Unified Approach to Sharing All Images and Records to Streamline Continuity of Care and Achieve Meaningful Use

By Michael J. Gray; Principal, Gray Consulting; February, 2013
Sponsored by an unrestricted grant from eHealth Technologies

Continuity of care, especially for patients that are transferred between organizations, suffers from the lack of any organized, efficient methodology of collecting and forwarding the required records and diagnostic images required for treatment. Healthcare organizations have been struggling with these problems for many years, and despite all of the digital technology and social media that connects us as individuals, our healthcare system remains broken. Rather than disparate and mostly unconnected solutions for transferring records and sharing images both inside and outside the organization, we desperately need a single, unified solution that will assure timely arrival of records and images to the caregivers that are responsible for the patient's treatment. This paper will explain the various challenges that compromise continuity of care today, and the package of technology solutions that represents an efficient and affordable solution.

Background

We are all at one time or another the recipient of healthcare, and unless dramatic changes are enacted, we or someone we care about will no doubt have personal experience with the negative effects of the "disconnectedness" of continuity of care. The limited ability to share all of a person's medical history can at best be inconvenient, and at worst tragic. One of the major motivations behind the federal government's Meaningful Use initiatives is to make the process of sharing medical records and images much more streamlined and unified. What is needed is a combination of technology and skilled services that is affordable and deliverable today—a solution that shares all images and all records amongst all caregivers.

According to The Institute of Medicine of the National Academies, which reported the results of a patient survey in September of 2012, our healthcare system is still broken when it comes to efficient transitions of care. This report indicates 20 percent of patients reported that their medical records and images never arrived at the provider with whom they had an appointment, and 25 percent of patients said that their physicians re-ordered tests to assure accurate information for a diagnosis. Not only does this alarmingly routine practice add cost to the US healthcare system and its patients, it is inconvenient to the patient to have new testing done, and the unnecessary radiation exposure from additional radiology procedures is just bad patient care.

There have been many advances in Electronic Medical Record (EMR) systems that improve care within a single facility, but huge gaps remain when transitions of care occur between facilities, as medical records are usually missing and a unified view of the patient's medical history is seldom achieved. Most of the electronic systems that manage the records and images that constitute the patient's longitudinal medical record do not naturally communicate with each other in order to merge the patient information. The problems are as diverse as the systems involved. Faxes end up in the wrong folder or do not make it into the EMR system. Image CDs don't work on the receiving end. Outside image providers are unresponsive and fail to deliver images on time. Patients are often confused and understandably do not comply with record and image collection requirements.

[1] http://www.iom.edu/Reports/2012/Best-Care-at-Lower-Cost-The-Path-to-Continuously-Learning-Health-Care-in-America/Infographic.aspx

Meaningful Use initiatives are being designed to support the drive for better sharing of information. Over the last three years there has been a burst in EMR deployments, as hospitals, clinics, and physicians prepare to meet the Meaningful Use requirements mandated by the federal government. Most present Stage 2 Meaningful Use requirements address electronic charting and the use of EMRs to manage and access "clinical" information, which consists of result reports, care summaries, and outcomes. This type of clinical information ingested and managed by the EMR is what we refer to as "little data."

EMR solutions do not manage "big data" like medical images, and for that reason they do not include even a basic medical image viewer. However, as we progress through Stage 3 Meaningful Use, access to comprehensive patient data will be a requirement, and that will certainly include medical images, which are today already included as menu options in Stage 2.

In order to share images and records within a healthcare system, most organizations have found it necessary to deploy multiple completely separate solutions, which necessitate large numbers of expensive interfaces and integrations. This is an unfortunate consequence of the fact that their costly new EMRs were just not designed for external record sharing and for managing images.

Furthermore, when it comes to sharing images and records outside of a healthcare system, for continuity of care, the current systems are just broken.

Let's take a look at the conventional solutions to image and record sharing, along with their associated problems. Then we will review what I consider to be an ideal Unified Solution to image and record sharing.

Conventional Solutions for Sharing Records and Images

What is needed is a way to improve the sharing of healthcare records and images in a unified manner.

There are countless use cases that require sharing of images and records, but I'd like to focus on one of the most complex use cases, which involves a patient being referred to a Cancer Center for further diagnosis and treatment. The Cancer Center is part of a health system and shares the health system's EMR. In this use case, there are many types of images and records needed from multiple providers, both inside and outside the health system.

