ADVERTISEMENT FEATURE

FOCAL POINT ON RADIOLOGY IN JAPAN

RADIOLOGISTS IN JAPAN ARE SCANNING THE HORIZON

Advances in X-ray, CT and MRI technology will require ever more specialists to interpret results — careful adoption of AI MAY BE PART OF THE SOLUTION.

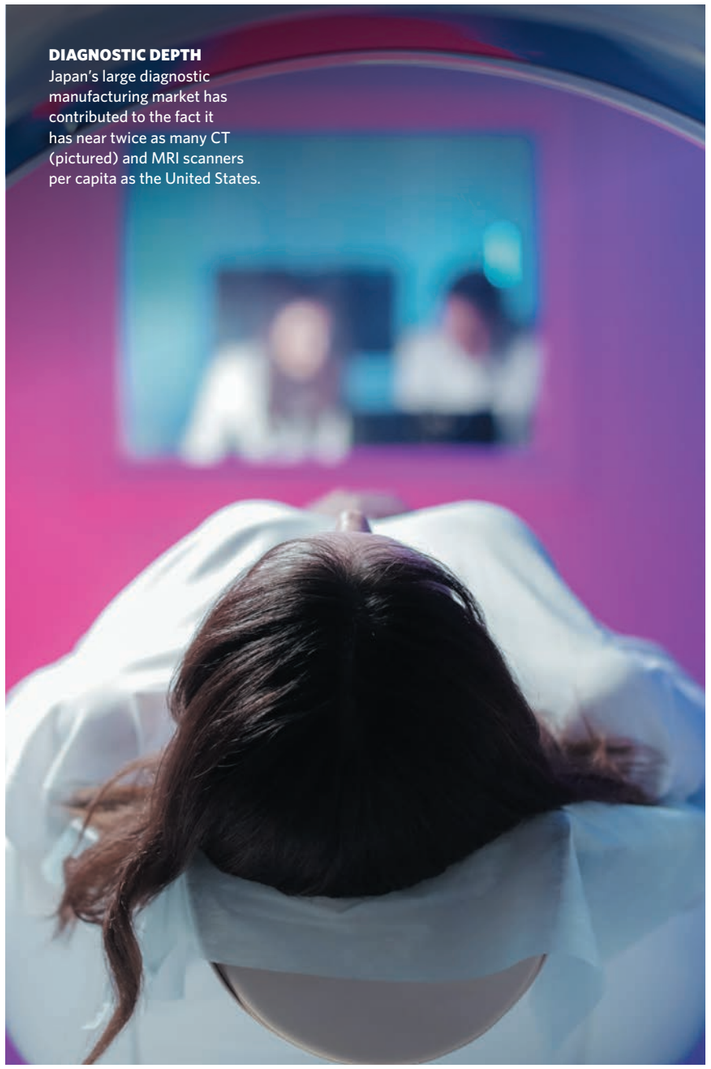
Some of Japan's biggest imaging and technology companies, such as Canon and Hitachi, have led recent advances in radiology — the science of using X-rays and other high-energy radiation for disease diagnosis and treatment.

As a result, the snapshots created by X-ray, computed tomography (CT) and magnetic resonance imaging (MRI) machines are becoming more detailed, and radiation treatment options for cancer are expanding.

These include two therapies that use relatively strong radionuclides that emit alpha particles to kill cancer cells. A new option recently approved in Japan is boron neutron capture therapy, which uses an interaction between neutrons and boron-treated tumour cells to deliver alpha particle therapy. Another advance uses injections of an alpha-particle emitting radionuclide, astatine-211.

"Japan is a leading country in terms of the number of diagnostic imaging devices per capita," adds Noriyuki Tomiyama, chairman of the Department of Diagnostic and Interventional Radiology at Osaka University in Japan.

Imaging device advances should further aid the early detection and treatment of everything from hernias and cancer to Alzheimer's disease. And Japan's rapidly ageing population is well placed to benefit — but only if there are enough experts to perform the imaging procedures and interpret the results.



