Reduce false alarms
  - Standardize content and format

Example of Human Factors Guidance

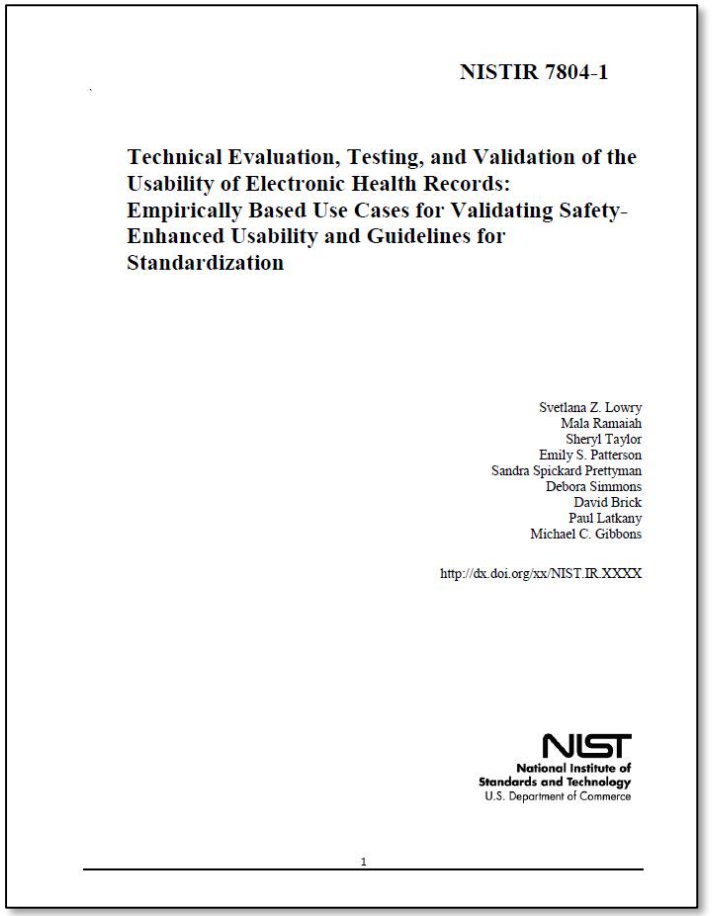
- For procurement, design, development, and testing of aviation systems, facilities, and equipment
- **Simplicity principle**: Information should be presented simply and in a well-organized manner
  - **Guidance example**: Information should be presented in consistent, predictable locations

NISTIR 7804-1 Guidance for Standardization

1) Consistently display information critical to **patient identification** in a **reserved area** to avoid wrong patient errors

2) Provide **cues** to reduce the risk of entering information and **writing orders** in the **wrong patient's chart**

3) Support efficient and easy **identification of inaccurate,** outdated, or inappropriate **items in lists** of grouped information by having information presented clearly and in a well-organized manner.



NISTIR 7804-1

Technical Evaluation, Testing, and Validation of the Usability of Electronic Health Records: Empirically Based Use Cases for Validating Safety-Enhanced Usability and Guidelines for Standardization

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3…Identification of inaccurate…items in lists

3.7 Support assessing relationships of displayed information and allowing users with appropriate permissions to modify locations and relationships for inaccurately placed information, including laboratory results, imaging results, pathology results, consult notes, and progress notes. This includes information within a single patient's chart as well as information placed in the wrong patient's chart. The information about the time and person that made the change should be viewable on demand.

Summary: Human Factors Guidance for Redundant Medication Order

NISTIR 7804 Guidance

1) Identify critical use risks
   - Causes of failures
   - Task difficulties
2) Create and test a mitigation plan
   - Interface modification
   - Augment software

NIST 7804-1 Guidance

1) Standardize grouped, organized list
   - in order to support easily assessing relationships of displayed information