Signify Research

WHITE PAPER

From Ecosystem to Insight:

How AI and Advanced Visualisation Enable Integrated Workflows

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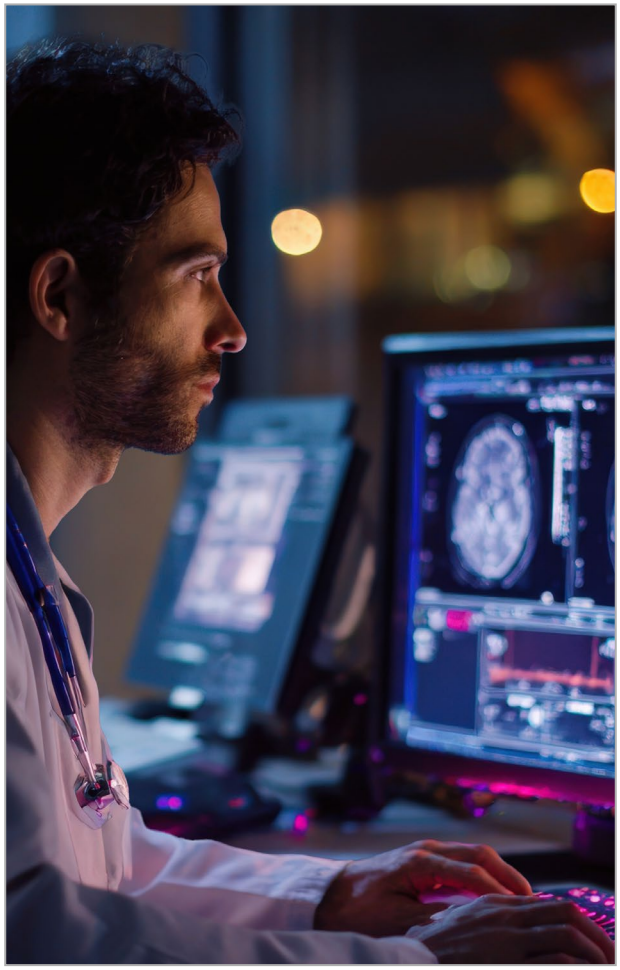

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Introduction

Advanced visualisation (AV), from simple 3D reconstructions to entire treatment planning workflows, is now nearly ubiquitous in clinical practice. It is recognized as a vital tool in diagnosis and planning procedures, especially in complex cases.

Its next chapter, however, could prove even more significant: serving as a symbiotic partner of generative AI to extend AI automation and insights to a broader range of cases or provide deeper, more contextually relevant understanding of the imaging record, making AI-enabled AV workflows more accessible and impactful.

AV and imaging AI products have already begun to unite, with vendors embedding and integrating some AI methodologies to automate tasks such as measurement, delivering efficiency gains without necessarily adding new clinical insights.

That convergence is now evolving.

Imaging AI has dominated the market's attention over the last decade, yet adoption remains concentrated to narrow use cases, limited by the prevalence of point solutions, challenges with workflow integration into PACS, and finite health-economic evidence. Modern AI approaches are now helping move industry conversation beyond isolated detection toward true workflow augmentation, impacting both the clinical workflows as well as the operational aspects of AI utilization.

The combination of agentic AI, including the use of Large Language Models (LLMs) as well as Large Vision Models (LVMs), together with earlier AI segmentation/detection tools and deterministic AV workflows opens the door to more holistic patient insights. The integration of both patient data and imaging data offers a level of contextualization and decision support that individual point solutions struggled to provide.

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This white paper explores the latest stage of this convergence. Drawing on interviews with four providers (sample detailed in table 1 below) and secondary research, it considers how combining AI and AV could unlock value where it matters most: clinically through earlier and more consistent diagnosis, operationally through better coordination of complex cases, and financially through reimbursement and efficiency.

Table 1: Sample of Provider Interviews

Participant	Region	Provider Type
1	US	Outpatient Network
2	US	Outpatient Network
3	US	Academic
4	UK	NHS Foundation Trust

AI in Practice

Imaging AI can deliver real value, but adoption in clinical use has been limited to specific, well-defined use cases such as stroke triage, FFR-CT, and 2D mammography. The widespread adoption and reimbursement of these tools are a reflection not only of intrinsic value, but of their impact on care pathways.