DIAGNOSTIC DEPTH Japan's large diagnostic manufacturing market has contributed to the fact it has near twice as many CT (pictured) and MRI scanners per capita as the United States.

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A CLEAR SHORTAGE

A shortage of radiologists to perform diagnostics has become a significant global problem, especially given the rapid advancements in the technology, and partly because of the ageing population globally.

"Older individuals often require more diagnostic examinations, such as CT and MRI," explains Tomiyama, and an older population also means fewer trained staff to complete those scans.

This issue is particularly evident in Japan's superaged society. Currently, only a portion of Japan's radiological imaging workload is handled by radiologists. A 2018 study showed that if other staff weren't picking up some of the slack, the potential workload for radiologists in Japan would be 2.8–4.2 times higher than in other countries.

Increasing the radiology graduate numbers in Japan is part of the solution — but the rise of artificial intelligence (AI) is both helping and hindering in attracting doctors to the profession.

AI VERSUS MANPOWER

AI that enhances images, detects abnormalities or flags scans for follow-up, holds promise to alleviate workloads, says Tomiyama. But the possibility that it may take jobs is also deterring graduate entry into radiology.

However, while more than 500 AI-based tools have been authorized by the US Food and Drug Administration (FDA) for use in medicine, AI isn't yet at the stage where it can replace radiologists. In the short term, the hope is that it could make clinicians' workload more manageable, says Tomiyama.

For example, many employees in Japan have a mandated annual physical, which sometimes includes a chest radiograph to look for signs of lung diseases. Currently, each of these radiographs must be examined by at least two doctors, but AI has the potential to take one of these doctors out of the equation, streamlining the process, says Tomiyama.

For other types of cancer, such as breast cancer, AI is already helping with detection. A 2022 study in Germany, supported by the company that developed the AI, found that a doctor and AI working together were 2.6% better at detecting breast cancers than a doctor working alone. And a 2023 study in Sweden found an AI-doctor combination was 4% better at detecting breast cancers than two doctors reading the scans.

Moreover, the number of mammograms in the 2022 study that were confidently classified by AI as normal amounted to 63%. Radiologists must still review these scans, but the AI speeds up this process by pre-emptively filling in their reports. Exactly how the assessments made by the AI software affects the decisions of radiologists — and whether this may create new risks — is yet to be determined.

Other studies have come to less positive conclusions about the efficacy of AI working without the oversight of radiologists to make diagnoses. A 2021 review found that in 34 of 36 studies, radiologists working alone outperformed AI working alone in terms of accuracy when it came to screening for breast cancer from mammograms. Another more recent meta-analysis has since shown standalone AI to be better at detecting breast cancers from mammograms than a single radiologist, but worse at identifying their type.

But other researchers believe that the accuracy of medical AIs has probably often been overestimated. They will need to be tested in many different settings for some time, says Tomiyama, as systems that work on one population or demographic might fail when applied to different groups.

In the past few years, the Japanese government has come up with a plan to fast-track the release of diagnostic AIs, by shortening the time it takes for assessment and approval. Hopefully these will be trained and validated on an ever-increasing amount of Japanese data, says Tomiyama.

And if AI can help reduce radiologists' workload then perhaps they can spend more time interacting with patients, explaining their diagnoses, and learning about rapid technological advances. "We're putting more focus on consultation time, and on what we're calling 'values-based radiology', which is about how to use radiology to really contribute to patient welfare," he says. ■

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THE NEED FOR DIAGNOSTIC IMAGING PEAKS in a patient's 70s for MRI and X-rays, and in their 80s for CT scans.

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2

Japan has **THE MOST CT AND MRI SCANNERS** per capita of any OECD nation.

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3

X-RAY SCANS of the chest, to screen for tuberculosis and lung cancer, are often part of annual health check-ups for employees in Japan.

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