



From Isolated Archive  
to Connected Hub:  
**The Evolution of  
Enterprise Imaging**

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# From Isolated Archive to Connected Hub: The Evolution of Enterprise Imaging

It's been nearly a decade since the concept of "Enterprise Imaging" began garnering attention within the healthcare industry. And yet, like so many technology shifts that originate with considerable hype, the current reality is that Enterprise Imaging (EI) has barely emerged from its infancy.

As the volume and complexity of medical imaging data steadily increases, hospitals and health systems must work to solve problems ranging from operational to clinical to technical. These challenging problems include siloed imaging data, complex and inefficient workflows, a range of disparate and often legacy systems, and the delicate balance of departmental needs versus enterprise goals. Enterprise Imaging has remained relatively nascent in the absence of a clear, unified solution to these problems.

While considerable progress has been made, the challenges faced by early EI adopters over the past several years are currently informing new approaches to better meet the needs and requirements for a successful EI strategy. As the technology advances, early adopters are shifting their trajectory while healthcare systems yet to embark upon a robust EI strategy are benefiting from the lessons learned.

## Definition of Enterprise Imaging

The collaborative HIMSS-SIIM Enterprise Imaging Workgroup defines Enterprise Imaging as "a set of **strategies, initiatives and workflows** implemented across a healthcare enterprise to consistently and optimally **capture, index, manage, store, distribute, view, exchange, and analyze all clinical imaging and multimedia content** to enhance the electronic health record."

**What is Enterprise Imaging?**  
Society for Imaging Informatics in Medicine

## Shaping the Next Evolution

EI is not and never will be “one size fits all.” It is much more than merely storage of medical images and an enterprise viewer for clinicians. The problems are complex, but the right solution can simplify them.

Vendor-neutral archives (VNAs) were the primary focus of early EI efforts and while critical, the archive is only one piece of a much larger puzzle. As consolidation within the healthcare industry intensifies, hospitals and healthcare systems require new, more comprehensive EI approaches that better address growth and scaling challenges while incorporating more flexibility and the ability to adapt to the unique scenarios of every enterprise.

*“Enterprise imaging is more than just a storage strategy.”*

**The Evolution of Enterprise Imaging and the Role of the Radiologist in the New World**

American Journal of Roentgenology; AJR 2017; 209:845-848

This white paper highlights five core pillars that will shape the next evolution of Enterprise Imaging. Whether an organization is establishing its inaugural EI strategy or looking to make adjustments to early efforts, prioritization of these elements will ensure a more future-proofed approach that realizes the full potential of this powerful technology.

## Drivers of Change

Many factors are driving the evolution of EI. The ongoing industry consolidation means that rapid onboarding of new facilities and integration of existing systems is a key factor in the success of any new technology installation. The transition from a volume- to a value-based reimbursement model and the emphasis on extracting maximum value from large investments in electronic medical record (EMR) systems are driving new operational requirements.

Clinically, as imaging volume rises across the hospital system and within an increasing number of subspecialties, more challenges arise. The siloing of imaging data, the proliferation of non-traditional data formats, and the difficulty of managing all of this complexity leads to inefficient workflows that impact productivity as well as patient care. Healthcare IT considerations are driven by the widespread adoption of EMRs, the growing complexity of mission-critical systems, the increasing acceptance of cloud-based technologies, and the promise of Artificial Intelligence

(AI) applications – all combined with the challenge of dealing with aging legacy departmental solutions. New IT investment must contribute to improved patient care through better diagnostics, increased patient access, and improved privacy protection.

Finally, changes to traditional healthcare processes and conventions necessitated by the COVID-19 pandemic are reshaping patient care in lasting ways. Particularly, the increased acceptance of remote interactions – between clinicians and their patients as well as fellow care providers – will persist. All of these factors contribute to next-generation EI strategies.

*“Enterprise imaging is on the horizon for every institution.”*

**The Evolution of Enterprise Imaging and the Role of the Radiologist in the New World**

American Journal of Roentgenology; AJR 2017; 209:845-848

## The Ten-Year Horizon

These drivers of change affect every enterprise in unique ways that decision-makers must balance as they develop strategies for the future. As the importance of imaging intensifies across the entire healthcare enterprise, it is only natural that the approach to managing imaging data – and leveraging it as an extension of the EMR – takes the same enterprise-wide scope.

