

Tools for enhanced radiology workflow in an EHR environment

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Technology is supposed to make life easier, but sometimes it makes things more complicated—at least until you get past the learning curve.

The federal government put forth the meaningful use (MU) initiative to encourage the standardization of electronic health records (EHR) by physicians, and to improve patient care by reducing errors in data, facilitating the transfer of records and data, and sending out e-reminders.¹

However, in a recent study, residents reported spending most of their time updating medical charts and documentation, and ordering tests, at the expense of direct patient care or education.¹ The results from the study showed that time spent on indirect patient care increased with the adoption of EHRs.¹

With the need to meet MU requirements under way and Accountable Care Organizations (ACOs) around the corner, now is the time for radiologists to find the tools to help push them past the rising workflow curve.

Making image-exchange meaningful

Staying at the forefront of technology has its growing pains, and adopting image-enabled EHRs is no exception.

The government is using the carrot-and-stick method to force healthcare IT standardization. The goals state that eligible professionals, hospitals, and critical access hospitals (CAHs) must successfully demonstrate meaningful use of certified EHR technology every year they participate in the program.¹

Here's the carrot: The Health Information Technology for Economic and Clinical Health Act (HITECH) offers physicians monetary incentives to use EHRs. Radiologists are eligible

providers (EP), who can receive up to \$44,000 over 5 years through Medicare, and \$63,750 through Medicaid, over the 6 years that they choose.¹ As of July 2012, nearly 600 radiologists have successfully attested to Stage 1 MU, which amounts to \$10 million in incentive dollars paid to date.³

Here's the stick: Stage 2 of the MU initiative proposes that EPs show that 10% of patients "view, download or transmit" their electronic personal health information (ePHI). The proposed Stage 2 optional imaging rule will require that more than 40% of all scans and tests ordered by EPs or hospitals be accessible through certified EHR technology.³ Plus, starting in 2015, Medicare payment reductions will begin for those not demonstrating MU.

With the introduction of the MU initiative, there has been an influx of IT tools designed to help eligible professionals, such as radiologists, achieve meaningful use goals. These technologies include electronic order-entry with decision support, standardized structured reporting, secure and ubiquitous access to an image-enabled health information exchange through cloud-based solutions, and mobile applications.

ACOs: New fee structure

Another force to be reckoned with is Accountable Care Organizations (ACOs), in which healthcare providers work together to manage and coordinate care for defined populations. Healthcare providers, including imaging services, are part of the ACO, providing care for that group of patients and being accountable for the quality, cost, and outcomes.

"In the world of ACOs, radiologists are no longer a revenue center for a hospital, but

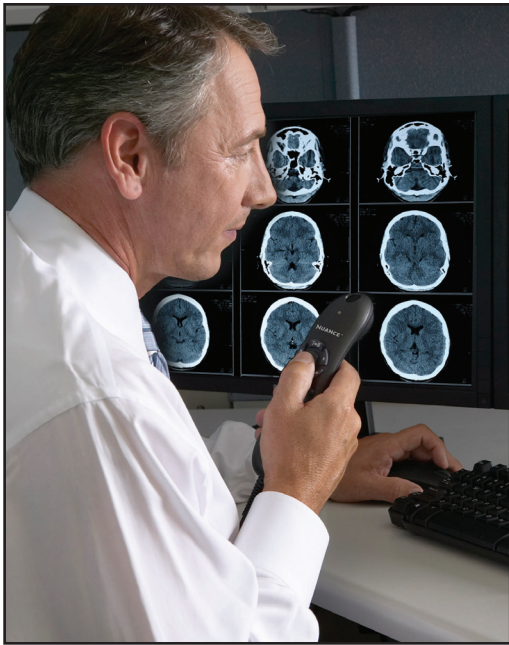


FIGURE 1. PowerScribe 360 Reporting by Nuance is a powerful radiology reporting platform that combine speech recognition, data capture, multi-site workflow and structured reporting.

instead are transitioning into becoming a cost center for an ACO,” indicated Barbara Dumery, Director of Diagnostics Solutions Marketing at Nuance Communications, in *Applied Radiology’s* Imaging InsideOut blog.

