Making Electronic Health Records Both SAFER and SMARTER

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The National Academies identified 5 objectives in declaring computer-based patient records an essential technology for health care in 1991.1 Future patient records should support patient care and improve quality; enhance the productivity of health care professionals and reduce administrative costs; support clinical and health services research; accommodate future developments in health care technology, policy, management, and finance; and have mechanisms in place to ensure patient data confidentiality.

Today, it is increasingly clear that electronic health record (EHR) implementation in the US has failed to live up to these expectations. Although the benefits of digital infrastructure are substantial, the adverse effects are as well. This outcome was foreshadowed by a report2 issued by the academies in 2009 as the US incentivized EHR adoption through the Health Information Technology for Economic and Clinical Health (HITECH) Act. This report stated, “current efforts aimed at the nationwide deployment of health care IT will not be sufficient to achieve the vision of 21st century health care and may even set back the cause if these efforts continue wholly without change from their present course. Specifically, Sustained quality improvement requires human cognition, clinical processes, and technology to work together. Success in this regard will require greater emphasis on providing cognitive support for health care providers and for patients and family caregivers….”2

Cognitive processes are foundational to the practice of medicine. For example, diagnostic excellence requires gathering data, integrating data to form hypotheses, iterative Bayesian thinking, choosing a communication format, and determining urgency of diagnosis.3 Although digital technology has great potential to support cognitive processes such as these, the EHR is proving to be a distraction as implemented in clinical practice. Why? First, the term electronic health record is a misnomer. The EHR is a complex sociotechnical infrastructure for automating clinical and administrative workflows within a health care facility or system. It is not designed primarily to capture and present a patient’s record as efficiently and effectively as practical. It is not an additive technology, such as a new imaging modality, that works within established practice workflows.4 Connecting EHRs to other health system technology requires complicated interfaces; connections among health systems require even more work.

Second, the EHR has many stakeholders, including physicians, health system executives, educators, regulators, and patients whose needs influence EHR capabilities.5,6 In the US, requirements for reimbursement, regulatory compliance, and administrative workflow automation often take precedence over clinical efficiency and effectiveness. For example, technology deployed by health system leaders to automate safeguards, such as the “5 rights” in medication administration (ie, the right patient, medication, route, time, and dose7), often is labor intensive and inflexible. Implementation of decision support such as vaccine recommendations rarely consider sets of demographics (eg, an adolescent taking a salicylate medication receiving a nasal flu vaccine) or current clinical situation (eg, a patient admitted for Guillain-Barré syndrome). As a result, clinical teams are challenged by repetitive documentation, alert fatigue, increased work-arounds, and decreased data quality.

Now that the US transition to digital health care infrastructure is largely complete, with work underway to improve interoperability and patient access, the authors call for placing equal priority on improving cognitive support. Sustained quality improvement requires human cognition, clinical processes, and technology to work together.

The recent Centers for Medicare & Medicaid Services final rule recommending hospitals assess their health care information technology using the Safety Assurance Factors for EHR Resilience (SAFER) Guides to monitor and improve technology safety and usability as used in practice is an important first step.8 These policy changes should stimulate shared responsibility between EHR vendors and health systems to add features to EHRs, such as readability and consistency of labeling similar functions, that lessen the cognitive load added to relatively uncomplicated tasks performed routinely by clinical teams.

Minimizing cognitive load of EHR tasks, however, is only one aspect of the work to be done. A similar set of guides could be used to monitor, protect, and lead to improvements in the cognitive support provided to the clinical team and potentially to patients through the appropriate use of EHR technology.

Cognitive attention of the clinical team is a scarce resource—one that is essential for quality health care. Cognitive processes require cognitive attention, defined as the act or state of applying the mind to concentrate, synthesize, and prioritize action. Cognitive attention paid to the patient’s reason for visit can be compromised by cognitive load (mental effort required to complete a task and the number of tasks competing for mental effort)
and improved through cognitive support (structures or processes that facilitate monitoring, synthesis, and decision-making).

The preprocedure time out is a commonly used example of protecting cognitive attention to improve quality. Health system leaders and EHR vendors can work together to take 3 steps now to protect the cognitive attention of the clinical team. First, debunk myths about what clinicians must document. Collaborative documentation is allowable if users identify individual contributions, confirmations, and differences in perspective. Second, avoid steps or interruptions in clinical workflows unless they are time-critical. Third, align decision support to role and task. Consider alternative strategies, such as bundling preventive care recommendations into an ad hoc guideline available to all care team members.

The final step toward EHRs that protect cognitive attention involves reducing residual cognitive load while increasing cognitive support. A second, SMARTER Guide could include 7 dimensions helpful for advancing measurement and improvement of EHR cognitive support:

- Synthesizing information and supporting goal-oriented search;
- Monitoring care decisions, taking patient data and care setting into account, and suggesting better alternatives;
- Automating routine tasks;
- Recognizing trends toward or away from idealized patient models;
- Translating important user actions into documentation;
- Exposing contextually relevant data; and
- Reliably and consistently performing these functions (Table).

The last dimension is represented in the SAFER Guides and may not require additional effort to measure its influence on cognitive support.

In addition, minimally interruptive measures of cognitive attention must be developed and integrated into clinical workflow to guide and sustain improvement, without affecting cognitive load. Two bodies of measurement research provide frameworks and methods to get started. The first combines a joint cognitive systems perspective and cognitive task analysis to assess cognitive influence of clinical tasks on EHR users. The second is the emerging measurement science leveraging EHR metadata such as audit logs.

While using SAFER and SMARTER Guides together could potentially be helpful to measure and improve on today’s EHR technology, cognitively supportive sociotechnical workflows also need to be developed. Today’s focus on interoperability opens the door to integrating novel approaches such as self-documenting clinical environments into tomorrow’s digital connectivity infrastructure. Today’s EHR infrastructure can continue to be used for what it does well, while enabling goal-oriented, interdisciplinary research and development to push toward solutions to the cognitive grand challenges of rapidly advancing biomedical science and health care landscapes.

### Table. Protecting Cognitive Attention by Reducing Cognitive Load and Increasing Cognitive Support

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<th>Reduce cognitive load</th>
<th>Increase cognitive support</th>
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<td>Improving EHR useability</td>
<td>Synthesizing information and goal-oriented search</td>
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<td>Automating or eliminating routine tasks</td>
<td>Monitoring care decisions and suggesting alternatives</td>
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<td>Reliably and consistently implementing EHR technology</td>
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**Abbreviation:** EHR, electronic health record.

*Includes goals of Safety Assurance Factors for EHR Resilience (SAFER) Guides.

**Includes goals of SMARTER Guides.**

### References