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Perspective

Applying requisite imagination to safeguard electronic health record transitions

Dean F. Sittig [1], Priti Lakhani[2], and Hardeep Singh [3]

[1]University of Texas/Memorial Hermann Center for Healthcare Quality & Safety, School of Biomedical Informatics, University of Texas Health Science Center, Houston, TX, USA, [2]Formerly at Office of Electronic Health Record Modernization, U.S. Department of Veterans Affairs, Washington, DC, USA, and [3]Center for Innovations in Quality, Effectiveness and Safety, Michael E. DeBakey Veterans Affairs Medical Center and Baylor College of Medicine, Houston, TX, USA

Corresponding Author: Dean F. Sittig, PhD, University of Texas/Memorial Hermann Center for Healthcare Quality & Safety, University of Texas Health Science Center at Houston, 6410 Fannin Street, Houston, TX 77030, USA; Dean.F.Sittig@uth.tmc.edu

ABSTRACT

Over the next decade, many health care organizations (HCOs) will transition from one electronic health record (EHR) to another; some forced by hospital acquisition and others by choice in search of better EHRs. Herein, we apply principles of Requisite Imagination, or the ability to imagine key aspects of the future one is planning, to offer 6 recommendations on how to proactively safeguard these transitions. First, HCOs should implement a proactive leadership structure that values communication. Second, HCOs should implement proactive risk assessment and testing processes. Third, HCOs should anticipate and reduce unwarranted variation in their EHR and clinical processes. Fourth, HCOs should establish a culture of conscious inquiry with routine system monitoring. Fifth, HCOs should foresee and reduce information access problems. Sixth, HCOs should support their workforce through difficult EHR transitions. Proactive approaches using Requisite Imagination principles outlined here can help ensure safe, effective, and economically sound EHR transitions.

Key words: electronic health records, Requisite Imagination, patient safety, change management

INTRODUCTION

Over the past decade, health care organizations (HCOs) have been transitioning from one electronic health record (EHR) to another. Selecting a new, presumably better, EHR offers hope to HCOs struggling to keep up with evolving EHR-related regulations and clinicians frustrated with their current EHRs.[1] For example, a study using the HIMSS Analytics database found that in 2012 and 2013, 434 and 305 hospitals, respectively, switched EHRs.[2] Many EHR transitions also occur following an organizational acquisition or merger; of 88 hospitals acquired between 2012 and 2014, 31 (35%) switched EHRs by 2016.[3] Since 2015, when the Office of the National Coordinator for Health Information Technology (ONC) estimated that 96% of nonfederal acute care hospitals had adopted a certified EHR,[4] the number of HCOs transitioning from one EHR

to another has been considerably greater than the number of HCOs transitioning from paper-based medical records to EHRs. Recent high-profile HCOs that have switched EHRs include Virginia Commmon University Health System,[5] Mayo Clinic,[6] Advocate Health Care,[7] and AdventHealth.[8] Similar transitions will likely continue. These EHR transitions are notoriously difficult, costly, and disruptive for organizations and clinicians.[9] For example, a 2020 review of EHR transitions based on "scant literature concerning EHR-to-EHR transitions, [i]dentified challenges include[ing] financial burdens, personnel resources, patient safety threats from limited access to legacy records, data integrity during migration, cybersecurity, and semantic interoperability."[10]

EHR transitions could involve a small clinic or a large HCO in multiple geographic locations with different EHRs.[11] For example,

the Department of Veterans Affairs with 171 medical centers and 1112 outpatient clinics is transitioning from a well-established, self-developed, open-source EHR, CPRS/Vista[12] to a commercially available, ONC-certified, product developed by Cerner (Kansas City, Missouri).[13] Reported problems at the VA's first transition site led to a temporary halt of the VA's entire nationwide EHR transition schedule.[14,15] Other institutions have experienced similar challenges. At Vanderbilt, for example, there were still over 4000 unresolved helpdesk tickets 3 months after their transition, even after significant efforts were made to close all tickets.[16] Organizational challenges also occurred at Brigham and Women's Hospital in 2016 which led to their first budget shortfall ($53 million) in 15 years.[17]

While EHR transitions solve certain problems, they impact not just the technology for delivering health care but also the clinical work processes and culture of an organization.[18] EHR transitions hence lead to unexpected sociotechnical consequences for clinicians, patients, and the HCO.[19] Thus, health care leaders and clinical staff who may not be as familiar with lessons learned from other EHR transitions, nor experts in health IT and informatics, often play a leading role in EHR transitions. Moreover, use of an unfamiliar EHR or an unstable relationship with the new EHR developer may lead to quality and safety concerns and excessive costs that HCOs will need to manage.[20] This is not surprising as the EHR is only one component within the larger complex, adaptive sociotechnical health care system.[21] We posit that a more proactive, deliberate, and comprehensive approach should be used to safeguard EHR transitions.