Pressure on costs will also force doctors to manage larger volumes of patients—despite the fact that patient care will become more time-consuming with growing demand for documentation, coordination of care, communication with other specialists and patients, and data review.⁴

“Timely reports are important because the new fee structure also means physicians across specialties will need to see more patients,” said Dumery. “As reimbursement moves from fee-for-service to a per-capita fee, radiologists will need to make sure they are ordering the appropriate tests, ensure radiology services meet the needs of the referring physicians, and that they provide good, consistent results, clear follow-up recommendations, and timely reports.”

The use of ACOs in Medicare is still at an early stage, with the launch of 88 new ACOs in July of 2012 bringing the total number to 153.⁴ Radiology groups can take action now to position themselves as more relevant in this new healthcare era. According to Dumery, they should start by creating joint ventures with hospitals to become part of an ACO, demonstrate

the value of their imaging services, and provide more patient-centric services.

Tools to streamline workflow

How can technology help radiologists to meet the challenges of MU requirements and treat more patients? Automation is one effective way to streamline the workflow.

CPOE

Over the last 10 years, computerized order entry systems (CPOE) for radiology with decision support for imaging have been proven clinically viable.⁶ A recent study conducted at Brigham and Women’s Hospital (BWH) in Boston centered on a Web-enabled CPOE system with embedded imaging decision support that was phased into clinical use between 2000 and 2010 across outpatient, emergency department, and inpatient settings. The primary outcome measure was meaningful use, defined as the proportion of imaging studies performed with orders electronically created (EC) or electronically signed by an authorized provider. The secondary outcome measure was adoption, defined as the proportion of imaging studies that were ordered electronically.⁵ The results showed significant increases in meaningful use and the adoption of CPOE.⁵

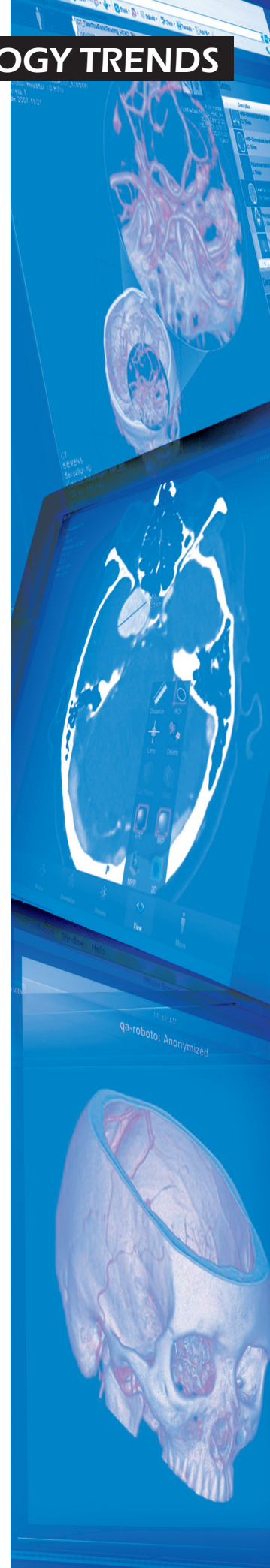
The ease and convenience of using evidence-based advice and online scheduling increased utilization to the point that the BWH radiology department had to meet rising demand for its services. CPOE contributed to efficiency in ordering imaging exams, said one of the study’s authors, Ramin Khorasani, MD, Vice Chair of the Department of Radiology at BWH.

Additionally, it fosters quality care. “It’s better for the radiology profession to have a case made to utilize evidence-based guidelines for diagnostic imaging rather than go the route of preauthorization by an entity that will not be as informed as the physicians requesting exam authorization,” Dr. Khorasani said.

Structured reporting, voice recognition

Structured reporting and speech-enabled documentation also help radiologists report more efficiently. If a radiologist is dictating a routine chest x-ray report, a structured template will recognize the type of exam that is being dictated, load a template, and prepopulate much of the terminology.

