



Adopting an Enterprise-First Imaging Strategy in Healthcare

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The production, sharing, storage and management of medical images in healthcare continue to increase in volume and intensity, with no end in sight. According to “IMV’s 2018 MR Market Outlook Report,”¹ an estimated 39 million MR procedures were performed in the United States in 2018, representing an 8-percent increase over the number of MR procedures performed in 2017. Meanwhile, “IMV’s 2018 CT Market Outlook Report”² estimates that about 82 million CT procedures were performed in 2018, representing an average annual increase of 4 percent over the previous years.

What’s more, the number of images made possible with each diagnostic imaging procedure has been exploding, ever since patient care organizations progressively moved away from film-based to digitally based imaging beginning in the early 1990s. The number of images per study has increased from dozens to, in some cases, thousands of images per study. That makes for very “heavy” digital portfolios of diagnostic images.

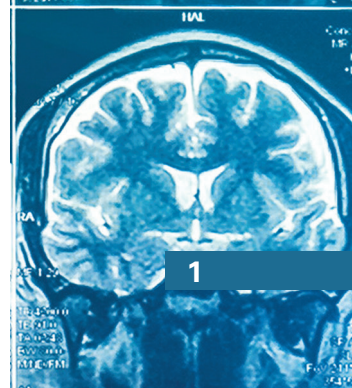
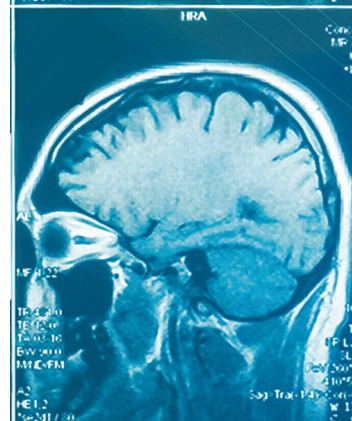
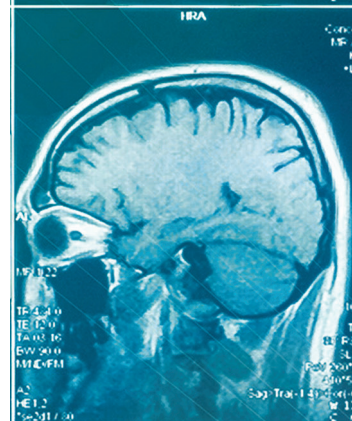
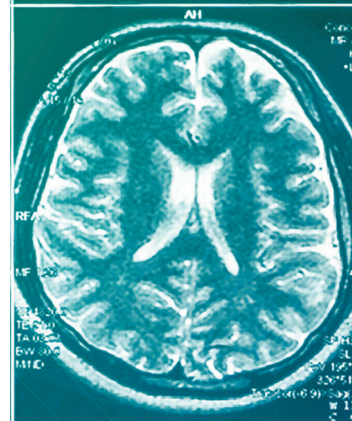
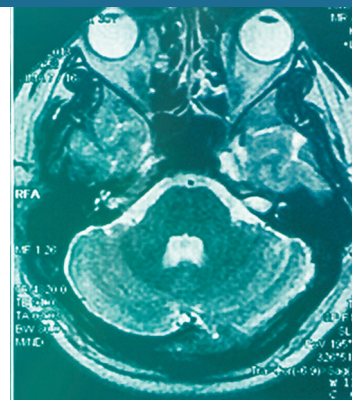
A Frost & Sullivan report titled “6 Reasons You Need a Powerful Enterprise Imaging Platform”³ states “Today, the medical imaging environment is more challenging than ever before, with new imaging technologies producing large and complex data sets intensifying complexities to store and distribute imaging contents across the healthcare enterprise. The challenge with the existing medical imaging landscape is an inability to handle massive amounts of imaging data procured from the combination of advanced imaging technologies,” not only from radiology, but also cardiology, neurology, orthopedics, gastroenterology, dermatology, pathology, wound care, ophthalmology on the diagnostic imaging-based side; interventional radiology, interventional cardiology, image-guided therapies and surgeries, on the procedural imaging-based side; and therapeutic, imaging-based specialties that include radiation therapy, radiation surgery, therapeutic ultrasound, and image-guided brachytherapy.

