Mitigating patient safety hazards of EMRs

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Human activity is error-prone

The Institute of Medicine has highlighted that all human activity is error-prone, including health care delivery (Committee on Quality of Health Care in America, 2000). For example, a recent meta-review of ambulatory care has found a median incidence of 5.6 preventable adverse drug events per 1000 person-months (Thomsen, Winterstein, Søndergaard, Haugbolle, & Melander, 2007). Entering patient information into an electronic medical record (EMR) system is another error-prone activity. The Joint Commission on Accreditation of Healthcare Organizations issued an alert regarding technology-related adverse events, including computer physician order entry and clinical decision support systems (The Joint Commission, 2008). They reported that some 25% of medication errors involved computer technology as a contributing factor. Other studies have documented issues such as alert fatigue, screen fragmentation, terminology confusion and lack of appropriate defaults (Bates et al., 2003; Campbell, Sittig, Ash, Guappone and Dykstra, 2006; Kral and Sittig, 2002).

Ideally, EMR systems should contribute to patient safety by reducing iatrogenic errors, by improving communication, and by making information available when and where it is needed. However, current indications are that the ideal has not yet been met. One large qualitative study has catalogued a variety of situations in which error rates have actually increased as a consequence of EMRs (Ash, Berg, & Coiera, 2004).

EMR usage

Error rates are higher with poor usability than with improved usability. In fact, the ISO definition of usability specifies, “The 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.” (International Standards Organization, 1998) Effectiveness, in turn, is defined as “having a definite or desired effect” (Barber, 2004), which implies the absence of errors.

To improve the usability of their systems and to thereby support patient safety, EMR vendors have a long legacy of human-computer interface research to draw upon. One fundamental principle arising from the research is that the interface should be organized purposefully, in meaningful and useful ways. Put another way, one key factor that contributes to users’ feeling of naturalness and familiarity is the consistency between screen flow and their own workflow.

Context of EMR usage

Physicians and nurses in an ICU, for example, report that they rely on large day-sheets to refer to an order list, problem list, vital signs graphs, and medication lists (Ash et al., 2004). One physician reports that when he picks up a patient chart, he gets his first impression from the size of the chart, which is followed by the relative size of its various parts. In both cases, service professionals use paper devices to maintain an overview of a patient. They seek details as needed; if interrupted, the overview helps them to re-orient.

Therefore, to fit into a physician’s workflow and cognitive process, the EMR chart must similarly provide a way to maintain the overview. Conventional designs that use multiple screens and modal pop-ups violate this requirement.

Usability

Drs. Farrell and Craig are developing an EMR prototype that provides an interactive graphical analogy to a physical chart. At a glance, it gives the viewer an immediate timeline of notes, reports, and results. One of its features is a graphical representation of events over time. This feature helps the physician to build a high-level mental map of the patient’s health status and history, including problem clusters and inter-relationships. Each item in the timeline is directly accessible. Being able to build such a mental map, the physician is in a better position to provide an accurate and efficient response, even in the face of interruptions.

References