With Powerscribe 360 by Nuance (Figure 1), if there is a contrast agent being delivered,



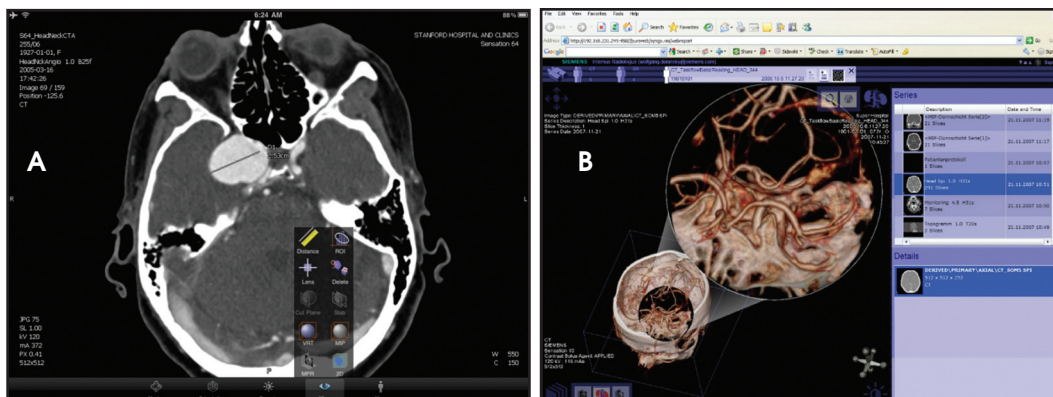


FIGURE 2. Siemens Healthcare offers 2 mobile solutions, *syngo*.via *WebView* (A) designed for fast reading and viewing of images within the hospital network, and *syngo*.via *WebReport* (B) provides referring physicians access to reports and images.

that information will be populated through an integration with Bayer or Medrad. The program also provides a radiation dose-reporting template, in which data are automatically populated through an integration with Radmetrics and DoseMonitor dose-tracking programs. Another example is an integration between PowerScribe 360 and Siemens' ultrasound system, which enters all of the ultrasound data and measurements (20 min). With these tools, the radiologist can interpret and diagnose a study when the referring physician most needs the report—while meeting with the patient.

Capturing the data automatically not only saves time but also reduces human error when inputting data. Structured-reporting templates make reports consistent, which is helpful for referring physicians. The template fields also serve as reminders to interpret all of the data in a report, such as the body part being imaged, to ensure that the radiologist receives appropriate reimbursement.

Image management tools

Image-management tools present another opportunity to automate processes. At Franciscan Saint Francis Health, Indianapolis, IN, (Saint Francis), radiologists work with oncologists to review and analyze multi-modality oncology datasets for tumor detection and monitoring. These doctors use IntelliSpace Portal, a multidisciplinary data collaboration platform by Philips Healthcare, which eliminates many manual tasks to improve speed and consistency. The platform supports a Multi-Modality Tumor Tracking application, which calculates the quantitative tumor response criteria based on the percentage change in lesion diameter; plots the figures on

a graph; and stores the results with the image series for the oncology team to reference. The follow-up series is automatically sent to the IntelliSpace Portal Server, so the user doesn't have to spend time uploading the datasets. Andrew J. Mullinix, MD, Diagnostic Radiologist at Saint Francis, says the new process cuts reading time by 5 to 10 minutes for a 5-lesion study. By automating several steps, the system makes the work more consistent, which helps technologists and physicians to more efficiently process reports. The best part about the IntelliSpace Portal for J. Louis Rankin, RT (R)(MR) (PET), 3D Technical Coordinator, Imaging Services, at Saint Francis, is its accuracy and consistency.

"The more accurate and consistent we are, the more volumes of data we can build up," Rankin said.

Time is mobile

Time spent on indirect care has increased with the adoption of EHRs. The growing information needs for patient care have led to more time spent locating or working on a computer at the expense of time at the bedside.¹ However, a recent study found that residents who used iPads were able to enter orders more quickly, and a majority of residents perceived that the iPads improved their work efficiency.¹

There are signs of similar workflow gains in radiology. Imaging-related mobile applications (apps) can simplify a PACS administrator's life by allowing a number of remote monitoring and remote-control functionalities around quality control, data movement, and information management.⁷

Smartphone technology for diagnosing patients was recently put to the test in the first