What’s more, the report notes, “It is anticipated that these too will join the enterprise imaging bandwagon, demanding their own version of imaging workflows and archiving systems. With the ongoing shift toward value-based care, providers are now focusing on streamlining the complex medical imaging environment with innovative technologies that can boost clinicians’ ability to make treatment decisions quickly and safely.”

Framing the Problem

As the diagnostic image management problem continues to grow and to vex healthcare IT leaders, the issues themselves are at least becoming clearer over time. Among the challenges:

- ▶ Legacy systems. Many hospitals and integrated delivery networks (IDNs) have a welter of different systems, with a crosshatch of types adding to the complexity. Not only do they have multiple legacy radiology and cardiology PACS (picture archiving and communication systems); they also have caches of images from gastroenterology, dermatology, and other “-ologies.” Furthermore, with business consolidation occurring at an unprecedented rate in



the healthcare industry, many of these organizations have multiplied all of these systems by a factor of several times.

- ▶ Core governance and management issues are impeding image management progress in every type of patient care organization, especially larger IDNs that have been growing through merger and acquisition activity.
- ▶ The project costs are often considerable, and the implementation timeframes can be daunting. Most larger patient care organizations find that they need outside help, as the complexity involved is significant.

The path forward

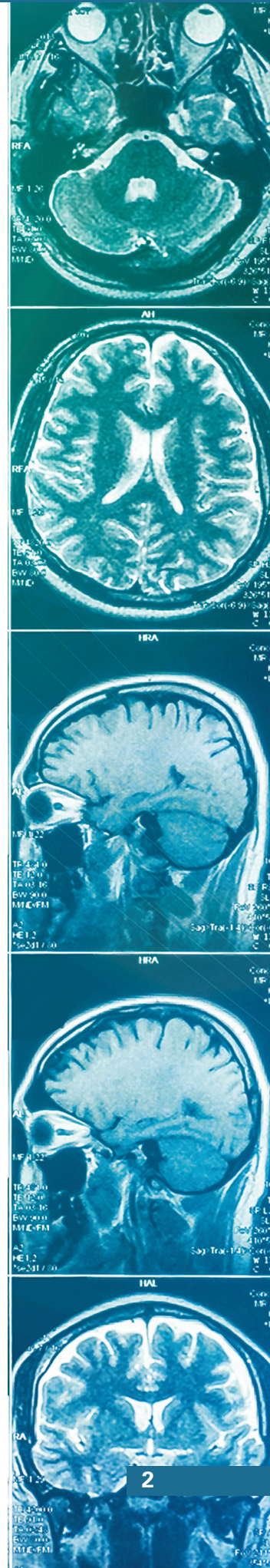
Following the release of the report, Siddharth Saha, Frost & Sullivan's vice president of research, transformational health, spoke with [Healthcare Innovation Managing Editor Rajiv Leventhal](#)⁴ about the report and its implications, particularly to the role of traditional imaging centers, such as radiology.

"One of the things we have been seeing in radiology is that there has been a bit of a rethinking about the role of radiologists," Saha told Leventhal. "This profession, which does a great job in clinical decision support, and everything else that radiology provides, ultimately is making a big difference in patient outcomes and in value-based care. But when you think about the enterprise imaging strategy, it is actually allowing for the use of so much information that is generated at the enterprise level. So [an enterprise imaging solution] is a solution that is helping the profession make that much more of a difference in clinical outcomes. Ten years ago, people thought of radiology as a service to the clinical process — you can go to a scan and take a look at the reports," he said. "But radiology is much more than that today. An enterprise imaging solution allows for the radiologist's contribution to the decision-making table; it's actually enhancing the role of the profession."

