All Imaging Roads Lead to PACS:

ETIAM Moves Major Medical Center Images, Whatever the Source, into Radiology PACS

November 2012

Whether on film, CD/DVD or electronically, today, most major American medical centers receive large numbers of outside images, and often spend significant time and money in managing them. One world-renowned U.S. Medical Center with a high volume of imaging workflow took major steps to bring order to these images and met with significant success. Its image management policies can serve as a guideline to help other facilities address similar issues.

Located in the major metropolitan area, the Center includes an internationally recognized flagship hospital on the main campus as well as nine hospitals and numerous outpatient facilities in the nearby city. Physicians see thousands of patients annually who look to the internationally regarded Center staff for consults and second opinions. The hospital also serves as a trauma center for a large surrounding geographic area.

The Center's goal is to have all medical images entering the main campus or produced in any of its departments—whether from inside or outside the hospital— stored in the main Radiology Department PACS in a standardized fashion. The PACS serves as an enterprise-wide image clearing house and is the primary image communications tool throughout the healthcare system. Currently, it provides the only way for multiple physicians throughout the Center's campuses to view images quickly and to share them with others for referrals, collaboration and second opinions.

While organizing all exams in a single system brings order to the thousands of files passing through the hospital every day, all this makes the imaging workflow extremely complex for those exams produced beyond the Radiology Department. For these files, patient identifiers, accession numbers and other information are typically inconsistent with the hospital PACS. Reconciling this patient information can be extremely time-consuming. Since 2007, the Major Medical Center has relied on an ever-expanding system of ETIAM technologies to automate the ingestion, management and communications of images as they are archived to the PACS.

Images beyond Radiology

On the average, about 250 exams on CDs/DVDs alone from beyond the enterprise enter the Center on a daily basis and must be imported into the Radiology Department PACS. Along with these, a wide range of additional images are brought into the system from a variety of settings, including:

- Patients from unaffiliated facilities travel large distances to come to the highly regarded Center for consults and second opinions, particularly for the Neurology, Cancer and Pain Management departments, bringing with them CD/DVD images in a range of DICOM and non-DICOM vendor formats.

- Exams from departments other than Radiology in the flagship hospital must be integrated into the PACS—largely Orthopedic, Pulmonary and Emergency Room exams. These are produced in DICOM but need to be updated with appropriate facility information before archiving into the PACS.

- Images from numerous additional Medical Center Hospitals and outpatient facilities in the Center area also are integrated into the PACS which is the only way they can be shared throughout the Center system.

- Finally, the Radiology PACS also plays a role in the communications of exams of potential stroke transfer patients from several unaffiliated community hospitals. These exams must be immediately available to all physicians consulting on the case to determine how patients should be treated and whether they should be transferred to the main Center campus for treatment.

Depending on where they originate, all these images require some degree of DICOM information reconciliation and specific image management workflows. Details count: All patient identifiers need to be reconciled to ensure that a single patient with exams from multiple settings does not have multiple identifiers. Likewise, the Center needs to be sure that different patients who happen to have the same name have different identifiers... and much more.

Some exams need to be available immediately for evaluation by physicians, while others are not of any particular need for rapid communications.

ETIAM Provides the Answer

ETIAM-Connect image management technology—in particular, ETIAM Viewer (formerly Open LiteBox) and ETIAM Nexus—has helped the Center's flagship hospital manage its images and image communications flawlessly. The technology has grown with the hospital as imaging volume increased and needs changed. It enables the hospital to adapt to different imaging workflows as needed.

ETIAM Viewer is a PC/Windows-based application which is deployed hospital-wide to import DICOM (and proprietary DICOM) exams from all media (CD, DVD, hard drive, DICOM servers and more, to view these exams and to transmit them to any DICOM destination). ETIAM Nexus is a Web application used to manage outside exams. These exams are imported from CD/DVD through ETIAM Viewer or sent directly and securely from outside institutions using ETIAM-Connect and its Secure Medical Networking technology.

Today, many exams enter the hospital at the departmental level through a series of ETIAM Viewer Windows-based applications running on Clinical Desks within each department, with manual assistance from Clinical Desk clerks. Most outside images—including these CDs, which are transformed into electronic images at the Desks, and exams sent electronically from other facilities directly to the Radiology Department—enter the PACS through an ETIAM Nexus device located in the central PACS Film Library.

