



Artificial Intelligence in Healthcare: 10 Questions

AI and machine learning technology are the rising stars of healthcare, empowering providers to deliver faster, more precise care.

By applying advanced analytics and artificial intelligence (AI) to data, healthcare providers can identify insights and patterns that enhance clinical, operational, and financial decision-making. Here's a closer look at AI and the latest research on how, when, and where it will impact healthcare delivery.

1. What is artificial intelligence?

The healthcare industry is generating massive amounts of structured and unstructured medical data, including machine-generated diagnostic, therapeutic, and monitoring information. By 2020, the amount of stored medical data will be an enormous 2,314 exabytes, according to estimates from Stanford Medicine.¹

To maximize the value of this collected data, healthcare providers are moving to platforms and diagnostic tools that use artificial intelligence (AI). AI is simply the ability of machines to simulate human intelligence. With the ability to rapidly distill information from diverse data sets, artificial intelligence enables healthcare providers to parse through large amounts of data and perform complex analytical tasks more quickly and with greater accuracy. By using artificial intelligence, these platforms can provide clinicians actionable insights at the point of care, as the data streams in.

Diagnostic imaging equipment such as CT, MR, and X-ray that are powered by AI and automation can transform the accuracy and speed of diagnosis for even the most complex medical conditions, helping clinicians make the best clinical and operational decisions. By giving the right information to the right person at the right time, AI and analytics provide the foundation for precision healthcare.

2. What is machine learning?

AI is generally defined as machine learning that can perform tasks that are characteristic of human intelligence, such as planning, understanding language, recognizing objects, and problem solving. Machine learning is another term, and it is the ability for the AI models to learn without being explicitly programmed. Essentially, the AI models are fed huge amounts of data, and they can adjust themselves and improve—and thus learn patterns.

Deep learning is a subset of machine learning that enables highly sophisticated learning. Deep learning was inspired by the interconnection of neurons in the brain. In deep learning, the “neurons” have discrete layers and are connected to other neurons.

Edison is an intelligent platform built to connect data from millions of medical devices, leading to new, AI-powered apps and services.

Each layer picks out a specific feature to learn, such as the curves and edges of a lung. Neural networks are huge. With more layers and neurons, and with massive amounts of data run through the system to train the neural network, the learning can be very sophisticated.

3. How is adding AI into your existing devices and processes transforming patient outcomes?

To be most effective, AI needs an integrated digital platform that can add continuous value to installed medical devices with advanced insights (developed using AI). To achieve that goal, GE Healthcare has developed Edison, an intelligent platform built to connect data from millions of medical and imaging devices, leading to new, AI-powered apps and services. Edison is intended to help accelerate the development and adoption of AI technology and empower providers to deliver faster, more precise care.

Edison enables GE Healthcare to integrate and assimilate global, multivariate data from disparate sources, apply advanced analytics and AI to transform the data, and generate insights to support clinical, financial, and operational decision-making.

Edison is comprised of applications and smart devices built using the Edison platform. Edison applications leverage analytics—artificial intelligence, machine learning, and deep learning algorithms and models—to identify patterns and to make suggestions. By extracting patterns that a physician can't see, AI can help physicians make faster, more informed decisions that can change the way they care for patients, ultimately improving outcomes.

4. Who is successfully leveraging AI and deep learning?

While AI has already achieved widespread adoption in certain sectors, the complexities of healthcare have resulted in slower adoption and deployment. However, AI is poised to play a significant role in the future of healthcare. The healthcare AI

¹ “How Big Data Will Unlock the Potential of Healthcare,” <https://www.visualcapitalist.com/big-data-healthcare/>

market will reach \$6.6 billion in 2021, and 39 percent of healthcare provider executives say that they're investing in AI, machine learning, and predictive analytics.²

To understand how AI is currently being used and will be successfully leveraged in the future in imaging and clinical apps, GE Healthcare enlisted MarketVision Research. Its team conducted a double-blind research study gathering information from more than 60 imaging leads, including radiology chiefs, radiology directors, managers, and imaging directors from the US and the UK.

The primary objectives of the study were to:

- Obtain a comprehensive understanding of AI in imaging, including perceptions, expectations, and usage patterns.
- Understand and rank the priority for clinical areas, use cases, and imaging modalities for AI.
- Identify the key pain points in current radiology and imaging workflow processes that AI tools can address.

The results from that research showed that use of AI in imaging workflows is expected to grow significantly over the next few years. While only 12 percent of the respondents are using AI today, in two years, 58 percent expect to have started using AI in imaging workflows. And in five years, 90 percent expect to have started using AI.