There are three types of sharing:

1. Obtaining images and records before referred care or treatment

2. Internal sharing within the health system during referred care or treatment

3. Sharing records and images externally both during and after referred care or treatment

The conventional approach to getting records and images from outside providers typically begins with the referral itself. Without guidance, it is difficult for the referring physician to know what specific information, records, and images are needed. As a consequence, they may send too little, or too much. Whatever is collected is often sent in a disorganized manner, usually by means of faxes or mailed copies. Consider that the process I am describing is not just an order for a procedure and delivery of a result; it is a transfer of care from one provider to another. In this case, all relevant records and prior imaging studies are needed for good patient care and continuity of care.

The problem is that in the vast majority of situations, records and images originate at multiple sources, and nothing is unified. Faxes don't get into a patient's physical or virtual folder. Pathology slides are sent to the wrong place. Often there is far too much information, and intake teams are overwhelmed by having to first sort through stacks of reports and images to extract

the relevant information, and then having to organize it into a useful, chronological order for their physicians. In a perfect world, electronic data management systems could possibly help to filter and organize all this information, but EMRs don't talk to each other, and neither do PACS, and many of these records are still in an "unstructured" format, making it even more difficult to pull them together into a usable longitudinal patient record.

One approach to gathering the right records and images from external sources is to rely on the patient to do the work. With this approach, an anxious and sick patient is burdened with the task of tracking down their medical records, which often leads to further difficulties for the staff at the patient's original providers as they attempt to fulfill patient requests for information that are confusing and incomplete. More often than not the net result is that too much of the wrong information arrives far too late.

Relying on the patient is not the answer.

Another approach to gather images and records from external sources is to rely on internal staff members at the treatment facility, who will generally have to request the required records and prior images from all of the patient's caregivers, one location at a time, by phone or fax. When responses are inevitably delayed or ignored, calls must be made a second or a third time. These same staff members generally have many other core responsibilities and therefore will find it difficult to keep up with and manage the process effectively, resulting in further delays, as well as distractions from caring for their patients. When records eventually do arrive by mail or fax, and the images finally show up as copies on film or CD, the intake team still must sift through a disparate collection of records and prior images that may not be complete— and the treating physician may never know whether this collection was complete.

Relying on clinical staff is also not the answer.

It is a logical assumption that a Health Information Exchange (HIE) should alleviate the problem of making records and images from external sources readily accessible. An HIE can certainly handle some of the records, such as results reports, discharge summaries, and a few others, but this approach works only for those providers and physicians that are connected to the exchange, and some record types are still not managed effectively by HIEs—in particular, medical images.

Most HIEs are not entirely the answer either.

Therefore, images are still by and large managed external to an HIE. The conventional solution to getting images from outside providers is to copy the images and associated reports to a portable media type like a CD. The provider staff must first copy the images to a CD and then send the CD with the patient or through the mail to the requesting facility. Response time "is what it is." The many problems associated with this process are well known. First of all, the initial request for the images may or may not be immediately addressed. Once it is, CD production and delivery are by nature very time consuming. The process of locating the images in the PACS and creating the CD copy is labor-intensive. Relying upon the patient to be the courier places an unfair burden on someone who has other major burdens to deal with. Once the CD finally arrives at the requesting facility, the technical challenges continue. It is not at all uncommon for the media to be completely un-readable, or for the image data itself to somehow be incompatible with the receiving device.

Transferring images with CDs is definitely not the answer.

Some facilities have attempted to solve this problem by subscribing to a Cloud-based electronic image exchange

service. While these solutions are workable and may be less expensive than the manual CD copy process, they are not without their problems. The provider still may not deliver the relevant images to the Cloud in a prompt manner. It is difficult to reconcile many additional viewing platforms with each provider's choice of a Cloud-based service, and the service may only support Windows platforms. The provider may neglect to include the report along with the images. The intended recipient may forget his or her password to the provider's service. Once the recipient has accessed the relevant images and reports in the Cloud, they may only be allowed to view them and not be allowed to forward the reports to their local EMR and the images to their local PACS. Considering all of these issues, it is worth considering whether adding another limited technology solution is really the answer.

In my opinion, traditional Cloud-based services are not the answer either.

In the end, the challenge remains: the treating physician still can not be assured timely record and image delivery, and as a result must wait sometimes weeks longer before they receive all of the records and images they need to be able to schedule the patient's first appointment. For a cancer patient, this additional two or three week wait might even be the difference between life and death, let alone more unnecessary anxious waiting.

Ideal Solution for Obtaining External Records and Images

The ideal solution for obtaining external records and images would achieve each of the following goals:

1. All records and images would be transferred electronically. This would improve delivery time, reduce the effort required, and assist in the identification and organization of the data.

