

Adopting an Enterprise Imaging Strategy

Laying the foundation for complete imaging health records

Published: June 2020



Introduction

Care pathways for many diseases and conditions are complex, involving interactions with many different care teams within a healthcare system. Medical imaging plays a significant role in an array of conditions and treatments. A patients' journey through a healthcare system is commonly tracked via digital patient record, provisioned by and enterprise electronic medical record (EMR). However, many aspects of imaging and its associated content are poorly integrated with EMR software, leaving significant gaps in the care record. The complexity and variety of imaging, diagnostic procedures and reports integration with digital care records, is challenging.

This paper will explore the importance of access to a complete imaging health record for patients, clinicians, IT administrators and other stakeholders in care pathway. Further, it will address how an enterprise imaging strategy forms the foundation for establishing longitudinal imaging health records and the potential benefits for key stakeholders. Finally, it will outline the important considerations and fundamentals for healthcare providers adopting an enterprise imaging strategy.

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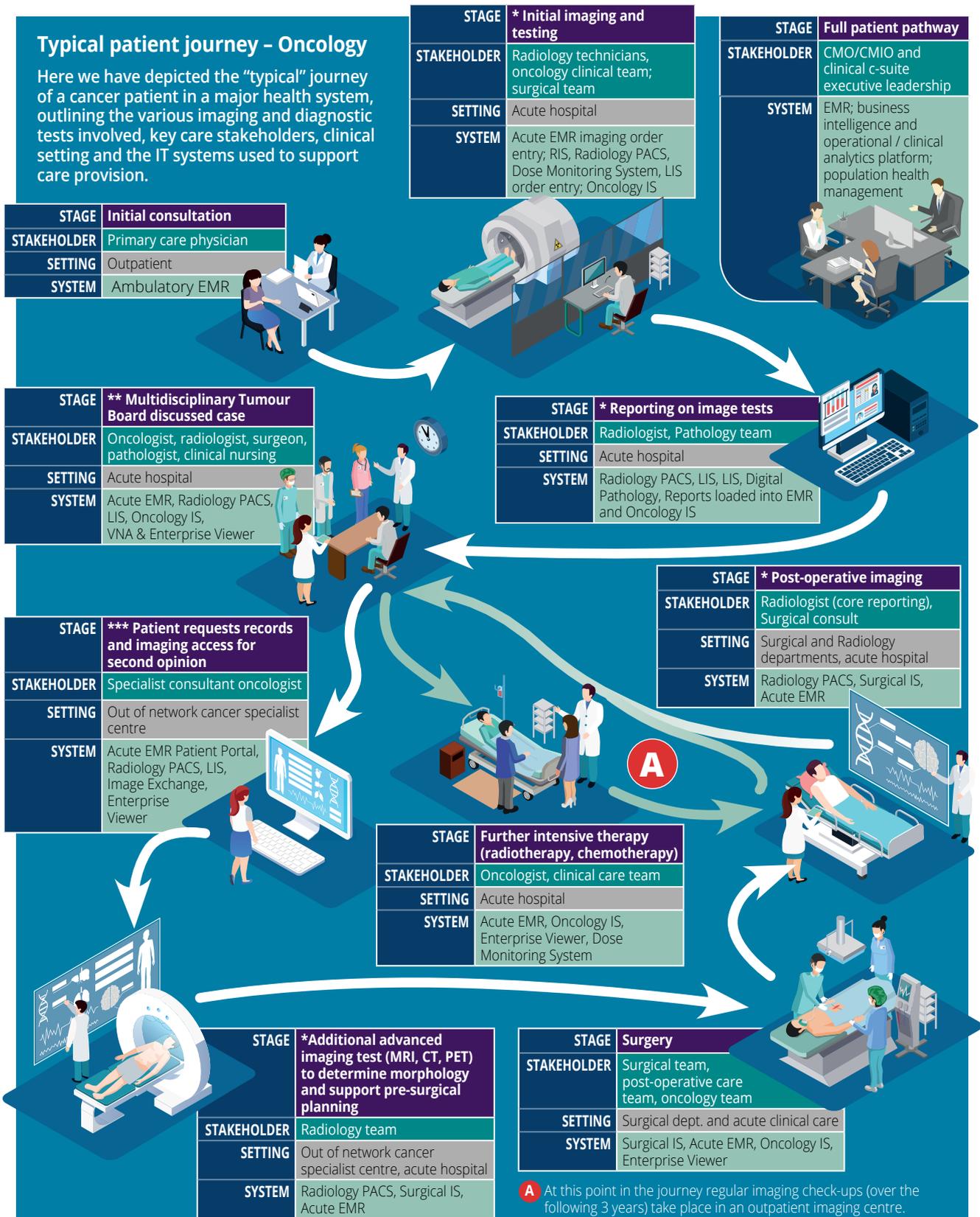


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Typical patient journey - Oncology

Here we have depicted the “typical” journey of a cancer patient in a major health system, outlining the various imaging and diagnostic tests involved, key care stakeholders, clinical setting and the IT systems used to support care provision.



