



Driving Positive Change in Healthcare

An Effective Enterprise Imaging Strategy is a Key to Meaningful Use

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The purpose of this eBook is to explore the six elements of a solid enterprise imaging strategy, and to highlight the most important considerations for healthcare organizations that are preparing to embark on this journey.

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Putting Medical Images into the Right Hands

Managing the mountains of images flowing into and through today's healthcare organizations requires a thoughtful plan of action. Is your organization up to the task?

When you hear the word "imaging," you instantly think of radiology, or perhaps cardiology, right? The problem is, imaging is so much more than that. The proliferation of digital imaging technologies—from cameras in mobile devices to low-cost ultrasound equipment and surgical scopes—has enabled the production of images in as many as 40 service lines throughout today's healthcare systems.

This means tremendous numbers of images are being acquired by a vast array of disparate devices. It also means that every healthcare discipline has its own medical images, many of which are stored in siloed archives that are either incompatible or inaccessible to the electronic health records (EHRs) that hospitals and clinics have been tasked with creating.

When clinical decisions need to be made, relevant images must be available and easily accessible via the EHR at the point of care, yet this is not always the case. What once presented itself as a simple storage and archival issue has now resulted in the disassociation of images from patient data records and the unintended consequence of making access to this important diagnostic content difficult at best.

In fact, some of today's most important clinical images are not even being retained at all. And when clinical content is retained, it is often being shared in ways that are neither predictable nor secure via a spectrum of specialties throughout the medical field.

Imaging has grown to become both complex and largely unmanaged, something which makes it a hurdle many healthcare CIOs are unprepared to tackle. Yet, because imaging plays such a pivotal role in patient diagnoses and the positive outcome of both short- and long-term care, it is a hurdle that must not only be tackled, but also mastered in short order.

Now that the race to implement electronic health records is in its final lap, industrywide attention is being sharply focused on EHR optimization with a spotlight on the importance of using medical images in a way that provides meaningful use to both caregiver and patient alike.

Therefore, developing an effective enterprise imaging strategy must quickly become a top-of-mind issue for CIOs and other hospital executives. Thoughtful consideration must be given to the process of collecting, storing, managing and accessing the rich information contained in medical image records and making that data actionable when it matters most.

This is a complex undertaking that requires careful planning to create a solution designed to complement the physician's clinical workflow. It requires an enduring effort and a level of governance to ensure, as time goes on, that the standards set forth are being adhered to and that the integrity of the information in the system remains valid. This is a systemic process that requires cooperation from a multidisciplinary team of providers, caregivers and health IT professionals, all working together toward a common goal.

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Establishing a Roadmap to Image Utilization

To create and execute a successful enterprise imaging strategy, healthcare organizations need a roadmap that shows them how the project will be implemented as well as how to make the best use of the images they have acquired and stored. To be most effective, this transformation not only requires the development of an innovative strategy, but also the adoption of repetitive, phased activities in which a multidisciplinary governing body has sought input and has jointly determined the sequence by which these strategies will be executed.

Former imaging initiatives—including picture archive and communication system (PACS), PACS replacement, and peripheral system implementations—do not provide an effective roadmap for your enterprise imaging initiative as a whole. The complexity of enterprise imaging is much deeper and convoluted than departmental project work alone. Challenges related to system replacement, cross-specialty stakeholder buy-in, cost and budget models, chronology and project planning, and ultimately, program and data governance require a detailed and thoughtful plan as well as the support and leadership of a strong governing entity.

This governing body cannot be just a figurehead committee that meets periodically to discuss updates. The governance of an enterprise imaging strategy, similar to an EHR program, requires a long-term, ongoing effort, and the two programs—EHR and imaging—must work in tandem for each to be considered both effective and meaningful to the care team. Therefore, the deployment of an enterprise imaging initiative requires an engaged, informed and empowered governance structure. There will be important decisions to be made throughout the entire project lifecycle, and many of these decisions will create conflict and pushback that requires skilled negotiation and compromise along the way.

