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A Snapshot of Imaging Technology

Exciting Developments and When to Expect Them

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Conversations with thousands of clinicians have given KLAS Research a picture of the current trends in medical imaging technology. Current users' successes and failures have generated some best practices for successfully implementing new technology.

Key Points

- Enterprise imaging strategies and tools are being widely adopted in many regions. Organisations with effective strategies are achieving positive outcomes today.
- While there are some positive Artificial Intelligence (AI) use cases being implemented in the imaging world, the uptake of the tools is slow, so AI will not have the impact it could on the imaging industry over the next 5 years.
- Digitised pathology processes are boosting efficiency and improving the quality of care. This technology will generate significant changes in the next 3 years and revolutionise the pathology industry over the next 15 years.
- To capitalise on imaging technology, organisations should create a comprehensive enterprise imaging strategy and get buy-in from all stakeholders, including department heads and clinicians.

Over the past 20 years, healthcare organisations all over the world have been investing in digital imaging solutions. As organisations in mature regions have digitised their various specialties, it has not been uncommon to select a different picture archiving and communication system (PACS) for each discipline, including radiology, cardiology, endoscopy, and more. This pattern creates a hodgepodge of eclectic solutions that are managed mostly at the departmental level.

Today, many clinicians in technologically advanced regions are ready to seek something better: consolidation. Organisations understandably want to reduce the number of imaging systems they use and the total amount they spend on imaging.

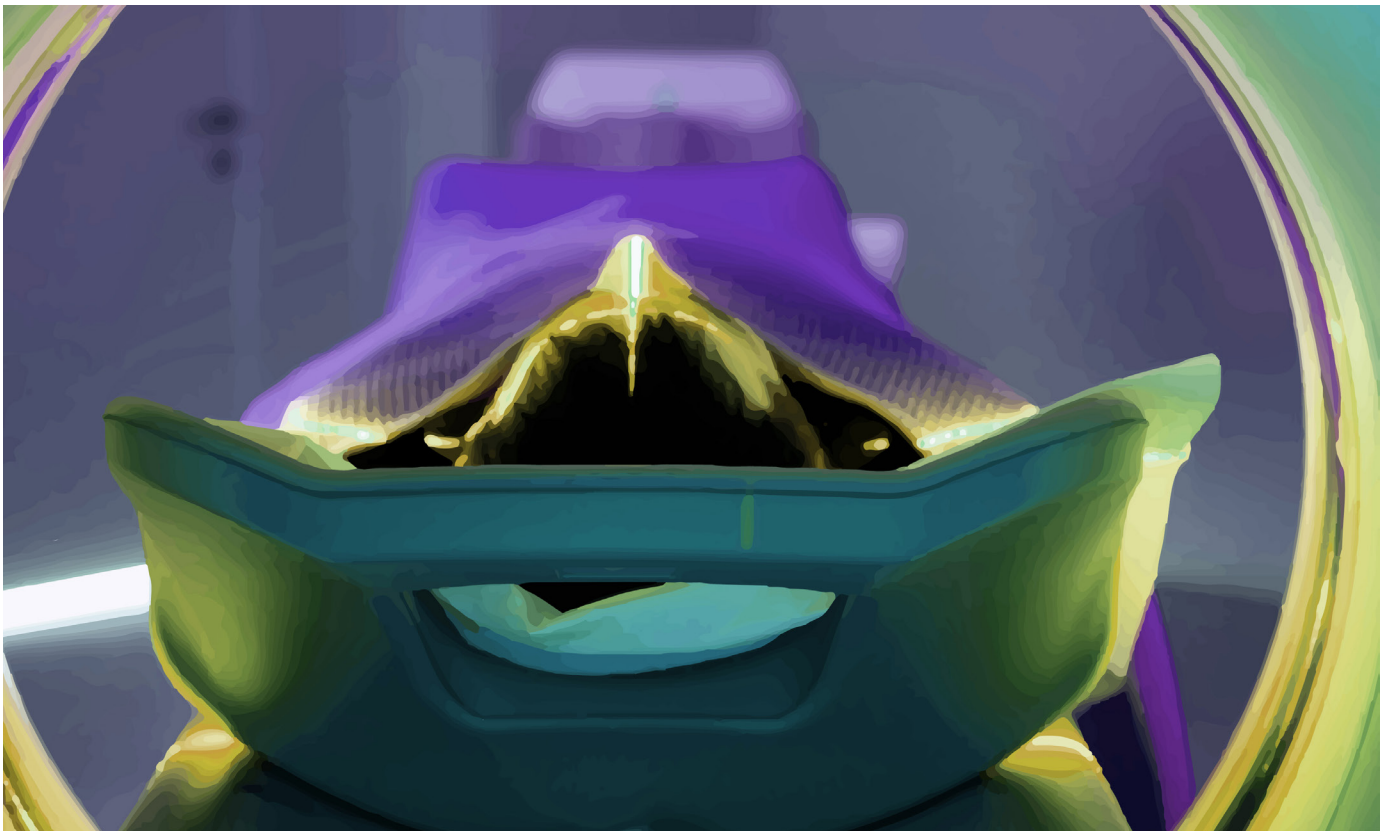
Ears are also perking up at talk of shiny, new tools such as artificial intelligence functionality. Many people are asking whether anyone is seeing positive outcomes from these solutions yet.

