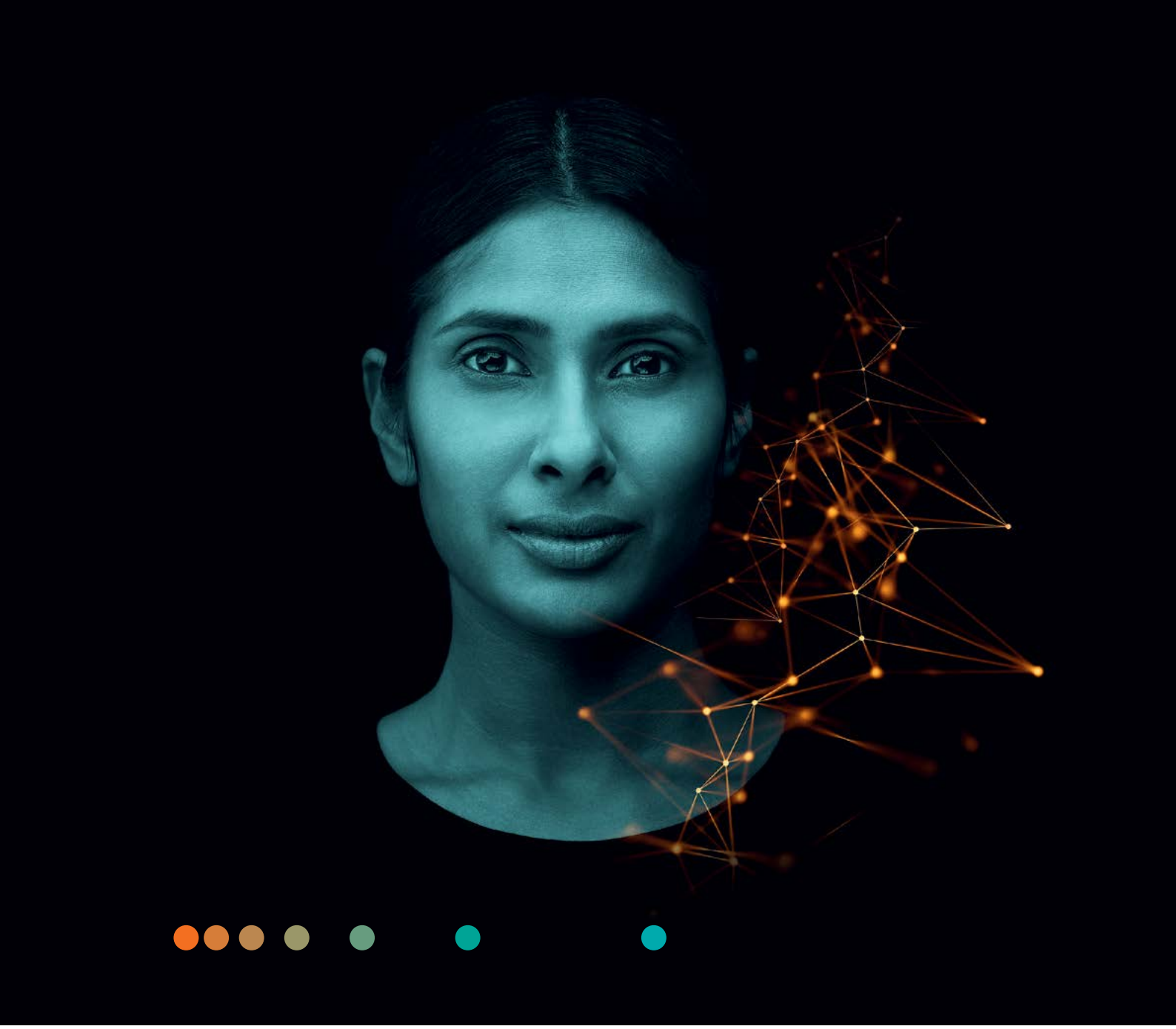

How can AI-powered technologies help radiology departments improve performance and efficiency?

Leading radiology clinicians and administrators answer

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How can AI-powered technologies help radiology departments improve performance and efficiency?