2. Delivery would promptly follow the request.
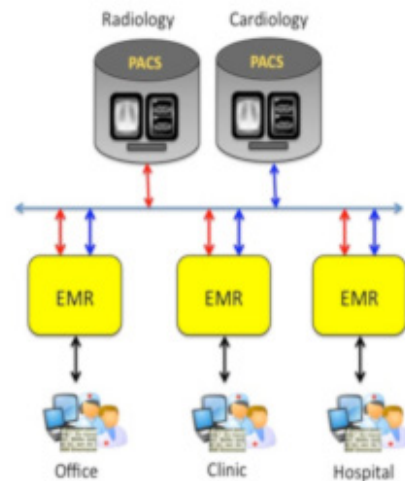
3. All records and images would be organized and automatically forwarded to the requesting organization's EMR and appropriate PACS.

4. All of the PACS must be interfaced to all of the EMRs to effectively image-enable the EMRs.

5. There would be an efficient manual process to handle records that are not in electronic format.

6. Most importantly, this ideal solution would assure prompt delivery of all records in the event of delays by people in the chain.

We have already reviewed the issues related to retrieving records and images from external referring locations. The challenges still do not end once they arrive, as there is a different set of problems associated with sharing records and images inside the health system. Most records are handled reasonably well by the health system's EMR, so I want to focus first on the issues with images—more specifically, how to image-enable the EMR.

First, I'd like to describe what I mean by image-enabling the EMR. All caregivers have learned to depend on accessing the various department PACS because that is where the image data is typically stored, and each of

those individual PACS provides the modality-specific clinical viewing application. The most common approach to image-enabling the EMR is illustrated in the graphic on the page prior. This approach involves interfacing each of the EMR systems (hospital, ambulatory, etc.) to each of the department PACS across the healthcare organization. The nature of that PACS/EMR interface is such that the EMR is aware of which PACS is managing a specific patient study. This simplifies the user access to a specific patient study, because any of the EMR systems can find any of the patient's studies. Once the user is logged into the EMR, it is usually not necessary to log into each of the PACS in order to access the images. Working within a specific patient context, the user is informed by the EMR of the availability of images associated with a results report usually by an icon embedded in the line of the directory or in the body of the actual report. Accessing and displaying the images is then as simple as clicking on that icon, which invokes the clinical display application associated with the PACS that is managing the requested images. Viewing the images assumes that the user is working with a compatible computer platform that contains the viewing client.

This scenario is the conventional approach that most healthcare organizations have taken to image-enabling their EMR: interfacing each of the EMRs to each of the PACS. While this approach simplifies the task of finding the desired imaging study, there are a number of significant issues or problems with this approach:

1. Each EMR still requires an interface to each department PACS. Since many organizations are behind in the deployment of all of these interfaces, the complete longitudinal record of the patient's medial images is incomplete.

2. Each of the display platforms in the enterprise has to be compatible with the clinical viewer associated with each of the PACS, and each of those viewing

applications must be installed on each of the platforms.

3. The user must learn and remember how to use each of the different PACS clinical viewers.

Some organizations have chosen to solve the problem of multiple interfaces by funneling non-radiology images to the Radiology PACS. This simply creates another set of problems. This strategy limits the user to the features and functions of the radiology viewing application, which are generally not very applicable to other imaging modalities like cardiology. This strategy actually costs more than the cost of the separate EMR/PACS interface, as it duplicates the storage capacity required to manage the images in two PACS, and it duplicates the cost of the software licenses associated with the acquisition and management of the image data in two separate PACS.

There are also problems related to the nature of the EMR/PACS interface. In many of the older EMR/PACS interfaces, the EMR link to the images in the PACS is hard-wired and not dynamically created on the fly. When the PACS is replaced, those links do not work with the new PACS. Because this approach involves accessing and using the individual PACS clinical viewers, the patient's complete longitudinal record of medical images is scattered over multiple PACS, so it is impossible to view all of the patient's images in a single viewing session. Radiology images have to be viewed in one session using the radiology viewer, and cardiology images have to be viewed in a separate session using the cardiology viewer.

Then there are the problems with platform compatibility and network bandwidth. Most PACS clinical viewers are only compatible with Windows platforms, so the user cannot access and view the images on their Mac, tablet, or smart phone. Most PACS clinical viewers are web-delivered thin client applications that reside on the viewing platform. Displaying images requires the eventual delivery of large volumes of pixel data to the

viewing platform, meaning performance routinely suffers over low-bandwidth connections. Alternatively, the clinical viewer could access a lossy version of the images, but a lossy version of the image frequently doesn't satisfy the user.

