An Effective Approach for Choosing an Electronic Health Record

By Robert Rowley, MD

The credit earned from the Quick Credit™ test accompanying this article may be applied to the AHRA certified radiology administrator (CRA) asset management domain.

EXECUTIVE SUMMARY

- With government stimulus money becoming available to encourage healthcare facilities to adopt electronic health record (EHR) systems, the decision to move forward with implementing an EHR system has taken on an urgency not previously seen.
- The EHR landscape is evolving rapidly and the underlying technology platform is becoming increasingly interconnected. One must make sure that an EHR decision does not lock oneself into technology obsolescence.
- The best approach for evaluating an EHR is on the basis of: usability, interoperability, and affordability.

Choosing an electronic health record (EHR) system is one of the most important decisions a practice or an organization can make. There is potential for significant cost, as well as disruption of daily workflows. Often the decision making process is arduous, whether it be done in committees or by an individual.

Adding to the urgency of the decision to implement EHRs are the moneys earmarked for this use in the 2009 American Recovery and Reinvestment Act, signed by President Obama on February 17, 2009. The provision of the legislation known as the Health Information Technology for Economic and Clinical Health (HITECH) Act allocates $19.2 billion for health IT, broken down as $17.2 billion incentive payments for EHR use and $2 billion as grants and loans for technology advancement. A very significant amount of money could potentially go to meaningful use of EHRs. Though the details of the criteria for receipt of these stimulus funds remain in process, what is known so far is:

1. Qualifying EHRs must meet certification standards as defined by the HHS Secretary and (at a minimum) provide clinical decision support, physician order entry, capture and query information relevant to healthcare quality, and exchange electronic health information from other sources.
2. The provider must demonstrate "meaningful use" which includes electronic exchange of information to improve quality and care coordination, including e-prescribing and reporting on quality measures.

Given what is at stake, what sort of criteria should be used to recommend an EHR? Many institutions have policies that require EHRs to be chosen from among ones that have been certified by the Certification Commission for Healthcare Information Technology (CCHIT). Independent medical practices may look among broader options, and frequently have chosen smaller, "lightweight" systems that have a limited feature set. CCHIT, in its certification process, has looked at the domains of: (1) functionality, (2) interoperability, and (3) security as its criteria set.

TABLE 1. Measuring Prospective EHR Systems

User	Task	Measuring Usability Relative to Goal		
		Effectiveness	Efficiency	Satisfaction
Admin	Create an appointment	Goal: 100%	Goal: 30 secs	Goal: 4.00
Admin	Enter a new patient	Goal: 100%	Goal: 2 mins	Goal: 4.00
Nursing	Enter vital signs	Goal: 100%	Goal: 30 secs	Goal: 4.00
Nursing	Administer immunization	Goal: 100%	Goal: 1 min	Goal: 4.00
MD	Create simple note 99213	Goal: 100%	Goal: 3 mins	Goal: 4.00
MD	Create full consult note	Goal: 100%	Goal: 5 mins	Goal: 4.00
MD	Write an Rx	Goal: 100%	Goal: 30 secs	Goal: 4.00
MD	Review refill requests	Goal: 100%	Goal: 1 min ea	Goal: 4.00
MD	Review lab requests	Goal: 100%	Goal: 30 sec ea	Goal: 4.00
MD	Review scanned documents	Goal: 100%	Goal: 1 min ea	Goal: 4.00

It specifically does not evaluate EHRs based on usability.[1] The result? As much as 30% of medical practices that install an EHR eventually deinstall it.[2]

Of the obstacles for EHR adoption, cost has been the main issue. However, usability (or lack thereof) is the next most important reason for resistance to EHR adoption.[3] Perhaps a better set of criteria for evaluating EHRs should be the following:

1. Usability
2. Interoperability
3. Affordability

The economic viability of an EHR vendor should also come into play when making a decision. It is always difficult to predict the future for any corporation, but at the very least there should be a discussion with an EHR vendor about how to migrate data out of their system should a decision be made to abandon their product and move to something else (either because the vendor stops doing business, abandons that product line, or a better solution arrives in the market down the road).