Executive summary

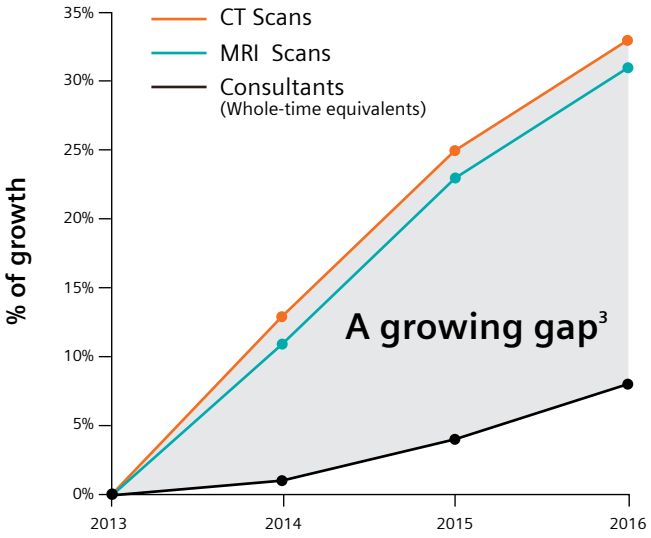
Siemens Healthineers invited a group of leading radiology clinicians and a group of radiology administrators from prominent institutions to help answer this question.

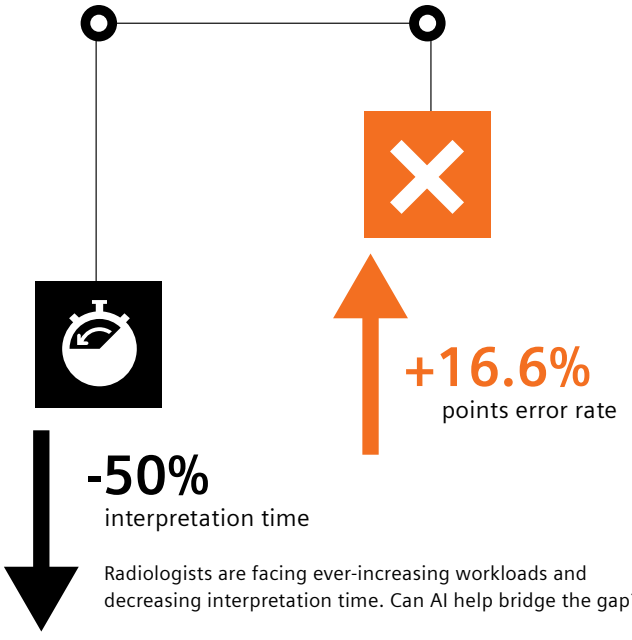
The groups held similar views on the primary value of artificial intelligence (AI) in radiology: the sheer volume of data that can be analyzed by algorithms far exceeds what even the most talented clinicians can achieve. According to our expert panels, with the potential for more than 2,000 images to be generated for a single patient, the volume of analysis will continue to grow.[1,2] However, convincing clinicians from across the care continuum that there is an important role for AI-assisted interpretations and analyses of imaging studies is a key challenge to expanding the usefulness of AI in radiology.

Other top-line findings included:

- AI provides novel opportunities for integration of clinical data and best practices from multiple sources into powerful clinical decision support tools.[1,2]
- AI can help standardize processes and procedures across the institution or enterprise.[1,2]
- AI can improve processes, both clinical and non-clinical, through simulations and predictive modeling.[1,2]

Both clinical and administrative groups agreed that AI is going to change the practice of radiology for the better. Clinical leaders believe robust AI-powered technologies will extend their capabilities and let them serve as knowledge brokers and integrators within the institution, while also freeing up additional time to spend with their patients.[1] Administrators emphasized potential benefits in efficiency, fleet utilization, and patient experience.[2]





Radiologists are facing ever-increasing workloads and decreasing interpretation time. Can AI help bridge the gap?[4-6]

What is AI?

Wherever you turn these days, there is a story about how AI is going to disrupt industries, displace workers, and change the way we live. Self-driving cars, recommendation algorithms on streaming services, and digital assistants are a few well-known practical applications of AI. With all the hyperbole and misinformation around what AI can and can't do, we decided to take a close look at how AI can reshape radiology to deliver better value, better outcomes, and better experiences for patients and staff.