An alternative to image-enabling the EMR through multiple PACS interfaces and multiple PACS viewers is the deployment of a combination Vendor Neutral Archive (VNA) and associated Universal Viewer. This approach, illustrated in this graphic, consolidates all of
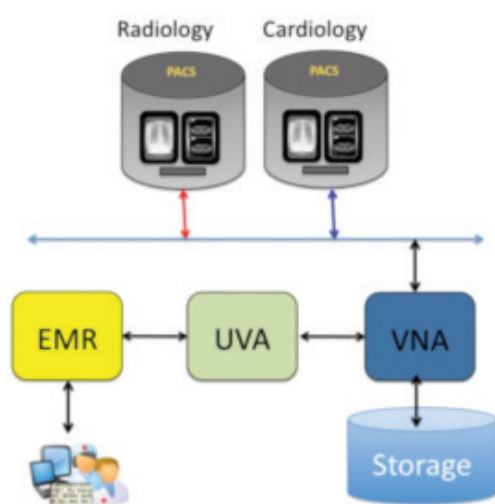
the enterprise image data from multiple-department PACS in a single repository, and reduces the interface count to one per EMR. Each EMR is interfaced to the single Universal Viewer, which in turn accesses all of the patient's images from the single VNA. With this approach, the users only have to learn and use a single viewing application. It also means that all of the patient's images can be viewed in a single viewing session. Unfortunately, deploying a Vendor Neutral Archive is a major IT project that requires substantial planning, lots of calendar time, substantial IT resources to both deploy and support the system, and significant financial investment. While

deploying a VNA and associated Universal Viewer is a valuable strategic initiative for the organization, deploying this package to simply image-enable the EMR is overkill.

In addition to all of these issues with image access, there is also the issue of internal communications with the referring physician. The referring physician needs to know what is happening with their patient at the referral facility. Has that first appointment been made? Did the patient show up for that appointment? What is the treatment plan? What follow-up is needed and who will be providing that follow-up? All too often, there is no communication about their patient until some time after the treatment is complete. Clearly, the referring physician needs to be kept in the loop.

Ideal Solution for Internal Record and Image Sharing and Referral Communications

The ideal solution for internal record and image sharing and referral communications would achieve each of the following goals. First, image-enable all of the organization's EMR systems with a single viewing application that connects to and can aggregate across all of the organization's department PACS or to a VNA—all of the repositories that manage all of the images. Second, organize all of the pertinent records and forward them to the appropriate (inpatient or ambulatory) EMR, and forward all of the pertinent images to the appropriate PACS (or VNA). Third, establish a formal and reliable method of communicating clinical information and patient treatment status to the referring physicians. Finally, provide all caregivers with the means to access all records and images.

The previous paragraphs address the issues related to obtaining records and images and sharing them within the organization. Following are the issues related to the sharing of records and images with outside providers and physicians.

EMRs are poorly designed when it comes to communicating clinical information with outside providers and physicians. While the EMR can provide templates for a printed letter or fax, that method of communicating clinical information outside of the organization is no longer satisfactory. Providing external access through an EMR portal is difficult because managing security with outside providers and physicians is challenging and very labor-intensive. Furthermore, EMR portals frequently do not provide access to the images, or at least not to all of the images. In this highly competitive environment, communicating clinical information, including images to the referring physicians, is critical to the organization's welfare. The referring physicians need access to images and results to continue treating their patients.

Department PACS are also handicapped when it comes to sharing images with outside physicians or with other PACS. Department PACS tend to be isolated by design to within the health system. Some PACS tend to be isolated to within the department. Integration of department PACS with outside PACS, even PACS from the same vendor, is difficult and rare. Integration of PACS from different vendors is technically challenging. This lack of integration between PACS prevents the construct of the patient's complete longitudinal medical image record. PACS are not the answer to external image sharing.

Many PACS vendors would have you believe that the Health Information Exchange will someday soon solve the image exchange problems, and that the XDS-I (Cross-enterprise Document Sharing for Imaging) profile will solve the PACS incompatibility issues. The XDS-I profile will simply enable disparate PACS to exchange image data; it will do nothing to guarantee that the images being exchanged will be compatible with the receiving PACS. Furthermore, every participating PACS and the HIE will have to support the XDS-I application, something which is certainly not the case today. More importantly,

most of the existing HIEs only handle the "little data" like clinical records and results, and they only handle some of the records. They do not handle "big data" like images. Then there is the unfortunate fact that not all of the outside physicians are connected to the HIE. HIEs have their limitations.

Cloud-based electronic image-sharing services were invented specifically to facilitate bi-directional image sharing between the health system and the outside physicians that refer their patients. I have already mentioned a number of problems that are common to these sharing services. Most important among those problems is the fact that most of these services only support the option to display the images that have been deposited in the Cloud. They do not even support the option to push those images to the local PACS. Those services that do support the option to transfer the images to the PACS provide minimal (if any) tag morphing capability, so the transferred images may not display properly and may not be compatible with the local PACS hanging protocols. The electronic image-sharing application must support extensive tag-morphing capabilities in order to assure complete PACS compatibility, and this function should be as automated as possible since most PACS administrators would hardly be expected to know how to manipulate DICOM tags to assure compatibility of the incoming images with their own PACS, much less how to manipulate tags to assure compatibility with external PACS.