A At this point in the journey regular imaging check-ups (over the following 3 years) take place in an outpatient imaging centre.

*Image access required by radiology / specialist
 ** Multidisciplinary need / clinical access / integration with EMR and other systems / care management plan
 *** Patient portal and access required.

Radiology PACS includes workflow orchestration, reporting and advanced visualization solutions.
Dose Monitoring System – For overall patient safety and quality tracking, Radiation Safety Office, Radiology Director and QC Director use Dose Monitoring solution. Radiologists and Oncologists also use it to support decision on clinical/treatment plan.

Requirements of key stakeholders in the patient journey

As outlined in the diagram on page 2, diagnostic and clinical stakeholders involved in care provision each have specific requirements. While the core EMR offers a central platform for tracking core administration, monitoring, clinical notes and reports, it rarely offers full access to diagnostic imaging data, which is usually managed and accessed in separate departmental systems.

However, as outlined in the care pathway above, each care stakeholder has a specific need for access to the EMR and an array of diagnostic information in order to be able to deliver appropriate and high standards of care to the patient. Below we have outlined some specific informatics requirements for leading care providers in a care pathway:

RADIOLOGIST

- Consolidated access to all imaging from radiology and imaging studies conducted in other clinical departments, including prior history
- Access to imaging studies conducted in outpatient imaging centres both within and out-of-network
- Singular user interface (UI) and user experience (UX) across all diagnostic reporting, viewing and sub-speciality reading

- Access to broader patient history and relevant diagnostic content from the EMR within core diagnostic UI
- Clinical collaborative tools for inter-departmental consultation

ACUTE CLINICIAN (ONCOLOGY/SURGEON)

- Access full patient case history from EMR including all associated imaging, reports and diagnostic results
- Streamlined tumour-board case management tools to support collation of relevant patient record content from across the patient record and diagnostic IT systems – allowing access to all imagery and pathology information in context of the EMR
- Collaborative tools for inter-disciplinary consultation ongoing care pathway management

PRIMARY CARE PHYSICIAN

- Updates and access to care management plan and associated diagnostic test reports and associated imaging
- Referral and communication portal to acute clinical and broader diagnostic team

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CMO/CMIO AND CLINICAL C-SUITE EXECUTIVE LEADERSHIP

- Aggregated view of major care pathways, outcomes and broader patient cohort management across health system
- Metrics and analytics on predictive cost of care, patient risk and care team resourcing
- Integration of clinical and diagnostic metrics into enterprise care management and population health solutions

IT ADMINISTRATOR

- Consolidate governance and maintenance, reducing manual processes for different applications
- Reduce IT resource required for custom APIs and time-intensive integration of system applications
- Minimise risk from security breaches and cyber-attack with enterprise-wide security management and compliance.

PATIENT

- Access to full digital patient record including full imaging data set (priors and current)

- Data access permission management for external care provision or specialty consult
- Access to view care plan and integrated communication platform between patient, primary care physician, oncology consultant and clinical care team
- Few healthcare providers today have enterprise healthcare IT systems that can support these needs; diagnostic imaging and associated reporting and data is commonly not included in the EMR, or with very limited integration. Instead, many health systems continue to operate a patchwork of legacy departmental imaging IT systems across the network. This creates many challenges from a clinical user perspective, namely:
 - Limited, decentralised or no access to complete medical imaging, medical photography, surgical video, pathology imaging and other important diagnostic or clinical data
 - Poor interoperability between IT software limiting data access or requiring extensive integration
 - Multiple diagnostic and clinical viewers
 - Limited integration of diagnostic data with patient record in the EMR.

What is Enterprise Imaging?

As our cancer patient pathway shows, imaging is no longer performed and accessed solely in the radiology department today. Therefore, radiology specific software products can have limitations in supporting the integration and access to imaging and associated data across the health network.