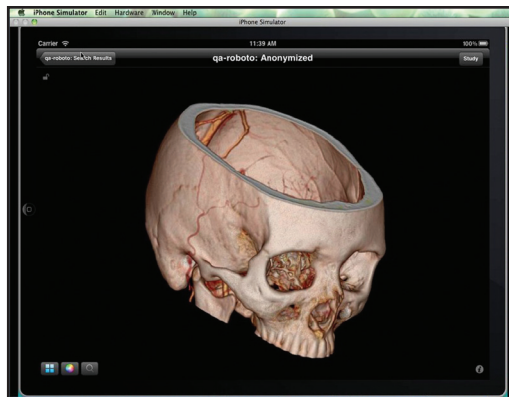
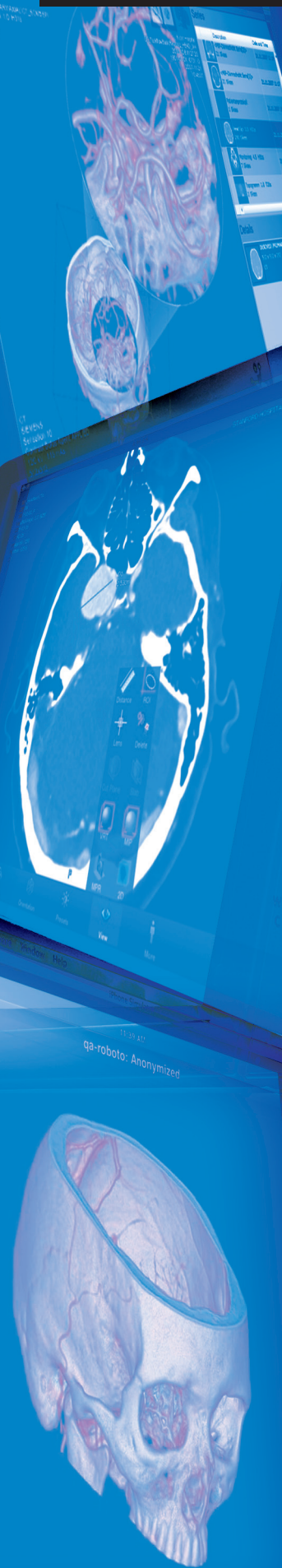


FIGURE 3. Fujifilm Synapse Mobility (Figure 3) is a zero-footprint solution that enables access from mobile platforms, including iPads, iPhones, and Android.

study⁸ to measure the efficacy of smartphone teleradiology applications in a real-world telestroke network at the Mayo Clinic. The study compared the quality of medical images using a particular smartphone application to the same types of information and images typically viewed via desktop computers. Mayo Clinic neurologists, working with emergency physicians and radiologists at Yuma Regional Medical Center (Yuma, AZ), compared brain scan images from 53 patients who came to that medical center with stroke. The study showed a high level of agreement (92%-100%) among all the reviewers over the most important radiological features.

“Smartphone client-server teleradiology systems coupled with high-quality resolution video conferencing may provide a complete telemedicine solution that fits in a physician’s pocket and an ACO’s pocketbook. ACO’s should be able to use these, when indicated, as well as other fast-evolving technologies for more efficient cost-effective healthcare delivery,” said Bart Demaerschalk, MD, Professor of Neurology, and Medical Director of Mayo Clinic Telestroke, and Dwight Channer, Telestroke Program Manager.

As standard desktop tools such as DICOM image viewers and image-enabled EHR portals become more widely available in mobile formats, the use of mobile apps for radiology will continue to proliferate.

One landmark decision in mobile radiology apps came in 2011, when the U.S. Food and Drug Administration (FDA) cleared the first mobile app to allow physicians to make medical diagnoses using images transmitted to their iPhones or iPads. The app, Mobile MIM,

developed by Cleveland-based MIM Software, supports viewing of medical images, displaying measurement lines, annotations, and areas of interest. Although the app was indicated for use only in the absence of a workstation, the latest radiology apps have been designed without workstations in mind.

Today, many radiology apps have been developed for mobile tablets and smartphones. At the 2012 RSNA conference, expect to see radiologists consulting their Mobile RSNA app, which is designed to streamline the annual meeting experience. Many apps, such as *Interactive CT and MRI Anatomy*, are educationally oriented, which helps medical students, interns, residents, doctors, nurses, and radiologic technologists who need to brush up on anatomical terms.

