

Increasing EHR System Usability Through Standards As One Approach to Reducing Clinician Burden

HL7 EHR-S Usability Work Group

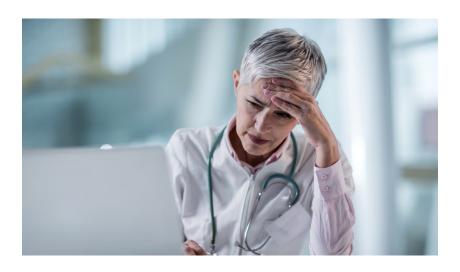
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EHRs' Unfulfilled Promises

- Decreased efficiency: EHRs add 1-2 hours to the average MD workday
- Disconnect from patients: providers spending 50% or more of their time in the EHR
- Disruption of clinician work-life balance and an epidemic of burnout
- Modest improvement in care process metrics and guideline adherence
- No significant change in large scale health outcomes
- Annual US healthcare expenditures increased from \$2 trillion in 2005 to over \$3.5 trillion in 2017

Why Do So Many Promises Remain Unfulfilled?



- Poor usability and poor support for clinical workflow are major factors—possibly the most important factors—preventing health IT from achieving its goals
- Suboptimal human factors engineering and a challenging user experience have a strong, often direct connection to decreased clinical productivity, increased cognitive load, increased error rates, increased user fatigue, and decreased user satisfaction—i.e. a connection to clinician burden



Physician Burnout

Burnout is a syndrome characterized by

- Emotional exhaustion
- Feelings of cynicism and detachment from work
- Sense of low personal accomplishment
- 54-68% of US physicians report at least one symptom of burnout (twice the rate of the general population)
- 70 % of US physicians report symptoms of health IT-related stress
- 53% of self-reported physician stress and burnout is correlated with EHRs and clinical process design highly impacted by EHRs
 - 1. Gardner, RL et al. (2019) Physician stress and burnout: the impact of health IT. JAMIA 26(2): 106-114.
 - 2. Kroth, PJ et al. (2019) Association of EHR design and use factors with clinician stress and burnout. JAMA Network Open 2(8):e199609

EHR Design and Use Factors Associated with High Clinician Stress

- Information overload (poor interface design)
- Excessive, inefficient data entry
- Slow, confusing system navigation
- Interference with patient-clinician relationship

Kroth, PJ et al. (2019) Association of EHR design and use factors with clinician stress and burnout. JAMA Network Open 2(8):e199609

HL7 EHR-S Usability WG: Goals

- Increase EHR system usability through standards
- Translate well established usability guidelines (heuristics) into functional conformance criteria for the HL7 EHRsystem Functional Model Release 2 (EHR-S FM)
 - Well defined function statements and descriptions
 - Criteria to evaluate conformance to the function
- Develop two companion functional profiles for the EHR-S FM
 - User-centered design functional profile
 - System infrastructure design functional profile

HL7 EHR-S Usability WG: Methods

- Recruit and engage clinicians, vendors, academicians specializing in usability and human factors research, implementers, SDOs, etc.
- Collect and perform an analysis of
 - Targeted literature reviews, environmental scans, and other academic sources
 - Government publications (AHRQ, NIST) and others from governments outside the US)
 - Technical materials (e.g., the UK's Common User Interface specification, Australia's usability specification)
 - Work items on usability from professional associations (e.g., the HIMSS EHR Usability Task Force)
 - Work items from SDOs (HL7, ISO/TC 215, ...)
 - ONC Standards coordination efforts and ongoing projects (ex; SHARP-C and UTH NCCD)

Conformance Criteria

EHR-S Functional Model

What systems must do to be considered an EHR (Functions)