Some of the most important decisions the governing body will need to make include:

- **Departmental priority:** The rollout of enterprise systems will include a timeline and chronology of events. There are often competing interests within an organization, and the governance team will determine the best strategy for deploying technology by department or function based on the organization and its various constraints.
- **Workflow optimization:** There are as many workflow models as there are departments within the organization. Decisions for leadership will include how to best fulfill each departmental need while meeting enterprise standardization efforts. Representation from departments is, therefore, critical to fully informed decision-making and to the actions the governing team agrees upon.
- **Integration and interoperability:** As the number of systems participating in the enterprise imaging model grows, a complex set of data integrity assumptions—and ultimately, criteria—must be developed, understood and internalized. Source of truth, custody of record, and many other important functions associated with updating and accurately contextualizing data is imperative. The details become absolutely crucial, and the governing body must understand where data is created, stored, updated, and archived; in addition, that data must be kept in context over time and throughout the patient record.
- **Rules of engagement:** An enterprise imaging initiative will encounter disparate systems that don't meet the enterprise clinical system's requirements for integration for a myriad of reasons, including age, design or source code requirements to name a few. Some of the aged or outlier systems can be a sensitive topic; the governing body will have to weigh options when absorbing these cherished information systems. Likewise, the governing body must participate in any ongoing or new system selection efforts to ensure money is not wasted procuring departmental or specialty systems that cannot meet the enterprise requirements.

Important Considerations:

Imaging is a rules-based endeavor:

Establishing solid data governance policies is a key activity of any imaging governance team. For example, you must determine right from the beginning what elements will need to be associated with every image or image set captured to ensure the uniformity required to intelligently surface the image in the EHR. Will the standardized naming convention be based on department type, image anatomy or something else? What level of anatomical granularity will be used? If these types of considerations are not made at the start, it will become very difficult, if not impossible, to present the data in a meaningful way to end users or to ponder concepts like predictive analytics.

Pre-set purchasing criteria are essential:

The governing body must also ensure that any image-generating device purchased meets pre-determined criteria for supporting efficient acquisition workflows. If an ultrasound is purchased by the endocrinology department, for example, it needs to be purchased with Wi-Fi capabilities and a DICOM Modality Work List (DMWL) license. If these are not purchased, the physician will be relegated to manually entering patient demographics which, of course, can result in typing errors, and the device will have to be tethered to the wall to upload images throughout the day. Similarly, if a new third-party image management system is being evaluated—perhaps a new obstetric or ophthalmology PACS—the governing body must consider standards such as HL7 or DICOM to ensure that the system can successfully integrate the required data elements needed to store those images in the vendor-neutral archive (VNA) in a meaningful manner.

Governance never ends:

Governance is an enduring process within an enterprise imaging program. It does not end with the conclusion of the initial project or any subsequent projects. It survives each of the projects and must continue forward, though not with the same level of intensity as in the initial projects. The governance of an enterprise imaging program will, however, be ongoing as needs arise to purchase devices, integrate third-party image management systems and, as time goes on, include new file types, such as audio. A governing body will need to continually discuss new developments such as these to ensure that the integrity of the organization's clinical imaging library remains intact.

Native or Standardized, That is the Question

Healthcare organizations are facing an increasingly important task when it comes to choosing the most effective methods for storing patient data across the enterprise. Before a single image can be effectively archived, however, there are a host of critical questions to be answered—will the data be stored in its native format or in a standard viewing format? Which departments will need to access and share these images? Will images need to be segregated for clinical and research purposes?

When faced with these questions, most healthcare organizations first think about a vendor-neutral archive (VNA). Indeed, the versatility of a VNA solution can be leveraged as the cornerstone of an overall enterprise imaging strategy. Most imaging modalities conform to the digital imaging and communications in medicine (DICOM) standard, an industry norm especially in radiology and cardiology environments. However, as organizations look at an overall enterprise imaging strategy, other image-producing service lines, such as ophthalmology, pathology, wound care, oncology and dermatology, almost exclusively produce image objects outside the DICOM format.

Before a single image can be effectively archived, there are a host of critical questions to be answered.

The ability of a VNA to ingest non-DICOM elements and to store them in a native format is a significant contributing factor to the scalability and enterprise applicability of the technology. By incorporating all image objects in a patient record, the VNA dramatically expands the ability to access information by allowing the source modality, application or device to retrieve the original image object with all its metadata preserved. This is not necessarily the case with DICOM wrapping or encapsulation.

