Top EHR Challenges in Light of the Stimulus

Enabling Effective Interdisciplinary, Intradisciplinary and Cross-Setting Communication

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O
n Feb. 17, 2009, President Obama signed into law the American Recovery and Reinvestment Act (ARRA). A portion of the law created the Health Information Technology for Economic and Clinical Health (HITECH) Act. Within the bill, approximately $1.2 billion in grants are available to increase the use of electronic health records (EHR). The bill created the term “meaningful use” as a measure to evaluate the use of EHRs. A definition of “meaningful use” has been created by both the Health Information Technology Policy Committee and HIT Standards Committee.

Yet, meaningful use varies with context, institution, clinician, patient, secondary uses of the data and third-party payors. The questions needing consideration are: Meaningful to whom? Meaningful for what purpose(s)? Meaningful under what circumstances?

The initial goal of the 2011 definition of meaningful use is capturing and sharing healthcare data, which would be meaningful for accreditation, reimbursement and healthcare policy more than it is focused on what would be meaningful for patients and the clinicians who care for them.

This will necessarily pose challenges to adoption and use of EHRs. ARRA provides financial incentives to lessen the perceived economic barrier to adoption, but other challenges to adoption also need addressing, as outlined in this paper.

While the specifications will continue to be refined in the coming months, the focus on data simplifies the evaluation, but hides the larger challenges of collecting, ensuring the accuracy of and sharing data. Healthcare data must always be placed in the con-
text of the delivery system, otherwise the meaning assigned to the data points could be lost.

Described below is how clinical data elements currently being discussed at the national level can be used successfully to improve healthcare through effective interdisciplinary, intradisciplinary and cross-setting communication. A number of challenges exist for even the limited goal of collecting and sharing data, as outlined later in the paper.

**CARE DOCUMENTATION AND MEASUREMENT**

One goal of supporting widespread use of EHRs is to guarantee improvements in care that are also measurable. Improvement in care coordination is one of the four major health outcomes policy priorities. The meaningful use measures and standards for care coordination are intended to promote data encoding, analysis, access, retrieval, exchange and use of summary information. While the selected measures and their corresponding standards represent a positive step, additional refinement and increased sophistication is required.

Improving care coordination is essential to enhancing the safety, quality and effectiveness of care. Healthcare is a team activity and as such presents a challenge for determining valid measures and standards of meaningful use.

Though measures and standards will evolve, at present they do not adequately capture the complexity of care coordination, and thus, are not valid representations of it. The focus of the measures and standards are on the elements “documented” and the ability to exchange those elements across systems. There appears to be no interest in dictating internal standards for collecting the data elements, but instead the specified standards apply to how the internal data is to be mapped and packaged for sharing with other organizations (e.g., SNOMED CT, CCD, HL7). This approach completely ignores the impact of context on the validity and reliability of the data captured at the point of care.

Absence of context raises considerable threats to data reliability and validity, in several respects. Studies repeatedly indicate that such threats occur when data in different formats captured at the point of care.

Mapping unique organization terms to standardized codes is no guarantee that translation represents the meaning intended by the clinician who documented the care. Moreover, the validity and reliability of data captured are also influenced by multiple factors that occur at the point of documentation into an EHR. These include the format, type and amount of content on the screens, the ease of data entry, the perceived value of the data, terminology used and the user’s levels of competency for which the person is entering the data. When a system is cumbersome, data entry appears to be busy work. Another challenge is training the clinician in new terminology to increase data quality. So too, if data once entered into an EHR is difficult to retrieve or not made available in ways that easily support clinician-to-clinician communication, decision-making and care, it will not be used.

**EHR’S NEED TO SUPPORT CLINICAL CARE**

While EHRs document data, one must remember EHRs do not coordinate care—clinicians communicating and working together do. EHRs must be presented and used as a tool for streamlining the capture and presentation of information that enable clinicians to coordinate care more efficiently and effectively.

Researchers have found that patient records, both electronic and paper, are documentation-centric rather than patient-centric. Given the number of external requirements (e.g., legal, accreditation), documentation is typically done to support the interests of others rather than patients. Moreover, studies of documentation practices indicate that nurses rarely use the patient record to communicate and make decisions about care, and instead rely on a variety of shadow record-keeping strategies (e.g., scraps of paper, unit forms, etc.). In general, studies have found that clinicians have overwhelming negative attitude toward formal record-keeping because it is seen as just a requirement.