Ideal Solution for External Record and Image Sharing

The ideal solution for external record and image sharing and referral communications is very similar to those goals identified for internal record and image sharing. First, image-enable the HIEs. Second, image-enable the EMR and EMR portals. Third, provide access to all of the department PACS images. Fourth, provide access

to all of the EMR records. Finally, provide access to the patient status, which effectively means providing timely communication with referring physicians.

The overarching goal of record and image sharing is to retrieve and to deliver all of the relevant records and all of the relevant images to all caregivers. Ideally this would be achieved with a unified approach to manage the multiple processes involved in getting all pertinent records and relevant prior images, and by developing a single solution that supports both internal and external sharing of all of those records and images. What is needed is a unified methodology for handling "big data" along with "little data"—that is to say, all of the patient's data— and thereby ensure that the entire referral care cycle is streamlined.

Ideal Solutions for Sharing All Records and Images

The goal is to achieve a Unified Approach to obtaining and sharing all relevant records and images. The ideal "solution" would meet all of the following goals:

- The electronic transfer of records and images from all sources in a timely manner.

- Organize all of the records and get them into the appropriate EMR system.

- Forward all of the images to the appropriate PACS or VNA.

- Develop and enable efficient manual processes for records that are not in an electronic format.

- Image-enable each of the EMRs deployed across the enterprise and image-enable the HIEs to which the organization belongs.

- One way or another, connect all of the EMRs across the organization to all department PACS. (I have already

recommended accomplishing this by interfacing each of the PACS to a Universal Viewing application, which in turn is interfaced to each of the EMRs.)

- Establish a methodology for timely communications with both the internal and external referring physicians.

- Enable all caregivers with access to the complete patient record, including images and EMR records.

This may appear to be a daunting challenge, but there is an approach that I believe can meet all of these goals— an approach that is, in fact, the combination of a single unified technology platform and a set of professional services.

First, let's look at a unified solution for getting and sharing images. The ideal solution for bi-directional external and internal image sharing would be a single unified solution based on the same technology components simply packaged in different configurations to support different use cases.

This first of five high-level block diagrams presents the technology components required to support bi-directional external image sharing through an HIE. Note the four key technology components in yellow. The first is an external Image Exchange Server located in the Cloud. There are three internal components packaged in an
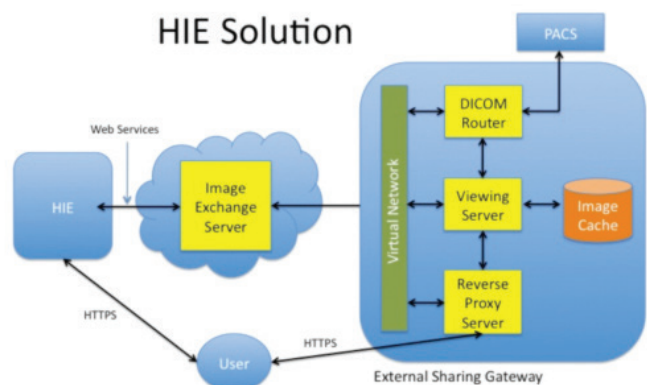
External Sharing Gateway located in the organization's data center. These three consist of the following technologies:

1. The DICOM Router, which handles tag morphing and provides the interface to the various local PACS.

2. The Viewing Server, which is the rendering server for the zero-client viewing application.

3. The Reverse Proxy Server, which processes the user requests from the HIE and allows authorized users to access the viewing application.

The on-site External Sharing Gateway in this case uses a VPN connection to the Cloud. Also note the Image Cache associated with the Rendering Server (presented in orange) and the VPN connection (presented in green).

The HIE is image-enabled by a solution that manages the image data in a Cloud Infrastructure. Here is how that would work. The HIE handles the credentialing and uses the HIE's internal EMPI to reconcile discrepancies between the MRNs (Medical Record Numbers) of the sending and receiving parties. The Sharing Gateway in the prior illustration is deployed in the facilities that expect to do a high volume of image-data transactions. A software suite that consists of the same three External Sharing Gateway applications is deployed on a local PC to support facilities or parties that expect to do a low volume of image-data transactions. As soon as the HIE receives an imaging report, it sends a command message to the Cloud-based Image Share application instructing it to forward a message to the External Sharing Gateway or PC-based software suite located at the facility that sent the report. That message results in the transfer of the associated images from the facility PACS through the External Sharing Gateway to the Cloud. As soon as the arrival of the images in the Cloud is confirmed, the HIE embeds a link in the report to its associated images that are now located in the Cloud. The Cloud infrastructure

includes a diagnostic quality, zero-client viewing application that utilizes server-side rendering technology.