At first glance, it seems that preserving the native format of a variety of non-DICOM image objects adds a tremendous amount of complexity to the management of enterprise image data. When storing images in their native formats, a countless number of additional data standards must be supported and managed. While DICOM is an attractive option due to its existing structured approach, the benefits of maintaining native image formats to the enterprise may be a more pressing concern.

While acknowledging the beauty of native data retention, it's also important to recognize that healthcare organizations' growing attention to analytics has emphasized the need to standardize the data elements acquired with each image in a uniform manner. Therefore, healthcare CIOs must carefully weigh all available options and discuss with their selected vendor partners how they will consistently and uniformly acquire data today in order to support predictive and prescriptive analytics—an idea gaining significant traction in the healthcare community—in the future.

DICOM or Non-DICOM?

For an application that does not speak DICOM, retrieving DICOM-wrapped image objects requires the objects to be unwrapped. This can create unnecessary latency and loss of important metadata and original image quality. Radiology, which favors the DICOM standard, may be one of nearly 40 image-producing service lines within an enterprise. As a result, DICOM wrapping forces a radiology workflow on all the other -ologies, whereas maintaining native data formats would allow the flexibility for each -ology to optimize the technology to fit its own unique clinical workflow needs.

It's also important to recognize that enterprise image acquisition is increasingly taking place in non-DICOM file formats even within service lines such as radiology and cardiology, which have been traditionally DICOM-friendly. The reason? There is an expectation among providers and the referring community that images may be retrieved easily and within standard formats (JPEG, TIFF, PDF, etc.) by the originating data source or on a mobile device. Viewers in the market today allow clinical and reference viewing independent of a PACS workstation, and fully accommodate most non-DICOM images. Thus, the availability of lightweight viewers eliminates the need for DICOM-wrapping. Technology has advanced to a point where a multitude of image formats can be much more easily supported.

Cross-Departmental Sharing

Vendor-neutral archives satisfy the need for cross-departmental data sharing and access. By serving as the imaging library for the enterprise, a VNA is able to offer federation or a pre-fetching functionality to legacy systems or disparate data silos across multiple image-producing departments. In doing so, the VNA can provide a single storage management strategy, regardless of the number of clinical systems (PACS or otherwise) an organization adopts. This provides the best solution for long-term longitudinal patient jacket image availability while establishing a short-term bridge strategy for immediate image consolidation.

A VNA can provide a single outbound point of integration to an EHR thereby eliminating management and support integration issues from multiple PACS environments. Performance is often improved in this way, especially in larger organizations where PACS can struggle to keep up with the demand. The VNA manages images and can scale much larger than a PACS. Additionally, a VNA can also be leveraged as a single point of integration into a health information exchange (HIE), a plus for enterprise analytics, as opposed to having every disparate clinical system integrate to provide data to bridging solutions.

Important Considerations:

Decide early about native format storage:

As images are generated, a decision must be made about whether or not they will be stored in their native formats or archived in a more standardized format like DICOM. There are advantages to each, something which IT and those needing access to the images must discuss and resolve early in the process.

Explore VNA advantages in sharing data:

The need for cross-departmental sharing and access can be satisfied by a VNA, which can tie together disparate data silos operated individually by the various –ologies in a healthcare environment, with the added advantage of offering a single outbound point of integration into both EHR and HIE systems.

Understand segregation issues well:

With the number of mergers and affiliations taking place in the healthcare field today, it's important to understand if images will need to be segregated. This is becoming a hot topic in healthcare IT, particularly for those providing an enterprise imaging platform for an affiliate organization.

Shareability Starts Before the Image is Captured

In the midst of increased mergers and industry acquisitions, healthcare leadership is becoming more cognizant of the need to have enterprise imaging strategies in place that answer a long-standing question in medical imaging: “How will we get our providers the images and data they need when and where they need it most?”

Clearly, acquisition is a critical component to a well-constructed enterprise imaging strategy. But enterprise image acquisition is much more than just diagnostic imaging modalities; it’s the acquisition and accessibility of any medically relevant image. And it’s the delivery of that image into the hands of the people that need it, whenever and wherever that need might arise.

We live in a mobile world with the expectation—and in many cases, the reality—that we can do anything from anywhere. Physicians and medical staff are constantly exposed to versatile technologies in their personal lives, though for the most part, in their professional lives, many are still tethered to clunky, disparate systems that separate them from important data at the point of care. Emerging technologies are changing this by creating cohesion between image-producing departments beyond radiology and cardiology for a truly seamless clinical experience.