Transitions of care occur in a variety of settings; as the patient moves from provider to provider in the outpatient setting to the emergency department of a hospital, to the inpatient setting. They may transition from hospital unit to unit to discharge to a rehabilitative or nursing home setting. Transitions may be planned or urgent. Providers, whether new to the patient or who have provided care at an earlier point in time or other setting, may not be aware of most recent events leading up to the transition. Transitions require a handoff, with a specific set of tasks to be completed by the next provider assuming care. This can include the need to follow up on pending results or need for confirmatory testing. The handoff may also define which treating physicians are responsible for which of these follow-up tasks. Structured data may not indicate to whom the completion of these tasks should fall. More often than not, however, the key pieces of missing data, or intended actions and handoff, get lost in the noise of unfiltered data. The raw data may not convey the context with the original intention.

The new requirement for additional documentation from frontline users on a short timeline to qualify for incentives is risky, and likely to cause unintended negative consequences. This is true for the selection and implementation of any care coordination templates. Users could perceive the addition of the meaningful use measures as yet another external requirement, unless proper attention is given to ensuring that the new measures enable practice at the frontline.

**PUBLIC HEALTH’S ROLE**

As part of the national healthcare team, public health agencies provide a critical role. Healthcare providers and laboratories have a statutory responsibility to report conditions of public health concern to public health authorities. Depending on the state, reportable conditions include infectious diseases, cancer, birth defects, firearm injuries, lead poisoning, hospital-acquired infections and antibiotic resistance trends.

This information is critical for monitoring disease trends, developing and analyzing public health programs and detecting outbreaks. For the most part, public health agencies receive
reports by phone, facsimile or by mail. Many conditions have been under-reported because the reporting process has not been automated; rather, it depends on the memory and interest of providers or laboratory personnel to report.

Electronic laboratory reporting (ELR), automated transfer of laboratory results to public health entities, has been introduced in many states over the past decade. This new technology has improved both the speed of reporting, as well as the completeness of reporting. However, ELR systems vary widely, and standards are still being refined. In addition, many clinical laboratories do not have systems that meet HL7 and other federal standards.

While ELRs assist public health surveillance, not all reportable conditions are identified by laboratory testing. Up to 17 percent of patients with tuberculosis may be culture negative. Other reportable diseases are a constellation of signs, symptoms and nonspecific laboratory tests; examples are rheumatic fever and Reye’s syndrome. Unlike ELR, automated electronic systems are not available to transmit these reports to public health agencies. Many states have developed Internet-based report forms that allow providers to submit reports electronically, but extraction of patient information from EHRs has not been widely used or required.

CHALLENGES

Deploying a new electronic record system, even with the best of intentions has been documented to increase morbidity and mortality in some locations. A few years ago, the federal government cited a failure rate of EHRs of more than 30 percent. As the nation continues to move forward with health IT, lessons from the United Kingdom add additional insight. Through an ethnographic study of the transition to a national summary care record, six interacting influences affect the outcome: immature technology; adopter concerns; interpersonal influence; organizational antecedents with technology; organizational readiness; and implementation process.

This demonstrates that sharing the electronic data of patients is not plug-n-play and a large number of factors can influence the outcomes outside of the technology. While some authors advocate training as the solution to the many problems, the issues may be significantly larger. However, one estimate of cost savings is $81 billion dollars a year if there is a transition to EHR’s nationwide. This number has been questioned by the Congressional Budget Office. The challenge posed for the United States is evident in the experience of other countries where full-scale EHRs with high CPOE is rare, even with a national healthcare system and mandated use. Recently, Britain’s National Health Service’s troubled moves toward a nationwide EHR system were investigated by Parliament; the Dutch minister for health announced that their national EHR would be postponed, despite announcing the rollout almost three months earlier; and smart card introduction in Germany was seriously delayed.

INFORMATION OVERLOAD

Improving care coordination by sharing healthcare data would intuitively seem to enhance the safety, quality, and effectiveness of care. Having the right data in the right context to assure the best decisions are made will reduce misuse and redundant services as well as medical error especially in light of losing medical information at transitions of care. However, the threat of information overload at the transitions of care, between disciplines, is a real concern. Data without context is simply noise. Finding the signal within the noise can be a challenge. The sheer volume and variety of data points in a patient medical record can be overwhelming.