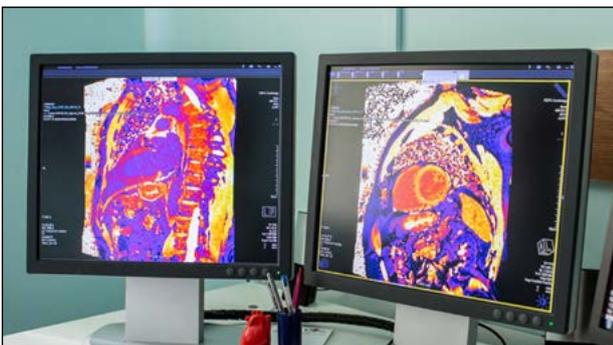
Some healthcare providers are therefore turning to an enterprise imaging strategy to centralize and consolidate all imaging data and associated content into a centralised platform, thereby

allowing better access and improved data management and administration. However, each health provider is also approaching enterprise imaging in a different way, blurring definitions.

The best consensus definition for enterprise imaging so far is offered from a partnership between two leading health informatics associations:

“ENTERPRISE IMAGING IS A SET OF STRATEGIES, INITIATIVES AND WORKFLOWS IMPLEMENTED ACROSS A HEALTHCARE ENTERPRISE TO CONSISTENTLY AND OPTIMALLY CAPTURE, INDEX, MANAGE, STORE, DISTRIBUTE, VIEW, EXCHANGE, AND ANALYSE ALL CLINICAL IMAGING AND MULTIMEDIA CONTENT TO ENHANCE THE EHR.”

Source: joint definition from; Healthcare Information and Management Systems Society (HIMSS) and Society for Imaging Informatics in Medicine (SIIM).



While conceptually this strategy addresses many of the requirements identified above making it an attractive option, execution is far harder.

From our extensive research tracking the evolution of imaging IT vendor portfolios, we see that enterprise imaging platforms today are increasingly focused on four key layers, with each layer focused on a specific set of competencies. In simplistic terms, this would be depicted as follows:

Clinical View and Collaboration Layer

Multi-ology, content diverse, mobile and zero-footprint, EHR integrated

Diagnostic Reading and Diagnostic Workflow Layer

Adaptive, single UI/UX, structured reporting, embedded AV, curated AI, decision support, adaptive supporting patient data display

Operational and Workflow Layer

Worklist management, triage, business intelligence, teleradiology management, QA, resource balancing, modality fleet management

Data Management Layer

Data ingestion, structured registry, tag morphing, exchange and routing, ILM, AI load management, push-pull w/EMR, LIS, other clinical systems

As outlined in the previous section, each stakeholder in the patient care continuum has a varied requirement for imaging access, thus will interact with each layer to a differing degree. It is also increasingly expected that all imaging data and associated content is accessible from each layer with a near seamless flow of data between each layer.



One existing framework that is available to providers to support planning and implementation of an enterprise imaging strategy is the Digital Imaging Adoption Model (DIAM) ([hyperlink](#)), a joint project by the European Society of Radiology (ESR) and the Healthcare Information and Management Systems Society (HIMSS) in 2016. The 8-stage framework provides a set of sequential compliance goals (levels 0-4), with Level 4 requiring imaging management at an enterprise level, integration with EMR/HIS and seamless receiving, processing and access to images from all patient units and departments within the healthcare provider network. Levels 5-7 are non-hierarchical and include addition of advanced tools such as analytics and personalised medicine capabilities, Clinical Decision Support (CDS) and advanced Health Information Exchange (HIE).

For many healthcare providers, the DIAM framework provides a clear starting point and means of tracking progress versus peers; however, each healthcare provider may also need to address additional nuances based on the combination of software already in use at their institution and other strategic or clinical initiatives. Furthermore, the DIAM is mostly focused on enterprise imaging management; some providers may also need to more broadly address not only centralising access to imaging content, but also access to associated diagnostic and clinical content that supports image interpretation and broader diagnosis.

The benefits of Enterprise Imaging within a typical patient journey

From our extensive research and market tracking, deployment of an enterprise imaging platform can offer substantial benefits to care provision. To show how, we have provided some specific benefits below to demonstrate the value and enterprise imaging strategy can have for clinical stakeholders in the patient journey outlined earlier in this paper.

