



Artificial intelligence and healthcare—why they need each other?

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Many healthcare systems and their delivery models revolve around episode-based care as opposed to preventative models (1,2). This approach has led not just to high costs in delivering healthcare but also inefficiencies and inability to service the rising demand for good quality and safe healthcare. Other issues that health systems face include workforce shortages and limited infrastructure to support the delivery of high-quality healthcare. In this context, poor administration of health services contributes to a high degree both in terms of costs and inefficiencies (3). Further to these issues, current health care models also have problems in terms of rising medical errors, resource waste, overtreatment or low-value care (1,2,4).

Many case studies and research have exemplified the role of digital health interventions including applications such as telemedicine, mobile health applications, internet of things and artificial intelligence (AI) in addressing the problems as mentioned earlier of healthcare (1,4,5). Unique among these digital health interventions is AI, which can be described as computers simulating human-like intelligence. AI, because of its technicalities and computing ability, is distinct from other digital health interventions (2,3). Some have contested that AI is not just transformative but also unprecedented as a technology (6). AI has, in recent years, demonstrated significant success in the treatment and management of diseases (1,4). Not only useful for medical treatment but also AI can support administrative tasks like billing, reimbursement and insurance fraud detection.

Machine learning (ML), which underpins AI, can analyse complex data for valuable insights that humans ordinarily cannot garner (1,5). This especially becomes pertinent considering the volume of medical and patient-related data that gets accumulated and inadequately used each year, whether it is in a single health service or the system. By

using ML to analyse patient data and match it to evidence-based medical approaches, the ability to deliver personalised medicine becomes much efficient in this era of big data (4). The increasingly full acceptance of AI in healthcare relates to this ability.

AI, through its advanced computing ability, is being used in all the three-core medical delivery areas: diagnosis, prognosis and therapy (3). When we analyse the medical treatment process and consider the patient data as the input and determination as to the output, the role of AI as an intelligent agent as an intermediary can be understood. Another dimension is the ability of AI to automate mundane tasks undertaken by clinicians to free up their time for human elements of clinical care like communicating with patients and critical decision making (4). The argument for this automation arises from the fact that AI as labour involves exponentially increasing processing power, time-invariant production, and cost-efficient scalability.

The ability to service specialities across the medical discipline is another allure of AI (*Figure 1*). AI can augment the care provided by non-specialised primary care physicians by interpreting medical images like radiological and histopathological images negating the need to refer to specialists in the area (2). In terms of specialists, AI applications can enhance the efficiency of the provision of medical care, especially in areas where voluminous and complex data has to be analysed to provide therapeutic insights. For example, radiological AI applications can semi-automate the process of screening medical images for a particular lesion and present the filtered images to the specialist for final opinion or data mine voluminous electronic health records for relevant clinical insights that can aid the physician in their treatment (2,7). Such cloud-based autonomous detection software is increasingly being

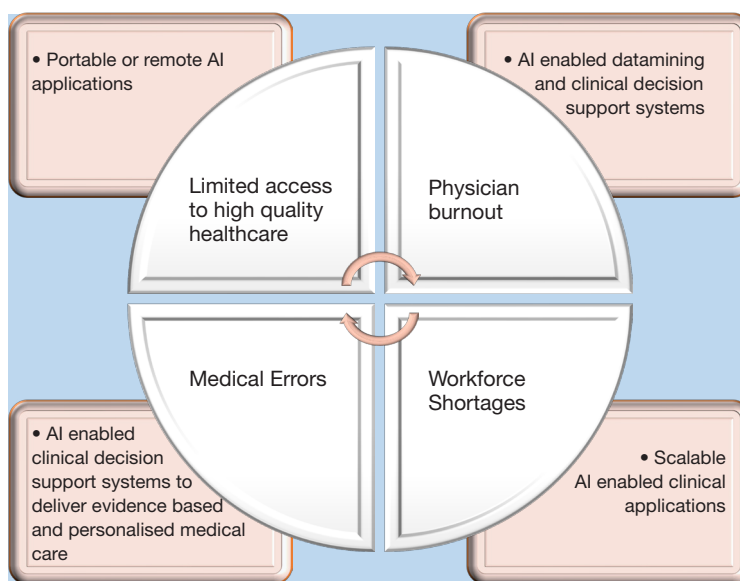


Figure 1 Current healthcare delivery issues and AI solutions. AI, artificial intelligence.

approved for clinical use.

From the above description, it may seem that AI is the panacea for the intractable problems health systems across the world face. It would only be a matter of adoption of AI technology in healthcare delivery to achieve the objectives of accessible, cost-efficient high-quality healthcare. However, the maturity of AI technologies varies across its various applications, and significant problems in operationalising AI abound (1,8). There is the problem of success of AI in one situation not being able to be replicated elsewhere, the issue of lack of generalisability. Also, concerns have been raised about the ethical and regulatory gaps in terms of adoption of AI in healthcare. The interests include issues associated with a lack of transparency with some AI algorithms, potential biases, and privacy concerns. Also, some have questioned the rush to adopt AI considering the poor digital health infrastructure and the limited number of specialist AI workforce in many countries (1,3). The concern is that the hype and rush may end up with user disillusionment and exacerbate existing flaws in healthcare delivery.

However, the drive to adopt AI is not without merit. While the focus on AI has magnified only in recent years, the concept of using AI in medicine has been explored since the 1970s (9). The experimentation with the use of AI in medicine has paralleled the waxing and waning of support for AI over the past few decades. So, there has been a considerable period to examine the utility of AI in medicine. Recent successes of AI and increasing funding available

for AI research and adoptions present an unprecedented opportunity to progress the adoption of AI in healthcare (4). A cautious and concerted approach where the technology is appropriately scrutinised and customised to the context where it is to be applied should address any concerns associated with the adoption of AI in healthcare (1). No one interested in the betterment of healthcare delivery and who has a stake in improving health outcomes of the community can rule out the promise of AI technology and what it can do to achieve high-quality personalised healthcare.

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