*“Organizations that recognize the need for EIM will experience improved efficacy, quality of care and economies of scale in achieving healthcare delivery improvements.”*

**The State of Enterprise Image Management**

Healthcare Innovation - Feb 21, 2020

Instead of perpetuating the inefficiency and complexity wrought by siloed imaging data and systems, hospital and health system leaders can streamline operations and workflow while improving patient care by developing a solid EI strategy for the next five to ten years. This is critical for ensuring that imaging systems meet the current and future needs of clinical staff and patients, while supporting the efficiency and financial objectives of the enterprise. Consideration of the following five pillars is paramount in evaluating solutions and approaches in formation of that strategy.



## PILLAR ONE

# The Enterprise Imaging Hub

An effective EI solution is not a self-contained system. It is a many-pronged entity that can flexibly accommodate and adapt to the unique – and ever-changing – needs of the healthcare enterprise. A solution that functions as a vendor- and application-agnostic “hub” of image management is what is required for future success.

This EI Hub must of course begin with a solid foundation – a robust and highly scalable clinical archive with powerful security to protect the integrity of the data and patient privacy. Image lifecycle and image object change management features are key elements for managing structural changes to studies across the enterprise. The archive must be standards-based and provide the ability to consolidate disparate imaging systems, indexing data in both traditional DICOM as well as non-DICOM (e.g. visible light images, videos, documents) formats so that clinicians can efficiently access a patient’s full longitudinal imaging record.

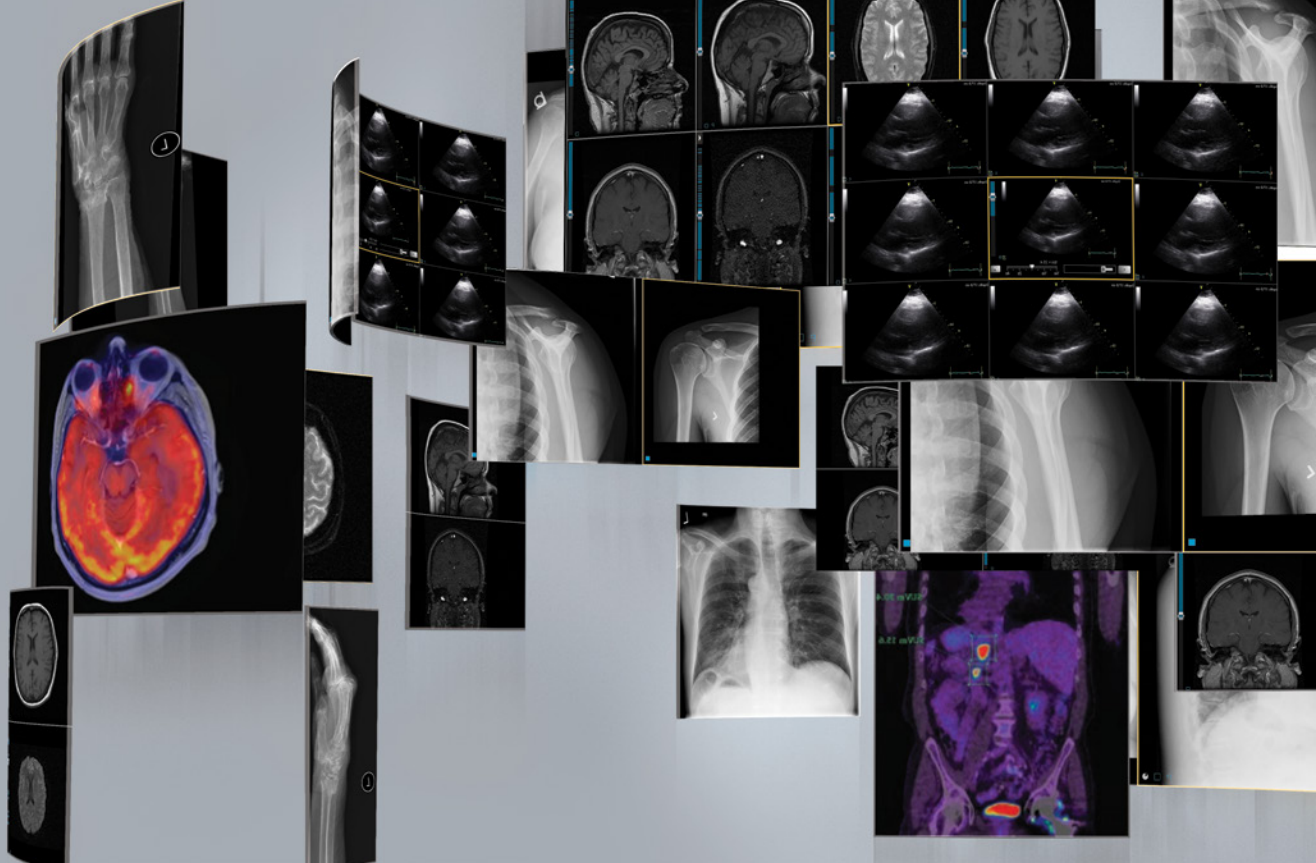
In departments outside of cardiology and radiology, digital imaging is less mature and often disorganized and fragmented. Images may be captured by practitioners via smartphone, medical camera, microscopes or other devices. They may not be accessible from within the EMR, impacting efficiency and/or accuracy while posing significant liability exposure due to lack of secure archiving. These non-traditional images and the risks they pose can be easily managed by a robust EI Hub.