AI refers to algorithms or programs that are designed to "learn" from experience and adapt themselves based on the new data. It is NOT a specific technology or application; it is a broad term that describes a slew of programs or algorithms that are designed to do things faster and more accurately than humans can. Increasingly, AI is becoming a part of medicine, conferring both clinical and operational benefits on healthcare enterprises that deploy it effectively.

Clinical benefits of AI in radiology

Technology has always been an integral part of radiology, so it is no surprise that radiology is one of the first specialties to adopt AI in daily practice. The clinical leaders we spoke with agreed that AI would not replace radiologists, but would rather extend their abilities and enhance their roles. Among the important concepts that emerged was the idea that the practice of radiology is moving from *descriptive* to *predictive*. The ability to recognize subtle patterns and shifts in imaging studies and to integrate multiple sources of data, including vast libraries of comparator images, electronic health records, and more, gives the radiologist an unprecedented perspective on the patient's condition, disease progression, and likely outcomes. AI-enabled automation and standardization of labor-intensive tasks extends radiologists' reach and enables them to read and interpret more imaging studies, while retaining ultimate decision-making authority.

In addition, AI can help optimize studies to minimize patient exposure to ionizing radiation and radioisotopes. Our panelists suggested that AI-optimized timing of contrast administration and scanning may help improve the safety and efficiency of the radiology practice. Such safety enhancements also improve patient experience and may even help lower overall costs by reducing errors and rescans.[1,2]

When time is of the essence (and when is it not?), AI shines. AI can speed up image acquisition and reconstruction, meaning that the clinical team can reach the right diagnosis and choose the right care pathway more quickly. These benefits can also extend to patient setup, post-processing, and reporting; saving time in these areas helps to further increase the speed to diagnosis.

Another area where AI-assisted radiology can have downstream effects is in radiation oncology, where AI-driven technologies can rapidly produce accurate contours of organs at risk to enable safer, more effective radiation treatments.

How AI helps optimize radiology operations

AI-powered tools can help optimize complex procedures involving administrationof contrast and timing of subsequent scans. AI can also help streamline routine scheduling processes. In modern connected radiology departments, software that integrates multiple factors like staff allocation, procedure prioritization, and status and maintenance schedules of imaging equipment can make operations run more smoothly. Key benefits include fewer missed appointments, reduced wait times, and an improved experience for both patients and staff.

AI-driven algorithms can significantly reduce the amount of time staff spend on manual operations like patient setup, slice prescriptions, measurements,

segmentation, and reformatting. This translates to a more efficient department and allows staff to practice at the top of their license, with more time for higher-value activities like consulting with colleagues, discussing study implications with patients, and dose planning.

Most imaging equipment in today's radiology department has on-board diagnostic and performance-monitoring capabilities. AI can automate oversight of the radiology fleet and develop proactive maintenance schedules. The result is increased uptime, more efficient utilization, and the potential for right-sizing the fleet.

Today, there are many AI-powered radiology solutions that can increase workforce productivity and optimize clinical operations. For example, support for rapid, accurate, and reproducible CT patient positioning is possible with the FAST workflow. By leveraging the FAST 3D camera, the FAST workflow can capture the patient's shape, positioning, and height in three dimensions.

Higher departmental throughput can also be supported with MR technologies like BioMatrix and DotGO, which automatically adjust to patient biovariability and optimize workflows.[7] And radiologists may be able to more quickly and accurately interpret thoracic images with AI-Rad Companion Chest CT, which leverages a powerful algorithm trained on an extensive library of expert-annotated images.[7]

These examples from Siemens Healthineers demonstrate how AI-embedded solutions can help healthcare providers develop robust, flexible standards that still allow personalization of diagnosis and care based on individual patient characteristics.

Getting there: Challenges to the adoption of AI in radiology

The most important hurdles to clear in adopting AI in clinical practice are ensuring interoperability of multiple systems and technologies and establishing trust in the accuracy and reliability of AI-supported findings.[1,2]

Med tech companies are leading the charge in interoperability. Solutions like teamplay for radiology and Atellica Diagnostics IT for labs enable centralized control, smart and secure data sharing and reporting, automation, and optimization of processes and procedures. These solutions provide timely access to patient data, protocols, and decision support tools across the care continuum.