Across most of radiology, adoption of clinical AI is slow, in part due to limitations in integrating it within broader clinical workflows. Despite thousands of algorithms and numerous vendors, only a few use cases drive the majority of spending.

By contrast, operational AI solutions have advanced more rapidly, supported by lower – or entirely absent – regulatory requirements and tangible benefits in systemic, rather than point, efficiency. Auto-impressions in radiology reporting and patient summarization, for example, have generated significant industry attention for their purported effects on streamlining diagnostic processes.

Combining the two, meshing the benefits of operational AI with the clinical insights of imaging AI, offers the opportunity for a more holistic approach, enabling smoother workflows and better-informed decisions alongside operational

efficiencies. The challenge is not AI's promise, but the difficulty of making it work in practice.

The Weak Link in AI Adoption

> *"Humans in healthcare are asked to be the source of integration, because all these systems are disparate."* **Participant 1**

Integration remains the biggest barrier. For radiologists, AI tools only deliver meaningful value when they are seamlessly accessible within existing workflows. This remains relatively uncommon in practice, or at least with a standard of integration which has enabled point acceptance or rejection of findings rather than driving a contextual workflow.

Hospitals rarely operate on a single, unified IT stack. Health systems are often managing a disparate ecosystem of software from PACS, VNA, reporting tools, imaging AI, EMR, and other departmental systems outside of radiology that add further complexity. This results in fragmented experiences for radiologists, the need to manually review and extract relevant information and non-standardized reporting outcomes for referring physicians.

While most AI vendors adhere to established standards for data transfer, such as DICOM SR and HL7, workflows, reporting formats, patient data consistency, and efficiency tracking tools

can vary widely between implementations. As a result, even with standardized integrations, the user experience and operational impact can be inconsistent, limiting the value of these tools across different settings.

When integration falters, the impact is felt directly at the workstation: extra clicks, duplicate data entry, inter-reader diagnostic variance, and multiple windows that pull radiologists out of focus, increasing burnout. AI is meant to save time, but too often it slows them down and doesn't provide the patient-specific insights necessary to determine the proper clinical pathway.

> *"Anytime you have to launch... and log into another program and pull up a study, it takes time and effort and energy, and it slows you down."* **Participant 2**

Turning Data into Usable Insight

Even when integration succeeds, clinicians face another hurdle: information overload. Connecting PACS, EHRs, and lab systems is only the first step. Without intelligent curation and presentation of the most pertinent, patient-specific data, radiologists drown in data, spending more time searching through records than interpreting scans.

False positives compound the problem. AI can flag dozens of possible abnormalities in a single image and each requires verification. Instead of reducing workload, poorly curated outputs can increase it and pose a clinical risk. A study in 2020 noted that "a large number of false positives create additional work for the radiologist...[it's also] even more dangerous, because it means that a potential lesion might get overlooked."[1]

The key challenge lies in making AI outputs relevant in context, embedding them into existing workflows, and ensuring applicability across the entirety of the patient record, let alone assuring reimbursement for work completed. Vendors are increasingly exploring alternatives to point solutions, expanding capability into body-area, or modality suites for example, yet full workflow orchestration remains limited.

> *"I spend so much time digging through old notes and trying to find information about what's going on with a patient, and why are they getting the study... if there was a way to harness the power of AI... to come up with a concise, relevant clinical history, that would be something that would be hugely beneficial."* **Participant 2**