Seamless and Meaningful Access

To make this all work, an organizational governance body will need to establish acquisition, storage and management strategies up front that make access to these images seamless and meaningful as time goes on. Four important concepts will have to be addressed, each of which are inextricably tied to the acquisition process:

- 1. Disparate image management system integration:** Disparate image management systems exist throughout every healthcare enterprise today. Multiple disparate PACS remain at the forefront of consideration for consolidation. However, there are also long-standing disparate imaging systems in cardiology, pathology, ophthalmology, and orthodontics to name just a few. Integrating these systems allows providers to consult each other with a truly complete patient jacket.
- 2. Point-of-care devices:** The definition of point-of-care devices has expanded with the emergence of a host of mobile devices, pathology slide scanners, and other advancements. For example, providers can now capture images at the point of care with their smartphones—a security nightmare for IT administrators, but a necessary workaround for providers who value efficiency as well as quality of patient care. To accommodate this, IT administrators need to provide secure corporate devices that can take the place of personal devices, and they must form policies to support these organically formed clinical workflows.

67%

Providers that feel image sharing is critical

96%

Providers that believe radiology has the greatest need for image sharing

Source: Peer60 Report: Medical Image Sharing 2015

- 3. Image acquisition clinical workflows:** Image acquisition workflows vary greatly within and between departments throughout an organization. Not all patient images are acquired after being prompted by a RIS or EHR order, and not all images acquired adhere to a fixed modality. Transfer CDs and IHE are other forms of image acquisition that need to be considered as parts of an overall enterprise imaging strategy. In short, leadership must have the ability to understand the special image acquisition workflows of each department in order to find a common ground.
- 4. Importance of data standards:** Clinically relevant data and images must be put into the correct context for providers to be able to efficiently find the answers they need. Even with DICOM data standards, radiology still requires normalization between proprietary systems and integration with non-DICOM information systems. As a result, DICOM headers must be tag morphed, procedure descriptions will require crosswalks, and standardized nomenclature will need to be deciphered.

If the goal is to make patient data easily sharable, when the data sets in different EHRs don't correlate, complicated queries will need to be built in order to connect the data sets. VNAs can help simplify this process by creating the enterprise master patient index (EMPI) as an interim step between connecting a physician's office on one EHR to a hospital on another. Sharing information seamlessly between disparate systems within the healthcare ecosystem is integral to a successful enterprise imaging strategy, but an application is only as good as the data it can share across a healthcare delivery network.

Important Considerations:

One size does not fit all:

A common mistake when designing an enterprise imaging strategy is to apply a single department's workflow across the board to all departments. While there are commonalities, a radiology workflow, for example, contains many more steps than a point-of-care imaging acquisition workflow. The key is to find the workflow that fits the majority of users to create a standardized and efficient process across service lines.

Uniform data collection is critical:

When acquiring images, it's critical to collect the same data about every image, something which requires considerable forethought when workflows are designed. The data collected about each image will play a significant role in the ability to provide data to the end user in a flexible, relevant format.

Seeing Things Differently

As the enterprise imaging market matures, the technology used to access and view images is rapidly changing. This is a factor that directly impacts the ways in which physicians, radiologists, clinical teams, administrators and patients interact with healthcare image objects. Whether the image is a chest X-ray, computerized tomography (CT) angiogram, echocardiogram cine loop, wound picture acquired by a mobile device, or a newly introduced 3D breast tomosynthesis image, there is a growing expectation that the viewing technology must deliver vendor-neutral, seamlessly integrated, mobile, secure and interactive results.

Integrated delivery networks (IDNs) undergoing enterprise image consolidations are faced with the challenge of combining various data and imaging silos that are indexed under multiple medical record numbers (MRNs) or master patient indexes (MPIs), thus creating a barrier for single longitudinal record access and visualization. In these cases, senior leadership will be looking for short-term bridge strategies that will allow them to produce a single technology to deliver all image objects, regardless of the end-user mix. Having multiple viewers and PACS is no longer financially sustainable or clinically feasible in the new healthcare model that is now so sharply focused on clinical quality outcomes.