The receiving party uses the HIE application to access the patient's health record.

The Radiology tab of the HIE displays a list of the Radiology Reports that have associated images available to access. In the ideal solution, the user has the option of viewing the images using the zero-client viewer or having the Cloud infrastructure automatically download the images directly to the local PACS, DICOM-conformant workstation, etc. In order to guarantee that the image data being transferred from the originating PACS is fully compatible with the receiving PACS, the Cloud Infrastructure MUST INCLUDE tag-morphing functionality.

It is important to note that the viewing of images through the zero-client viewer does not involve downloading of all image pixels and all of the grey scale to the user's display platform. That is because the server-side rendering application is sitting in the Cloud next to the uncompressed image data. The image result from the rendering operation that is actually downloaded to the PC, Mac, or mobile device is actually a web page forwarded via HTTPS. This page represents a small fraction of the actual lossless image data that was submitted to the rendering operation.
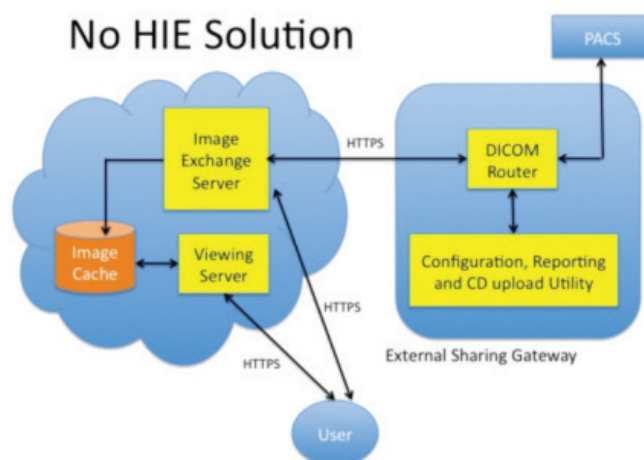
This second of five high-level block diagrams presents the technology components required to support bi-directional external image sharing between users that do not belong to an HIE. Once again, the four key technology components in the External Sharing Gateway are indicated in yellow. In this case, there is no need for a Reverse Proxy Server; however, a CD upload Utility has been added to the Sharing Gateway. Both of these External Sharing Gateway components are simply software modules that can be hosted by a PC.

In this case, the Viewing Server, its associated Image Cache, and the Image Exchange Server are all located in the Cloud. All of the external communications and data transfers are via secure HTTPS, not VPN. The key technology components are virtually the same building blocks previously introduced, but in this use case they are re-packaged and relocated from on-site to Cloud.
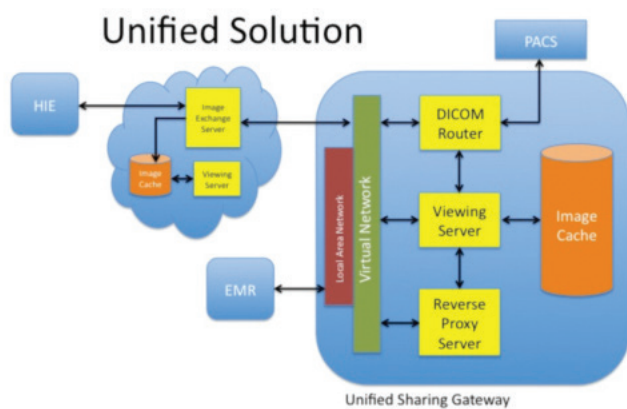
This third of five high-level block diagrams presents the technology components required to support internal image sharing, both through the EMR physician portal and through direct access to the Viewing Server. This application only requires two of the four key technology components indicated in yellow: the DICOM Router and the Viewing Server.
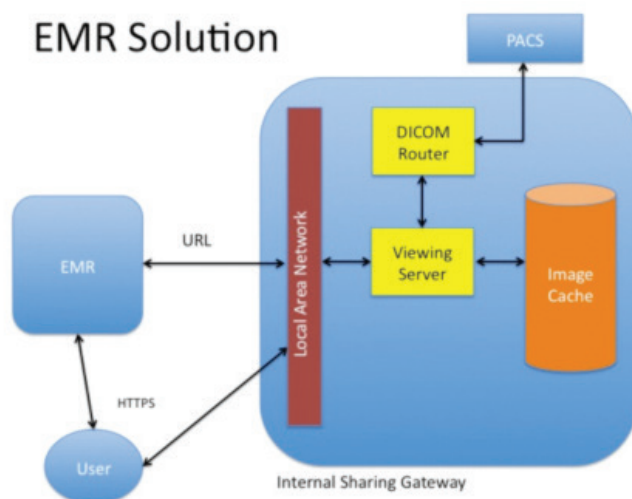
The Internal Sharing Gateway, in this case, uses a URL connection over the Local Area Network to communicate with the Viewing Server. When the request for studies is forwarded through the EMR physician portal to the Viewing Server, the server pulls the requested image or images from the associated image cache. The image that results from the Viewing Server's rendering operation is delivered to the user via HTTPS.

