

Certification/Adoption Workgroup

Panel 1

Nancy Stagers, PhD, RN, FAAN
Professor of Informatics, School of Nursing, University of Maryland

Questions: 1) How do clinicians generally view usability? 2) What aspects of use/workflow/device interaction/data presentation are the most important regarding clinicians' EHR systems? 3) How do providers define what are mission critical usability issues, and what are ease-of-use usability issues?

Clinicians/nurses generally view electronic health records (EHRs) as superior to paper-based systems but consider EHR usability a significant challenge. The following represent comments from the Alliance for Nursing Informatics¹ leaders, views from nurses in EHR projects and my research.

Supporting patient-centered information flow. A central premise for EHR usability is having patient-centered data for effective care coordination. Nurses assume *primary* responsibility for coordinating care, a national priority and central element of nursing practice. Data and information must flow seamlessly with the patient, across and within systems, making integration/interoperability a usability concern. Using pressure ulcers as an example, as many as 3 million patients are treated in U.S. healthcare facilities each year for pressure ulcers, costing an estimated \$15.6 billion. Research shows the value of nursing care in prevention and treatment, from the ICU to the home. The ICU nurse should be able to see the pressure ulcer treatment plan used by the home care nurse and vice versa. Today, however, nurses must access each profession's plan of care separately through disparate systems, if they are available at all in a system. Systems may have different data structures and user interfaces. As a result, the "patient centered plan" is highly dependent on a provider's memory, and plans of care are often created de novo for each inpatient episode.

Another example is a surgical patient's information flow. A surgical patient enters the ED, goes to the OR, then to PACU, ICU and an intermediate care unit before being transferred to a community hospital. Even within one facility, each area can be supported by a different vendor's product. Interoperability among these systems varies from none to partial, including paper documents, thus affecting care continuity, patient safety and clinician efficiency. To coordinate care, nurses must access and navigate each system to retrieve salient data and manually enter data into their own system.

EHR design and usability should reflect the interdependent nature of clinical teams as well as independent, professional roles. Today less emphasis is placed on team-based care generally and the roles of some team members specifically. Functions to support patient-centered teams need to be available, coordinated across individual roles, meaning that better support is needed for nurses, pharmacists, respiratory therapy, nutrition care, physical therapy, social work, occupational therapy, ancillary EHR users in laboratory, radiology and patients using personal health records integrated with EHRs.

Another major consideration of EHR usability is the design and use within specific contexts. The usability of an EHR designed for patient care in medical units will be quite unusable in home care, pediatrics or a labor and delivery setting because of differences in work design; yet organizations still deploy EHRs without considering this basic premise. Usability testing will need to take into consideration typical health contexts such as: acute care, intensive care, home care, skilled nursing facilities, infusion centers, interventional radiology/cardiology and personal health records linked to EHRs.

Finding Critical Data. A significant usability challenge is finding pertinent data in the sea of available electronic information in an EHR. Clinicians need to be able to answer these kinds of questions: 1) What

has changed on this patient over the last 2/4/8/12/24/48 hours? 2) Are these patients' vital signs/lab values trending up or down over time? 3) How has the change in medication affected the patient's blood pressure or pain scale rating? 4) What is the set of combined social, financial, and functional status information that will impact the decision to place a patient into an independent living versus a skilled nursing facility? These usability challenges require data to be available across traditional EHR modules in a format that is consolidated beyond alerts for discrete issues. Stead and Lin called this "cognitive support"² for providers.

Currently, users must flip through screen after screen to find data of interest for even seemingly simple data. This is a serious issue for nurses. In hospitals, nurses often lead care coordination across disparate professions and information. Nurses work with patients and families to coordinate outcomes. Nurses are patients' 24 x 7 patient advocates coordinating across the team of providers, but data for this coordination is often assembled via memory, on paper, or contained in a separate note within a set of hundreds of other documentation entries in an EHR. One clinician called re-entering these kinds of data, "Death by keystroke." Not only time-consuming, this process is highly prone to errors of omission.

Summary screens and interdisciplinary care coordination for health team members should be available in a format that is consistent across vendors. Summary screens would include data trends and other easily discernable changes in patients' conditions. Adaptive screens are needed so that clinicians can tailor screens to salient information for *this nurse, this setting, this time, this patient*.

Providing Synthesized Data. Specific usability challenges exist anywhere information synthesis occurs for care coordination such as patient handoffs or in electronic medication administration (eMARs). Clinicians need to be able to obtain the "big picture" of the patient. For example, what are the current problems for this patient who has multiple co-morbidities? Are there critical changes in this patient for the last 12 hours since I was on shift? How much insulin did this patient receive over the last two days and how does that correlate with serum glucose levels? These kinds of data represent material for patient care handoffs and are difficult to locate in data-intense EHRs.³ Electronic MARs are currently a particular challenge.⁴ These need to be designed for "at a glance" information with commonly understood icons, support for common tasks such as a list of missed medications and easily discernable medications that are being held.

Mandating Consistency. Currently every EHR has a unique set of icons, displays and information flow. Most clinicians use more than one EHR and must learn and remember differences in navigation, formats, icons, system quirks as well as the location of crucial information. Consistency is needed for common functions and icons. A national library of standard healthcare icons should be available and used across EHR vendors. Common terms for functions, consistent designs for critical applications such as eMARs and consistent summary pages should be available to minimize errors, omissions and delays in locating pertinent information.

Last, the impact of new regulatory changes such as medication reconciliation or documenting "end IV times" creates substantial effort for sites and providers, can result in system work-arounds, inelegant solutions and inconsistencies as every vendor instantiates changes differently. These changes are well-intended but act as cobbled, piecemeal changes over time without consideration to overall workflow.

National efforts to improve usability standards and interoperability are suggested, for example: 1) Create a national electronic master patient index and master provider index 2) Create a national healthcare icon library, 3) Create standard patient summary displays for use across systems, 4) promote usability in organizations and vendors by incorporating principles in the HIMSS Usability Maturity Model.^{5,6}

Thank you for the opportunity to present this material.

References and Resources

1. ANI (2011.) Alliance for Nursing Informatics. Available at <http://www.allianceni.org/>
2. Stead, W., & Lin. (2009). *Computational Technology for Effective Health Care: Immediate Steps and Strategic Directions*. National Research Council of the National Academies. Washington, D.C.: National Academies Press.
3. Guo, J., Irdarren, S., Kapsandoy, S., Perri, S., & Stagers, N. (in press). A heuristic evaluation of a vendor's Electronic Medication Administration Record (eMAR). *Applied Clinical Informatics*.
4. Stagers, N., Clark, L. Blaz, J. & Kapsandoy, S. (in press). Why patient summaries in Electronic Health Records do not provide the cognitive support necessary for nurses' handoffs on medical and surgical units: Insights from interviews and observations. *Health Informatics Journal*.
5. TIGER. Usability and Application Design Collaborative Report. TIGER (Technology Informatics, Guiding Educational Reform). Available at: <http://www.thetigerinitiative.org/resources.aspx>
6. HIMSS (2011). Promoting Usability in Healthcare Organizations: Initial Steps and Progress Toward a Usability Maturity Model. Health Information Management and Systems Society (HIMSS) Usability Taskforce. Available at: http://www.himss.org/content/files/HIMSS_Promoting_Usability_in_Health_Org.pdf.