Current market viewers, however, offer healthcare providers the ability to federate their legacy PACS or other image repositories, and to display these images in a single patient context. This model allows expedited image enablement of the EHR while eliminating cumbersome migration costs. Therefore, an organization struggling to decommission legacy systems is now able to integrate various image repositories and provide a single point for image viewing for all of its physicians via an EHR portal.

This opens the door to new innovations. Clinical and reference viewer vendors are now looking to expand on existing technology, designing it to offer broader diagnostic features and tools, whereas in the past, radiologists, for example, would simply have used an entirely different viewer. From the perspective of healthcare IT, having a single viewer to integrate and support is financially appealing, especially when it meets the ever-growing requirements of the clinical end-user community.

On the Move

In this changing healthcare culture, patients are also becoming significantly more involved in their own care and are proactively looking for ways to stay connected. As a result, mobile access technology has grown exponentially over the last several years to provide a better means for doctors and patients to view the same sets of image objects. Whether a physician is reviewing a patient's post-surgical hip X-rays in the office or a patient is gaining access to her fetal ultrasound via tablet, the web-based HTML5 technology inherent in the viewer allows this to occur.

Seven Important Truths about Medical Imaging

- 1. Imaging's complexity is often misunderstood.**
- 2. Imaging has its own language.**
- 3. Imaging requires a strategy.**
- 4. Disparate storage systems must be minimized.**
- 5. Imaging requires security.**
- 6. Today's plan must include tomorrow's M&As.**
- 7. HIEs require regional participation.**

Access and Visualization

Outside the reference viewer industry, many applications that offer built-in viewers are also focused on providing such alternatives to their proprietary and thick-client coded architectures. Combining secure access with the freedom of mobile technology, physicians are no longer glued to a single workstation in the hospital limiting their ability to increase their rounds and improve patient-to-physician interactions.

True zero-footprint viewers that have no plugins required are now capable of using server-side rendering to stream large image sets like CT angiograms with ease, giving clinicians the ability to do HTML5 image markups and annotations. This means streaming medical images to a mobile device has become as easy as streaming music videos online. As a result, depending on the user preferences or privileges, tablets in a busy healthcare environment have become powerful tools for physicians on the move.

Equally important is the ability for members of a care team to collaborate on patient care. As the concept of value-driven healthcare evolves, referring and specialty physicians will need to partner in new ways to enable more efficient coordination of shared patient diagnoses and treatment planning. Collaboration tools built into the viewer technology have significantly improved the ability for physicians to expedite follow-ups and clarifications of any questionable pathology that specialists have noted in image interpretations. In addition, such tools allow interactive work sessions between centers of excellence and areas that may not offer specialty services bringing all available resources to the point of care, thereby reducing unnecessary logistical challenges for the patient.

Important Considerations:

Know your image users:

When selecting enabling technologies or designing a program for image access and visualization, it's important to understand the various categories of image users and to define the requirements for the viewer based on the needs of the viewing audience, including:

- **Diagnosticians:** The physicians that read images and provide interpretations—radiologists and cardiologists are good examples.
- **Clinical decision-makers:** Providers with a high reliance on images for patient care; these clinicians may also employ third-party software to manipulate the images. Neurologists and orthopedic surgeons fall into this category; an orthopedic surgeon, for example, will use a template to design a hip implant, manipulating the medical image to determine how much bone to shave for a proper fit.
- **Referential users:** Most imaging users fall into this category; these are the care providers that view images for clinical reference purposes on a daily basis, most often via EHRs.
- **Remote users:** People that are off-site—not in the hospital or clinic—comprise this category; many of these users view images on a mobile device.
- **Patients:** Of course, patients are also an important consideration and a growing sector of the image viewing population.

Keep it private:

There are times when patients do not want “just anyone” inside the healthcare setting to view their images, so it is important to select a viewer that can customize the view based on the user's role in the care setting.

CDs: Acceptable, but Not Exceptional

There is a growing need to exchange and share imaging studies with outside entities. Hospitals that have foregone the traditional merger and acquisition route to become affiliates, for example, have a need to share both individual patient and population health data, though their modalities for exchange and viewing may be very different. Patient transfers between facilities, specialty and professional consultations, and even telehealth opportunities have created a new way of thinking about the delivery of images between two related, yet independent points of care. CDs, however, still remain both the most-used and one of the largest bottlenecks in healthcare today.