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Information needs vary between disciplines. For example a treating cardiologist requires specific details about coronary anatomy, including original images of a procedure; however, the primary care physician may only require the date and type of procedure to provide aftercare. Often, lengthy reports provided from a consultant to a referring physician may add confusion rather than clarity containing a few data points of useful value to the receiving physician buried in a several-page report. The experience of physicians having to sort through pages and pages of prior records to find the few critical pieces of data needed for the next decision can be overwhelming and time consuming, causing the provider to avoid the search altogether.

The unsolicited push of information, such as receiving lengthy unfiltered reports and records, may result in important information getting lost among myriad non-useful information.

Alert fatigue is a behavior whereby physicians become so inundated by alerts regarding drug interactions, dosing alerts and other types of decision support that they ignore the alerts altogether, often ignoring a critical alert that if acted on would prevent a medical error.

Another example of information overload from an unsolicited push is a recent creation and consequence of first generation electronic health records. With an uninformed computerized request of information, the provider may try to avoid the information onslaught by searching through volumes of data for specific values, but may not be aware of important information that may be overlooked. The threat of unsolicited push and uninformed computerized request are that critical information may be missed, misinterpreted by taking data out of context, or providers may be mislead by trivial or mis-prioritized data resulting in delay or incorrect decision-making.

Reconciliation of medication lists (as well as active or resolved problems) is a specific challenge at transitions, and one that is beginning to be addressed within hospitals. Patients
take numerous medications, which change multiple times during hospitalizations. Existing medications may be held temporarily, changed or discontinued. Following the trail of medication changes and the indications for change is difficult. Knowing the rationale for the changes is important, but reviewing every adjustment and rationale is unwieldy and often difficult to find in the structured record. Conflicting problems lists may result from important treatments being withheld or inappropriate treatments being provided. Harm from reconciliation errors are well documented.33

Implementation of health IT solutions must recognize the pitfalls of information overload and find the balance between pushing critical and timely data in context with the ability to search and select data needed by a specific provider in a specific context.

CHALLENGES OF COMMUNITY AND PUBLIC HEALTH COLLABORATION

The challenges for data sharing with public health are not so very different from data sharing between clinical healthcare providers. Surveillance and registry systems cost hundreds of thousands of dollars, and vendors often market retooled clinical EHR systems rather than systems designed for public health needs.

Public health electronic systems have not been standardized so that they can talk to each other, but instead have focused on ability to transmit key reporting information to the Centers for Disease Control. Very little attention has been paid to interactivity with clinical EHR systems.

For some conditions, treatment of a patient requires a close liaison between the clinical provider and public health. An example is tuberculosis, where the clinical provider diagnoses the disease and prescribes treatment. Public health provides case management, assures the drugs are taken and investigates close contacts for TB infection or disease. Communications occur using telephone, facsimile and letters. With evolving electronic public health clinic systems and clinical EHR systems, there is a potential for more efficient communication strategies as systems enable efficient communication and data sharing. With efficient communication, the treating clinicians and public health workers could make informed decisions during treatment and investigation.

Immunization registries are an example of the benefits of electronic clinical and public health communication. These registries provide a complete record of a child’s immunization to clinical care providers, public health, schools and parents. Registries help prevent missed opportunities to vaccinate a child, save time in searching for records of previous immunizations from other providers and prevent repeated vaccinations. All states now have some form of an electronic immunization registry.

Unfortunately, most systems require at least some double-entry of information because many clinical providers do not have EHRs. The double entry can lead to data-entry errors in one of the systems. Despite this shortcoming, many registries are able to pull basic demographic information from electronic billing systems and can pre-populate the registry with birth certificate and other public database information, saving considerable data-entry time for providers. Effective data sharing from clinic to public health and back can provide a backbone to efficient and timely care, providing patients with the immunizations they need, and preventing duplicate immunizations due to lack of records.

Public health agencies with existing electronic systems and registries will be reluctant to put forth the effort and expense to link to new EHRs that clinical practices and hospitals will be implementing in the next several years. Although the ARRA has committed funds to encourage clinical providers and institutions to implement EHRs, there has been no parallel effort directed at the public health sector to complete this important link. Without public health representation at the table, the quality of healthcare at the local, state and national levels may fail to meet the goals as outlined in the proposed meaningful use standards.