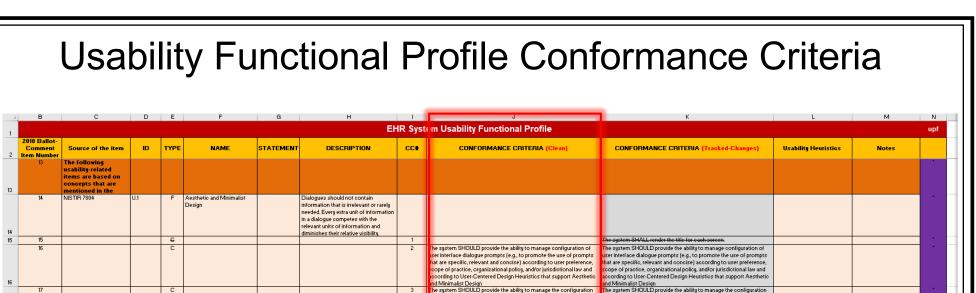
Measurable aspects of conformance to function (Conformance Criteria)

Usability Functional Profile

What EHR systems must do to be usable (Usability Functions)



Measurable aspects of conformance to function (Conformance Criteria)



f user interface screen/window layout (e.g., to promote clean,

fficient, uncluttered human-computer interfaces, with minimal pression of a screen's title, identification fields, logos, banners, lialog boxes, prompts, alerts, reminders, pictures, graphics, and/or

leuristics that support Aesthetic and Minimalist Design

Users should not have to wonder whether different words, situations or actions mean the same thing. Follow

Usability_FP Usability Glossary

ons) according to user preference, scope of practice, organizational

olicy, and/or jurisdictional law and according to User-Centered Design

he system SHOULD provide the ability for a user to maintain selected

er-generated text by transforming the selected text from one case to other case (e.g., transforming UPPERCASE to Sentence Case).

The system SHALL render computer interface text elements according ot user-Centered Design Heuristics that balance the use of IPPERCASE text versus other case text according to scope of tractice, organizational policy, and/or jurisdictional law. The system MAY provide the ability for a provider to capture and

ender a "self-generated, temporary, free-form note" for later entry as

ormal, definitive documentation (e.g., using raw, original, abbreviated,

emporary, shorthand note that may use marks) according to user-role

risdictional law. Note: The raw, original, abbreviated, shorthand marks

re not typically needed by the author after they have been reformatted

to formal, longhand notes and are tupically discarded by the author.

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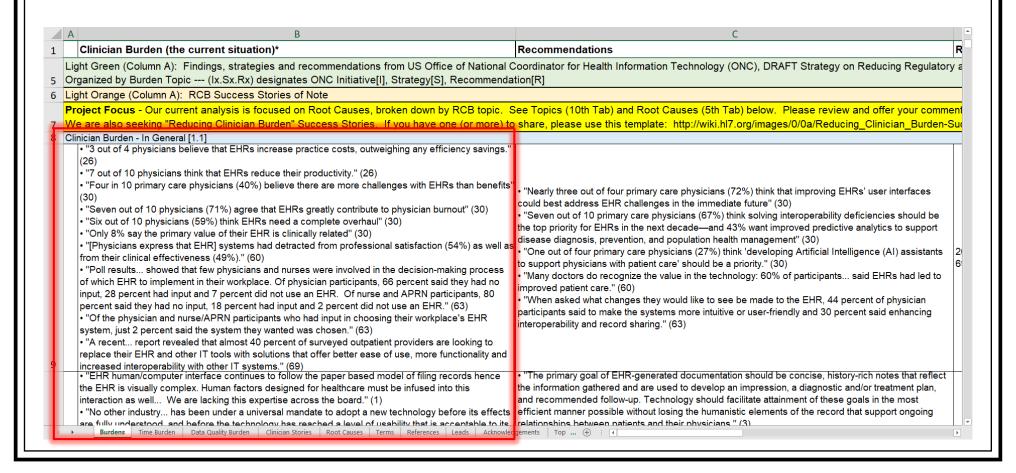
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RCB Project Analysis Worksheet