	RADIOLOGIST	ACUTE CLINICIAN (ONCOLOGY, SURGICAL, PATHOLOGY, CLINICAL LEADS	CMO/CMIO AND CLINICAL C-SUITE EXECUTIVE LEADERSHIP
IMPROVED EFFICIENCY	Harmonised, common user interface; adaptive diagnostic tools and patient data display; integrated reporting, orchestrated workflow balancing workload and exam prioritization.	Faster information aggregation and simplified scheduling for tumour boards or other multidisciplinary care team meetings.	Faster access to consolidated analytics on operational and clinical performance of diagnostic imaging and multidisciplinary care teams.
DIAGNOSTIC QUALITY	Consolidated and universal access to all imaging data, analysis tools and longitudinal record.	Ongoing access to full longitudinal imaging record from diagnostic and procedural use, including surgical video, pathology slides and radiation therapy output.	Centralised care quality tools for monitoring clinical guideline compliance, outcome metrics, image ordering patterns and staff workload to ensure highest quality of care provided.
MULTI-DISCIPLINARY COLLABORATION	Smart diagnostic workflow and virtual consultation tools within diagnostic interface supports virtual consultation.	EI platform integrated with EMR offers foundation for establishing tumour board workflow and tracked care management pathway.	Consolidated imaging IT platform allows greater coordination, management and prediction of demands on clinical and diagnostic resources, enabling more efficient care in complex pathways.
ACCESS	Mobile and remote-access support; allows radiologist access from any location.	Remote and out-of-network access portal for specialist consultations for complex cases.	Enterprise Imaging IT platform provides foundation for range of analytics and operational modules to support decision making and governance for CIO, CFO, CMIO and CNO executives.
INNOVATION	Consolidated platform offers improved access and opportunity to leverage embedded workflow, structured reporting and decision support tools, augmenting radiologist working practices.	Centralised data management offers foundation of implementing advanced clinical decision support tools and new approaches to care provision.	Integration of enterprise imaging with EMR and care management tools creates new opportunities for implementing new multi-disciplinary care models and improving patient care outcomes.

The benefits of Enterprise Imaging for wider provider organisation

An enterprise imaging strategy can also have much wider impact on a health provider from a non-clinical perspective too, offering long-term efficiencies and operational savings over the contract term. Some specific examples include:

IT DEPARTMENT

- Reduced IT redundancy for maintaining disparate imaging software and services
- Improved cybersecurity with centralised platform
- Greater scalability and common architecture
- Common and proven standards foundation; integration and interoperability support for future integrations and upgrades
- Fewer data migrations
- Lower demands on IT resources for training and support with common system and UI

ADMINISTRATION AND FINANCE

- Simplified procurement and contracting for imaging informatics
- Better management of staffing, resources and equipment utilisation across the enterprise
- Faster access to aggregated departmental, site or enterprise data metrics

- Integrated tools to predict spikes in demand and impact on diagnostic services and care teams
- Consolidated enterprise order entry and recognition for all imaging services including point-of-care imaging

REFERRING PHYSICIANS AND OUT-OF-NETWORK CLINICIANS

- Simplified, centralised and secure access to all relevant information and care plan updates
- Robust image and patient-data exchange
- Essential tools to support bi-directional collaboration and reporting between primary physician, acute team and out-of-network specialists

An enterprise imaging strategy therefore offers a substantial opportunity for healthcare providers to both improve their clinical outcomes and operational processes. Most importantly, it can also drive care standard improvement and better support complex care provision.

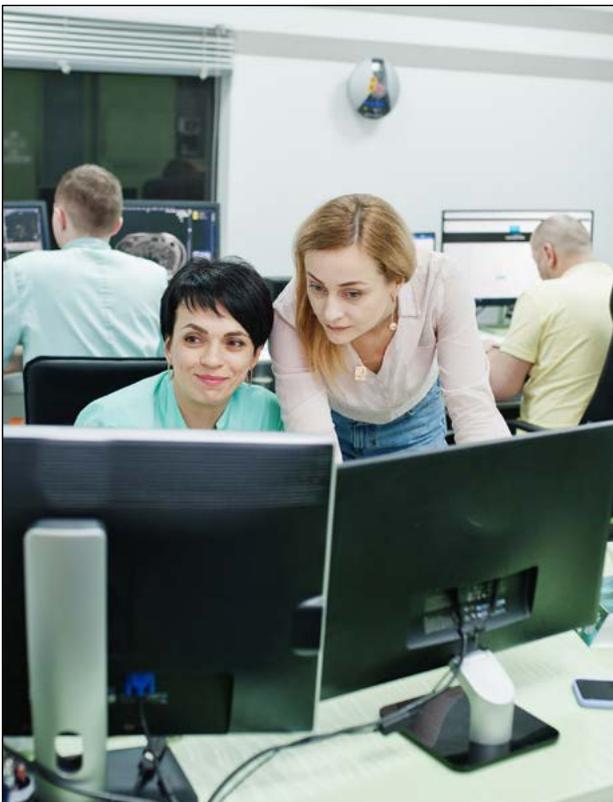
However, with the evolution of imaging IT informatics products from departmental software to broader enterprise platforms, selecting a vendor partner to work on an enterprise imaging implementation can be challenging.