PAPER PERSISTENCE AND SOCIAL AND ORGANIZATIONAL ISSUES IN HIT

Because clinical work is highly collaborative with clinical teams dispersed in both space and time, records are crucial to coordinating clinical work. One challenge involves ways in which the physical properties of records affect collaboration. Electronic records certainly offer numerous benefits, yet paper has characteristics that are difficult to provide electronically.24 Even in the few benchmark institutions with comprehensive EHRs,25 there can be workarounds and persistence of paper records.24,26

For example, paper still is being used at a large Veterans Affairs Medical Center (VAMC), with a fully implemented EHR. Even though some of the ways paper is used circumvented the intended EHR design, introduced potential gaps in documentation and generated possible paths to medical error, other uses assisted healthcare employees in their work. Clinicians thought paper records more convenient and efficient, better able to be customized or organized for individual patients, more helpful for longitudinal tracking of data for particular patients, an easier reminder tool and memory aid, and more secure than EHRs.

Moreover, they are reluctant to use EHRs in the presence of patients, either because they feel it interferes with clinician-patient interaction or because of embarrassment over poor typing and computer skills.26 Challenges to eliminating paper records and additional uses for paper, then, may be based on poor system design, poor training or ways in which EHRs cannot possibly duplicate some of the conveniences, flexibility, and portability of paper.24

While EHRs are complex, some challenges to adoption and use can be lessened by attention to best practices, change management and decades of research on project management and adoption of innovation.27,28

To help meet the challenges, it is important to make clear to everyone what benefits each can expect from EHRs. For example, the U.S. National Research Council advised that nationwide deployment of health IT would not achieve its goals unless it pro-
vided healthcare workers and patients with support for decision-making and problem-solving.

Meaningful use guidelines include some CDSS features, such as checking for drug-drug interaction. While physicians see some CDSS applications as helpful to them, they have been slow to adopt other CDSSs, or ones implemented in ways that may adversely affect their clinical autonomy, their role as chief architect of patient care, their views of the art of medicine and their relationships with patients. These factors also affect EHR and CPOE adoption, so when combined with requirements for CDSS, the challenge is all the more complex and daunting.

‘MEANINGFUL USE’ IMPLIES MULTIPLE MEANING TO DIFFERENT PROFESSIONALS

Meaningful use for practicing clinicians involves generating, sharing and using information for the direct care of patients. Accurate problem lists, medication lists, chronic disease management flow sheets, etc., are critical to providing clinical care.

Electronic prescribing, electronic laboratory with order tracking and results reporting, as well as legible documentation, provides immediate value to providers and patients. Decision support at the point of care, such as drug allergy alerts, drug-drug interactions and drug-disease interactions all contribute to error reduction.

Nevertheless, all of the above functions require sharing patient data among clinicians and across institutional boundaries, as required by “meaningful use.” Without the sharing of data, all of these functions quickly become obsolete. Data sharing is a bedrock requirement for the hopes of simultaneously achieving cost reduction and quality improvement.

However, clinicians experience changes in job responsibilities, interprofessional relationships, and communication patterns through such data sharing as occurs in telehealth. Moreover, their practices are more open to view by other clinicians, as well as non-clinical parties ranging from patients to government agencies. As this sort of information becomes more publicly available, data ownership, privacy, confidentiality and clinician-patient communication and relationship also are challenged. All of these pose further social, legal and ethical policy challenges at all levels—from institutional to national.

Another set of challenges at the clinical level involves what information is needed by other clinicians and for what purpose. In paper records, clinicians record data they consider of clinical importance, rather than all data that might be required in an EHR. Meaningful use might require additional documentation to ensure full utilization of the EHR and enough context to help others interpret data being shared. Having to enter this additional data poses another burden, and having to search through such “extraneous” data can interfere with the goals of improved patient care coordination and safety by making it more difficult to notice what is truly important, as described above.

In addition, different views of data related to clinical care are needed by different kinds of clinicians. Different specialties and different ancillary personnel clearly will emphasize and focus on different aspects of a patient. For example, “meaningful use” of EHR to nurses would include the provision for documenting, storing and retrieving nursing data in ways that support the effective delivery and communication about care among team members who change over time and space. While terminology and discipline-specific encoding of data is different for medicine and nursing, many of the terms are encoded in SNOMED-CT. Allowing the data to cross clinical disciplines is a long-term requirement to ensure the efficiency and cost savings promised.