RCB Project Burden Statement

Cell B 69

• "Improve presentation of clinical data within EHRs. EHRs contain vast quantities of clinical data and are capable of sending and receiving incredible amounts of patient information with a keystroke. This can present a challenge for the end user trying to locate one critical piece of information; a needle in the proverbial haystack. Various modes of information storage also complicate finding desired data—some information is stored as structured data, while other data are contained in scanned images files..." (50, I2.S1.R4)

NISTIR 7804 Heuristic:

Aesthetic and Minimalist Design

Usability FP Conformance Criterion

Cell O 31, ID U.1, CC 2

The system SHOULD provide the ability to manage the configuration of the representation of data (e.g., by configuring the user interface screen/window layout to promote clean, efficient, uncluttered human-computer interfaces, with minimal expression of a screen's title, identification fields, logos, banners, dialog boxes, prompts, alerts, reminders, pictures, graphics, and/or icons; offering differing representational modes for conveying raw-data information (e.g., pain scale of 1-10 versus frown/smile face)) according to user preference, scope of practice, organizational policy, and/or jurisdictional law and according to User-Centered Design Heuristics that support Aesthetic and Minimalist Design.

RCB Project Burden Statement

Cell B 110

• "Better align EHR system design with real-world clinical workflow. A disconnect exists between real-world clinical workflows and the design of health IT systems. Clinicians and other health care providers often must modify their optimal clinical workflow to satisfy the electronic workflow of the health IT system..." (50, I2.S1.R1)

NISTIR 7804 Heuristics:

Flexibility and efficiency of use Recognition rather than recall

Usability FP Conformance Criteria

Cell O 46 ID U.2 CC14

The system SHOULD present menu choices in a clinically relevant, contextually consistent, and workflow optimized fashion according to user preference, user role, scope of practice, organizational policy, and/or jurisdictional law and according to User-Centered Design Heuristics that support Recognition Rather than Recall.

Cell O 162 - 164, ID U.8, CC 4 - 6

The system SHOULD provide the ability to capture various combinations of steps of a workflow into a single command from a user in order to complete a task (e.g., so a novice can perform a complex command in a stepwise fashion versus an expert performing multiple steps with a single command) according to user preference, scope of practice, and/or organizational policy.

RCB Project Burden Statement	Usability FP Conformance Criteria
 Cell B 89 "[There is often insufficient capability to] distribute work appropriately across members of the care team" (4) "[There is a lack of ability to designate] clear role transferability and accountability within the team" (4) "Routing all communication among team members through the EHR adds layers of inefficiency and distracts the team from higher-quality verbal communication. 	Cell O 54 ID U.2, CC 22 The system SHOULD render practitioner names, titles, and roles as expressed in a consistent, minimal, and appropriate fashion according to user preference, scope of practice, organizational policy, and/or jurisdictional law and according to User-Centered Design Heuristics that support Consistency and Standards. Cell O 557 – O 562, CC 1, 2, 6 The system MAY provide the ability to capture a request-for-action from another provider(s).
NISTIR 7804 Heuristic: Consistency and standards	The system MAY provide the ability to transmit a request-for-action to another provider(s).
Usability WG Heuristic: Manage workflow communication support	The system MAY provide the ability to transmit to another provider an acknowledgement of the receipt of that provider's request-for-action.

RCB Project Burden Statement	Usability FP Conformance Criteria
 "Promote and improve user interface design standards specific to health care delivery. There is currently variable adherence to usability best practices among EHR products. This creates greater difficulty for end users to perform common workflow tasks and may increase clinician 	Cell O 43, ID U.2, CC 11 The system SHOULD present consistent, distinct, easy-to-understand icons with supplemental interpretation capability (e.g., depending on technology-specific capabilities, a mouse-over popup description or a long-press versus a finger-tap on the screen).
frustration" (50, I2.S2.R2) NISTIR 7804 Heuristic: Consistency and Standards	Cell O44, ID U.2, CC 12 The system SHOULD present consistent, semantically self-evident, standards-based iconography that is limited to basic types of icons (e.g., no more than twelve-to-twenty icon types per screen as recommended by industry guidelines).

Comments And Questions?