5. When and how should healthcare systems use AI?

Despite its potential to transform healthcare, AI is not a product by itself. AI is a tool that is most powerful when solving for a specific problem and is integrated into the clinical workflow, providing seamless assistance and guidance at precisely the right point of care. Smarter tools that combine the deep training and expertise of a clinician with the power of AI empower clinicians to make the best care and operational decisions for their patients, while eliminating much of the friction that has led to physician burnout, and spending less time delivering the human touch to patients.

According to the MarketVision research, the most important use cases for AI app development all focus on the high priority areas of screening and computer-aided detection, computer-aided diagnosis, and quantitative measurements.

Top 3 Categories for AI App Development

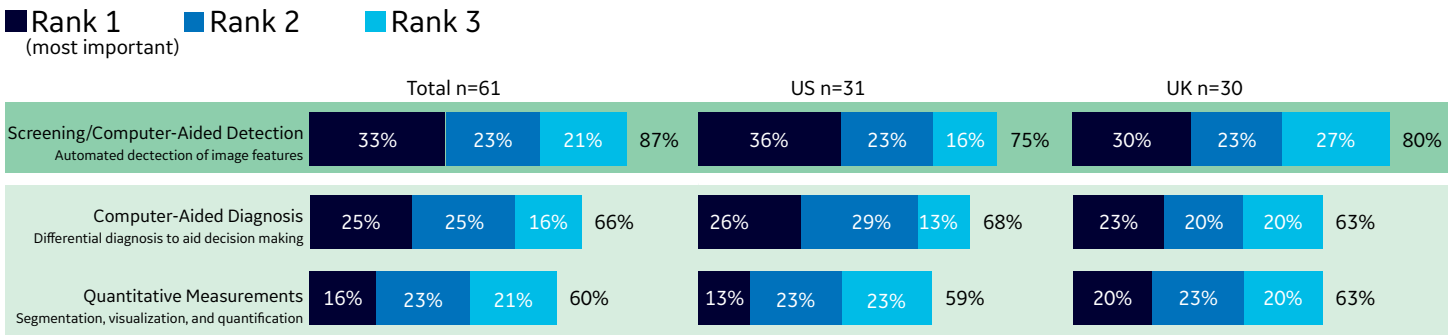


Figure 1: MarketVision research shows the most important use cases for AI app development focus on the high priority areas of screening, computer-aided diagnosis, and quantitative measurements.

² "GE Healthcare Accelerates AI Model Development and Deployment with Launch of Edison Integration to American College of Radiology AI-LAB™," <https://www.businesswire.com/news/home/20190408005494/en/>

6. Which clinical and business operations are best suited for AI today?

A staggering 90 percent of all healthcare data comes from imaging technology, yet 97 percent of it goes unanalyzed or unused.³ Given these statistics, medical tech is a prime contender for AI. GE Healthcare designed Edison to harness data in a way that can improve scan consistency, help detect and prioritize cases, and identify diseases.

At the top of the priority list for clinicians worldwide is the fight against cardiovascular disease as well as cancer. According to the American Cancer Society, cancer causes 1 in every 6 deaths worldwide today. Hospitals and clinicians are challenged to find new ways to diagnose, stage, and treat these diseases.

Not surprisingly, the MarketVision research revealed a high priority for AI apps to focus on detecting breast cancer. AI apps related to detecting and assessing strokes were also ranked highly among the group, followed by a focus on AI for cervical spine fracture detection to help segment, localize, and characterize cervical spine fractures automatically.

7. What is the potential of AI in clinical practice?

By adding AI to imaging devices, the clinician may be able to make a diagnosis faster and with more accuracy. AI and automation have the potential to help improve the quality and possibly lower the cost of care by automatically gathering and analyzing repeat/reject data for X-rays for quick review. Smart automation may be able to eliminate hours of manual work and provide insights into ways to reduce repeat X-rays and unnecessary radiation exposure for patients.

Combinations of AI Apps with the Greatest Reach

(An imaging lead is "reached" if the proposed combination includes at least one of their highly preferred areas) Total n=61