Different record information, though, also is needed by different categories of clinician within the same specialty or department. For example, junior residents and senior clinical staff keep different kinds of records and provide different record information to their counterparts.

Further, the meaning of clinical information is negotiated among clinicians, according to their knowledge of each other and of the patient. What is meaningful, then, depends on that particular patient, the clinical use of what is being recorded and what personnel are recording it. Ensuring this context is preserved while sharing the data outside the institution that created the data is a large unmet challenge requiring additional research.

Without concise context and data, clinical teams may not trust the data. The myth that EHRs in and of themselves will improve quality of healthcare delivery must be overcome.

On the patient side, different patients will have different ideas of what data is meaningful to them. The HITECH Act specifies patients’ rights to a digital copy of their medical record. However, simply giving patients access to EHR information through their personal health records (PHR) will not necessarily achieve the meaningful use goal of engaging patients and their families or making care more accessible.

Far more is needed than simply providing such information for patients to feel engaged and empowered by PHRs populated with EHR data.

Assuming, however, that this is a step along the way, it would be helpful for that data to be intelligible to non-clinicians, organized in ways patients and their families can easily use and understand, presented in a culturally sensitive and educational/literacy—appropriate manner and include information that patients might want clinicians to have, but would not ordinarily be included in EHRs. Similar challenges are evident in making records of EHR access and use available to patients, where an understanding of why so many different individuals might access a record may be difficult even for those who use EHRs.

CONCLUSIONS

A number of challenges exist for wise implementation of health IT. With any new method in healthcare there are intended and unintended consequences. The goal of this transformation is to improve the healthcare system. However, healthcare is a team activity and all of the participants need to be informed, engaged and participating. Healthcare team members do not need to be buried in data, but instead given the correct information at the correct time. As the country moves forward in this experiment,
incremental steps to validate that the change is progressing positively need to be measured.

In addition, attention must be paid to weaknesses in the current healthcare system to prevent codifying them in health IT. Our current system is focused on episodic care, rather than patient-centric, and has been weak in care coordination. While encoding all current data in episodic care could help, it does not coordinate the care.

There is poor communication throughout our current system. Physicians are communicating less and less with each other, resulting in reduced quality. Sharing data without context, interpretation or discussion will lead to a worsening of this problem. Systems should promote and enhance communication around patient data and patient care. We have a system of systems; e.g., government systems, insurance networks, regional hospital networks, numerous small practices all of which try to develop small closed systems. However, patients are not bound to these systems; they move in, out, and across system boundaries. Health IT solutions must promote open systems where information will flow with the patient, not be contained within a single hospital medical record system.

In conclusion, we recommend that the government mandate the creation of standardized “meaningful use” measures that truly improve the coordination of care and address the complexity of the spectrum discussed in this article. This would require full testing and thoroughly evaluating the refinement of a process designed to support collecting and using the required data elements in the EHR in ways that demonstrably improve care coordination. Rigorous testing and evaluation under real time conditions in situ in a variety of settings is needed to monitor “meaningful use” and achieve the benefits promised by the HITECH Act. JHIM

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REFERENCES


information technology on quality, efficiency, and costs of medical care. Ann
J.ijmedinf.2009.04.001.
27. Kaplan B, Harris-Salamone KD. Health IT success and failure:
recommendations from literature and an AMIA workshop. J Am Med Inform
28. Leviss, J., H.I.T. or Miss: Lessons Learned from Health Information
Technology Implementations. Chicago: American Health Information Management
Association; 2009. 29. Stead WW, Lin HS. Computational Technology for Effective
30. B. Kaplan. The influence of medical values and practices on medical
computer applications, In: J.G. Anderson and S.J. Jay, ed. Use and Impact of
Camb Q Healthc Ethics. 2008;17(4):401-416. 10.1017/S0963180108080535.
32. Kaplan B, Lundsgaard HP. Toward an evaluation of an integrated clinical
33. Osterlund CS. Documents in Place: Demarcating Places for Collaboration
34. Kaplan B. Objectification and negotiation in interpreting clinical images:
jama.300.1.21.