



## Daily News

# PACS forges connection to electronic health record

by [Greg Freiherr](#)

Radiology is no neophyte when it comes to information technology. Viewing, managing, and storing digital images has made IT a necessity for the specialty, one of the earliest adopters of data management tools. But lately, radiology has lost ground to other specialties that have successfully implemented image management techniques pioneered by radiology PACS. On a parallel track, the electronic health record has also picked up speed.

In the annual leadership survey conducted by the Healthcare Information and Management Systems Society, 24% of more than 200 healthcare IT executives have a fully operational electronic health record in place, and 36% are in the early stages of EHR installation.

"If radiologists are going to continue to add value to healthcare, they have to be able to share the results of their diagnostic process with the outside world—with primary physicians, other specialists, and patients," said Chris Carr, director of informatics for the RSNA. "XDS-I is the mechanism for doing that."

XDS stands for Cross-enterprise Document Sharing. It provides a standards-based means for sharing data across different IT systems. XDS-I is the imaging part, enabling distributed ownership of radiology images yet allowing centralized sharing of patient health information. Other versions of XDS serve other domains, such as pathology, in much the same way.

Using XDS-I, institutions retain their own images and control the information gathered about patients at their site while participating in an EHR by creating a registry of information. XDS builds "pointers" to this index. These pointers direct other IT systems to documents and images stored in repositories spread throughout the network, allowing providers to search and retrieve images and documents.

XDS, which appeared last year as a technical framework within the Integrating the Healthcare Enterprise initiative, represents a pairing of two standards: DICOM for handling images and HL7 for managing patient data. Other standards must also be addressed in healthcare IT, but none are as critical for allowing interdisciplinary flow of data.

## DICOM Rules

DICOM rules the radiology world, establishing the framework for viewing and managing large data sets generated by modern imaging modalities. The DICOM-based architecture, however, means that PACS are not suited to serve as the backbone for a comprehensive healthcare IT network, said Michael Glickman, president of Computer Network Architects, a Rockville, MD, company specializing in system integration networking and telecommunications services. Within the DICOM framework, PACS is strong when it comes to image management but weak in terms of handling other types of data.

"DICOM doesn't give you the implementation guidelines; it doesn't provide the needed optionality," he said. "It is designed to handle gigantic data sets. You don't want to use the trade-offs associated with sending around 10- and 15-megabit files when sending a five-character message."

IT systems built on HL7 handle these smaller data packages: data sets for billing and claims, patient allergies, laboratory results, and pharmacy orders, which can be handled with minimal bandwidth.

The RSNA, HIMSS, and IHE are working together to support the adoption of standards and, ultimately, implementation of XDS. Its integration into healthcare information systems will be the means by which these systems communicate among themselves, paving the way to a true EHR.

In this scheme, different specialties reside in individual domains, operating independently but sharing information. These include radiology, pathology, oncology, and cardiology, as well as laboratory, patient care devices, and patient care coordination. More domains are in the offing.

The merger of these domains into the EHR is largely theoretical. Although many companies have implemented individual IT solutions, particularly PACS, no comprehensive healthcare IT network yet exists in the real world. The first such networks are beginning to take shape, however. One is a regional health information organization in Philadelphia, and the other an ambitious effort to link the medical records of all Canadians (see "Health data exchange aims to improve cancer imaging," page 21).

## HEALTHY RELATIONSHIPS

The challenge for radiology in such undertakings is finding a way to share the knowledge contained in its imaging records with referring physicians. Just as important is solving the problem of how other IT systems share information with RIS and PACS.

At the 2006 HIMSS meeting in San Diego, the IHE tried to simulate how a healthy relationship among IT systems might work. It linked a RIS and PACS into an EHR spanning a regional health information organization (RHIO).

The patient case, used as an example, began with a physician ordering a chest x-ray for an inpatient at one hospital. It ended in the emergency room of another. Ten IT systems from 10 different vendors lay in between. XDS formed the common tie between many of the information exchanges, regardless of whether they were patient demographics or images.

"Hospitals may have vendors that deliver more than one piece," said John Donnelly, president of IntePro Solutions, a consulting firm in Colonia, NJ, that manages healthcare IT system installation. "But we were trying to demonstrate that, in the IHE world, this doesn't have to be."

The test began with a physician ordering a chest radiograph using CPSI's ChartLink computerized physician order entry. The order and patient demographics were transferred to a Cerner RIS, which created a work list item. A "radiologist" reviewed the order and routed it to the appropriate modality, in this case using a third IT system, the Kodak DirectView DR, which specializes in digital radiography. This system notified the Cerner RIS when the radiograph was completed, then transmitted patient data along with the images to a GE Centricity PACS.

"HL7 and DICOM were working as a pair," said Ellie Avraham, engineering manager for product development in Kodak's health imaging division. "The process started in HL7 and, as it came into the RIS and PACS, began using DICOM methods."

The PACS image manager confirmed storage and notified the DR modality to delete the images from local storage. It also notified the RIS and reporting system that the images were available for review

and, if necessary, postprocessing.

"Physicians" evaluating the patient's chest x-rays decided to postprocess them on a stand-alone review station that is part of an Infinitt PACS. Pulmonary nodules were quantified and the images annotated to include measurements.

When completed, the postprocessed images were transferred to the Centricity PACS, which created a manifest of images and published them in the IBM document repository. The IBM system then registered these documents using HXTI's iHistory, a vendor-neutral software that creates a registry of patient information.