ETIAM Nexus runs as a central appliance over the hospital intranet and all users are authenticated for security. The ETIAM Nexus server automates many aspects of the exam reconciliation process, while specially trained technologists perform the most sophisticated changes in a matter of seconds, as the image enters the PACS. ETIAM Nexus supports all the varied workflows required for images from the multiple sources involved and allows the fine-tuning of information that enables the Center to manage images their way—easily, cost-effectively and accurately.
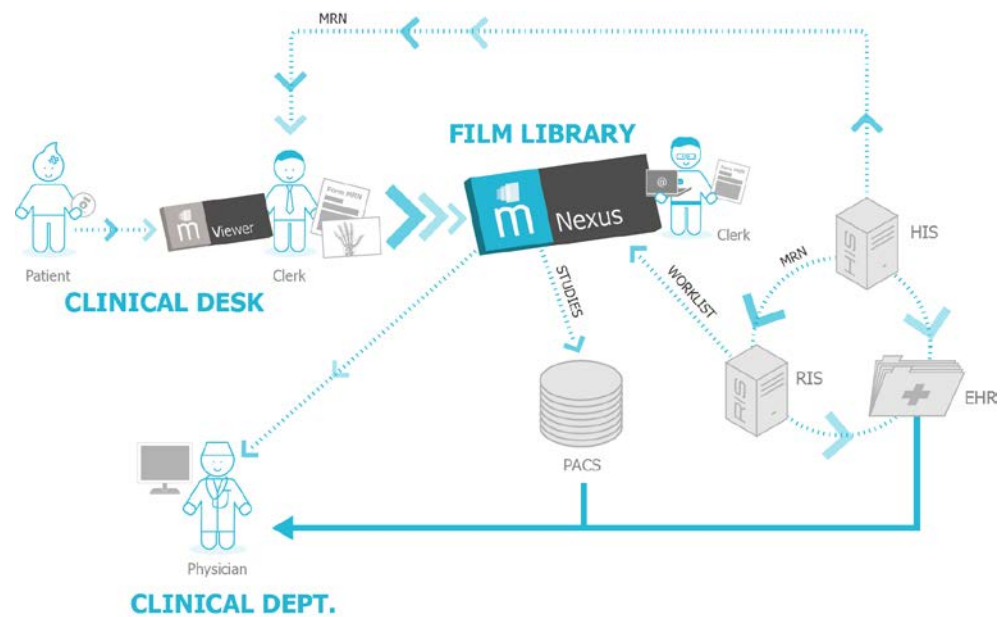
Below is a look at selected use cases and how ETIAM technology has evolved to meet the hospital's changing needs.

Stroke and Trauma Transfer

When human life hangs in the balance, seconds count. Immediate and precise treatment of stroke cases can mean the difference between life and death. Three partnering institutions take advantage of the Center's expertise by immediately pushing images of stroke patients to the Center's ETIAM Nexus using dedicated VPNs. In the future, using ETIAM Web Upload (part of the ETIAM-Connect system), digital images from critically ill patients may also be uploaded from key local community hospitals over the Secure Medical Network to the ETIAM Nexus Web image enterprise gateway at the Center Film Library.

Whatever the originating PACS solution, ETIAM Nexus accepts all images, adds information that identifies the images as urgent and stores them immediately to the hospital PACS. In addition to enabling users to rapidly differentiate images needing immediate attention, this information helps avoid conflict with existing PACS exams.

Priority is expressed in three ways: a special prefix is added to the patient ID to enable easy filtering when querying the PACS, the exam is identified as "STAT" and shown in red in Nexus GUI, and upon reception of the exam a pager message can be generated. In the interest of time, these images are given temporary patient identifiers before storage to the PACS. From there, they become available in real time throughout the hospital to physicians who have been notified by telephone of their arrival by the remote community facilities. These images become the focal point for Center's evaluation and consultation on stroke treatment plans—including whether patients should receive crucial medication at their local hospitals, typically thrombolytic, or be transferred to the Center's Trauma Center for advanced treatments.

Later, these images, earmarked as only a temporary PACS integration, are updated with existing Center patient identifiers if they exist.

External CD Consults

For the myriad of patients who come individually to the Center—CD/DVD in hand—for consults and second opinions at the department level, an entirely different workflow comes into play. But, again ETIAM Nexus is the focal point of streamlined organization and storage of images into the PACS. Using ETIAM Viewer, physicians immediately open, display and read exams on any CD/DVD, whatever the format. This even includes difficult-to-read Philips/iSite and AMICAS PACS files.

The world-renowned hospital has more than 4,000 ETIAM Viewer workstations running on local PCs hospital-wide. However, for easier maintenance, the application is managed centrally.

