

Implications of Artificial Intelligence (AI) on Dynamics of Medical Education and Care: A Perspective

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ABSTRACT

Artificial Intelligence (AI) applies to the development of systems endowed with the intellectual processes characteristic of humans. The AI era is likely to profoundly impact present system of Health care. Large data storing, processing and its interpretation through Electronic Medical records (EMRs) indicate great potential benefit to health services. Devices are likely to outperform humans, more so cognitively; and coming to terms with this fact require physicians to brace themselves to practice in a technologically enhanced environment. In near future, AI is likely to take a central place in health care with everything revolving round its mechanics. The era of AI envisages new roles of a physician and health professionals should realise the importance of being efficient in interacting with these machines in an efficient manner. Patient psychology and empathy shall take a central place in patient care and budding doctors should be braced with such relevant competencies. Accordingly, AI needs to find a suitable place within the curriculum of medical education that deals with technology, interactive learning environments and managing AI systems. It is also imperative that medical teachers realise the potential of AI on health care and are suitably equipped to train these emerging concepts to future doctors.

Keywords: Electronic medical records, Health care, System

INTRODUCTION

The AI is re-shaping and re-defining the professions in a big way. Consequentially, health profession dynamics is undergoing a sea change in terms of education and care. This article reviews the prospective change and challenges that await medical education and care with AI's perspective. The reference search, for this review, was carried out electronically for databases viz., PubMed, Medline, Scopus, Index Copernicus and Google Scholar. Publications identified in the search were screened by examining abstracts or summaries for any reference to Artificial Intelligence in Health care. An advanced systematic literature search was done for English-language articles on Pubmed, by connecting the Mesh terms: "Artificial Intelligence" AND "Health care" OR "Health", "Artificial Intelligence" AND "Medical Education" OR "Health Professions Education".

By definition, AI applies to the development of systems that are endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalise, and/or learn from experience [1]. Colloquially, the term is often used to describe machines or computers that mimic "cognitive" functions relating to intellectual processes of human mind, such as learning, problem solving, ability to reason, discover meaning, generalise, and/or learn from experience [1,2]. As we progress towards the era of AI, the potential impact of AI on various professions and their functionalities is a debatable concern [3]. Schwartz WB, in 1970 wrote about the possibility of a computer as an intellectual tool in health care that can alter the role of the physicians and impact the nature of medical manpower recruitment and medical education [3]. In fact, AI has substantially impacted health care in terms of assisting physicians by use of sophisticated algorithms to gain insights in treatments and inform proper patient care. It is influencing health care in early detection of malignancies, AI-powered radiology assistance, Cloud-based digital drug discovery, Virtual reality-enabled robotics for surgeries, Hospital risk predictions, Robot-facilitated heart therapies etc. AI tools are dominantly being applied in cancer, neurology, cardiology and stroke in early detection and diagnosis, treatment and prognosis.

The challenge is to acknowledge the potential of AI by different professional streams and strive to keep this technology beneficial for mankind.

Health Care and AI

From streamlining operations to better decision making; growing body of research on AI proves profound impact on Healthcare, Automotive, Finance and Economics, Government, Video games, Military, Audit, Advertising, Arts etc. The influence is already visible in various sectors viz., Cyber-security, Cloud Hosting, Manufacturing, Healthcare, Construction, Senior Care, Retail, Business Intelligence, City Planning, Mental Health Diagnosis and Treatment, Education, Fashion and Supply Chain Management. Evidently, four out of these are directly related to health and health education. In this perspective, future medical practice is presumed to change the ground rules of profession in terms of: 1) Patient care being provided in many locations with convenience and demonstrable results as a priority of stakeholders; 2) Machine-based analysis of huge meta-data sets as standard for patient care; and 3) Machines as more informed in multiple aspects (because of huge data sets and its interpretation) and able to perform tasks which were traditionally performed by physicians. The advantage of large data storing, processing and its interpretation through EMRs indicate great potential benefit to health services. The growing body of data will enable clinical decision making within the complex intersection of machines, patients and their families and an expanding array of health professionals [4]. Sooner than later, AI will be able to perform differential diagnosis and clinical reasoning more efficiently than humans. With continuous flow of data sets, this will prospectively improve and fine tune its intellectual programming [5-7]. Devices are likely to outperform humans, more so cognitively and coming to terms with this fact require physicians to brace themselves to practice in such a technologically enhanced environment.

AI could be beneficial in places with limited access to health care, particularly in high-disease or low-resource settings. Health care in India, with its multifaceted challenges, AI driven solutions [8] AI is supposed to present solutions to address healthcare problems [8].