In the study of human–machine system design and organizational culture, the concept of Requisite Imagination, defined as the ability to imagine key aspects of the future one is planning, has been used to anticipate what might go wrong and how to identify potential ways to test the new system.[22] This concept could also be applied to new health information technology implementations or transitions, especially in areas where prior safety problems have been well documented. For example, before transitioning to a new automated system for communicating abnormal laboratory test results,[23] one should consider how results sent to clinicians who are on vacation or have left practice will be managed such that patients do not "fall through the cracks."[24] In this paper, we apply principles of Requisite Imagination to offer 6 recommendations on how HCOs can safeguard their EHR transitions proactively. These principles can help create organizational ownership, resilience, and trust needed to overcome several universal challenges of EHR transitions.

Implement a proactive leadership structure that values communication

Requisite Imagination requires leaders to create a culture of open and transparent communication that prepares everyone (eg, physicians, nurses, pharmacists, clinical laboratory, and diagnostic imaging representatives), to think about the potential consequences of making the proposed changes and prepare for them. Because many things can go wrong with any health IT transition, leaders should create a governance structure that includes experts with technical and operational expertise in planning and monitoring activities to oversee the EHR transition and intervene as issues arise. Organizational leaders should encourage EHR users to speak up if they perceive something is wrong and ensure that management takes them seriously. Leadership should also encourage probing diagnostic questions and multidisciplinary investigations when the answers to questions indicate deeper problems may exist. Despite well-known benefits of open communication and user input to inform change

management processes,[25] they are often a neglected component of EHR transitions.[26]

Leaders can ensure representative clinicians are engaged in transition planning and EHR configuration and are compensated for their time accordingly.[27] Clinicians are used to their daily workflows based on specific screens and content within the user interface of their existing EHR, but many of these workflow processes will be disrupted by the new EHR user interface displays, content, and navigation pathways as well as variations in adoption rates for these new workflows by the larger care team. Dedicated clinician engagement (eg, protected time) could help build new EHR content that facilitates safe medication ordering (eg, order sentences, order sets, and default doses),[28] clinical decision support (eg, health maintenance reminders and medication–condition interaction checks),[29] and better visual displays of clinical data (eg, screen layouts and graphs).[30] This helps ensure that the EHR content better meets user needs, thus improving clinician experience and the efficiency of their new workflows.

Implement proactive risk assessment and testing

Transitions often lead to clinicians performing tasks previously handled by others and frequent workarounds (ie, omission of process steps, process steps performed out of sequence, or unauthorized process steps)[31] that by-pass safety procedures. Existing clinical alerting mechanisms,[32,33] for example, may need to be modified or redesigned to accommodate differences in EHR design or outright limitations. Proactive risk assessment, that is, identification of potential risks before they occur with a goal of either mitigating their impact or preventing them from occurring, is thus essential. The best assessment strategy would include conducting a self-assessment using SAFER (Safety Assurance Factors for EHR Resilience) Guides available from the ONC.[34] SAFER Guides are a suite of checklists that proactively identify safety and effectiveness concerns related to both EHR technology infrastructure and clinical processes.[35] Recently the Center for Medicare and Medicaid Services required their use by eligible HCOs beginning in 2022.[36]

Additionally, implementation of proactive testing procedures across the entire EHR-enabled healthcare delivery system can evaluate both technical and organizational components related to the forthcoming change. Technical components include not just individual modules of the EHR but also the planned system-to-system interfaces between the EHR and ancillary components such as laboratory and radiology. Proactive testing must include end-users of these systems and involve end-to-end clinical workflows in both the "test" and "production" environment (ie, with test patients).[37] Rigorous testing conducted prior to go-live and before major system upgrades can identify problems for resolution and prevent clinician frustration or patient harm.

Anticipate and reduce unwarranted variation

Deming, a pioneer in continuous quality improvement, said, "Uncontrolled variation is the enemy of quality"[38] but in reality, unexplained variation is the norm in clinical practice. For example, some HCOs allow clinicians to create their own "personal" order sets, but this introduces significant practice variation, reduces the evidence-based character of the order sets, and introduces significant long-term maintenance issues.[39] Organizations should anticipate similar unwarranted variations related to EHR design, development, configuration, and use. These variations worsen quality and increase cost. To address these variations, they can standardize certain EHR

features, functions, nomenclature, and workflows, as well as testing, training, and maintenance activities across users, departments, and locations.[40] Furthermore, by reducing unwarranted variation in how certain clinical data (eg, vital signs, weight, and laboratory results) are defined, collected, coded, and stored, organizations can increase interoperability with EHRs from other HCOs.

HCOs should also identify the *necessary* variations or gaps between current workflows, roles, and responsibilities and the new EHR's functionality and capabilities. This could help engage operational leaders in configuring the new EHR and in reenvisioning and redesigning activities to mitigate problems and prepare for the transition. Both of these anticipatory activities can reduce patient risk, clinician training requirements, and administrative costs.

