Managing Your Clinical Information Systems through Electronic Health Records

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Industry, government and health care providers are all clamoring for electronic health records (EHRs)—so much so that the advent of EHRs appears to be only a matter of time. Consider that:

A few years ago, the Leapfrog Group (made up of more than 170 companies and organizations that buy health care) called upon health organizations to implement computerized physician order entry (CPOE) systems as a way to reduce medical errors. The efforts of other countries—combined with national initiatives such as anti-terrorism response and an FDA imperative to accelerate the progress of clinical trials—have caused organizational stirs in the Department of Health and Human Services (DHHS). Though actual substantial funds have not yet been budgeted, DHHS does agree that if the current efforts continue over the next 10 or so years, the United States will have somewhere between 5,000 and 30,000 silos of information that can't be shared.

President Bush and other national leaders have publicly called for development of a national health information infrastructure. The US government developed plans that call for all Americans to have an electronic health record by 2014. The plans so far call for a hierarchical set of local/regional and state networks and finally a national network that facilitate peer-to-peer sharing of patient electronic health record information.

Health organizations are starting to examine the implications of the government's plans. Individual provider organizations will need:

• Their own EHR systems that facilitate clinical process automation within their offices and organizations and also share and access that same information on these networks.

• Information that conforms to a number of messaging and data and content or vocabulary standards.
• An understanding of the defined standards that cover a wide variety of data and activities, and verification that fundamental and core elements of any planned implementation such as data representation and source level coding are not contrary to these standards.

Accenture believes that in light of the inevitability of EHRs, all hospitals and health systems clearly need to consider developing electronic methods of storing and tracking clinical information. However, our experience indicates they will face some fundamental architectural problems with existing technologies. These include scalability, reliability, recoverability, interchangeable vocabularies and integration.

Scalability

Health organizations need to determine if a single EHR system will be big enough to support all users, with the functionality they want. Architectures in use today do not scale (or at least have not demonstrated scalability) to the EHR requirements. Vendor systems can only be reliably measured by their "largest live implementation." EHR systems scale well until their single online data store develops unacceptable spikes of peak congestion. The numbers of simultaneous sessions and active interfaces correlate to online systems performance.

At present, most vendors who sell to large organizations can support a maximum of about 5,000 simultaneous logons. In addition, none have demonstrated scalability in thin-client, rules-based order entry or structured clinical documentation. Stress testing has proven unreliable and elusive prior to going live. Interfaces, in particular, are difficult to test in a way that demonstrates their effect on live systems performance. The tests often return a false positive, in spite of the fact that the product is essentially installed and the environment connected and set. Reasons why stress tests pass when they should fail:

- It is difficult to faithfully reproduce the numbers and mix of users in a scripted environment.
- Anything less than a level of random activity that represents the true live standard deviation will play to architectural benefits that diminish as the load gets heavier in real life—e.g., the same transactions against the same records play in cache. (Real-life distributions don't all fit in cache at the same time.)

- Message-sourced inbound transactions are difficult to script (without using identical/similar data).
- Relational database management system designs are optimized for minimum response time at an interactive device to transactions that are heavily weighted (in real life) to inquiry.
- Inbound messages (unsolicited updates to the database) are almost entirely write/update transactions. De-normalization and multiple-index optimizations extract a heavy performance price when the activity shifts from inquiry to write/update.

Health organizations will need to develop backup plans to provide clinicians with access to critical clinical information that is only available in an electronic form if systems become suddenly unavailable.

Reliability

At least in part, health organizations have a goal of replacing paper records that are currently used for the administration of clinical and business processes. Paper processes may technically exist as a downtime procedure. But classic "downtime" paper procedures are ineffective when procedures have been redesigned to make best use of information technology. And paper charts are frequently misplaced or for some other reason unavailable.

Yet, unlike an electronic environment where access to records depends upon system availability, paper charts (if they have not been misplaced) can be available, even though it may require time and effort to find them. The issue of reliability is one that few health organizations have ever truly encountered, so Accenture believes that health IT executives need to consider this when preparing for a paperless environment. They need to look at any time that systems are unavailable to users,

including both scheduled and unscheduled downtime. They should require reliability of at least 99.999 percent (i.e., availability for all but about five minutes per year). They need to determine what their vendors support, and their vendors' demonstrated need for scheduled downtime.