Ultimately, the path forward inevitably involves the development of enterprise image management as a core strategy. An important article that framed this issue was published in the October 2016 issue of the *Journal of Digital Imaging*, by Christopher J. Roth, Louis M. Lannum, and Kenneth R. Persons. In the article, entitled "[A Foundation for Enterprise Imaging: HIMSS-SIIM Collaborative White Paper](#),"⁵ the authors write that "A successful enterprise imaging program encompasses a number of key elements," including "governance, enterprise imaging strategy, enterprise imaging platform (infrastructure), clinical images and multimedia content, EHR enterprise viewer, image exchange services and image analytics."

It all starts with governance

Roth, Lannum and Persons believe that effective and engaged governance is key to a successful enterprise imaging strategy. The HIMSS-SIIM collaborative workgroup defines enterprise imaging governance as "the decision-making body, framework, and process to oversee and develop strategies for the enterprise imaging program, technology, information,



clinical use, and available financial resources.” The governance bodies for enterprise imaging are responsible for bringing together a wide group of clinical, administrative and information technology stakeholders to make decisions.

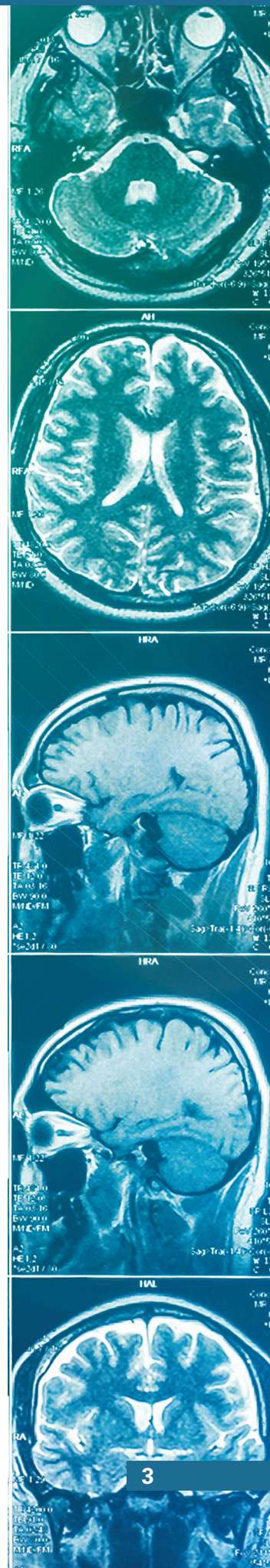
The authors stress the importance of addressing governance early when embarking on enterprise imaging. Specifically, they recommend starting anew with a core group of constructive enterprise imaging stakeholders and executives encompassing a variety of clinical and IT roles to oversee all imaging activities and service lines. This practice can help foster cross-departmental knowledge sharing and temper historical turf battles that may be carried over from when each imaging-intensive department controlled and maintained its own imaging operations.

Other experts agree. “You need a comprehensive and diverse committee, you need good governance, and you need for everyone to work together, in order to achieve success in enterprise imaging management,” says Razvan Atanasiu, director of research and development and chief technology officer at Hyland Healthcare. “IT involvement is important because there’s a tsunami of data now. Medical imaging requires a lot of storage, and needs to be archived for long periods of time. Study volumes and sizes are also growing. Twenty years ago, a study was 50-100 slices; now we’re talking about 1,000 or more. This is a good thing because these detailed studies help provide a more accurate diagnosis.”

Still, Atanasiu says, “IT involvement alone is not enough. There are several imaging-intensive departments that exist throughout a healthcare enterprise, and true enterprise imaging requires the involvement of all of these specialties. You need to audit your enterprise to discover all the imaging silos that exist throughout your organization and determine the best strategy to manage these images as a whole.”