1 Implementation of artificial intelligence (AI) applications in radiology: hindering and facilitating factors - PMC

The Opportunity of Combined Workflows

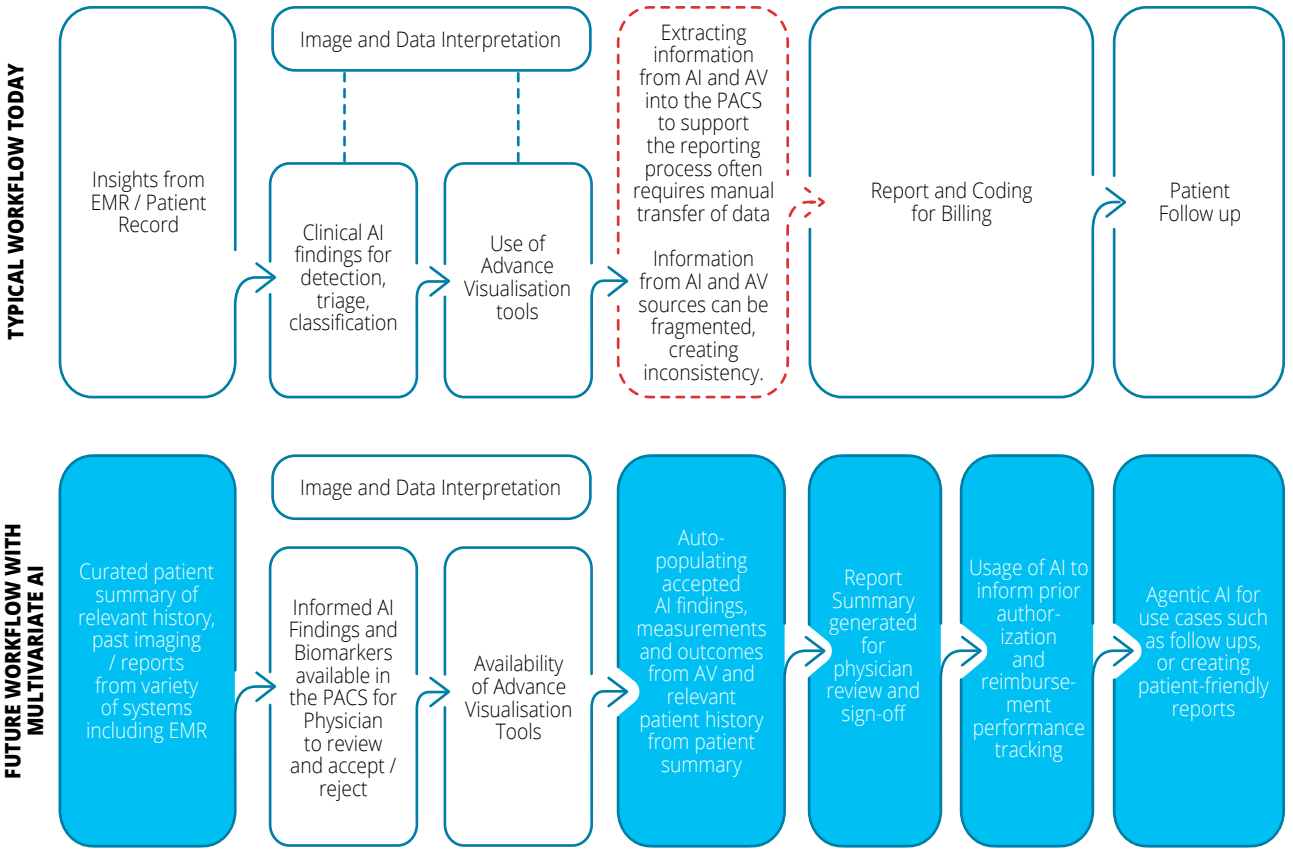
Most generative AI applications today can run independently or integrated into PACS, workflow or reporting solutions. However, there is also value when paired with advanced imaging solutions, including the capability of longitudinal case tracking. Instead of supporting image interpretation alone, generative AI integration can streamline case processing from prioritization to preauthorization analysis to case follow up tracking, accelerate turnaround times, and ultimately improve outcomes across the wider health system.