Considerations when defining and implementing an Enterprise Imaging strategy

Undertaking an enterprise imaging strategy can appear daunting for healthcare providers given the scale and complexity of scope. Planning and preparation for adopting an enterprise imaging strategy is therefore especially important. We believe the following initial stages are important aspects to consider, either independently or in partnership with a chosen consultant or vendor.

1. Define organizational objectives
2. Assess current state & identify gaps against common frameworks (e.g. DIAM)
3. Define requirements to achieve EI goal
4. Establish governance structure and build strategic support from executive and clinical leaders
5. Develop phased project plan with clear milestones to meet specific targets and objectives
6. Identify ROI for each major stakeholder group and communicate



7. Produce detailed cost-analysis and staged budget plan; seek budget approval
8. Commence procurement and implementation process
9. Regularly review progress and refine plan, budget and governance as required at each phase

There are many types of IT software and services available to support an enterprise imaging strategy. While a detailed analysis of core features and functions of each offering is beyond the scope of this paper, below we have also outlined some fundamentals that healthcare providers should demand from their chosen enterprise imaging partner.

PROVEN TRACK RECORD OF CARE OUTCOME IMPROVEMENT

- In depth understanding of patient-centric care and ability to support diagnostic and clinical access to complete longitudinal patient record
- Reference sites from similar healthcare providers with tangible and demonstratable benefits
- Expertise in core imaging applications and actively pursuing strategy of products and services to support personalised precision medicine

SCALABILITY, RIGOROUS STANDARDS AND INTEROPERABILITY

- A robust, standards based central platform for image management across multiple clinical applications for all sizes of healthcare provider
- Clear track-record of implementation in a variety of customer sites with varying legacy configurations, especially different EMR platform integrations
- A strong and clear register of IHE profiles for the product portfolio and demonstration of ongoing innovation around new interoperability profiles and standards

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BALANCE OF IN-HOUSE DEVELOPMENT AND INTEGRATION OF THIRD-PARTY BEST OF BREED

- Expertise in a variety of medical imaging applications, with numerous robust native-integration partnerships with third-part specialists to address specific diagnostic or clinical need
- Clear pipeline for mid- and long-term platform and portfolio innovation and evolution, without requiring extensive future migration
- Active leadership in development or integration of clinically validated and regulated AI-based tools and applications

RICH TOOLSET OF INTEGRATED ANALYTICS TO SUPPORT ACTIONABLE OPERATIONAL DECISION MAKING

- Centralised platform seamlessly linked to variety of business intelligence and operational analytics tools to leverage real-time and historical operational data
- Consolidated analytics to track and query patient, staff, utilisation, financial and safety data in a common user interface
- In-house professional services and consulting to support ongoing optimisation of platform and operational processes to drive institutional performance improvements.

Conclusion

Adoption of an enterprise imaging strategy offers a clear opportunity for healthcare providers. Centralising the access and management of all diagnostic imaging and associated data has clinical, operational and broad administration benefits for a health system. More importantly, it offers the chance to improve the overall provision of care to patients.

Access to diagnostic imaging data from across the health system within the context of the EMR can provide a rich, longitudinal patient history, essential to support multidisciplinary care teams in making better care management decisions. This also can drive higher standards of care and patient outcomes, while providing a foundation for use of next-generation diagnostic and clinical software tools such as artificial intelligence and advanced analytics.

Combined, an enterprise imaging strategy can support health systems in driving towards highly personalised care based on precision medicine, drastically improving care provision and the patient's journey through the health system.

About the author



Steve has more than a decade of experience in healthcare technology market intelligence. He has served as Senior Analyst at InMedica (part of IMS Research) and Associate Director for IHS Inc.'s Healthcare

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His areas of expertise include imaging informatics, clinical IT software, medical imaging hardware and broader digital precision

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