Proper governance has been vital to the enterprise imaging efforts of UNC Health Care. Based in Chapel Hill, North Carolina, UNC Health Care is a HIMSS Stage 7 validated provider that successfully integrated medical images of all formats with its EMR, creating a true longitudinal patient imaging record. The provider established an enterprise imaging committee to make crucial strategic decisions. The committee was led by clinicians and supported by the IT department. In fact, the physician champion for enterprise imaging was a radiologist. This made the difficult task of changing the health system’s traditional PACS environment easier for the radiology and cardiology departments to accept.

“With our enterprise imaging initiative, we found that you needed the upper level of governance to establish key principles and get leaders involved, but you also needed the front-line level work groups involved to get the job done correctly,” says Dr. Don Spencer, chief medical informatics officer at UNC Health Care. “With governance, we established a clear escalation path to ensure that disagreements were escalated to the higher levels of governance, but other decisions were not. With proper governance and escalation, you can avoid the indecision that often results in a project standstill and keep the initiative moving forward.”



Adopting an “enterprise-first” imaging strategy

According to many industry leaders, enterprise imaging strategies continue to evolve. “Initially, enterprise imaging focused almost exclusively on the management of radiology and cardiology images,” says Hyland’s Atanasiu. “Those assets are still a main component of these initiatives, but they have expanded significantly to encompass other specialties such as dermatology, pathology, gastroenterology, mammography and much more.”

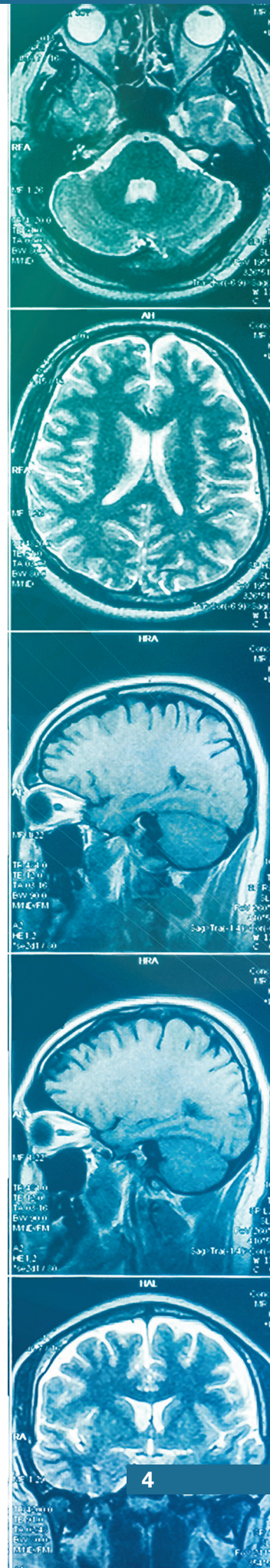
Sandra Lillie, global director for enterprise imaging sales and strategy at Hyland, agrees with Atanasiu’s frame on this. “For many, the idea of enterprise imaging simply means implementing proprietary radiology and cardiology PACS on a larger scale,” Lillie says. “This approach is still very departmentally focused. At Hyland, we’re challenging providers to think about the healthcare enterprise first when it comes to imaging, as opposed to prioritizing department-level needs. Providers need to think about the enterprise first and consider all medical images across the organization, whether they are DICOM-based, or other types of multimedia.”

Lillie goes on to say that the evolution of enterprise imaging management is not unlike the early evolution of EMRs, where diverse clinical systems and patient accounting systems were brought together in a new, integrated way. “When you look at the efforts of the HIMSS and SIIM work groups, that’s the mission,” she says. “The industry has a pretty good handle on radiology and cardiology, because they’ve become fairly mature in workflow and standards. Now, we need to broaden this concept to address other specialties and image sets, many of which are not order-based and often stored in an insecure manner. We need to rethink through policy, governance, and inventory, almost like when the radiology industry moved from film to digital in the 1980s.”