Usability

Usability is not as subjective and vague as one might imagine. It can be systematically approached in the following way: (1) define a set of user groups—front window intake, nursing, physicians; (2) assign a set of "test tasks" that each user group performs as part of their daily work—make appointments, check patients in, take patients from the lobby and put them in rooms, record vital signs, create chart notes, review prior records, etc; and (3) for each task, identify effectiveness, efficiency, and satisfaction.[4]

In this schema, one can define "effectiveness" as the percentage of users who can successfully complete the task (error free), "efficiency" as the amount of time required to complete the task, and "satisfaction" as a user completed (1–5 scale) satisfaction number after doing the task. A grid can be assembled, with each identified task on rows, and the columns being these 3 items. Target goals can be entered in each item of the grid, and this can then be used to measure prospective systems. A hypothetical example might look something like Table 1.

Different people will have different needs for an EHR system. Clerical and front desk personnel, for example, will be more involved with how to schedule appointments, enter new patient information, or verify insurance coverage. Nursing personnel will be more involved in knowing who is waiting in the lobby, entering vital signs, or doing specific tasks like giving immunizations or injections. Physicians have a different set of tasks, such as creating chart notes, reviewing imaging results, reviewing lab results, writing prescriptions, responding to refill requests from pharmacies, or generating patient handouts. Therefore, when creating lists of tasks for evaluation as described, they must reflect the common tasks that each of the user audiences face. The system must be able to be effective, efficient, and satisfactory to each of the types of users.

Using the same hypothetical example, the completed evaluation grid comparing

TABLE 2. Comparing EHR Systems

User	Task	Measuring Usability Relative to Goal		
		Effectiveness	Efficiency	Satisfaction
Admin	Create an appointment	Goal: 100% **EHR A:** 95% **EHR B:** 100%	Goal: 30 secs **EHR A:** 2 mins **EHR B:** 20 sec	Goal: 4.00 **EHR A:** 3.7 **EHR B:** 4.5
Admin	Enter a new patient	Goal: 100% **EHR A:** 95% **EHR B:** 95%	Goal: 2 mins **EHR A:** 5 mins **EHR B:** 2 mins	Goal: 4.00 **EHR A:** 3.0 **EHR B:** 4.2
Nursing	Enter vital signs	Goal: 100% **EHR A:** 100% **EHR B:** 100%	Goal: 30 secs **EHR A:** 15 secs **EHR B:** 20 sec	Goal: 4.00 **EHR A:** 4.5 **EHR B:** 3.8
Nursing	Administer immunization	Goal: 100% **EHR A:** 98% **EHR B:** 100%	Goal: 1 min **EHR A:** 1 min **EHR B:** 45 sec	Goal: 4.00 **EHR A:** 3.7 **EHR B:** 4.5
MD	Create simple note 99213	Goal: 100% **EHR A:** 90% **EHR B:** 90%	Goal: 3 mins **EHR A:** 7 mins **EHR B:** 5 mins	Goal: 4.00 **EHR A:** 2.0 **EHR B:** 3.8
MD	Create full consult note	Goal: 100% **EHR A:** 90% **EHR B:** 98%	Goal: 5 mins **EHR A:** 10 mins **EHR B:** 7 mins	Goal: 4.00 **EHR A:** 2.0 **EHR B:** 4.0
MD	Write an Rx	Goal: 100% **EHR A:** 100% **EHR B:** 100%	Goal: 30 secs **EHR A:** 1 min **EHR B:** 20 sec	Goal: 4.00 **EHR A:** 3.7 **EHR B:** 4.5
MD	Review refill requests	Goal: 100% **EHR A:** 95% **EHR B:** 95%	Goal: 1 min ea **EHR A:** 1 min ea **EHR B:** 30 sec ea	Goal: 4.00 **EHR A:** 4.0 **EHR B:** 4.0
MD	Review lab requests	Goal: 100% **EHR A:** 100% **EHR B:** 100%	Goal: 30 sec ea **EHR A:** 20 sec ea **EHR B:** 20 sec ea	Goal: 4.00 **EHR A:** 4.5 **EHR B:** 4.5
MD	Review scanned documents	Goal: 100% **EHR A:** 95% **EHR B:** 95%	Goal: 1 min ea **EHR A:** 1 min ea **EHR B:** 45 sec ea	Goal: 4.00 **EHR A:** 3.7 **EHR B:** 4.5

2 systems might look like Table 2. One can see that some systems may be more usable in certain settings (like administrative), while others are more useful in other settings (like creating chart notes or prescription writing).