Several PACS-related apps are available for access with a web browser or as an app for the iPad and iPhone. Siemens Healthcare offers two *syngo.via* mobile applications, the WebReport and WebViewer (Figure 2). While not indicated for diagnostic viewing or reading on mobile devices, *syngo.via* WebViewer is designed for fast reading and viewing of images within the hospital network, and *syngo.via* WebReport provides referring physicians inside and outside the hospital with secure access to reports and images. CoActiv provides EXAM-BROWSER, a cloud-based viewer, that runs on smartphones and tablets and is designed for quick clinical reviews, even in 3D. Fujifilm Synapse Mobility by Fujifilm Medical Systems USA (Figure 3) is a zero-footprint solution that enables access from mobile platforms to the Synapse suite to display high quality, interactive 3-dimensional images. It allows user to manipulate images using the zoom, window and level, and MIP/MPR within the application, just as the physician would do at a clinical workstation.

Referring physicians often need a quick professional consultation for images at hand. One app designed to enhance the referring physician’s experience is RedSnap, a free cloud-based clinical tool that supports receiving professional consultations quickly and easily for difficult cases sent via iPhone. This tool is designed especially for referring physicians and radiologists in areas of the world where expensive PACS software is cost prohibitive.

“This is especially helpful for referring physicians to quickly get an opinion from a rad-pro.

Table 1. Radiology Mobile Apps**Centricity Radiology Mobile Access**

<http://www.appbrain.com/app/centricity-rad-mobile-access/com.ge.centricity.mobile>

Claron Technology Nil App

<http://itunes.apple.com/us/app/nil/id520915903?mt=8>

CoActiv EXAM-BROWSER

<http://www.coactiv.com/coactiv-products/exam-browser>

Dicom Droid

<http://www.appbrain.com/app/dicomdroid/bz.tis.dicomdroid2.activities>

DICOM Echo

[http://www.appbrain.com/app/dicom-echo-\(free\)/com.ldstg.Android.DicomEcho](http://www.appbrain.com/app/dicom-echo-(free)/com.ldstg.Android.DicomEcho)

Dragon Mobile Apps

<http://www.nuance.com/dragonmobileapps/>

Fujifilm Synapse Mobility

<https://itunes.apple.com/us/app/fujifilm-synapse-mobility/id530181278?mt=8>

Interactive CT and MRI Anatomy

<http://www.appbrain.com/app/interactive-ct-and-mri-anatomy/droid.jp.heteml.macmic2>

Mobile MIM

<https://itunes.apple.com/us/app/mobile-mim/id281922769?mt=8>

Mobile RSNA

<http://www.appbrain.com/app/rsna-mobile-connect/org.rsna.cordova>

MRDS

<http://www.appbrain.com/app/mrds/eu.MRDS>

mEHR

<http://www.partners.org/>

Siemens WebReport

<https://itunes.apple.com/us/app/siemens-syngo-via-webreport/id408500024?mt=8>

Siemens WebViewer

<https://itunes.apple.com/us/app/siemens-syngo-via-webviewer/id410836437?mt=8>

TechHeim Mobile PACS

http://www.androidzoom.com/android_applications/medical/techheim-mobile-pacs_beghc.html

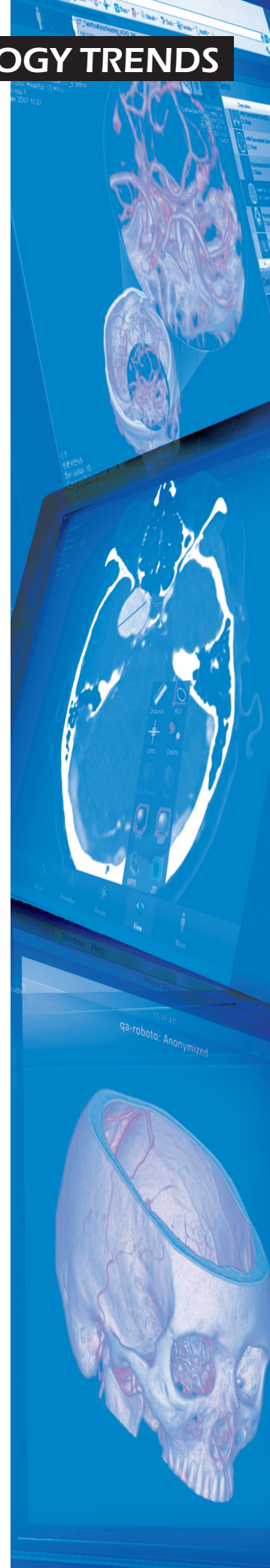
If a chiropractor has a neck radiograph and sees something on his viewing box, he just takes the image, and sends it in seconds to the community, and could receive an opinion in seconds. Otherwise, if it goes the standard way — it takes days to weeks to get a read if a referring physician sends a study to an office,” explained Roland S. Talanow, MD, PhD, a Diagnostic Radiologist at EduRad, based in Lincoln, CA, who also develops Web-based software for education and clinical applications.