While similar to the evolution of EMRs, Lillie believes the transformation of enterprise imaging is occurring at a faster pace, thanks in large part to the proliferation of new digital modalities and smart devices that are digitizing many aspects of care (e.g. digitized surgery, point-of-care ultrasound, etc.). Incorporating these new elements into an enterprise imaging strategy means not only embracing open standards, but developing new workflows for non-order-based imaging assets. Providers must be able to identify, consolidate and connect these disparate images to key clinical systems in order to manage them effectively in context of the patient record.

“This is why the concept of enterprise-first imaging is so important,” Lillie emphasizes. “It places the emphasis where it needs to be—on framing everything holistically, in order to correctly organize processes for the good of the entire organization.”

The University of Rochester Medical Center took an enterprise-first approach to imaging when it began implementing a new medical imaging roadmap six years ago. “Healthcare delivery organizations are under tremendous pressure to increase efficiency and decrease



costs,” says James Forrester, director of integrated clinical systems at the University of Rochester Medical Center. “That’s difficult to do when patient data is siloed. We developed an enterprise imaging roadmap that started with a reconstructed PACS in radiology and imaging sciences where a VNA served as the core of the strategy. This gave us flexibility and allowed us to reach out and embrace other image-generating departments like the cardiovascular service line, perinatology and maternal-fetal medicine, point-of-care ultrasound and visible-light images, particularly those coming from scopes.”

According to Lillie, there are many ways to begin an enterprise-first imaging strategy. For example, an organization’s leaders may choose to focus on improving the visualization of both DICOM and non-DICOM objects or they may choose to focus on more niche areas, such as shoring up point-of-care imaging workflows. The choice will depend on what the most urgent processing need is in an organization. Is the organization at risk of exposing PHI? Is it dealing with failing PACS systems? The answers to these and other questions will likely determine whether they focus on image management, support a diverse set of end-users with universal access or focus on specific specialties.

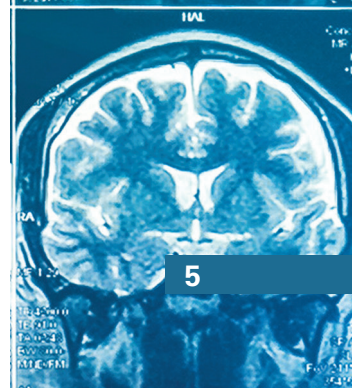
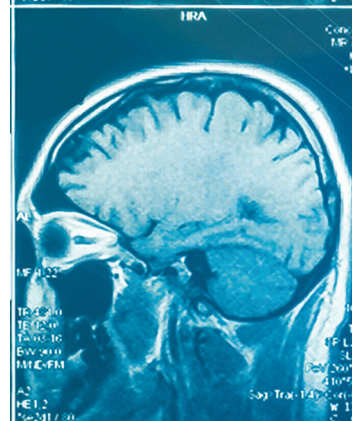
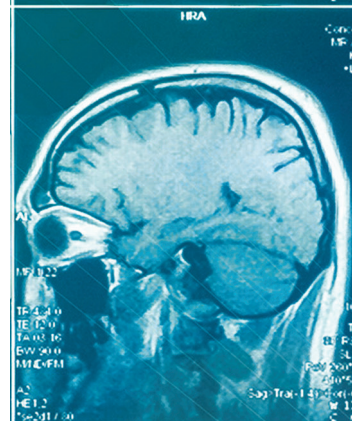
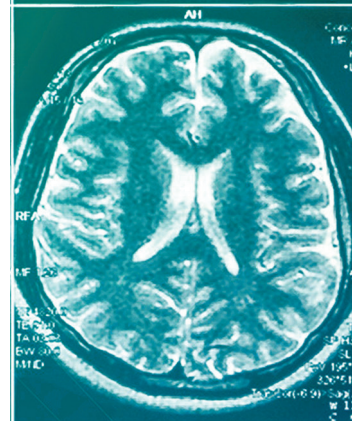
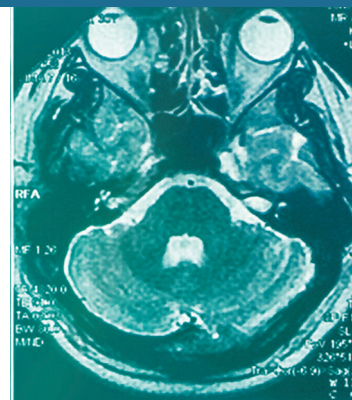
The key components of an enterprise imaging platform