When evaluating tasks for physicians, it is probably best to include tasks from the "7 ambulatory workflows"–billing and accounts receivable, scheduling, in-house messaging, documentation of patient interactions, processing refill requests, reviewing and acting on lab results, and managing external correspondence about patients.[5]

The tasks enumerated for testing in this manner can also address some basic,

universal needs which had been previously addressed by "functionality" questions in the old CCHIT approach. Diagnostic imaging reporting, a physician portal for order entry, a method for automated notification and confirmation to patients, room and equipment scheduling, and other workflow tasks particularly relevant to radiology services would all be "task items" that would populate an evaluation table, as illustrated. Other basic items that should be tested might include medication reconciliation, alerts regarding medication or contrast material allergies, online scheduling, patient-portal access to deliver results, etc.

An EHR system can be thought of as having 2 main components: the clinical tools and the billing tools. They may or may not be from the same vendor. For example, many practices may outsource their billing to a service agency, who might have its own system and would not be able to utilize the billing component of a given EHR. Therefore, the clinical system chosen must have the flexibility to interact with its own "internal" billing management system, as well as output "superbill" billing messages to external billers who may be using their own systems.

When "usability" is an evaluation domain, the needed "functionality" features (which is what CCHIT has focused on) are already taken into account. Going forward, CCHIT (a public-private effort) may lose its place in the certification process and be replaced by a government controlled body (the HIT Standards Committee) under the Health and Human Services (HHS) deparment.[6] The new government certification process may end up adopting the inherited CCHIT criteria set (they have until December 2009 to define their certification criteria) or they may adopt modification.

Interoperability

Interoperability is the key difference between an EMR and an EHR—an EMR collects encounter and other clinical data within a practice or organization, while an EHR is able to interact with other systems in other practices or organizations.[7]

The first phase of development of EMRs mainly replaced a physician's paper chart rack with a local database—a step forward, but still leaving the distribution of clinical data segregated into silos across the landscape (see Figure 1). The goal of interoperability is to be able to seamlessly link the data in multiple practices and achieve a "one patient one chart" virtual chart that draws from different practices' sources, similar to how a hospital inpatient chart is "one patient one chart" with multiple physicians entering information on a given patient, but expanded to the outpatient setting.

Such a goal has been elusive, since the traditional EMRs created by different vendors have significantly different data structures, and interoperability is a challenge. The response to this dilemma has been the creation of a standardized input/output file called a Continuity of Care Record (CCR).[8] This is intended as a way in which relevant clinical information can be output into a standard format and imported similarly. Many EHR systems have the capability of importing and exporting, but to date this has not been used very much, as an infrastructure to transport these files (like a "CCR bulletin board") has yet to emerge in a meaningful way. Part of the vision of health IT going forward under HITECH is a more harmonious way of sharing (at least) medication, laboratory, and clinical summary information.[9] Exactly how this desired level of interoperability will evolve remains to be seen—nevertheless, the directive to develop a nationally standard method of exchanging useful clinical information is in place.

Clinical chart sharing will continue to be difficult for locally installed traditional EMRs, particularly for smaller "lightweight" products that are not able to import or export CCRs. However, next generation EMRs that are Web based (and therefore hosted) are emerging into the market and are in a much better position to allow clinical chart sharing. Rather than point-to-point CCR connections being needed, a hosted system is potentially able to share charts among users of the same system regardless of where they are located, and integration into external systems is done from a single server (one connection) rather than one for every installation.

Technology is rapidly advancing and the term "cloud computing" has emerged

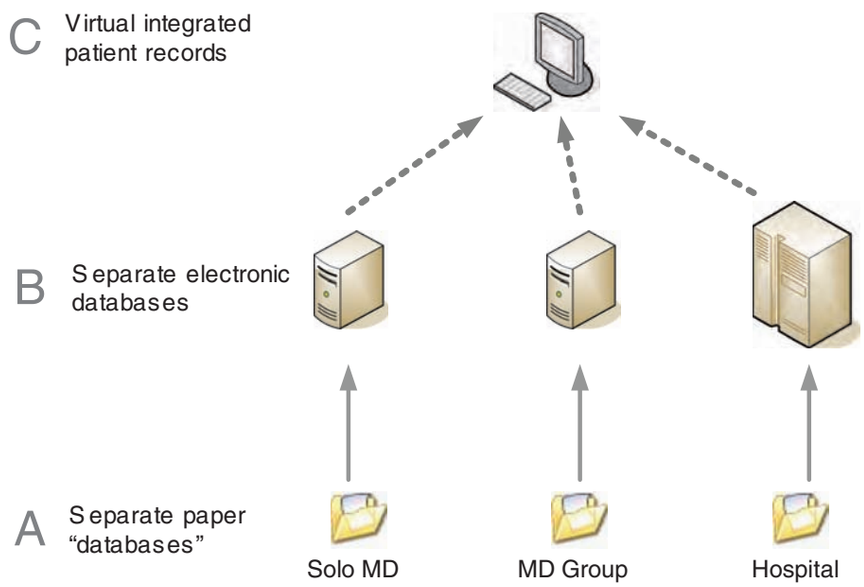

Figure 1 • The phases of EMR development (from "A" to "C").