In this case, the Image Cache associated with the Viewing Server is considerably larger, because it is typically sized to manage six to 12 months of all new study data forwarded by the local PACS or imaging modalities. The image cache is the solution to the dependence on DICOM interfacing between the DICOM Router and the various department PACS or imaging modalities. Ad hoc image data retrievals by the Viewing Server through the DICOM Router directly from the various PACS would be painfully slow, because the DICOM communications protocol has significant overhead. The work-around is to set up each PACS to automatically route each new study to the Internal Sharing Gateway as soon as possible, where they end up being stored on the Image Cache. In situations where the PACS cannot auto-route new studies or cannot route them until after they are read, the protocol is to have the imaging modalities route the new study data to the Internal Sharing Gateway, where the DICOM Router is used to [1] route the study data through the Viewing server to the Cache, and then [2] route the new study data to the PACS. Images are accessed and managed from the report displayed by the EMR portal, just as they are in the HIE example.

The Internal Sharing Gateway also offers the authorized user the option of directly accessing the Viewing Server to search and retrieve images for review. This alternative to going through the EMR portal may prove to be more expedient for experienced image users who are not working within the EMR.

EMR Solution

Internal Sharing Gateway

Unified Solution

Unified Sharing Gateway

This fourth high-level block diagram presents all of the key technology components required to support ALL of the organization's image-sharing applications. That includes: [1] Bi-directional external image sharing between users that are both connected through an HIE and those that are completely independent, and [2] internal image sharing both through the EMR and through direct access to the Universal Viewer.

The key components or building blocks are the same, they're just packaged slightly differently in this Unified Configuration. There is some component duplication. The image viewer is both on-site and in the Cloud, and therefore the associated image cache is both on-site and in the Cloud. The point I want to emphasize is that by using the same key technologies as building blocks, it should be possible to configure a unified image sharing solution that will satisfy ALL of the organization's image-sharing requirements.

I also want to emphasize that the organization should be able to start with any ONE of the sharing applications and then add any of the OTHER applications by simply adding any missing key components, changing the packaging, and upgrading the software licensing to match the requirements.

There is also a unified solution for records that accomplishes record retrieval, assured delivery, and referral communications.

A Cloud-based Referral Management Application is an ideal way to manage a patient referral. The referring physician logs onto the Referral Management Application and is guided to enter just the information specific to the patient's condition. This Referral Management Application then provides a specific list of records needed for the proposed treatment. The Referral Management Application is also used to provide up-to-date information on the patient's treatment and notifications of any important events. The Referral Management Application can even report to the organizations business leaders current trends on referral activity, thus allowing them to deal immediately with any fall-off in referrals.

Unfortunately, the record retrieval process involves many sources that need to be managed. When outside records are requested, the following are required:

- Management of patient consent

- Timely access to complete records

- Quality reviews for accuracy, legibility, and completeness of the records

- Some method of protection from outside facilities sending the wrong patient's records

- Minimal staff time spent requesting, accessing, and then delivering records and images into the EMR and PACS

- Records delivered to the EMR, chronologically and by record type

All of these tasks need to be unified with all other aspects of sharing infrastructure, such as access to outside images through the EMR. An ideal solution would be

to use skilled professionals to manage patient consent when needed, collect all required records quickly and efficiently, then organize them and place them in the receiving facility's EMR. These professionals could be internal dedicated resources, but it may be more effective to use an external service. With this combination of technologies and services, the provider will get ALL the relevant historical information for a patient.

There is a serious consequence of delayed retrieval. Often, the first visit cannot begin until all of the records are in place for review. This common practice often delays care and treatment for weeks. If the provider knew that all the records would be delivered in a few days, then timely appointments could be made and care and treatment could quickly begin. This concept of proceeding with the knowledge that all of the relevant records and images will be available shortly, referred to as "Assured Delivery," is probably the most significant aspect of the unified solution for records.

The solution for images can be combined with the solution for records.