Establish a culture of conscious inquiry with routine monitoring

Conscious inquiry encourages observation, questioning, and presentation of findings and conclusions. But it is difficult to know if the new EHR is working as designed, being used as expected, or leading to unintended adverse consequences.[41] This is because transitions involve complex and widely dispersed events over time where clinicians interact with a new EHR in different ways while trying to accomplish important, time-critical tasks with a high cognitive load. Thus, measuring, and monitoring clinical and administrative operations through multiple methods, such as adverse event reports,[42] help-desk tickets,[16] audit logs,[43] and key clinical,[44] operational,[45] financial,[46] and patient satisfaction,[47] performance indicators is critical to identify signals of problems. This may entail development of new classification taxonomies to help identify key problem areas and allow leaders to "drill-down" and identify potential root causes.[48] In addition, one can develop anomaly detection algorithms[49] to monitor system usage logs (eg, laboratory result routing error logs or alert firing/override logs) to identify bugs and glitches before they affect patients. All of these data should be analyzed and reviewed expeditiously for anomalies and unsafe system behaviors by scientists, engineers, and clinicians, who can then help inform corrective actions. Additional experts could be brought in for advice as specific issues are identified through monitoring. EHR developers, clinicians, and administrative leadership all have a shared responsibility to implement a culture of conscious inquiry.

Foresee and reduce information access problems

To ensure uninterrupted patient care, easy, fast, and complete access to historical patient data is essential.[50] First, anticipating that information access problems will inevitably occur, HCOs should import as much valid coded data (eg, patient demographics along with clinical problems, allergies, medications, laboratory test results, and immunizations) and free text data (eg, ambulatory visit, hospital discharge, and procedure notes) as possible from their old EHR.[40] It may not be possible to automate all data migration tasks, therefore, HCOs should invest in resources to manually migrate or "curate and prep" each patient's chart to reduce the cognitive burden associated with data reconciliation for each patient's first visit with the new EHR. HCOs should also review and test their data migrations to ensure they are complete, correct, and commensurate with newly collected data.[51] If all necessary data cannot be migrated to the new system, read-only access to the old EHR needs to be maintained. This parallel system maintenance has significant costs concerning clinician time and attention as well as financial and personnel costs for the HCO.

Even in large, comprehensive, well-integrated care delivery systems, many patients will receive some care from external providers. Failure to consider a patient's past medical history in current clinical decision making[52] or quality measurements[53] can lead to errors of omission and commission, along with inaccurate measurements. Thus, organizations should participate in external health information exchanges to improve care continuity. They should also participate in regional and/or national consortia to facilitate sharing of information on key EHR pain points and solutions learned by others.[54]

Support the EHR user workforce

In EHR transitions, change is difficult for the workforce to navigate. While the workforce may initially hope that the new EHR will be easy to use and even "intuitive," the reality is that inevitable changes in screen design, layout, and workflows between the new EHR and the old EHR, coupled with new procedures for finding, entering, and reviewing information must be managed carefully to prevent negative impacts on organizational finances,[9] user frustration,[55] and staff morale.[56] The entire workforce should always be aware of what changes are forthcoming, how high-quality care will be maintained, and how they will be supported.[57] Tight coordination among the IT analysts, informatics specialists, and the EHR training team along with operational and clinical leader support is required to perform ongoing monitoring, outreach, and training updates for the workforce. Preparatory activities could include rigorous workflow specific training before go-live, providing users with dedicated "protected time" away from clinical duties to attend this training, encouraging clinicians to practice using the system before go-live, and providing additional 1-on-1 support to clinicians who continue to struggle.[58] Organizations may decide to hire external staff who are experienced using the new EHR to provide additional support to clinicians for 2 to 4 weeks following go-live. In addition, leadership should plan on reducing the number of patients seen in clinics or treated in the hospital for the first few weeks following go-live while the inevitable "kinks" in the system are worked out.

CONCLUSION

The next decade will be dominated by transitions from one EHR to another; some forced by hospital acquisition and others by choice in search of a better EHR. EHR transitions cause major health care delivery disruptions and can lead to positive transformations. Minimizing risk and associated disruptions during transitions are essential to safeguard patient safety, the well-being of clinicians using these systems, and the financial futures of organizations making these transitions. Organizations that use Requisite Imagination principles to help them prioritize investments in robust governance, transparent communication, process and EHR standardization, realistic expectation management, extensive user training and system testing, access to historic data, continuous monitoring of EHR transition processes, and ongoing end-user support should be able to develop the organizational resilience and teamwork necessary to ensure safe, effective, and economically sound EHR transitions.

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DFS wrote the first draft of the manuscript; PL and HS made many substantial edits and contributions and approved the final version of the manuscript.

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DATA AVAILABILITY

No new data were generated or analyzed in support of this research.

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