Interoperability is also fundamental. A true EI Hub functions effectively to support an ecosystem of cross-enterprise applications. Optimally, these will range from a robust set of native products offered by the same vendor to extensive third-party integrations and data flows. The multitude of specialized solutions already in use by individual departments must be seamlessly accommodated.

*“Implementing a true EIM will require interoperability with a number of systems, and it cannot be considered standalone.”*

**The State of Enterprise Image Management**  
Healthcare Innovation - Feb 21, 2020

Finally, and perhaps most critically, an EI Hub should be able to orchestrate workflows across all the various specialties – this is where the real, but often overlooked, potential lies. Vendor-agnostic, specialized workflow capabilities should extend far beyond the unified presentation of disparate exams in a worklist. An ideal EI solution will streamline cross-enterprise workflows without compromising support for the unique, distinct needs of each department and its clinical users.



## PILLAR TWO

# Comprehensive Diagnostic Viewing

Just as with workflow characteristics, each image-producing department has specific viewing requirements and preferences that are unique. Diagnostic excellence also depends upon the availability of a viewing solution that satisfies the required depth and breadth of each department or subspecialty.

For example, viewers and workflow for radiology and associated specialties such as mammography, orthopedics, or neurology will have different characteristics than those for cardiology, general ultrasound, or obstetrics. The latter workflows are less about images and more about structured data and quantification.

Thus, there is no single viewing solution nor common workflow for every scenario across the enterprise. An ideal EI solution will support a range of specialty viewers and automatically launch the required one from the worklist, based on the user or type of case.

Patient and enterprise-wide viewing considerations must not be forgotten when developing an EI strategy. The broader clinician base also requires seamless image and report access via the EMR and/or associated portals. Flexible and secure access, from a broad range of mobile and other devices, must be ensured for this wider audience.

*“Having all patient images and associated reporting data easily accessible from within the EHR and at the point of care is essential for the quality of care.”*

**10 Steps to Strategically Build and Implement your Enterprise Imaging System: HIMSS-SIIM Collaborative White Paper**  
Journal of Digital Imaging (2019) 32:535-543

Where or how the data is stored is irrelevant to the clinician, enterprise user or patient. A powerful EI Hub launches the right viewing technology and drives a specialized workflow based on the data, optimizing and maximizing the user experience.



## PILLAR THREE

# Autonomy and Flexibility

No two institutions will have the same path toward achieving EI goals. The components required, and the right order in which to migrate to new systems or integrate with existing systems in order to minimize disruption and maximize ROI, will vary widely from organization to organization, and from department to department.

Flexible, modular approaches to EI that can separate viewing and workflow functionality from the back-end storage considerations are best poised for future-proofed success. An EI solution that assumes customers will move to a standard set of components across the enterprise, all at once or on a prescribed schedule, will fail to achieve the promise of EI.

Instead, a standards-based EI Hub architecture with data aggregation and workflow orchestration capability is far more practical and financially feasible. It will allow applications, departments, and sites to be integrated quickly and easily, in a manner that makes sense for an individual organization and that avoids costly and disruptive downtime.

As consolidation and acquisition trends dominate the industry, the advantage of a modular approach to EI adoption cannot be overemphasized. Organizations should be able to integrate storage and/or standardize viewer technology over time, as user acceptance, institutional priorities, and budgets dictate.

Achieving rapid return on investment via cost savings and enhanced clinical value is an objective for any mission-critical technology installation; EI is no exception. Charting the right course toward this goal will be different for every institution, with radiology typically first due to its imaging importance and foundation of critical systems. Proceeding to specialties with similar image management needs and high revenue value (e.g. cardiology, obstetrics) is often the fastest path to maximizing ROI. A universal worklist with the ability to launch a range of viewers in context and access images in a variety of repositories will streamline departmental onboarding and thus accelerate ROI.



