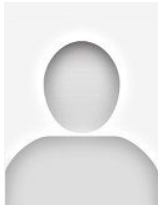## Volume 17 - Issue 2, 2017 - Best Practice

Enterprise Viewers: Key Pointers

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Top tips for selecting and implementing an enterprise viewer to allow clinicians to access and store medical images across the healthcare organisation.

What are the key criteria for selecting an enterprise viewer?

1. Enables access to all images

An enterprise viewer should give access, from within the electronic medical record, to all the images an institution has for a patient, not only radiology images. Medical imaging typically starts with radiology, but images from other clinical departments also need to be viewable through an enterprise viewer. These include visible light images from endoscopy and pathology, for example, and photographic images, such as photos of a rash taken by a dermatologist.

2. Adapts to image type

A good enterprise viewer should be able to adapt to the image type. For example, if you are viewing a set of computed tomography (CT) scan images, the viewer should have the tools they need to flip through a stack of images. If you are viewing pathology slides the viewer should have the tools to enable them to flip through the images, which are of the same slide imaged at different focal points. The viewer needs to adapt to different tasks depending on what the image is, including taking measurements, and manipulating the image.

3. Allows logical organisation and easy thorough Labeling

Among the fundamental differences between radiology images and other images is that radiology images are often from an ordered event. You place an order for a CT scan, a CT scan happens in a scheduled workflow and a transactional ID number is assigned to that study. If images are not scheduled, such as an x-ray taken in the operating room after an operation, or images taken in the emergency department, often they do not have an accession number or transactional ID. With a good enterprise viewer, that shouldn't matter, and it needs to be able to organise that information, certainly by date but even better by encounter. The system needs to allow labelling of those images to try to understand what they were part of and to reduce unnecessary repeat imaging. A good enterprise imaging system will allow and enable those who create the images to appropriately label them if they are not already labelled, without too much hassle. For example, if it is an ophthalmologic image of the retina, the record needs to show which eye it was, the date of the exam and the circumstances, for example if dye was put in the eye, if the pupil was being dilated and so on.

The conditions under which the image was taken are also relevant. In radiology we capture the images and the conditions in which the images are acquired, such as the reason for the exam, whether or not contrast was administered, how much radiation was used, what pulse sequences were used in the magnetic resonance imaging (MRI) scan and so on. Radiologists are used to capturing that kind of data. It's important for other

disciplines that when they put images into these enterprise imaging archives they capture as much clinical and technical information about the image so it can be used to greatest effect. The simplest use case is that the patient has had a bunch of studies done, and they come into the primary care doctor's office, and the doctor wants to review their chart. There is also a lot that can be gained for research, trying to mine the medical data that we have for images that meet certain criteria, for example to see if patients with a particular disease have commonalities in images of their retinas, to find out if we can discern a trend or discover a pattern. The ability to do research on those images is severely affected by how well those images are labelled. A good enterprise image archive and viewer should be able to bring that information to the fore to allow the clinician to act on it.

4. Presents the relevant images

Sometimes less is more when you want to sift through the information effectively. In the old days, you took a picture, you looked at a picture. Today CT machines can take very thin slices of a body part, thinner than we would even like to look at. We can take those thin slices and use computer algorithms to reconstruct a 3D view of a body part, the skull, an organ etc. We store the source images from which something is rendered, but it's the thing that is rendered that is useful to look at. The original thin slices are part of the patient imaging record, however. I've had the scenario where I'm going over a CT scan with a doctor in the emergency department and they're asking me a question about slice no. 573 out of 1200. That's not useful. They need to be looking at the 100-slice view. A good enterprise viewer will not only help you get faster to the images you want, but it will also hide from you the images that you don't want. It's not concealing those, but it will put them out of immediate view and sift them out, thus presenting the information that is relevant to the clinician, but retaining the information that we require for legal and for other technical purposes.

5. Retains key images and radiology markers

It is important for any clinical viewer to be able to convey the key images and allow the choice of showing or hiding these. If the radiology department's Picture Archiving and Communication System (PA CS) system is with one vendor, and the hospital uses an enterprise viewer from another vendor, you have to make sure that the enterprise viewer preserves the marking of key images and annotations from the PA CS. The radiologist may put arrows, markers, circles and measurements on images that they want the referring physician to see. An enterprise viewer also needs to be able to show or hide computer-aided detection (CAD) markers, for example circles around the areas of suspicion on a mammogram.

6. Documents are not images!

Documents do not belong in an enterprise image viewer, because they are not images. They can be turned into images, and sometimes that happens in healthcare because it's an easy option. For example, a document can be turned into a DI COM object and added to the images for a CT scan. There are zoom in and pan tools for CT scans, that don't work the same when you're dealing with a document. It's better not to have the same viewer for documents, unless the viewer is set up to work with documents, for example if it's a good PD F viewer. The typical enterprise clinical viewer is not really designed for documents.

Is it easy and intuitive for other disciplines to label their images?

Radiologists have the information automatically: the technical information is provided by the imaging equipment and for the most part the clinical information is provided by the doctor ordering the test. By contrast, when a surgeon is taking a picture either during or after surgery, they don't typically record why. It may be because they are worried about leaving something inside the patient, or worried about something anatomically wrong. They know why, they just don't write it down. I've seen situations where doctors use a regular consumer camera to acquire images and create a jpeg with information about the photograph that doesn't tell where or why it has been done, eg which eye was it or whether the patient was given an injection. In the radiology world this would automatically be known, and noted in the computer. So it is a culture shift for those other disciplines. It's not just a case of shoot the picture and store it. The more context you can give it, the more useful it will be to others, who don't know what you know when you took the image.

What are the key success factors for implementing an enterprise information strategy?

First and foremost is communication—with other departments and with referring physicians, explaining what you are planning to do. Radiology departments tend to carry most of the weight on the decision-making, because they have the bulk of the images. But that shouldn't lead them to act unilaterally, as that can cause resentment. You need to make sure you get buy in before you make any decision, so they are comfortable with the direction you are going in. Perhaps the next most important department after radiology is cardiology. Cardiology tends to use a lot of the same machines as radiology for imaging tests such as echocardiograms, cardiac CT and so on. Their needs are very similar to radiology. A good example of something they want is the ability to display cardiology data in tandem with radiology data, such as ECGs alongside the echocardiogram. You need to make sure you have buy in from the chief information officer of your institution and from all the other departments.

What are the technical requirements for running an enterprise viewer?

Today most of the companies that provide the better PACS systems also have a very strong and robust enterprise viewer. An enterprise viewer should run on Windows, Mac, IoS and Android operating systems. Viewers may run as a web solution or as a native app. Some vendors provide an HT ML solution, so that the viewer is really a web page that can work across the four platforms. Others use a native application, but then they need to develop one for each platform. There are arguments to say that native apps tend to be better and more customised. However, an HT ML solution gives more versatility.

Are most hospitals using enterprise viewers these days?

All hospitals have some kind of enterprise viewing solution. The solutions may be weak or old—some hospitals in the New York area are using a viewer that only runs on Internet Explorer. When hospitals started to adopt PA CS in the late 1990s and early 2000s, they mostly looked at medical imaging as something they had to deal with internally. It wasn't seen as an imperative to get the images on the web. Now it is an imperative and is beginning to become mandatory. You have to put the information in the hands of the referring doctor and also the patient. It is a major paradigm shift, to get images on mobile devices. The outside world marches on, and if you want to accommodate them, you cannot use 5-year old technology, it won't work. It's as bad as using no technology. You can't drag your feet any more. That's a big change to institutions, to recognise that they need the competitive advantage. It's not an option, they have to change.

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