Digital medicine
Upending the model of AI adoption

In 2016, Geoffrey Hinton, a pioneer of deep learning artificial intelligence (AI), predicted radiologists’ extinction within 5 years. 7 years later, radiologists have yet to be replaced, and radiology AI—use of AI for image interpretation—is not widely implemented in many high-income countries. Yet adoption has been rapid for certain use cases in some low-income and middle-income settings.

The use of radiology AI centred on accurate chest x-ray diagnosis of tuberculosis is an exemplar. Alongside addressing the social determinants of tuberculosis and improving access to rapid diagnostics, treatment, and good quality care, an important element in tuberculosis control is bringing chest radiography to underserved populations. Tuberculosis is endemic and dispersed—present, for instance, among people who live in Mumbai’s slums and Himalayan villages—and diagnostics must travel to the people. Many individuals with tuberculosis have little access to physicians, let alone radiologists. Considerable investment in x-ray machines is needed. In some instances, mobile vans bring x-rays to patients. Typically, an x-ray van screens several people in a village and it usually takes a few weeks for x-ray interpretation. Radiology AI has the potential to address this diagnostic delay by providing a level of expertise that is comparable to a radiologist, within minutes; the immediacy of the interpretation helps to start treatment.

AI is also expanding the reach of x-ray diagnostics beyond detection of tuberculosis, with automated, instantaneous, provisional interpretations emerging as a part of rural medicine diagnostic toolkits. Increased internet access is helping to make this possible. For example, Starlink, a satellite broadband internet system, can be accessed in the most improbable places, such as Everest Base Camp (EBC), so that AI can talk to the cloud. In such settings radiology AI has the potential to detect high altitude pulmonary oedema. Radiology AI is trained to detect abnormalities, but doctors are still needed to correlate x-ray findings clinically. The one diagnosis AI makes with certainty is a normal chest radiograph, which is vital for physicians at remote places like EBC to know when deciding whether their sick patients need evacuation.

It is not just x-rays that AI is facilitating. Smartphone imaging with ultrasound is getting rapidly adopted in some low-income and middle-income countries (LMICs). With the simple attachment of the probe to the base of the phone, high-resolution imaging can be immediately obtained for any part of the body except the brain. AI has enabled acquisition of video images by untrained personnel, including echocardiograms, along with automated interpretation that has fostered rapid diagnosis of various conditions, such as pneumonia and heart failure. Furthermore, research has shown the potential of the use of AI to diagnose anaemia in young children in Ghana through smartphone images, although further clinical validation is needed.

Such innovative clinical uses of AI are being supported with public funding from entities such as the Global Fund to Fight AIDS, Tuberculosis and Malaria, USAID, the World Bank, and philanthropic organisations including the Bill & Melinda Gates Foundation. For example, the non-profit organisation Right to Care is making AI-powered x-ray screening for tuberculosis widely available in sub-Saharan Africa. Whatever AI’s legacy will be, it must thank public health initiatives and stakeholders in LMICs for its upbringing.

Why is the model of AI adoption being upended? In high-income countries, such as the USA, the business case for AI is predicated on commercial, profit-driven models, in which vendors must show that AI will increase the bottom line or reduce health-care costs. In some low-income and middle-income settings where public and philanthropic funding is involved, adoption of AI is typically based on medical need not financial return. Usually, innovations such as computed tomography and magnetic resonance imaging flow from high-income countries to LMICs. But radiology AI points to a different trajectory. Just as Indian companies such as Wipro and Infosys once supplied information technology expertise to the USA, so it could be that innovators in LMICs will in future supply US hospitals with mature algorithms developed in their regions. Perhaps one day US health care might implement AI for chest x-rays just to catch up with Africa.

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