



AI Diagnostics: Transforming Patient Care

Artificial intelligence is revolutionizing health care by enhancing diagnostic capabilities and improving access to care.

Artificial intelligence, or AI, could help save your life.

There are emergency physicians, anesthesiologists, generalists, cardiologists, obstetricians, nurses, and other specialists using AI-powered software today to detect diseases and guide procedures faster and more accurately. A key goal among healthcare providers is for AI to expand access to care and diagnostics in underserved areas, equipping them with lifesaving tools and insights to better serve their patients.

Dr. John D. Martin, MD, a vascular surgeon at the University of Maryland Vascular Center, uses an AI-driven ultrasound tool, Butterfly Network's iQ3, to help assess the

gravity of conditions, like aneurysms, deep vein thromboses, clogged arteries, and defective heart valves.

With the iQ3, a portable, whole-body ultrasound device with intuitive AI software, providers can immediately assess results on mobiles or laptops, and share findings with patients.

"The integration of AI in point-of-care ultrasound is transforming how we approach patient assessments," says Martin, who's also chief medical officer at Butterfly Network. "At a high level, the main goals of our ultrasound AI tools are to assist healthcare professionals in the key functions of image acquisition and image interpretation."

The AI can reduce variability, allowing less experienced users to capture critical insights with greater



A healthcare provider demonstrates how the iQ3 ultrasound device works

confidence, ultimately elevating the standard of care across all medical settings, he says.

PROMOTING EQUITY THROUGH INNOVATION

Investigators from the University of North Carolina, Chapel Hill, and the University of Zambia published a clinical study in the August 2024 *Journal of the American Medical Association (JAMA)* showing that AI can enable novice users to estimate gestational age as accurately as expert sonographers. That ability can transform pregnancy care for geographical regions with limited resources.

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iQ3 ultrasound devices used in the UNC study.

“It’s a major step forward in our ability to provide quality prenatal care worldwide,” says Jeffrey S.A. Stringer, MD, FACOG, the study’s lead author, as well as a professor and director of global women’s health at UNC.

Stringer is also developing a tool that reveals placental position and could answer whether there are multiple babies or other factors that could complicate delivery.

Ari Moskowitz, deputy director for medical devices and AI at the Bill & Melinda Gates Foundation, calls the study “a significant step forward in our mission to improve maternal

and newborn health globally.”

AI helps extend the reach of point-of-care ultrasound, Martin says, “enabling providers of varying skill levels to bring imaging to underserved regions and provide lifesaving care, no matter where the patient is.”

ELEVATING IMAGING AND SCREENING

AI programs analyze vast amounts of patient data, from medical history and demographics to vital signs and test results like ECGs, EEGs, and EMGs. These algorithms also process medical images, such as biopsies, MRIs, CT scans, and X-rays, improving the quality of interpretation by removing variability and user error. Together, this comprehensive data analysis enhances diagnostic precision and consistency.

The Icahn School of Medicine at Mount Sinai in New York, N.Y., has leveraged computer-derived AI scores to discover rare variants of 17 genes linked to heart disease.

“This could lead to new ways to identify gene targets for the treatment of coronary artery disease,” says Ron Do, PhD, a Charles Bronfman professor in personalized medicine at Mount Sinai.

Meanwhile, the Mayo Clinic in Rochester, Minn., is using AI to analyze MRI and PET scans to discern predictive elements for clinically relevant outcomes that may not be visible to the human eye.

“Modern imaging is incredibly rich in information, and the human eye cannot fathom all possibilities,” says Oliver Sartor, MD, Mayo’s chief of Genitourinary Cancers Disease Group and director of radiopharmaceutical trials.

Then there’s the ArteraAI Prostate Test, which can help clinicians determine the best therapy course for patients diagnosed with localized prostate cancer who have not yet received definitive therapy.

Artera’s multimodal artificial intelligence (MMAI) biomarker leverages a unique algorithm that assesses digital images from a patient’s biopsy slide and learns

from that patient's clinical data. AI combines this information to predict whether that patient will benefit from adding hormone therapy and to estimate long-term outcomes.

The algorithm was developed via large sets of data from thousands of prostate cancer patients and tens of thousands of histopathology biopsy images — and has been clinically validated using multiple Phase 3 randomized trial data.

Also, an oncology AI algorithm for subclinical breast cancer detection can identify women at high risk of breast cancer, perhaps years in advance.

"AI scores suggest it may be useful for risk prediction and for identifying women who might benefit from more frequent or supplemental screening, such as ultrasound or MRI," says Diana L. Miglioretti, PhD, division chief and professor of biostatistics at the University of California, Davis, School of Medicine. JAMA Network

Open reported these findings in October 2024.

"Mammography alone doesn't work as well for women with dense breast tissue because dense breast tissue and tumors both are white on mammograms," she says. "The research shows promise that AI sees something that mammography misses. The algorithm can detect early disease with unprecedented accuracy."

Dr. Miglioretti's perspective also comes from co-leading the US Breast Cancer Surveillance Consortium (BCSC), a network of breast imaging registries with information collected from over 13 million breast imaging exams since 1994.

"What's exciting is that AI gives women a risk assessment that works better than models based on clinical risk factors such as age, breast density, family history, age at the birth of their first baby, and presence of benign breast disease,"

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It also flags women for higher risk while they're still at the clinic, faster than radiologists who later evaluate batches of mammograms.

LOOKING AHEAD

AI is not without regulatory hurdles. The FDA has issued a regulatory framework for AI applications in medicine, delegating responsibilities to specific federal agencies.

Regulatory concerns about AI in medicine include issues surrounding discrimination, privacy, psychological harm, and the physician-patient relationship.

There's a learning curve on all sides for the regulatory process, Martin says. "There is work being done to achieve consistency and expertise on both sides, and these regulations are important to make sure AI is applied where it works."

As advancements continue, it's important to consider that AI itself is just one piece of the puzzle.

"AI can extend the capabilities of clinicians, offering critical insights that were once out of reach, ultimately ensuring that patients everywhere receive the best possible care regardless of their location," Martin says. "AI's role in health care is not to replace clinicians but to empower them. By automating routine tasks and providing real-time guidance, AI helps streamline workflows, enabling providers to focus on what matters most — delivering personalized, compassionate care."

The combination of human expertise and artificial intelligence has the potential to move the entire field of medicine forward. When used correctly and responsibly, AI enhances the capabilities of healthcare workers, enabling faster, more informed decisions and allowing providers to deliver more focused care. This technology is set to transform patient outcomes by improving efficiency and access to advanced diagnostics. With AI's potential to extend the reach of high-quality care, we can move toward a more equitable health system, ensuring that no patient is left behind, no matter where they are.



The IQ3 ultrasound device can connect directly to a phone.