Luckily, the conversations my colleagues and I have with hundreds of healthcare stakeholders give us a decent idea of the status quo and what the near future will likely bring. Let's take a look at the exciting trends and opportunities in the world of digital imaging.

EI, the VNA, and the Universal Viewer

Many healthcare leaders want a single imaging platform or solution that can aggregate and store all of their organisation's images across departments. It's equally important for their imaging technology to provide all physicians with the specialty-specific abilities and measurements that they need to be successful. Thus begin conversations about enterprise imaging, the vendor-neutral archive, and the universal viewer.

Enterprise imaging (EI) can be defined as "the ability to store and/or view images across the enterprise from more than one service line or storage solution" (Rasband &



Barton 2020). The vendor-neutral archive (VNA) provides the storage side, while a universal viewer can handle viewing.

Healthcare organisations in many regions—including the US, UK, Canada, Netherlands, Nordic regions, Southeast Asia, and Oceania—are acquiring VNA solutions quickly. In some parts of Canada and Europe, VNA decisions are being driven at a regional level. For example, a province in Canada might have only one PACS for the 100+ hospitals in the province. In addition, certain Nordic cities (such as Bergen and Stockholm) now host enormous archives in which to manage images for the entire region. The goal: to have a single source of truth with all patient-history data.

Overall, healthcare organisations are doing better at storing data in a single system than at viewing data in a single system. However, in the US, "[r]eported access to relevant images through both the VNA and universal viewer is up nearly 20% from 2018, with the most progress on the universal viewer side (primarily being used referentially). This shift is improving clinician productivity" (Rasband & Barton 2020). This progress will continue as healthcare leaders ask questions like, "What do we want to do with imaging in the long term? How can we improve our EI setup? What tools or changes are coming next?"

Artificial Intelligence

Everyone is talking about healthcare artificial intelligence (AI) tools, which KLAS Research defines as software that provides machine learning or natural language processing capabilities for healthcare-related clinical, operational, or financial areas" (Pretnik & Krotz 2019). Relatively few organisations are using AI in imaging yet. While there are a few use cases yielding positive outcomes (they will be discussed below), I don't expect AI to be widespread in the imaging industry for at least five years. A number of significant barriers will probably keep progress slow.

One of these barriers is that some clinicians are hesitant to adopt tools that they fear will make clinicians obsolete. The truth is that AI technology isn't advanced enough to do that, and it isn't even designed to. The goal of most AI tools is to increase efficiency by doing some manual work for the clinicians, leaving those workers to do more of what they do best: think critically and interact with patients.

For example, certain vendors provide built-in triaging functions in their imaging tools. In a radiology PACS, such AI functionality can run algorithms on patient scans in the background, flag scans that show serious or urgent problems, and automatically shift those scans to the top of the radiologist's queue. A radiologist can immediately be shown the scan of a patient with, say, a brain bleed, and get that patient to the hospital in time for life-saving treatment.

AI functionality can also improve the process of screening for breast cancer. The enormous numbers

of negative tests tend to create a constant backlog of images. However, an AI tool can quickly sift through the negatives and flag images that will need a closer look. Clinicians can then spend more time studying those cases and talking with patients. Before long, patients may even be able to hear by the end of an appointment if the results of the screening have been marked as negative.

As AI tools are refined and more widely adopted, they will facilitate advances in radiology, cardiology, precision medicine, and many other areas. The clinician experience, patient experience, and standard of care will all improve. Let's not stop talking about AI anytime soon. The more we normalise the usage of AI tools, the faster we can overcome its stigma and spur adoption.

Digital Pathology

Pathology may not be considered "traditional" imaging, but it's an area ready to erupt in relevancy. Because of recent technological advances in image capturing, workflows, and AI, organisations in certain regions are starting to use digital pathology technology for primary diagnostic work, not just research. I think pathology will see dramatic changes in the next 2–5 years and be totally revolutionised in the next 15 years. It takes just a quick comparison of manual and digital methods to see why.