As Forrester points out, a VNA is a crucial component to an enterprise-first imaging infrastructure. This centralized solution, based on open standards, is good at managing very high volumes of medical images, and distributing them, in a cost-effective way. It’s an essential piece of technology to enable interoperability across the enterprise, and that’s important not only in the present, but for ensuring a flexible infrastructure that can facilitate future growth.

Roth, Lannum and Persons also stress the importance of a VNA in an enterprise imaging infrastructure. Their report states, “A standards-based DICOM and non-DICOM clinical image and video storage repository is central to the enterprise imaging platform. Using modalities alone as guides to classifying various forms of enterprise imaging content is inadequate. Instead, leaders must go beyond simple forms of classification, and describe and organize clinical imaging and multimedia content by the intent of its use by the performing providers.”

There are a variety of approaches leaders can take to integrate a VNA as part of their enterprise imaging strategy. For example, they can enable a VNA-centric data flow (where the VNA is the primary archive), a PACS-centric data flow (where the PACS is the primary archive) or take a hybrid approach that meets somewhere in the middle.

“We’ve actually used a hybrid approach where we’ve put the VNA routing tier in between the modalities and the PACS itself and then the VNA archive after the PACS,” says Forrester. “That VNA routing tier is the DICOM equivalent of an HL7 interface engine. It allows us to manipulate the metadata and ensure data integrity. This approach also allows us to get the images to the viewer as quickly as possible and allows us to leverage the built-in reconciliation and data management tools that are in the PACS platform, ensuring the data is most likely to be pristine or clean when it goes over to the permanent archive.”



Hyland's Atanasiu adds that the open nature of a true VNA helps facilitate image migrations and system consolidation. "As everyone knows, healthcare enterprises are growing in size as they acquire each other," he says. "As a result, these systems inherit many different heterogeneous PACS systems from multiple vendors. A VNA is much more cost-effective than a PACS in how it manages storage and workflows. A VNA allows you to support multiple PACS systems, and replace them with each other. And that helps providers manage the costs associated with either consolidating PACS vendors or moving from one PACS vendor to another."

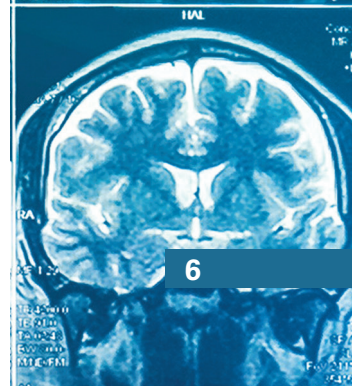
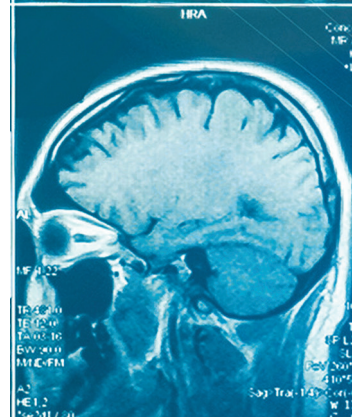
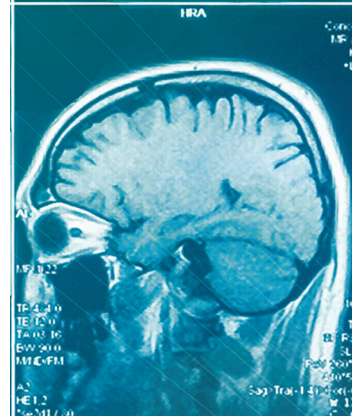
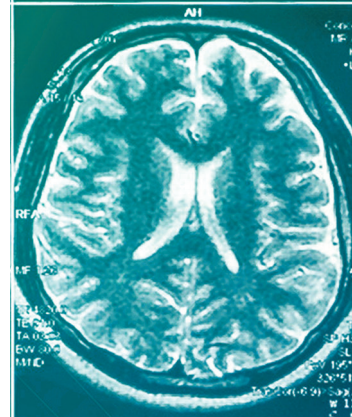
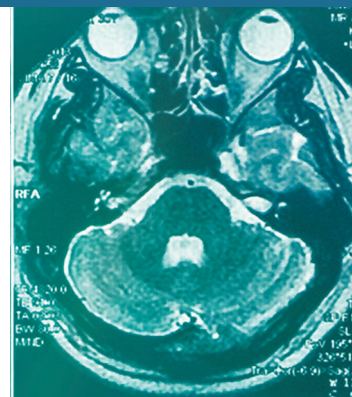
Another crucial element of an enterprise imaging infrastructure, according to Atanasiu, is a universal viewer. This viewer should be flexible, allowing for clinical referential viewing — both within the EMR and outside of it. The viewer should also provide advanced visualization capabilities that can benefit traditional imaging centers such as radiology and cardiology by allowing them to interpret imaging studies outside the confines of a traditional PACS workstation. The universal viewer should also be well-integrated with the VNA and very lightweight — meaning that no code or plug-in is needed to run it. Users should be able to access it immediately via any browser-based device.