After images are viewed, the innovative software helps the hospital automatically integrate the relevant exams into the PACS, and to make sure all information is accurate and unique to each patient. Clerks at the Clinical Desks work directly with patients and the ETIAM application to take advantage of the patient's ability to confirm information first hand, while completing the exam integration procedure.

To initiate the process, ETIAM Viewer creates a unique online form which is automatically populated with all information from the DICOM exam header. If the patient is new to the Center, a unique patient identifier is created. Alternatively, the clerk works with the patient to identify an existing number. Completing this identification step with the patient is crucial so that specific information can be verified to ensure the correct record is associated with the patient. Clerks also manually enter information such as the doctor's name and telephone number. Exams are copied to a local server where they are cached. If the CD contains multiple exams for various medical conditions, the clerk selects only the relevant ones.

A significant benefit of this system is that patients, who are often reluctant to turn over their CDs/DVDs, can keep their original exam copies without the fear that they may become lost in the physical transfer to the Film Library.

Clinician/patient consults proceed in a timely fashion, using local copies of the exam, and another digital copy is attached to the form and pushed to the Radiology Film Library. On some ETIAM Viewer installations, an exam can be earmarked as an emergency case—which triggers a special process discussed below.

Center Outpatient Facilities and Hospitals

A similar process takes place when exams are transferred to the main PACS from the Center's facilities outside the main campus. These facilities have access to the central Hospital Information System (HIS) and can properly identify the patient using the relevant Center Medical Record Numbers (MRN). However, because these exams were not scheduled in the Radiology Information System (RIS), they lack an accession number for that PACS. Therefore, exams are pushed to the main campus Film Library with a clear identification of their origin.

General Emergency Case

Some image types have special fields that allow the files to be flagged at the Clinical Desk as an emergency case. Typically, the exam is flagged with a red "STAT" marker. Once completed, these exams trigger an email, which is transformed into a pager message requesting a Film Library clerk to import the images immediately so that they are available to relevant physicians.

The process is streamlined, free from human intervention and precise.

Importing to PACS at the Film Library

At the Film Library, the ETIAM Nexus server efficiently processes all exams to ensure they are accepted by the PACS quickly and precisely. With images flowing from 18 separate channels, ranging from transfer stroke patients to CD consults, properly reconciling exams for import into the PACS is challenging. Prior to ingestion, specially trained clerks manage small details that make the system run flawlessly, such as manually aligning exams for existing patients with existing record numbers. They may have to adjust certain fields such as an imaging station name to note that the exam was acquired offsite. The clerks are grouped into teams, assigned to specific channels. When received, the exam is entered on a worklist, which includes all the exams to be imported into the PACS with their relevant status (pending/completed/failed). A study and its associated form are placed into a folder and, using ETIAM Nexus, the fields from the form automatically populate the DICOM header. The clerk creates an order in the scheduling system which creates an entry in the DICOM worklist containing a newly created accession number.

After processing, ETIAM Nexus queries the DICOM Modality Worklist to populate this accession number inside DICOM images as required by the PACS.

Conclusion

The management of outside images, and CDs in particular, is becoming a major difficulty at many hospitals. Given the increasing volume, a standardized hospital-wide process to handle these images is required. While image management may follow a range of varied scenarios, a mechanism for distinguishing trauma or other urgent images from non-urgent files is critical. Also, care must be taken to ensure that outside images are identified with existing files for the same patient, if any. Efforts must also be made to ensure that images for patients with similar names are identified properly.

Automated processes should play a key role in streamlining the management of outside images. Such automation must be able to process images on any media—whether film, CD/DVD or electronic. It must also effectively deal with images in standard DICOM or any common DICOM variant. As imaging documents and images from beyond radiology are increasingly stored electronically, a management system (typically, EHR) should also include and automate the management of these images.

The import of all outside images into a central PACS is an effective path to sound outside image management, although other hospitals may address the situation differently. But, whatever the management plan, the automation technology discussed in this document can help bring order to the large number of outside images a hospital receives every day and streamline the workflow significantly.

About ETIAM

ETIAM, the medical image connectivity company, provides secure medical networking solutions to hospitals and healthcare professionals with end-to-end, easy-to-use, feature-rich software and services, through a unique software technology and platform. With more than 2,000 customers in Europe and North America, ETIAM solutions allow physicians to securely and reliably exchange medical images while benefiting from 24/7 support. ETIAM solutions seamlessly integrate documents, film, video, visible light and other images, transports and distributes them to any PACS and electronic health record (EHR) systems.

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