Establishing trust is necessary on multiple levels. Radiologists must trust the technology they are using; they have to believe that it is providing actionable, accurate information that is in accordance with their own clinical judgment and established best practices.

Trust has to extend out of the radiology department across the entire healthcare enterprise. Other healthcare professionals must believe that they can rely on the information they are getting from radiology, especially with the vital role imaging studies play in guiding therapy and dosing. These data must be transparent and explainable to colleagues throughout the care continuum.

Our panels of clinical and administrative leaders identified several other key challenges:[1,2]

- **Liability concerns:** What happens if AI and staff disagree on interpretations? What if an AI-powered technology makes a mistake?
- **Data privacy and protection:** Increasing data sharing can also mean opening up new vulnerabilities. Careful data governance is required now more than ever.
- **Reimbursement:** Payers are likely to lag behind practitioners and may closely scrutinize the use of AI-powered technologies for diagnosis, treatment planning, and other functions with clinical implications. This could produce a chilling effect in some markets.

Collaboration between healthcare providers and med tech companies is the way forward in overcoming these obstacles and can yield huge dividends. Siemens Healthineers is currently helping its customers to create the conditions in which AI-powered technology can thrive. A strong partner has the wherewithal to identify and implement the necessary changes and also to educate clinicians on the value of these changes and how they will improve the quality of care delivery.

Barriers to adoption of AI:[1,2]

The AI-empowered future of radiology

The key clinical impact of AI on the practice of radiology is the transformation of radiology from a descriptive science to a predictive one. This carries with it important changes to the radiologist's job description. Some members of our clinician panel envisioned a new role for the radiologist as a "data broker" across the healthcare enterprise, with unique access to insights on disease progression, treatment effectiveness, and population-based benchmarking.

Both the clinician and the administrative groups expressed confidence that AI will reduce the amount of time radiologists spend reading and interpreting scans. For administrators, that translates to increased throughput and efficiency; for clinicians, it means more face time with patients and colleagues.

AI can help expand precision medicine by standardizing processes and procedures, while still allowing for personalized adaptations to individual patients (e.g., AI-powered technology that allows for substantially shorter scan times for patients who can't hold their breath or maintain a certain position for any length of time).

Another point of agreement across groups is that the radiology department will be an early adopter and leader in AI-powered technology in medicine. The volume of data, digitalized processes, and standard formats (e.g., DICOM) already present in radiology, coupled with perennial financial pressures, makes this department an ideal fit for the advantages that AI can generate. Improved outcomes and gains in efficiency are bound to make other parts of the healthcare enterprise take notice and start putting AI to use in their own clinical context and as part of coordinated, integrated clinical pathways.

Siemens Healthineers is working toward that future with healthcare providers. We invite you to learn more at:

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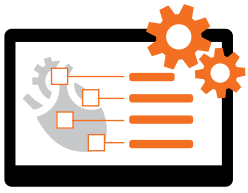
Emerging roles for AI in imaging and beyond[8]

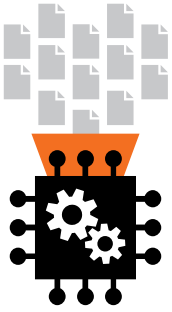


Processing

Automatic extraction of all image parameters

Assessment

Fully quantitative diagnostic and risk stratification scores



Scaling up

Machine-learning-based metrics incorporating a large number of clinical and imaging variables in real-time beyond the limits of human cognition

Customized benefit

Personalized risk assessments and tailored management plans

At Siemens Healthineers, our purpose is to enable healthcare providers to increase value by empowering them on their journey toward expanding precision medicine, transforming care delivery, and improving patient experience, all enabled by digitalizing healthcare.

An estimated 5 million patients globally benefit every day from our innovative technologies and services in the areas of diagnostic and therapeutic imaging, laboratory diagnostics, and molecular medicine, as well as digital health and enterprise services.

We're a leading medical technology company with over 120 years of experience and 18,500 patents globally. With about 50,000 dedicated colleagues in over 70 countries, we'll continue to innovate and shape the future of healthcare.

The outcomes and statements provided by customers of Siemens Healthineers are unique to each customer's setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, and level of service/technology adoption), there can be no guarantee that others will achieve the same results.

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