Most pathologists are still looking at slides under the microscope and then writing reports in their lab systems; a pathologist aided by digital tools can take images of a slide, scan them into the computer, and then manoeuvre and magnify those images effortlessly. Traditional measurement techniques involve special rulers and drawing on slides; in a pathology PACS, a pathologist can measure even curves or areas with just a few clicks. Manually counting each of a slide's mitotic cells takes ages; new AI technology can highlight the appropriate cells instantly.

These slick, new systems won't necessarily save smaller organisations money. However, current users testify of three main benefits: (1) improved quality of work, (2) improved efficiency, and (3) remote-reading capabilities (Lagemann & Christensen 2020). I will share a couple of specific examples.

Healthcare stakeholders in the Netherlands have set up a telepathology network. If a participating facility's pathologist is unavailable or needs a second opinion, the facility can now send a link to an expert elsewhere in the country. The expert can then click on the link to see the scan in real time and give input. That sure beats sending studies via the post or paying couriers.

Similarly, an Austrian clinician friend told me how elated their pathologists were to be able to attend multidisciplinary tumour board reviews electronically instead of driving four to eight hours each way to attend in person. These savings of time can equate to real savings in money.

With a projected shortage of pathologists, it's becoming critical to use pathologists' hours wisely. As digital functionality and algorithms relieve pathologists of manual tasks and travel, these pathologists can use their expertise to do more meaningful things, such as collaborating with and training each other, giving diagnoses, and arranging effective treatments.

There are still limitations in digital pathology tools, and there are geographical, political, and legal barriers to overcome. However, the outcomes from early adopters are so momentous that I expect many of the barriers to be torn down swiftly. In fact, some softening of legal barriers has already happened as governing bodies have eased restrictions on the usage of digital pathology systems in response to COVID-19. This will further allow digital pathology tools to proliferate. At that point, it will be up to healthcare organisations to maximise the technology (and manage the enormous data burdens from pathology archives that can run in the petabytes or even exabytes) through effective strategising.

As AI tools are refined and more widely adopted, they will facilitate advances in radiology, cardiology, precision medicine, and many other areas

Invest in an Imaging Strategy

About three years ago, I talked with a healthcare leader in the UK about their imaging tools. I learned that they had purchased a VNA and asked what they were doing with it. The response? "We haven't taken it out of the tin. Someone told us we should combine a VNA decision with our new PACS, but the VNA is now sitting on the shelf because we don't know what to do with it."

Many healthcare leaders move forward with a VNA, AI, or other decision without buy-in of enough departments and

clinicians. Some organisations waste the potential of their VNA by using it as backup storage for their radiology PACS. Others don't set up a governance structure and then wonder why their clinicians are confused or resistant.

Each of these situations leads to wasted resources and unhappy clinicians, and each can be prevented or corrected with a comprehensive EI strategy. Healthcare leaders should follow these best practices when outlining and executing a plan to take advantage of imaging technology:

- **Start early**. Begin discussing and planning long before any new tools arrive. If you have already implemented new tools and can see that your strategy is inadequate, regroup immediately to prevent further problems.
- **Put governance in place before purchasing any new tools.** Get input beforehand from every department so that the governance structures will be more likely to work and be supported. IT/PMO steering committees are particularly effective and produce the most outcomes (Rasband & Paxman 2018).
- **Understand the tools' capabilities and decide how you will use them.** Remember that a true EI setup will connect multiple service lines, consolidate everything into a single source, and provide specialty-specific functionality to each clinician.
- **Get all department heads on board.** It's okay if these leaders don't all agree with the specifics of the plan from day one, but they must at least understand and agree with an overall vision for EI before the organisation can move forward.
- **Create a realistic rollout timeline.** Decide the order in which new tools will be introduced and which departments will implement when. Start with the departments most eager for change. This will give other department heads time to prepare.
- **Educate and include the clinicians.** They need to feel involved in the planning process and confident that they can be successful with the incoming tools. One Director of Pathology advised, "Take the time and money to let every pathologist do his or her own individual validation so that the pathologists will trust the system…We first introduced about 20 test cases for the pathologists to do both digitally and through the microscope so that they could note any differences" (Lagemann & Christensen 2020). Such efforts lead clinicians to embrace new tools.
- **Foster partnerships with your supplier(s).** Organisations that view their supplier as a strong partner report higher-than-average outcomes for their EI tools (Rasband & Paxman 2018).

Warning: Progress Ahead

In a world of mind-boggling technology, it's good to see that healthcare imaging tools are finally starting to catch up. Seizing and managing new tools and methods will pose plenty of difficulties. However, as healthcare leaders follow IT pioneers by strategising wisely and implementing boldly, they will enhance the lives of clinicians and patients beyond recognition.

About KLAS

KLAS is a healthcare IT–focused market research firm. Our mission is to improve the world's healthcare by amplifying the voice of providers and payers through data. KLAS provides transparent insights on the software and services that healthcare leaders use every day. ■

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