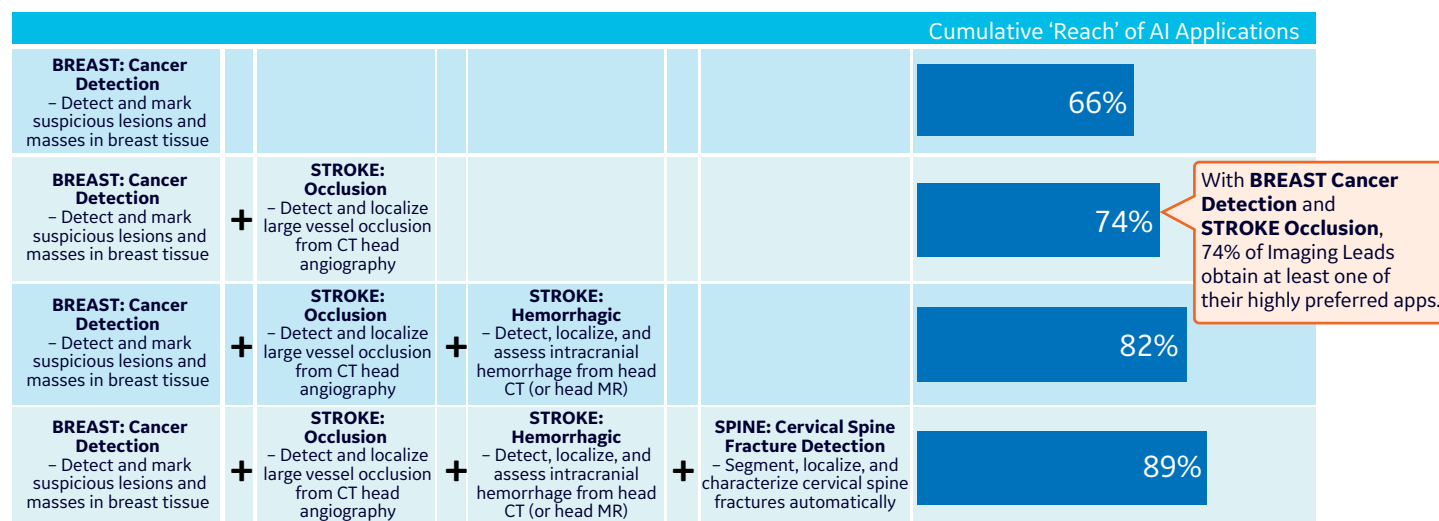


Figure 2: By offering the breast cancer, stroke occlusion, and stroke hemorrhagic applications, 8 in 10 imaging leads obtain at least one of their highly preferred AI apps.

³ "One of the largest AI platforms in healthcare is one you've never heard of, until now," <http://newsroom.gehealthcare.com/new-apps-smart-devices-launch-healthcare-edison-ai-platform/>

AI can also have a powerful impact on clinician productivity. Radiologists, for instance, may review hundreds or thousands of patient scans—all day, every day. AI can streamline that workflow. AI can be used to analyze a patient's scans to identify markers, and then prioritize those selected images with possible findings for review by the radiologist. That enables radiologists to improve their throughput and precision.

8. How can your hospital system drive efficiencies and success with AI?

AI has the potential to help hospital systems improve workflow, efficiencies in multiple areas. The top two preferred use cases for AI apps for most clinical areas are: first look review and automatic 3D volumetric image measurements. Looking beyond those two, the research identified several other key use cases for AI app development that hospital systems may want to consider:

- Diagnostic decision support to aid decision making.
- Automatic 2D labelling and measurements for risk stratification, tumour staging, and lesion characterization.
- In specific clinical areas, AI can be effective for stroke imaging by providing automatic image reformatting in the PACS to save reprocessing time (for example, perform some types of post-processing automatically).
- For brain imaging, AI can provide automatic volumetric visualization and show anatomically relevant views without operator assistance. AI can automatically select organs of interest, viewing parameters, and orientation to provide optimal repeatable views, which would save the clinicians valuable time.

Top Use Cases for AI Apps

Top Four Use Cases for AI Apps in Each Clinical Area (N-values vary because respondents were only asked this question for their top 5 Clinical Areas)										
	Breast	Lung	Stroke	Cardio-vascular	Liver	Brain (non stroke)	Chest (non-lung)	Bone	Urology	
	50	42	42	40	33	31	29	22	16	N-value
"First Look" Review Automatic identification of areas of concern and screen out normal / negatives	1	2	1	2	1	1	1		2	
Automatic 3D Volumetric Image Measurements Identify areas of interest in a volumetric data set based on anatomical or functional criteria (Ex: automated tumor volume; automated cardiac wall thickness assessment)	2	1	3	1	2		2	1	1	
Diagnostic Decision Support Differential diagnosis to aid decision making	4		4	3	4	3		4		
Automatic 2D Labeling and Measurements for risk stratification, tumour staging, lesion characterization, etc.	3	3			3		3		3	
Automatic Image Reformatting in PACS to save reprocessing time (Ex: perform some types of post-processing automatically)			2			4	4			
Automatic Volumetric Visualization Show anatomically relevant views without operator assistance. Automatically select organs of interest, viewing parameters and orientation to provide optimal repeatable views. (Ex: Automated 3D vascular views; Automated views of lumbar spine or discs)				4		2				
Automation in Quality Assurance Automated assessment of image quality, including parameters like patient positioning, motion, signal to noise, injection or tracer success				4					4	
"Second Look" Review Review image after radiologist completes primary read to mark or flag anything that may have been missed for the radiologist to review		4								
Clinical History / Indications Filter and automatically display relevant clinical history and indications for patient based on exam context such as lab, pathology and surgical notes								2		
Automated Reporting Pre-populate reports with content for radiologists to review								3		