The Cloud-Based Referral Management Application is added and fully integrated with the platform for sharing images. An external service of skilled professionals is used

to manage the overall Record Retrieval process, including collecting non-electronic records like pathology slides. The Referral Management Application is used to store and manage all of the records in an organized manner and to transfer the records to the Health System's EMR. Most importantly, the Referral Management Application and external services are used to "Assure Delivery" of records in three days instead of three weeks, so patient visits can be scheduled promptly and treatment can begin without delay.

This unified solution of a single technology platform, combined with a service of skilled professionals, can leverage the organization's existing solutions: EMRs, PACS, HIE.

It can adapt as these existing solutions progress to provide more comprehensive solutions for image and record sharing. It can fill in the gaps for sharing all images and records with all providers, using a single platform instead of multiple solutions to get records electronically. Most importantly, this unified solution can assure delivery to speed patient care and treatment.

Conclusion

There is ample evidence that the healthcare system is broken when it comes to transitions of care. Significant issues exist with the current approaches to sharing images and records. Key records are often missing, and accessing images is problematic. What is needed is a single Unified Technology Platform that can fill in the gaps for both images and records. The solution would support [1] getting images and records before treatment, [2] internal sharing during the treatment, and [3] external sharing after the treatment.

For all the promise of Health Information Exchanges, most of the existing HIEs have their limitations. Lots of key records never find their way to the HIE, and very few
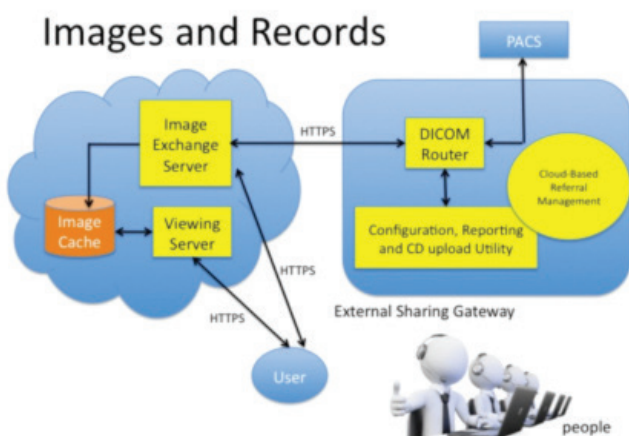
HIEs can facilitate medical image exchange. Despite all of the capital and effort invested in deploying an Electronic Medical Record system, the EMRs have their limitations as well. Key records from outside providers don't find their way to the EMR, and EMRs do not manage image data. They do not include even a basic image viewer. Years of experience suggest that transferring image and record data by copying it to CDs is also not the answer. Either the images don't display properly on the receiving end, or the data cannot be retrieved from the CD. Most of the current-generation Cloud-based Electronic Image Sharing services have their limitations as well. Some of these services only allow basic viewing of the images, and the few that do allow transfer of the image data to the local PACS suffer the same data compatibility issues experienced with CD transfer.

The goal is straightforward. What is needed is a unified approach to managing the internal and external sharing of images and records, and the importing of both records and relevant prior images. In technical terms, here are the four major requirements:

1. A methodology for image-enabling the HIE and the EMR which includes both the technology for accessing the image data and a universal viewing application for displaying and collaborating with the data.

2. The technology solution must facilitate the exchange of data between disparate PACS and guarantee that the data is compatible with the receiving PACS. This will require a tag-morphing application and an extensive library of mapping routines based on field experience.

3. The technology needs to support a methodology that will assure timely delivery of both internal and external records and images.

4. Most importantly, the technology should be based on a single platform rather than multiple solutions.

In my opinion, a Unified Solution—a single technology platform—exists today. The technology components include:

- An Image Exchange Server

- A DICOM Router

- A server-side rendering, universal-display application featuring a zero-client that is compatible with Windows, Mac, and mobile platforms and multiple browsers

- A Cloud-Based Referral Management Application

- A Professional Services component that can efficiently and effectively manage Record Retrieval

The entire package can be deployed, or any of the individual modules, depending on specific needs and budget.

The good news is that there is a company that can provide this Unified Solution today: eHealth Technologies. eHealth Technologies is a leading provider of continuity-of-care solutions to leading health information exchanges (HIEs) and over half of the nation's top 100 hospitals, including 12 of the top 17 U.S. News & World Report Honor Roll Hospitals for 2012–2013.

The company's eHealth Connect® solutions improve continuity of care by streamlining and largely automating transitions of care. Any external medical record and diagnostic-quality image is available when and where it is needed. Referrals are streamlined, with communication between parties largely automated—keeping caregivers connected during healthcare transitions. Contact them to learn more about how their unified solution can help you.