The increasing interconnectivity of all data, including health data, is at the crux of interoperability

to describe a virtual interface that draws from multiple data sources.[10] Web based applications are much better at accomplishing this than older client/server locally installed systems. In healthcare IT, an example of this would be displaying hosted, stored digital radiology images within an EHR system, even though the image hosting service is not related to the EHR vendor's system. Another example would be the insertion of decision support around imaging ordering at the point of care, where the ordering physician would be prompted by patient specific health plan criteria for a particular study, and the health plan authorization process gets started right then and there. The EHR becomes a seamless portal into the health plan authorization system. The increasing interconnectivity of all data, including health data, is at the crux of interoperability, and has led some to lobby that interoperability should be the main (if not only) criteria for EHR certification.[11]

As previously noted, one important type of interoperability that many systems offer is the ability to interface with a billing system. Sometimes this is accomplished by integrating billing into the EMR system (sometimes called an EMR/EPM system), thus requiring a biller to use the same system as the one the physician uses. Other systems simply output billing messages, which function like electronic "superbills" that a biller (onsite or offsite) can use to generate bills on whatever system the biller has historically used. This is a more flexible and practicable solution, though tight integration is lost.

Some other, more basic kinds of interoperability should be mentioned here. E-prescribing is a form of interoperability, since it involves transmitting an e-prescription from a local EHR system through a remote portal (eg, Surescripts) in order that the prescription appears in the local pharmacy's system. This is hailed as a step toward EHR adoption and is being rewarded by CMS this year.[12]

Laboratory integration is another type of interoperability. Commercial reference laboratories, and sometimes hospital laboratories, are able to output lab results (via HL7 formatted text files or directly via Web services) and transmit them to EHR systems. Again, when the EHRs are separate, in physicians' separate offices, the lab data is separate as well, and sharing lab results with other physicians also taking care of the patient remains problematic. With hosted EHR systems, there is the possibility that labs (reviewed by the ordering physician) become placed in the common "one patient one chart" record and become visible to everyone taking care of the patient (and sharing the chart). The potential for reducing unnecessary duplication of lab testing is significant.

Sometimes, in a hospital setting, the interoperability goal is more limited: simply getting all the department systems (lab, radiology, medical records, pharmacy, order management, and billing) to interact with each other. Connection with outside physicians' practices will be difficult if in-house interoperability has not been achieved.

Affordability

The cost of EMR/EHR systems has been the biggest barrier to adoption. In 2005, the average initial cost was found to be approximately $33,000 per physician (somewhat higher per physician for smaller practices and lower for larger practices), with maintenance costs of about $1500 per physician per month.[2] In a client/server locally installed system, there are also additional hidden costs—eg, the cost of the hardware infrastructure to house the software, the cost of IT consultants needed to maintain the network, the cost of data backup, third party software costs, training costs, support costs, and annual costs after the first year.[13,14]

Hosted systems, on the other hand, are intrinsically less costly to implement—the hardware and ancillary software costs, as well as data backup costs, are not present. On-site vendor time required to supervise installation and conduct training (a hidden cost) is also seldom needed in a hosted model. All that is needed is an internet connected computer in order to log on and use the system. Training may well be done by online support rather than on-site support. Radiology digital imaging hosting has been available in the marketplace for a number of years and has been used by hospital based radiologists as well as community orthopedists. The same is now being seen in the ambulatory EHR space.

Traditional business models utilized by many vendors has been for the physician users to foot the cost of the system themselves. The result has been the low EHR adoption rates seen to date. It has been estimated that of all the system benefits resulting from EHR use, only 11% of that benefit is seen by the physician directly.[15]

With the emergence of hosted, Web based EHR systems, the development of alternative, novel business models has also emerged. There have been lower cost per patient models, as well as models that offer the EHR free to the end user (paid for by alternative revenue streams, including advertising).[16]

Regardless of the underlying business model, hospital subsidy and support of EHR installations has been commonly seen, hoping to support the local hospital medical community. The thrust of this is to relieve the cost burden from the shoulders of the practicing physicians in order to lower cost as the biggest barrier to EHR adoption.