Recoverability

Since the goal of EHR implementations today is to effectively replace the paper chart and optimize administrative and clinical processes to use electronic information, EHR systems need to be instantly recoverable in the event of downtime, or if a failure occurs.

Health organizations will need to develop backup plans to provide clinicians with access to critical clinical information that is only available in an electronic form if systems become suddenly unavailable. Emergency care, scheduling and registration, order entry,

and clinical documentation are just a few of the work processes that would need to continue seamlessly, even with a primary systems interruption.

Furthermore, this recovery must be complete with no loss of information. This will require sophisticated backup. This backup must prevent any IT failure (including a fire in the computer room) from making care impossible or unsafe. At present, this level of recoverability exists only when vendors host the applications or an organization's IT department is willing to make a significant capital investment. As a result, health IT executives need to make sure that adequate hardware, infrastructure and tested processes exist in their complete EHR implementation to guarantee this recoverability.

Interchangeable vocabularies

Health organizations are frequently challenged by a variety of code sets or master files that have proliferated across their facilities. Most often, this is due to acquisitions that were never optimized. The US government is starting to pre-scribe specific vocabularies that will need to be used for HIPAA attachments transactions and the future exchange of electronic patient information between health care organizations.

To support a portable, interoperable electronic health record, health orga-nizations will need to replace their local vocabularies and synchronize their use of government-specified code sets. While it may be possible to eventually migrate systems and practices to common vocabularies, current systems and historic data need to be maintained through mapping infrastructures. These infrastructures will manage the correct translation of the semantic meaning of clinical data. The mapping will need to be valid for the life of the record (i.e., the patient).

A few vendors have started to address this issue. Buyers of EHR systems need to ensure that they acquire and use the right technology to safely use, maintain and transport coded patient information.

Integration

At present, most electronic record systems do not integrate with those of other vendors (and some systems offered by the same vendor aren't even integrated with each other). Most vendors currently offer their products on a variety of hardware and associated operating systems. Each vendor uses a particular approach, and no two vendors have a similar approach, much less a detailed design. No two site imple-mentations of a given vendor system are the same. No two sets of interfaces are the same, and no two implemen-tations use the same vocabularies. In short, nothing is designed or imple-mented to integrate beyond a specific implementation.

Vendors design their applications with a baseline assumption that their approach and architecture doesn't need to co-exist to be successful. They often support integration with external appli-cations with significant differences in philosophy and detail. Moreover, features that work across a vendor's own inte-grated applications will not always cross over foreign system interfaces in exactly the same way. And even if a hospital would like to implement a total vendor solution, it may not be practical on many different dimensions of time, scope, economics or provider organization politics.

True interoperability will require that all features and functions work across all applications. The term "semantic interoperability" is now being used to describe a level of integration that facilitates the movement of data between systems. A practical definition of the term "semantic interoperability" is the interchange of data where not only can the information be transmitted between/among systems, but the receiving system can understand and reuse the information in many different contexts, across all health care informa-tion application domains. This includes documents, reports, and rules for decision support.[1]

There is a high probability that any vendor chosen today will have to sig-nificantly alter its current approach to internal and external integration, secu-rity and nomenclatures over the next few years. The federal and some state governments have already started to specify standards for integration and nomenclature to support portable electronic medical records. Providers will receive incentives to comply. Payers and political groups like the American Association of Retired Persons are beginning to demand it.

[1]Courtesy of Health Level Seven.

High performance through electronic health records

Government, industry and patient demands promise to make electronic health records a "when," not an "if," for the US health care industry. All players need to prepare for the inevitable. The change will not be easy and will involve radical change in the scalability, relia-bility, recoverability, interchangeable vocabularies, and integration of clinical systems.

But the end result promises to be more efficient and effective health care, and result in high performance for health care players.

For more information on how Accenture can help you achieve high performance through electronic health records, please contact:

Lewis Redd
+1 678 657 5478
lewis.redd@accenture.com

John Quinn
+1 216 535 5186
john.f.quinn@accenture.com

John Celi
+33 4929 47565
john.s.celi@accenture.com

Sally Boyer
+1 302 830 6057
sally.e.boyer@accenture.com

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