"Once you've put a universal viewer on top of a VNA, the other extremely important piece of technology is the EMR," says Atanasiu. "By integrating these imaging solutions with the EMR, you create a single point of access for clinicians and support a successful disaster recovery plan and a business continuity plan."

This strategy supports Roth, Lannum and Persons' contention that one of the key goals of any enterprise imaging initiative is to provide clinicians with user-friendly EMR-based channels to image viewing that fit into their existing workflows. The authors believe an enterprise or universal imaging viewer is needed to deliver all forms of imaging to the EMR and note the importance of creating broad and secure methods for sharing diagnostic images of all types, across any patient care organization.

Finally, all of these elements, Hyland's Lillie notes, must be connected to an overall organizational business strategy to ensure success. "Ultimately, enterprise imaging needs to align with the overall mission of the healthcare organization and support its service lines and patients," she says. "The imaging strategy needs to help the organization achieve its business plans for the current year and five or ten years down the road."

Fundamentally, Hyland's Atanasiu believes that senior healthcare IT leaders need to actively prepare for the ever-growing volume of medical images and the costs associated with them. "Consolidated storage is very important, both with regard to total cost of ownership and simplifying portfolio management," he says. "Typically, CIOs have hundreds of applications in use throughout their organizations, all of which require maintenance and support. By breaking down the silos and creating an enterprise-wide imaging strategy, you have fewer vendors, and you have a very clear storage strategy that you can manage at the enterprise level."



With this infrastructure in place, he emphasizes, migrations won't require extensive costs, because a VNA can consolidate images from multiple platforms in the background. Furthermore, a universal viewer, integrated with a VNA and an EMR, can help improve enterprise-wide image visibility by helping to bring previously dark specialty images into the light.