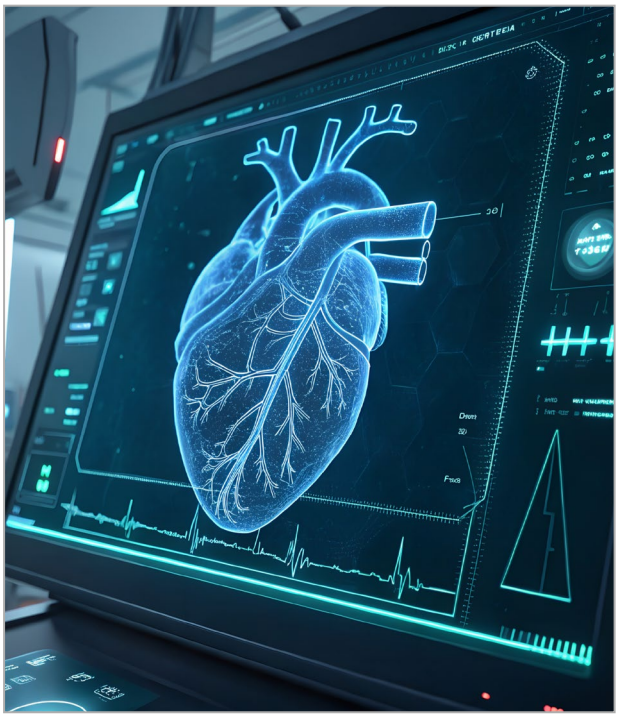
Clinically, combining generative AI with advanced imaging enables more consistent, longitudinal insights. Plaque analysis, for example, can inform follow-up imaging after an intervention or inspire additional clinically justified procedures, while AI-driven tracking of lung nodules over time improves consistency across providers. By linking imaging with broader clinical and operational data, agentic AI extends its benefits well beyond the radiology department.

The first wave of deep-learning AI focused on triage, detection and quantification, while the latest generation, including LLMs and generative AI, is better suited to aggregation, workflow orchestration, and reporting. Crucially, agentic AI systems can adapt continuously, adopting to specific clinician workflows and prompts, enabling personalized optimization that earlier methodologies could not achieve.

When these two strands are brought together with advanced visualisation, the result is a compelling opportunity to enhance decision-making for clinicians and create more meaningful engagement with patients over time. Additionally, it creates the opportunity to improve the background financial logistics in the hospital, allowing for improved provision of services.

Figure 1: Comparing Reading Workflows





Longitudinal and Cross Functional Case Management

Longitudinal case management is among the clearest applications. In oncology, for instance, imaging AI can automate tumour measurements, delivering consistent insights that can be loaded into advanced imaging programmes for reliable tracking and prognosis, while using agentic AI to inform how images could be read based on changes in other non-imaging patient parameters. This consistency not only supports individual treatment decisions but also enables aggregation into patient cohorts, helping hospitals benchmark their performance in cancer care and generating more consistently annotated datasets for research.

AV tools then make these findings extensible for both clinicians and patients, increasing the diagnostic ease and value. When combined with data from EMRs, genomics, or radiomics, to offer insights into family history comorbidities and ancillary findings, the workflow strengthens the ability to stratify patient for better treatment targeting and optimise care pathways dynamically across an entire disease course.

LLM-based AI, which also incorporates Large Vision Models (LVMs), developed and optimized per use case, can aggregate multi-modal data including prior imaging, pathology, and clinical history, while a combined solution presents both imaging and correlated patient data in a clear, interactive format. This automation reduces the preparation burden for each participating stakeholder of a cross functional team, providing a clearer and more holistic picture of the patient, and enables more effective collaboration and the possibility of improved reimbursement outcomes.

> *"You get a more holistic view and image of the patient. It's easier for radiologists to interact with that, and easier for radiologist to validate the AI. I think that's how the two systems will come together."* **Participant 1**