Take, for example, the patient being transferred from one facility to another. Both critical care and routine transfer patients are often moved with CDs quite literally strapped to their chests. In critical care scenarios, this practice can create a delay in care planning; CDs cannot be read until they are received. If the receiving team of caregivers, however, had access to the patient's images as soon as they were notified of the impending transfer, the images could be considered and the patient's care planned while the patient was en route prior to arrival.

Patients who need specialty consultations are in a similarly difficult position. Patients themselves are commonly tasked with obtaining copies of prior imaging studies and bringing the images with them to their specialty consult appointment.

Often, the patient forgets to bring the CD, or the specialty physician is unable to access the imaging studies on the CD; in either scenario, the result is a delay in care. When physicians have access to the images prior to the consultation, they can be more fully prepared for the time they spend with the patient in person.

As the number of clinical affiliations increases, there is a greater demand for professional consultations, and these physicians need to share images quickly and efficiently to coordinate patient care. When remote collaboration is augmented with real-time image viewing, treatment planning is enhanced. Similarly, as telehealth technology has shown, when providing care at a distance can improve quality of care and outcomes, new technologies coupled with a new generation of tech-savvy consumers are creating opportunities to proactively improve the value of care provided as well as the level of both patient satisfaction and engagement.

Moving Away from CDs

Until recently, CDs have been the media of choice when providing image access to patients as well as providers outside their primary care facility. From treatment delays and viewing difficulties to the inconvenience of tasking patients with physically transporting their own medical records, the use of CDs in the image exchange process has resulted in both patient and physician frustration—challenges that need to be overcome.

Aside from delays and frustration, however, the creation and management of CDs can also be a costly proposition. Industry research shows the average cost of producing a CD to be approximately \$10. If an organization produces 20,000 CDs a year, that's an expense of \$200,000 annually—and most medium to large organizations produce many, many more CDs than that. Add to that the cost of managing all the CDs that are received by an organization's providers and the annual expenditure increases quickly.

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Image Exchange

To address these challenges, healthcare organizations are adopting image exchange and sharing technologies that can significantly reduce, and in some cases eliminate, the need for CDs. There are several solutions on the market today that enable the efficient and secure movement of images between organizations and individual providers.

Virtualization Strategies

Recent developments show that the imaging industry is taking a cue from data analytics technologies and beginning to leverage virtualization capabilities. This evolution allows for the viewing of images between organizations without first requiring a physical movement of the imaging data. This tactic is beneficial if a referential review of the images is needed without the consistent physical retention of images within the viewing provider's local VNA or PACS.

Image virtualization tools often allow imaging studies to be viewed and also support the ad hoc movement of the study if the clinical decision is made to retain a copy locally. Thus, including virtualization as part of an overall enterprise imaging strategy can provide access to the imaging data much more quickly and at a fraction of the cost associated with more traditional move/retain exchange models.

Important Considerations:

Prioritize use cases:

When considering how images should be exchanged in cooperative care environments, identify the variety of use cases that will be supported by the image exchange program and prioritize according to positive impact, with an emphasis on reducing time-to-treatment.

Make strategic workflow decisions:

A multi-disciplinary group of physicians, administrators and IT professionals need to evaluate workflow decisions to ensure the success of the image exchange program answering such questions as:

- Will received images be triaged before presentation to a physician, and if so, what is the process?
- When and how will received images become part of the local electronic health record (EHR)?
- Will received images be viewed by the physician within the context of the EHR or in a separate viewer?
- When allowing patients to upload images, how will patients be given access, and what information will be required to ensure relevancy of the data received?
- What groups will be most impacted by the changes – patient transfer centers, radiology, others?

Carefully plan the patient portal:

Will patients be able to upload or access images through the patient portal? If images are made available to the patient, will the entire study be presented or only key images referenced in the diagnostic report?

The Cornerstone of Meaningful Use

The execution of a successful enterprise imaging strategy provides a platform to acquire, retain and make meaningful use of a wealth of clinical information that has previously been unmanaged. More specifically, it affords a unique opportunity to build an archive of clean and uniform imaging data that is being produced by as many as 40 different service lines within a typical healthcare organization.

