Editorial

Artificial Intelligence in Medicine: Potential Benefits and Risks

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A recent field of science and technology is artificial intelligence (AI). It already significantly impacts various human activities at all societal scales, ranging from individuals to social organizations, corporations, and countries. Almost every industrial, economic, and societal sector is experiencing rapid growth in artificial intelligence, from information technologies to commerce, manufacturing, space, remote sensing, security, defense, transport, and vehicles, and, since the turn of the century, medicine and health care.[1]

Deep learning tools and AI are expected to have an impact on healthcare on three different levels: for clinicians, primarily through quick, accurate image interpretation; for health systems, through improved workflow and the potential to lower medical errors; and for patients, through the ability to process their data to improve health.[2]

Soon, almost every clinician will be utilizing AI technologies. Deep neural networks (DNNs), which can read medical scans, pathology slides, skin lesions, retinal pictures, electrocardiograms, endoscopy, and many more domains, were primarily used for pattern recognition in this. Radiology is one area where artificial intelligence has received much attention. Over two billion chest X-rays are performed globally each year, making them the most used type of diagnostic scan. One study evaluated the performance of one deep neural network and four radiologists in identifying pneumonia in over 112,000 tagged frontal chest X-ray images. The results showed that the algorithm could outperform the radiologists.[3]

Deep neural networks have also been used in a variety of medical scans, such as bone films for fractures and aging estimation, tuberculosis classification, and vertebral compression fractures; CT scans for lung nodules, liver masses, pancreatic cancer, and coronary calcium score; brain scans for signs of hemorrhage, head trauma, and acute referrals; magnetic resonance imaging; echocardiograms; and mammograms. A machine learning-based method for detecting diabetic retinopathy has received approval from the US Food and Drug Administration. It was the first time the FDA had given the go-ahead for a medical gadget that runs a screening test and refers patients to a specialist without requiring a clinician to interpret the results or image.[1]

About 350 million people are suffering from depression worldwide, and AI may help both the patients and the severely understaffed medical community. Digital methods for measuring depression and mood are being developed, and they involve keyboard input, speech, voice, facial recognition, sensors, and interactive chatbots. It has been demonstrated that Facebook posts can predict the diagnosis of depression that would later be recorded in electronic medical records.[4]

Hypothetically, hospital palliative care resources may be more effective and precise if crucial outcomes could be predicted. AI predictive technologies may make it easier to decide which patients would benefit from palliative care and who would most likely get sepsis or septic shock. Machine- and deep-learning algorithms have successfully predicted a wide range of significant clinical indicators, from Alzheimer's illness to death, using data from electronic health records.[5]

Ongoing initiatives to digitize surgery include integrating all preoperative data for a patient, including their complete medical history, lab results, and scans, as well as machine vision observation of the team and equipment in the operating room and

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the surgeon's performance. Using AI, extremely delicate microsurgery, like that inside the eye, has now been accomplished.[6]

Wearable sensors can constantly monitor all vital signs, such as pulse, blood pressure, blood oxygen saturation, respiration rate, and temperature. They can prevent a significant proportion of patients from needing hospitalization. The FDA approved a smartwatch algorithm in late 2017 to identify atrial fibrillation, and Apple later got FDA approval for the algorithm it used with the Apple Watch Series in 2018. When medical and social media data are combined with real-time physiological monitoring provided by wearable technology, clinically relevant automated interventions (such as calls to the police for suicidal prevention or drug delivery) can be triggered.[7]

With the help of AI, drug discovery is being transformed on many levels, including highly sophisticated natural language processing searches of the biomedical literature, data mining of millions of molecular structures, designing and manufacturing new molecules, predicting toxicities and off-target effects, determining the ideal dose for experimental drugs, and developing cellular assays on an enormous scale. Using machine learning to anticipate toxicity can significantly reduce the need for preclinical animal testing there.[8]

AI is also expected to play a significant role in personalized, precision medicine; gene editing; reading and decoding brain signals; brain-machine interfaces; neuromodulation; neuroprosthesis; prevention and monitoring of disease outbreaks, Etc.[2]

Despite all of its potential, significant challenges and dangers are associated with AI technology. In particular, when it comes to validation and preparedness for application in patient care, there is a chance that the hype around artificial intelligence will surpass the science behind it. How well data security and privacy can be guaranteed is a crucial concern for the future of AI in medicine. There is a chance that an algorithm may be intentionally hacked to do widespread harm to people, such as giving people with diabetes too much insulin or making defibrillators fire inside the chests of heart disease patients. Privacy protection is further hampered by the growing possibility that a person's identity could be identified using facial recognition or a genetic sequence from vast databases. There can be no exceptionalism in AI in medicine since it needs to undergo rigorous research, be published in peer-reviewed publications, and undergo clinical validation in a real-world setting before being implemented in patient care.

Though there has been considerable buzz about AI replacing physicians, it is improbable that the machine will replace physicians soon. However, in a few decades, patients may be comfortable interacting with artificial intelligence terminals and even trust them as their primary source of medical guidance.

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