## PILLAR FOUR

# Cloud-Enabled

The acceptance and adoption of cloud-based solutions is trending up in healthcare. As cloud implementations mature, healthcare IT is becoming increasingly comfortable about sensitive data residing securely in the cloud. A 2019 survey of 242 healthcare provider executives performed by Reaction Data showed 70% of respondents support the opinion that healthcare IT is headed for the cloud.<sup>1</sup> The COVID-19 pandemic has also contributed to a further acceleration of this acceptance.

Moving sensitive, mission-critical systems to the cloud is typically a gradual, progressive process for a healthcare institution. An EI vendor should have a solid cloud-based offering and be willing to accommodate each institution's particular timeline and priority for moving to the cloud (see Pillar Three).

Signify Research estimates that half of new EI initiatives will be cloud-based by 2025, and more than 80% in 10 years. Cloud-based solutions can offer automated upgrades, better disaster recovery, and the ability to fund with operating budget dollars rather than as a capital expense. Decreasing the cost and complexity of using in-house IT resources to manage critical systems holds significant appeal. The cloud also provides a foundation to enable deeper and richer analytics and intelligence capabilities to further empower an EI Hub (see Pillar Five).

<sup>1</sup> Cloud Adoption Trends in Healthcare, <https://www.reactiondata.com/report/cloud-adoption-trends-in-healthcare/>





## PILLAR FIVE

# Augmented Intelligence

The EI solutions best poised for the future will incorporate a solid vision for augmented intelligence with comprehensive analytics features and seamless integration of artificial intelligence (AI) into natural workflows. Augmented intelligence can enable ongoing, demonstrable improvements across the enterprise in productivity, efficiency, and clinical accuracy. In addition, these features can support population-based surveillance and analysis to facilitate public health programs.

While still early in adoption, artificial intelligence technologies are gaining traction and are beginning to demonstrate increased business and clinical value. They will continue to evolve, especially as the return on investment becomes more clearly defined. Rather than a replacement for clinical expertise, AI should be viewed as a core supporting healthcare technology capable of enhancing clinical workflows and outcomes by assisting human clinicians and administrators in making better decisions, more efficiently.

*“AI can provide greater efficacy and efficiency to the imaging procedure, impacting the way images are interpreted, as well as the workflow orchestration of how they are accessed.”*

**The State of Enterprise Image Management**  
Healthcare Innovation - Feb 21, 2020

In order to remain competitive and maximize operational and clinical efficiencies, the EI system needs access to rich and deep sets of cross-functional data from all corners of the healthcare organization. Leveraging data intelligently requires a flexible data management platform that will democratize that data into actionable information for anyone.

Business Intelligence Analytics capabilities leverage the strategic value in imaging data by aggregating cross-functional data from across image generating services, presenting it in real-time and in-context to the right person as needed. In this way, meaningful insights will inform actionable decision making.



## Conclusion

As leaders plot the course of a healthcare organization's future amidst ever-changing circumstances and industry conditions, a solid Enterprise Imaging strategy offers stability and great potential for assuring that enterprise goals are met – today and into the future. The growing importance of imaging within every department and across the entire healthcare enterprise means that a robust, enterprise-wide strategy for managing – as well as leveraging – that data has never been more critical.

Enterprise Imaging technologies are evolving far beyond the VNA in order to better meet the needs of hospitals and health systems focused on efficiency optimization without compromising quality of patient care. A scalable, flexible “hub” that accommodates data consolidation, specialized workflow automation and best-of-breed clinical tools is the future of EI. Careful consideration of the five pillars discussed here will aid in forming the most effective and future-proofed strategy for Enterprise Imaging.

## About Intelerad

Intelrad is a leader in enterprise workflows, specializing in diagnostic viewing, reporting, collaboration, and clinical data management solutions for hospitals, imaging centers and reading groups. Renowned for innovative features and functionality, Intelrad solutions increase productivity and streamline workflow by overcoming technical barriers in distributed and complex environments. Highly scalable, flexible and robust, Intelrad offers high performance solutions with industry leading customer service and support.

Intelrad Solution	Description
IntelOne® XE	Seamlessly link clinicians to patient images and reports stored across disparate HIS, EMR, PACS and VNA systems.
Clario SmartWorklist™	Allow radiologists to read from anywhere, and ensure the right radiologist gets the right exam at the right time.
IntelViewer™	Intuitive, web-based, feature-rich DICOM viewer that offers high performance in both local and remote environments.
IntelConnect® EV	Zero-footprint, clinical and referral portal with diagnostic-grade images.
TeleDiagnostics™	Quick to deploy solution that rapidly enables secure remote reading and reporting for medical imaging.

For more information, visit [www.intelerad.com](http://www.intelerad.com)