Another app that enhances the referring-physician, and ultimately, the patient experience is MRDS (Medical Report Delivery System). This mobile app integrates with a RIS-PACS to enable authorized physicians and patients to view images and reports as soon as they become available from the radiology clinic.

Voice recognition apps, including Dragon Mobile Apps, powered by Nuance, allow radi-

ologists to speak text messages and e-mails, to search their mobile devices, and to dictate reports. With the PowerScribe 360 mobile radiologist app, attending radiologists can sign off on reports in their queue and consult a radiology-content specific reference tool to look up terms on the fly.

Advanced visualization benefits referring physicians when consulting with patients. Claron Technology’s Nil app includes side-by-side viewing, arrangement and comparison of multiple series/multiple studies. Other notable DICOM PACS apps include TechHeim Mobile PACS, a DICOM viewer app for displaying and manipulating medical images on Android phones; DICOM Echo, which tests and validates DICOM connection with DICOM systems; and last year introduction by Boston-based Partners HealthCare System of mEHR, an EHR-viewing app that supports a DICOM viewer.



Closing the imaging loop

Closing the loop on the imaging cycle will become increasingly important for radiologists as they highlight their role in delivering patient care. Personal (or patient) health records (PHR) can more directly connect radiologists to patients, as patients will get results after undergoing an imaging exam. PHRs will also play an important role in Stage 3 of the MU initiative, which will promote patient access to self-management tools.

RSNA Image Share is a PHR network created to enable radiologists to share medical images with patients using PHR accounts. The project was launched in 2009 through a \$4.7 million contract with the National Institute of Biomedical Imaging and Bioengineering (NIBIB) to build a secure, patient-centric medical imaging-sharing network based on common open-standards architecture. Images are exchanged over an edge server linking a radiology department or imaging center's PACS and RIS to a cloud-based server. The edge server provides security services and packages the exam for safe and secure distribution over the Internet. Once a patient registers on the network, she follows a series of steps that tell the edge server to retrieve that patient's reports and images.

Patient enrollment in the 2-year pilot program began in 2011 at Mount Sinai Medical Center (New York, NY), followed by the University of California at San Francisco, the University of Maryland, the University of Chicago, and the Mayo Clinic. Both Dell and lifeImage provide the cloud-based and vendor-neutral platforms that serve as the clearinghouse for images and reports from any hospital or imaging center and deliver them to standards-compliant PHRs.

In healthcare, where time is of the essence, PHRs can enhance imaging workflow by providing a single repository to access medical data, instead of collecting data from disparate hospital systems. Furthermore, a PHR may help reduce the number of redundant imaging exams and the use of CDs and DVDs to transfer medical data.

The PHR benefits patients by providing convenient access and storage of their medical information, and to date, the PHR pilot program has enrolled >300 patients.

"Over the last few months, we have increased the number of patients we enrolled from 1 or 2 a week to 10-plus. Patients are interested and understand the benefit of making the images available under their control," said David S. Mendelson, MD, FACR, Chief of Clinical Informatics MSMC, Professor of Radiology, Director of Radiology Information Systems, Pulmonary Radiology, at The Mount Sinai Medical Center (MSMC), and Co-Chair Integrating the Healthcare Enterprise (IHE).

"We are just starting a formal survey process, to obtain detailed information as to the patient and physician experience," said Dr. Mendelson. It looks likely radiologists and referring physicians also stand to benefit just as much as patients from PHRs.

By complying with MU criteria and implementing workflow solutions before the era of ACOs takes off, radiologists will be well positioned to meet the new demands of an image-enabled EHR environment.

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