Without a mandate for required data elements and uniform data sets, a VNA established solely for the purpose of storing data becomes a very expensive missed opportunity. Without these principles, images may be retained, but the meaningful use of the images becomes nearly impossible. Careful consideration must therefore be given to data governance principles in the early stages of planning an enterprise imaging strategy, with particular attention paid to naming conventions and data requirements.

Naming Conventions

In order to retrieve precise information from patient records, healthcare IT organizations must first learn to speak the right language—and naming conventions form that language. When planning naming conventions, consider what data components will comprise imaging study descriptions; the department where the images were acquired, the modality used to acquire the image, and an anatomical reference are common choices.

With regard to anatomical references, decisions must also be made as to the granularity of the anatomical descriptions that will be used. A dermatologist, for example, might need a greater level of granularity than the majority of other caregivers searching for images within the same patient's electronic health record (EHR).

Another important area of consideration is presentation, or how the images will be displayed to the viewing provider. If the image descriptions are displayed in a worklist format, for instance, the first characters within the naming description should be modality type or department—something relevant to the end user.

Until recently, a standard vernacular of imaging names did not exist. Therefore, each organization developed its own internal vocabulary, including names for imaging and procedural studies. Over the past few years, however, the Radiological Society of North America (RSNA) developed a comprehensive lexicon, RadLex, for the purpose of standardizing the indexing and retrieval of radiology information resources.

RadLex unifies and supplements other lexicons and standards, including the Systematized Nomenclature of Medicine Clinical Terms (SNOMED-CT), Logical Observation Identifiers Names and Codes (LOINC), and Digital Imaging and Communications in Medicine (DICOM). Although RadLex provided a turning point in the unification of naming conventions, it is focused strictly on radiology and does not reflect digital photography and other point-of-care imaging studies. Thus, additional data is required.

Based on the patient's medical history and the physician's specialty and past clinical behavior, data analytics tools will soon be able to retrieve and compile the imaging studies and reports a caregiver will want to review during a patient's visit, presenting those images directly to the physician at the point of care—the very essence of what meaningful use is all about.

Data Requirements

Determining the data that needs to be associated with each set of images committed to a VNA must be accomplished early in the planning of an enterprise imaging implementation, well before the first image is presented for retention. Attention should be given to how each set of images, or each study, will be uniquely identified within the system. In radiology, for example, each diagnostic imaging test is assigned a unique identifier called an accession number. This may be unique to radiology, but the same concept applies when thinking about imaging at the enterprise level.

Clearly, careful deliberation is needed when developing naming conventions. A standardized imaging study name should, for example, be a required data element during the acquisition process. Doing so at the point of acquisition ensures that imaging studies are consistently named and that caregivers can easily identify the images they are looking for from a worklist. Without proper naming conventions, searching for images will become a point of frustration for the entire care team. Proper and uniform identifiers can also be frequently used in analytics queries.

If the imaging studies will need to be logically segregated in the VNA, for example, separating research imaging studies from imaging studies present within the patient's electronic health record, specific and uniform data elements will need to be assigned to indicate to which logical partition the study should be committed.

By establishing uniform naming conventions and data sets at the beginning of the enterprise imaging process, healthcare organizations save themselves tremendous amount of work on the back end. The ultimate goal is not simply organization; it's the analysis of collected data to present meaningful, actionable information to caregivers in the right format, at the right time.

With such a well-planned, well-executed approach to acquiring, storing and retrieving medical images, providers will be able to use predictive analytics to better assist physicians. Based on the patient's medical history, and the physician's specialty and past clinical behavior, data analytics tools will soon be able to retrieve and compile the imaging studies and reports a caregiver will want to review during a patient's visit, presenting those images directly to the physician at the point of care—the very essence of what meaningful use is all about.

Important Considerations:

Naming conventions matter:

Establish data governance principles during the earliest stages of an enterprise imaging strategy with particular care taken to uniformly identify naming conventions and data requirements that will work well in a data analytics environment.

Imagine the outcome:

Details are the cornerstone of a well-executed enterprise imaging strategy. It is those details, coupled with the ability to intelligently retrieve and analyze what has been collected, that will deliver actionable results to improve patient care, clinician workflow, and satisfaction in the end.



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The Logicalis Group has annualized revenues of over \$1.5 billion from operations in Europe, North America, Latin America, Asia Pacific and Africa. It is a division of Datatec Limited, listed on the Johannesburg Stock Exchange, with revenues of over \$4 billion.

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