"From the user perspective, you saw very little of what was done," said Vijayanand Tirumalai, lead systems designer for GE Imaging and Information Systems. "But you could see the results when you walked over (to another station in the RHIO)."

Centricity used the Initiate Identity Hub to map its local patient identifier to the RHIO. This software sorted the relevant information from duplicate and fragmented records, and then linked them together and across the various data sources.

The true test of the integrated system came when the patient appeared at another hospital, in this case one of nine pods scattered throughout the IHE interoperability showcase on the HIMSS exhibit floor. Simply identifying the patient was the first hurdle.

The healthcare system in the U.S. does not require a unique identifier for individual patients. Consequently, each time a patient arrives at a hospital, even those within a RHIO, the network must distinguish among patients with a similar or even the same name.

This was accomplished in the IHE event with a patient identifier cross-reference (PIX), which used smart algorithms to query a central server for the patient's demographic data. Leveraging PIX, a "radiologist" at the second hospital mapped the patient's ID to the RHIO using the Initiate Identity Hub, looking for manifests of the images residing in the registry. Once found, a Centricity RIS was used to retrieve the chest images of the patient from the RHIO. The transaction was then recorded in the HIPAAT Universal Audit Repository, a Web-based, stand-alone central repository of the myriad events that occur during processing of patient data.

Each step was as precise as clockwork, with each transaction completed quickly and efficiently. But the end result was a surprise-and not a pleasant one. The images retrieved and displayed at the second hospital were unprocessed DR images and did not include the nodule measurements made using the Infinitt review station. Donnelly figured it was simply a case of a pointer gone wrong.

"The postprocessed images came back to the PACS, but when the pointer was put in, it was pointed at the image set that came from the modality and not the review station," he said. "That's all it takes for a mistake to happen."

## **ALL-IN-ONE SOLUTIONS**

The challenge of combining technologies has led some companies to offer all-in-one solutions. Examples are Siemens' Soarian, GE's Centricity Enterprise, and Philips' suite of IT products.

Soarian is homegrown, developed specifically as a comprehensive EHR. The system uses algorithms that synchronize workflow across the enterprise, anticipating needs and simplifying tasks, using embedded analytics to monitor, measure, and act on incoming data. Soarian merges with the domains within an enterprise, integrating, for example, with Siemens' scalable PACS and syngo Imaging, Workflow, and Dynamics to create a consolidated imaging IT foundation for radiology and cardiology.

The current Centricity Enterprise is a rebranded version of the IDX Carecast system, obtained through GE's acquisition of IDX in January. The system automates workflow, supporting clinical, financial, and administrative processes, as it links core clinical processes for orders and results across several domains, including radiology.

Philips' suite of products represents a consolidation of IT systems: the iSite PACS, acquired through Philips' merger with Stentor; its CareVue Chart, which provides real-time clinical decision support; and shared data management using the Xtenity platform, developed in partnership with Epix Medical. Xtenity includes a clinical data repository, patient registration and scheduling, ADT (admission, discharge, transfer), billing, and inpatient and ambulatory applications. The Xtenity RIS is part of this platform, connecting with iSite PACS.

These portfolios have the advantage of flexible functionality and tailored interfaces. But only a few institutions are likely to purchase such solutions.

The IHE is trying to elevate the industry to this level of performance by defining the roles that must be performed in a comprehensive IT system. In this approach, vendors make equipment that serves one or several different roles.

"The vendor decides which systems they want to play which roles," Donnelly said. "They can have one system play multiple roles, if that makes sense to them from a marketing perspective. But when they bring that system into the IHE world, it has to be able to play the roles as defined in the IHE framework."

For the time being, XDS is the newly hired stage manager in an IT play in which the actors-and not the production-are the draw. Some vendors, however, are building XDS into their products.

XDS-powered systems could establish a substantial presence as early as the 2006 RSNA meeting, according to Carr. XDS, however, probably will not appear on vendor marquees, at least not with the panache that accompanied recent 3D and RIS/PACS integrations.

"Traditionally, vendors try to find radiologists' hot buttons," Carr said. "XDS-I, as important and wonderful as it is, represents back-office stuff for a lot of radiologists. It's unlikely that vendors will try to make it a major differentiator for their products."

## **EMBRACING INTEROPERABILITY**

The true potential of XDS will be realized only when radiology embraces the need for interoperability. Standing in the way are traditional issues of data ownership and interdepartmental rivalries.

"Radiology has been slower to come around to the importance of the EHR than some other areas of medicine," Carr said. "Primary-care physicians in particular immediately grasped the value of being able to see a patient's history. They have been vocal drivers of this process."

With the advent of digital imaging and PACS, however, radiologists have come to appreciate the value of accessing prior imaging exams. And this may be the way to drive home the relevance of radiology in the larger scheme of the EHR, he said.

"The image-enabled EHR is an absolute necessity for the way radiology is practiced," Carr said.

PACS vendors are battling the issues that stand in the way of IT interoperability. Each year dozens gather after the RSNA meeting in an industry connect-a-thon. This five-day event provides a test bed for working out the bugs that get in the way of connectivity. January's connect-a-thon linked more than 60 IT systems, exposing weaknesses and failures but also highlighting strengths.

Vendors returned to their engineering labs to pursue possible solutions. XDS-I featured prominently among them.

For much of the past decade, radiology has been ahead of other disciplines by virtue of PACS, which was born of necessity to handle an explosion of imaging data. Now, if PACS is to continue to prosper, radiologists must accept their position in the broader scheme of an EHR.

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