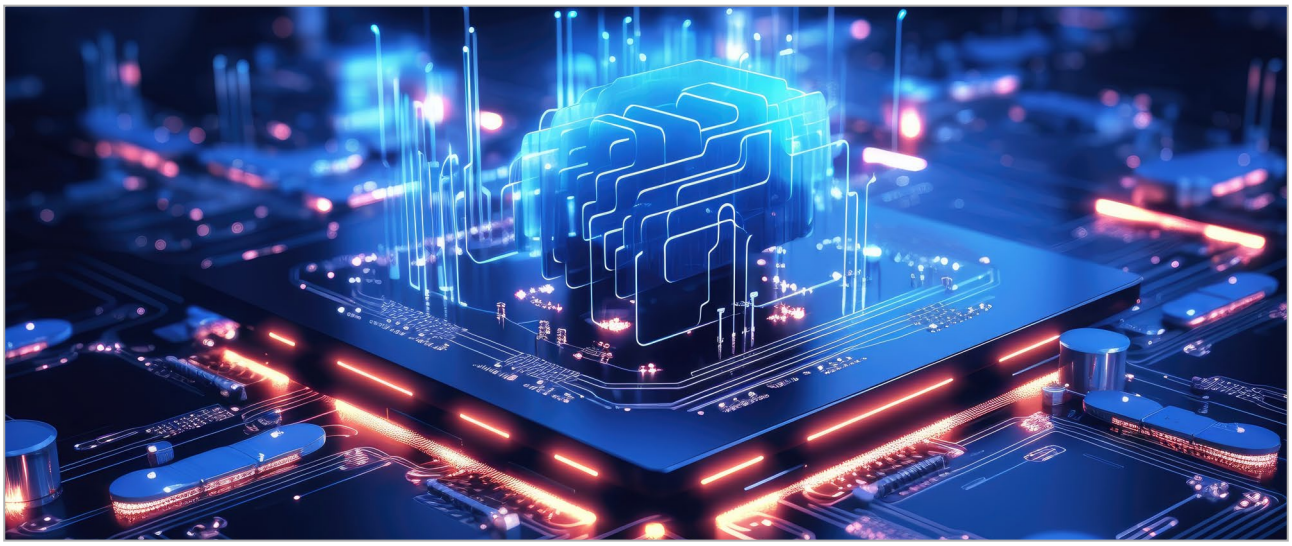
Cardiac Imaging

Cardiac imaging demonstrates significant potential for combined AI and advanced imaging workflows. AI can help identify discrete functional changes, such as shifts in fractional flow reserve (FFR), while advanced imaging excels at visualizing how cardiac function evolves over time, helping pave the path for more tailored care. This combination enables clinicians to make more informed decisions, for example determining whether to intervene immediately or monitor a patient further.

For high-risk individuals, clear visualization of disease progression can support preventive interventions and behavioural change in addition to clinical intervention. Similar principles apply in stroke imaging, where immediate triage is critical, followed by advanced imaging to assess the extent of viable brain tissue and guide ongoing prognosis and treatment planning.

Operational Efficiency

Beyond clinical decision-making, combined AI and advanced imaging workflows offer important operational benefits. Generative AI can aggregate relevant patient history from a variety of data sources including the EMR and reimbursement metrics, streamlining not only clinical, but insurance reporting as well. By prompting or automating the inclusion of wider patient and procedure context, these tools can accelerate claims approval by checking data sufficiency, ensuring adherence to payment prerequisites and efficacy guidelines, for example.



"Oftentimes our billing company will send me a notification: 'you've got to go back and look at this dictation, because the reason for exam doesn't support payment'. We could really head that off and make sure that the relevant information in the history is in my report, before I sign it." **Participant 2**

Together, these tools can provide insights beyond single patient reporting. Generative AI can highlight trends across cases, while also integrating AV-generated results and AI outputs into PACS for more consistent documentation. However, successful adoption will depend on vendors that can offer a single management structure to handle integration, support, and supporting compliance, reducing complexity while unlocking greater value from all forms of imaging and clinical data.

Ultimately, the promise of combined AI and AV lies in uniting clinical insight and operational efficiency, enhancing workflows for both patient care and hospital financial processes. While still emerging, these workflows signal a future in which imaging moves beyond detection and planning to become a fully connected, actionable care management system.

Future Evolution and Considerations

Before an institution can begin to harness the transformative power of new AI models and new paradigms for their implementation, it must first assess its current position on the technology journey and consider how any AI solution fits into its broader strategy, including the institution's transition to hosting imaging solutions in the cloud.

The next phase of generative AI, combined with clinical AV and AI, could create a more seamless ecosystem connecting clinical, operational, and administrative functions. The key question remains: how will these tools deliver measurable value?