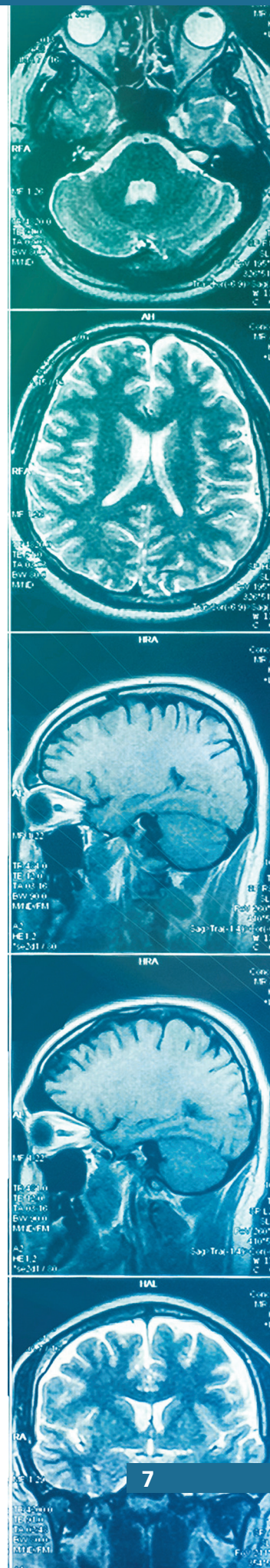
In the long run, enterprise imaging eliminates the complexity of managing multiple disparate imaging applications. Rather than every department having its own storage, storage costs and viewing applications, enterprise imaging allows everyone throughout the enterprise to retrieve and view their images and imaging data from the same system.

The advantages of enterprise imaging

When executed correctly, the advantages of enterprise imaging are attractive, to say the least. For example, UNC Health Care has eliminated nine PACS and three reporting systems since it first implemented its enterprise imaging solution in 2016. Another six PACS systems are planned for elimination in the coming months. The tight integration between the enterprise imaging system and the EMR has also significantly improved electronic image sharing throughout the enterprise, all but eliminating the need for in-network providers to burn CDs or DVDs in order to transport images from one PACS system to another.

The University of Rochester Medical Center has also experienced several benefits from enterprise imaging. "The advantages we've seen from enterprise imaging over a PACS-only approach span clinical, financial and operational areas," says Forrester. "On the clinical side, we've been able to move toward a patient-centric model where healthcare providers can access imaging data from a single EMR-centric workflow. Yet, the image-generating department can maintain autonomous workflows, maintaining their efficiencies. From a financial perspective, we've saved millions of dollars over the past three years due to software consolidation and economies of scale. From an operational perspective, we are able to take imaging into acquired health systems years before the EMR and have a single patient record with regards to imaging, where all the imaging is linked."

The next several years will be crucial for hospitals and health systems, as policy and payment changes force leaders to enhance organizational efficiency with regards to diagnostic image storage, sharing, and management. CIOs, CTOs and their colleagues need to adopt an enterprise-first imaging strategy to ensure cost-effectiveness, usability, and digital transformation, in a healthcare industry under greater scrutiny than ever before.



Adopting an Enterprise-First Imaging Strategy in Healthcare

Key Takeaways

- ▶ Piecemeal approaches to diagnostic image management are becoming less and less manageable as image volumes increase across many medical specialties.
- ▶ Accelerating business consolidation among hospitals, medical groups, and integrated health systems is increasing the need for strategic, high-level approaches to image management.
- ▶ Proper governance is crucial but challenging, given the diverse technologies, data, people, and organizational areas involved. A highly strategic approach is essential to success.
- ▶ Only an enterprise-first imaging strategy can bring together all the disparate pieces of the puzzle and help CIOs, CTOs and their senior healthcare IT colleagues make all those pieces work together in a systematic way.
- ▶ The technology exists to execute on an enterprise-first imaging strategy; it is important to find a technology vendor that can be a true partner in the implementation.
- ▶ The technology is available to integrate the various elements in the imaging landscape, but it must be tied to overall organizational business strategy and to clinician end-user needs.
- ▶ The advantages of enterprise imaging are well documented, if implemented correctly.
- ▶ Ongoing policy and payment changes will put intensifying pressure on senior healthcare IT leaders to drive their organizations towards hyper-efficiency and cost-effectiveness in this area.

NOTES

¹ <https://imvinfo.com/product/2018-mr-market-outlook-report/>

² <https://imvinfo.com/product/2018-ct-market-outlook-report/>

³ <https://go.frost.com/enterpriseimagingplatform>

⁴ <https://www.hcinnovationgroup.com/imaging/radiology/article/21076824/the-evolving-imaging-informatics-landscape-researchers-explore-the-new-world>

⁵ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5023525/>