Conclusion

The choice of an EHR can seem daunting, but there is a systematic approach that can minimize the risk and yield a system that is

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the best fit for a practice or organization. Using the approach of usability, interoperability, and affordability, one can review the products in the marketplace and make sound decisions. One thing is clear: technology is advancing rapidly and the large, expensive, locally installed options are no longer the only alternatives available. Hosted, Web based next generation EHRs may well afford the lowest cost, best interoperability, and greatest usability seen to date.

The future of EHRs can be seen in expanded interconnectivity between different data sources ("cloud computing"). Accessing decision support with health plans from within an EHR interface, interacting with patients in a HIPAA secure fashion for scheduling, result reporting, wellness and health management prompting, and online consultation are all features that will become the mainstream in the foreseeable future. One needs an EHR that is able to grow with the evolution of technology and interconnectivity that is direction forward.

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QUESTIONS

Instructions: Choose the answer that is most correct.

1. **Healthcare facilities are being encouraged to implement EHR systems because of:**
   a. Security issues
   b. Technology platforms are becoming increasingly available
   c. Government stimulus money becoming available
   d. Upcoming government mandates

2. **The best approach for evaluating EHR systems is on the basis of:**
   a. Usability
   b. Interoperability
   c. Affordability
   d. All of the above

3. **The 2009 American Recovery and Reinvestment Act was signed on:**
   a. January 17, 2009
   b. February 17, 2009
   c. March 17, 2009
   d. April 17, 2009

4. **The Health Information Technology for Economic and Clinical Health Act allocates how much for incentive payments for EHR use?**
   a. $38.2 billion
   b. $19.2 billion
   c. $17.2 billion
   d. $2 billion

5. **Many institutions have policies that require EHRs to be chosen from among ones that have been certified by CCHIT. Which of the following is NOT evaluated by this certification process?**
   a. Functionality
   b. Usability
   c. Interoperability
   d. Security

6. **The main obstacle for EHR adoption is:**
   a. Cost
   b. Usability
   c. Functionality
   d. Security

7. Before selecting an EHR vendor, a discussion should take place about how to migrate data out of their system in the event that:

a. The vendor stops doing business
b. The vendor abandons that product line
c. A better solution arrives in the market down the road
d. All of the above

8. By defining a set of user groups, assigning a set of "test tasks" for each user group, and identifying effectiveness, efficiency, and satisfaction for each task; usability can be:

a. Subjectively approached
b. Instinctively approached
c. Systematically approached
d. Indiscriminately approached

9. The efficiency of usability is defined as:

a. The percentage of users who can successfully complete the task (error free)
b. The amount of time required to complete the task
c. The satisfaction a user has after completing a task
d. All of the above

10. The EHR system does NOT need to be effective, efficient, or satisfactory to each of the types of users.

a. True
b. False

11. An EHR system can be thought of as having 2 main components:

a. Clinical and patient tools
b. Security and clinical tools
c. Billing and security tools
d. Clinical and billing tools

12. A system that collects encounter and other clinical data within a practice or organization is known as a:

a. EHR
b. EMR
c. CCR
d. EMP

13. A system that is able to interact with other systems in other practices or organizations is known as a:

a. EHR
b. EMR
c. CCR
d. EMP

14. To be able to seamlessly link the data in multiple practices and achieve a "one patient one chart" is the goal of:

a. Interoperability
b. Usability
c. Functionality
d. Linkage

15. Because traditional EMRs are created by different vendors that have significantly different data structures, a standardized input/output file has been created called a:

a. DICOM
b. HITECH
c. CCR
d. HL7

16. A better way to accomplish "cloud computing" is to use:

a. Client/server locally installed system
b. Web based applications
c. "Lightweight" products
d. Point-to-point connections

17. Besides billing, other types of interoperability include:

a. E-prescribing
b. Laboratory integration
c. Hospital department systems (eg, radiology, medical records)
d. All of the above

18. In 2005, the average initial cost of an EMR\EHR system per physician was found to be approximately:

a. $1500
b. $3300
c. $15,000
d. $33,000

19. Web based hosted systems are intrinsically less costly to implement.

a. True
b. False

20. Hosted, Web based next generation EHRs may well afford the:

a. Lowest cost
b. Best interoperability
c. Greatest usability
d. All of the above