Artificial Intelligence in Medicine: A Paradigm Shift

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The ability to learn, make decisions and solve problems is considered to be part of human thinking capacity. It is called Artificial Intelligence (AI) when a machine can achieve these capacities autonomously.[1] Remarkable progress have been made by AI in the field of medical science providing powerful tools for improving health care delivery.

AI in medicine can be divided into two subtypes: Virtual and physical. The virtual part ranges from applications such as electronic health record systems to neural networkbased guidance in treatment decisions. The physical part deals with robots assisting in performing surgeries, intelligent prostheses for handicapped people and elderly care.

Artificial intelligent uses techniquessuch as fuzzy expert systems, Bayesian networks, artificial neural networks, and hybrid intelligent systems in different clinical settings in health care. Computers learn the art of diagnosing a patient via two broad techniques, flowcharts and database approach.The flowchart based approach involves translating the process of historytaking. This requires feeding a large amount of data into machine, encountered in routine medical practice. The database approach utilises the principle of deep learning or pattern recognition that involves teaching a computer via repetitive algorithms in recognising what certain groups of symptoms or certain clinical/radiological images look like.

There is virtually no area in medicine and care delivery that is no already being touched by AI.[2] Current application AI in medicine are administrative, decision making, procedural purpose and so on.[3] The administrative uses are online scheduling and checkins in medical centres, digitisation of medical records, reminder calls for followup appointments and immunisation dates for children and pregnant females to drug dosage algorithms and adverse effect warnings while prescribing multi-drug combinations. For decision making AI deals with the function of diagnosis, management, followup of diseases, research works, drug development etc.

Artificial Intelligence based programs gained FDA approval are Alivecor (2014) for ECG monitoring and early detection of AF. Medtronic smartphone paired for glucose monitoring in endocrinology. Empatica (2018) for wearable Embrace associated with electrodermal captors to detect epilepsy in neurology, Paige.ai (An AI based algorithm) capable to diagnose cancer in computational histopathology with great accuracy.

Other AI based programs in practice are in cardiology, pulmonary medicine, endocrinology, nephrology, gastroenterology, neurology, oncology, and so on. healthcare delivery system. Radiology is the branch that has been the most upfront and welcoming to the use of new technology3.AI can provide quick substantial aid in radiology by labelling abnormal findings from normal in computed tomographies, X-rays, magnetic resonance images especially in high volume settings, and in hospitals with less available human resources.

Lot of AI based program in practice yet to approve by FDA are, DXplain (A decision support system) developed by the university of Massachusetts in 1986, gives a list of probable differentials based on the symptom complex and it is also used as an educational tool for medical students filling the gaps not explained in standard textbooks.[4] Germwatcher detect and investigate hospital acquired infections. Babylon can be used by the patients to consult the doctor online, check for symptoms, get advice, monitor their health, and order test kits.CBTpsych.com, an online course treat patients for social anxiety using therapeutic

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approach of cognitive behaviour therapy, developed at University of Sydney. The DaVincirobotic surgical system has revolutionised the field of urological and gynaecological surgeries. AiCure (App developed by National Institute of Health) which monitors the use of medications by the patient via smartphone webcam access and hence reduce non-adherence rates. Fitbit, Apple and other health trackers can monitor heart rate, activity levels, sleep levels and some have even launched ECG tracings as a new feature. All these new advances can alert the user regarding any variation and let the doctor have a better idea of the patient's condition. The Netherlands uses AI for their healthcare systemanalysis - detecting mistakes in treatment, workflow inefficiencies to avoid unnecessary hospitalisations.

Apart from the inventions which already exist, there are certain advances in various phases of development, which will help physicians be better doctors. IBM's Watson Health equipped to efficiently identify symptoms of heart disease and cancer. Stanford University is making a Program AI-assisted Care (PAC). PAC has intelligent senior wellbeing support system and smart ICUs, which will sense any behavioural changes in elderly people living alone and ICU patients, respectively, via the use of multiple sensors. PAC is also extending its projects over Intelligent Hand Hygiene support and Healthcare conversational agents. Hand hygiene support is using depth sensors refining computer vision technology to achieve perfect hand hygiene for clinicians and nursing staff reducing hospital acquired infections.Healthcare conversational projects analyzes how Siri, Google Now, S voice and Cortanarespond to mental health, interpersonal violence, and physical health questions from mobile phone users allowing patients to seek care earlier. Molly is a virtual nurse that is being developed to provide follow-up care to discharged patients allowing doctors to focus on more pressing case.

Although the AI augmented medicine encounter success in many areas of health care it is not a panacea, it can be brittle, may work only in a narrow domain and may have builtin biases that affect can affect marginalised group. Its acceptance by the health care personnel can be limited initially for certain reasons. First, unpreparedness due to the lack of basic and continuing education regarding this discipline. Second, the early digitisation of healthcare processes, increase administrative burden related to electronic health records, Third, fear of risk of AI replacing physicians, Fourth, lack of a legal framework that physician are exposed to potential legal outcomes when using AI. In addition the machines may be able to translate human behaviour analytically and logically but certain human traits such as critical thinking, interpersonal and communication skills, emotional intelligence, and creativity cannot be honoured by machine.

AI would be an integral part of medicine in the future. Hence, it is important to train the new generation of medical trainees regarding the concepts and applicability of AI and how to function efficiently in a workspace alongside machines for better productivity along with cultivating soft skills like empathy in them. Some of the universities have already taken the initiatives to change the medical curriculum to expertise the future doctors in AI.

In conclusion, it is important that primary care physicians need to be well versed with the future AI advances and the new unknown territory the world of medicine is heading toward. The goal should be to strike a delicate mutually beneficial balance between effective use of automation and AI and the human strengths and judgment of trained primary care physicians. This is essential because AI completely replacing humans in the field of medicine is a concern which might otherwise hamper the benefits which can be derived from it.

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