Market-Driven Opportunities

Market dynamics will shape adoption and financial impact. With adoption at scale, there is a possibility that reimbursement frameworks transition away from procedural coding toward more general treatment models combining multiple diagnostic, analysis, and treatment vectors.

In the US, AI and advanced imaging workflows can help institutions meet MIPS requirements and position them for future CMS reimbursement of AI-enabled applications, particularly as workflow integration increases the demonstrable value of these tools.

Integrating imaging-derived AI and AV insights with EHR, pathology and lab data may also create opportunities for partnerships with pharmaceuticals and life sciences companies. For example, identifying patients eligible for clinical trials could provide institutions with additional revenue streams.

Public healthcare systems such as the UK face different pressures and reimbursement

frameworks, with efficiency the primary goal. LLMs can support drafting reports, automating routine workflows, and streamlining administrative tasks, freeing radiologists for higher-value work.

"The main thing is you take out all your neighbouring steps [of reporting], and you surface all of the really important clinical information, and you filter out the rest of it. So you're streamlining, and you're focusing just onto the crux of what the radiologist needs to know at that particular point in time." **Participant 4**

Financial Efficiency

Billing and reimbursement can benefit from richer, more cohesive data capture. Operational AI, such as revenue cycle management tools, helps hospitals capture more information more consistently, improving billing accuracy and efficiency.

AI tracking tools looking at data sufficiency for reimbursement deliver clear value for both providers and patients, supporting better clinical documentation while strengthening financial outcomes. As these solutions mature, they can further boost reimbursement, making adoption attractive even within tight budgets.

Clinical Insights and Operational Gains

AI and AV tools can consolidate fragmented patient information into a single, holistic view and ensure relevant information is visible to the specialist. Beyond the solutions available today, the next generation will also be able to highlight areas of greater concern in the patient context and provide the right summaries and inputs for reports. Additionally, they will remove the need to manually gather data across multiple departments and systems.

"The value is that it ensures a more complete and high-quality interaction. The easier it is to get the data, the easier it is for somebody to interpret the data, not spend the time getting it." **Participant 3**

Integration and Risk Management

Despite the potential, challenges remain. Generative AI is still maturing, and large-scale LLM deployments are often cloud-dependent. This offers benefits, such as access to the latest algorithms and the ability to extend diagnostic capabilities remotely, but also raises considerations around cost, latency, and data governance.

Institutions can maximise value by consolidating workflows through a single partner, standardising both clinical and operational processes across multiple underlying systems. This approach not only ensures more consistent implementation but also enhances efficiency, supports measurable improvements in patient care, and allows hospitals to fully leverage the capabilities of AI and advanced imaging technologies.

"So there's one company and they make sure everything's aligned. That's definitely the way to go in the future. Integrating clinical tools, but also all the documentation, in terms of information governance, and any post-market surveillance." **Participant 4**

The Path Forward

The convergence of operational AI and AV in imaging is inevitable, but success depends on thoughtful integration, interoperability, and continuous learning.

The industry must work together to maximise the technologies' potential. Providers must take an active role, asking the right questions and shaping implementations while remaining mindful of both the promise and pitfalls observed in earlier AI deployments.

Early adopters will play a crucial role in demonstrating real-world ROI, testing the boundaries of both clinical and operational efficiency, and helping vendors refine their offerings. Beyond providers, vendors as well as industry and regulatory bodies also have a role to play in driving collaboration and supporting the industry in the adaptation of new technologies.

Ultimately, this convergence marks the next step in a broader evolution. Providers demand improved detection, enhanced operational efficiency, better patient care, and measurable ROI, all underpinned by a smarter, more connected imaging ecosystem.

With proper execution, the convergence of AI and AV can deliver on that clinical and operational promise, securing AV's most important chapter yet.

At Signify Research we are passionately curious about Healthcare Technology and we strive to deliver the most robust market data and insights, to help our customers make the right strategic decisions. We blend primary data collected from in-depth interviews with technology vendors and healthcare professionals, to provide a balanced and complete view of the market trends.

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