Figure 3: In the MarketVision research, the "first look" review, 3D image measurements, decision support, and 2D labeling and measurement use cases are consistently seen as the most important.

9. What are the best practices for AI in healthcare?

AI applications that run automatically and seamlessly with a PACS can be the most efficient, specifically for imaging modalities and radiologists. According to the MarketVision research, AI applications embedded in and accessible through PACS are strongly preferred over standalone AI solutions (see Figure 4). Specifically, 74 percent of those in survey responded that they would prefer AI applications to come from their PACS vendor and incorporated in their PACS (rather than separate standalone applications or incorporated into their scanners).

AI applications that integrate easily and effectively into familiar radiology workflows allow practitioners to avoid separate logins or outside data sources, which can add layers of complexity and time.

10. What insights and competitive advantages can be obtained by adding AI into your workflow?

Respondents in the survey cite improved clinical outcomes/quality of care as the leading desired outcome from adding AI into the workflow. Second on the list is improved efficiency and productivity in operations, followed by a financial outcome of reduced costs, including reducing medical legal costs and reduced staffing.

Preferred Deployment of AI in Imaging Applications

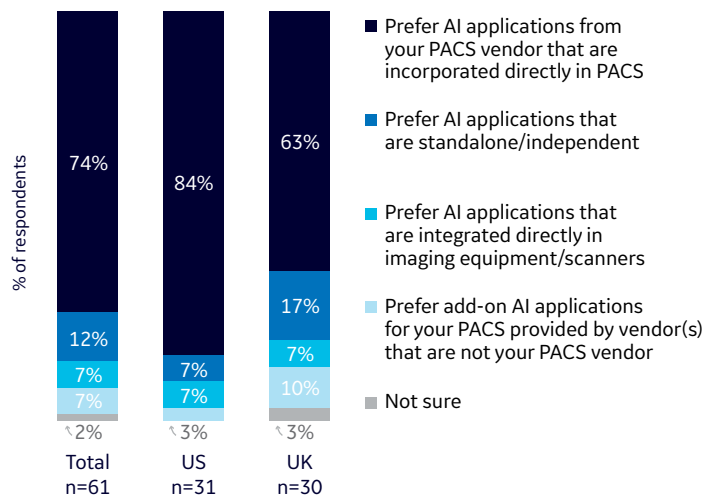


Figure 4: According to the MarketVision research, AI applications embedded in and accessible through PACS are strongly preferred over standalone AI solutions.

The research uncovered many of the specifics of how AI can be effectively applied, and it confirmed its value: AI in healthcare is positioned to have life-changing, long-term impacts. Adding AI into devices, applications, and workflows will spur radical changes around point-of-care treatments and enable practical, time- and cost-saving efficiencies that promise to cap or reduce spiraling expenses.

About GE Healthcare:

GE Healthcare is the \$19 billion healthcare business of GE (NYSE: GE). As a leading provider of medical imaging, monitoring, biomanufacturing, and cell and gene therapy technologies, GE Healthcare enables precision health in diagnostics, therapeutics and monitoring through intelligent devices, data analytics, applications and services. With over 100 years of experience in the healthcare industry and more than 50,000 employees globally, the company helps improve outcomes more efficiently for patients, healthcare providers, researchers and life sciences companies around the world. Follow us on [Facebook](#), [LinkedIn](#), [Twitter](#) and [The Pulse](#) for latest news, or visit our website www.gehealthcare.com for more information.

About MarketVision:

For more than 35 years, MarketVision has provided its clients with innovative design, execution and interpretation of marketing research to deliver fresh consumer insights and market knowledge to clients worldwide. As a full-service marketing research consultancy, MarketVision offers services ranging from research design and implementation to statistical analysis and marketing consulting. MarketVision is headquartered in Cincinnati but has client service offices in Indianapolis, Cleveland, Los Angeles, New York, Philadelphia and Dallas.

MarketVision is among the 50 largest research firms in the U.S. and is a contributing member to the Insights Association, ESOMAR, PMRG and other research organizations. Learn more about MarketVision at www.mv-research.com/.



Imagination at work

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