The Relationship between Health IT Usability and Patient Safety: Towards an EHR Usability Safety Framework

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Improving People's Lives through innovations in personalized health care
Usability:
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

Patient safety:
System attribute that influences the risk of patient harm due to errors
The EHR-USF Framework

Use Errors
- Patient ID error
- Mode error
- Data accuracy error
- Visibility error
- Consistency error
- Recall error
- Feedback error
- Data integrity error

Severity Frequency

Risk Factors

Patient Harm
- Never events
- Sub-standard care
- Morbidity
- Mortality

Detectability Complexity

Evaluative Indicators
- Workarounds
- Redundancies
- Burnout

Medical Center
Use Error: Patient ID Error

- EHR: Patient A
- EHR: Patient B
- Imaging: Patient A
Use Error: Mode Error

Direct Dose Mode (mcg/min)
Weight Dose Mode (mcg/kg/min)

Test Mode
Production Mode
Use Error: Data Accuracy Error

Lidocaine Hydrochlor
Use Error: Visibility Error

80 mg
Use Error: Consistency

Kilograms or pounds?
Use Error: Recall Error

One Time Dose
Use Error: Feedback Error

1 tablet
Use Error: Data Integrity Error
The EHR-USF Framework

**Use Errors**
- Patient ID error
- Mode error
- Data accuracy error
- Visibility error
- Consistency error
- Recall error
- Feedback error
- Data integrity error

**Risk Factors**
- Severity
- Frequency
- Detectability
- Complexity

**Patient Harm**
- Never events
- Sub-standard care
- Morbidity
- Mortality

**Evaluvative Indicators**
- Workarounds
- Redundancies
- Burnout

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Medical Center
Never Events

Wrong patient action of commission
Wrong patient action of omission
Wrong treatment action of commission
Wrong treatment action of omission
Wrong medication
Delay in care
Unintended care
The EHR-USF Framework

**Use Errors**
- Patient ID error
- Mode error
- Data accuracy error
- Visibility error
- Consistency error
- Recall error
- Feedback error
- Data integrity error

**Severity**

**Frequency**

**Risk Factors**

**Detectability**

**Complexity**

**Patient Harm**
- Never events
- Sub-standard care
- Morbidity
- Mortality

**Evaluable Indicators**
- Workarounds
- Redundancies
- Burnout

**Medical Center**
Scenario #1: Ambulatory Care (Diabetic)

Includes NIST Test Procedures (V1.1)

§170.302.a Drug-drug, drug allergy, formulary checks
§170.302.c Maintain up-to-date problem list *
§170.302.d Maintain Active Medication List *
§170.302.h Incorporate Lab Test Results *
§170.304.h Clinical Summaries *
§170.306.a Computerized Provider Order Entry
§170.306.g Reportable Lab Results *
§170.302.g Smoking Status
Scenario #1: Ambulatory Care (Diabetic)

Task 1: Review active patient medications and medication history to identify if prescription refills are needed and ensure that discontinued medications do not need to be renewed
Task 2: Review patient labs to determine if changes are needed for care plan
Task 3: Modify active medications
Task 4: Order new medications
Task 5: Update problem list
Task 6: Order a consult
Task 7: Document progress note
Scenario #2: Inpatient Care (Chest Pain)

Includes NIST Test Procedures (V1.1)

§170.304.h  Clinical Summaries *
§170.306.a  Computerized Provider Order Entry
§170.302.q  Automatic Log-off
§170.304.b  Electronic Prescribing *
§170.304.j  Calculate & Submit Quality Measures
§170.306.e  Electronic Copy of Discharge Information
§170.306.h  Advance Directives
Scenario #2: Inpatient Care (Chest Pain)

Task 1: Document STAT administration
Task 2: Enter vital signs
Task 3: Order cardiac labs
Task 4: Modify active medications
Task 5: Review labs
Task 6: Document DNR status
Task 7: Determine status of STAT medication ordered 2 hours prior
Task 8: Finish handoff documentation
Task 9: Day 2. Review morning labs, vital signs
Task 10: Transfer to outpatient medications
Task 11: Print discharge summary
Task 12: Print a quality measure report
Factors to Approach Real-World Complexity

- Increase dose of existing medication
- Drug interaction warnings: false alarms
- Taper dose for steroids
- First dose now and subsequent doses tomorrow
- Verbal order
- Change form of medication (PO to IV)
- Handoff
- Interruptions
- Follow-up documentation of prior work
- Batch transfer of medications
Thank you for your attention

Questions?