AI Era and Role of Health Professionals

According to Ken Masters, AMEE guide, 2019, doctors are in the initial stages of an important new role, largely characterised by gathering and entering patient data into EMR and AI systems. It

is redefining medical practice and ethics in a big way with the key technical developments that revamps computer as an 'intellectual,' 'deductive' instrument, parallel to a physician's role in the medical-care system. The guide envisages AI to replace many traditional activities of the physician and mandate new roles viz., [5]:

1. Being proactive in AI system design
2. Working and communicating with AI diagnostic systems
3. Deeper counseling and related activities
4. Teaching medical AI by a good team of experts from medical, educational and computing fields, an effort directed towards moving from 'Artificial Intelligence' to 'Artificial Wisdom'.
5. Robotic surgeries and interaction with e-patients.

In near future, AI is likely to take a central place in health care with everything revolving round its mechanics. The patient-physician inter-phase is much likely to be occupied by the machine, posing a greater challenge for the doctor to maintain his/her relevance in patient care and judiciously interpret computer's interference, both at the same time. The physician and computer may collaborate in history taking, physical findings, laboratory data etc and help in the probable diagnosis and treatment module [3]. Patient care will largely be based on continuous monitoring by analytics of huge meat data sets.

It is prudent for health professionals to realise the importance of being efficient in interacting with AI and to learn from it. Psychological re-orientation of changing roles of a physician need to be addressed at all levels particularly through continuing medical education [5]. As such, the need for direct human interaction between patient and a doctor will always be there. Customised counseling, breaking bad news, performing small procedures etc., are a few tasks that cannot be tagged to a machine. Health professionals, hence, should learn psychology from patient's perspective and be more humane and empathetic – these tributes which will largely define the role of health professionals in near future. They will have to be trained to use the intelligence tools involving large data sets, while assuring the mastery of compassionate care.

Medical Education Through the Lens of AI

Demanding learning environment, information overload, ever-expanding body of knowledge and scientific discoveries define medical education in today's era. Learners struggle with managing, organising and retaining information. A welcome change in the era of AI for medical education will be the focus on teaching judicious information management. This anticipated change, however, needs to find a suitable and substantial proportion within the curriculum of medical education. Though, a fundamental understanding of the biomedical sciences and their interconnectedness with clinical practice ought to remain central to medical education; it is equally vital that the learners learn to practice medicine safely in a data-rich

environment supported by Artificial Intelligence. Learners develop a clear understanding of the four Vs of big data: Volume (the amount of data today is vast compared with the amount in the past); Variety (data come from many different sources of varying validity); Velocity (data are being generated very fast and momentum is increasing); and Veracity (the quality of the data being generated needs to be assessed) [4]. The knowledge and technical expertise of how data is being aggregated, analysed, and personalised in health care delivery through AI applications need urgent attention and thoughtful revisions within the medical curriculum. A curriculum that successfully deals with technology, interactive learning environments and managing AI systems with relevant information is warranted. Learners should be carefully trained in verbal communication, voice input, translating tactile information, diagnostic suspicions into digital form and use data mining tool within clinical environments. They should be 'AI literate' and well abreast with the shift in language of medical education like intelligent tutoring systems, adaptable virtual facilitators, data mining, intelligent feedbacks etc.

CONCLUSION(S)

New roles of a doctor, as mentioned in previous paragraphs, necessitate new dimensions in Medical education. A radical change in medical curriculum is warranted to prepare future doctors for their new roles in the era of AI. Curriculum revisions incorporating AI related competencies that brace future doctors for provision of optimum Health care should be focused upon. Medical Institutions must sensitise medical teachers about the imminent impact of AI in medical practice and should be adequately trained to train these emerging concepts to the learners. In view of its long learning curve, such trainings should begin sooner than later before it becomes pervasive. Health care has already entered the exosphere of this vast space of AI and in no time we will find it immersed in its infinity. The time to act is now.

REFERENCES

- [1] Encyclopedia Britannica. Artificial intelligence. <https://www.britannica.com/technology/artificial-intelligence>. (Last Accessed on October 25, 2018).
- [2] Russell Stuart J. Norvig, Peter Artificial Intelligence: A Modern Approach, 3rd ed. Upper Saddle River, New Jersey: Prentice Hall. 2009, ISBN 978-0-13-604259-4.
- [3] Schwartz WB. Medicine and the computer: The promise and problems of change. *New Engl J Med*. 1970;283(23):1257-64.
- [4] Wartman SA, Combs CD. Medical education must move from the information age to the age of artificial intelligenc. *Academic Medicine*. 2018;93(8):1107-09.
- [5] National Strategy for Artificial Intelligence, http://niti.gov.in/writereaddata/files/document_publication/NationalStrategy-for-AI-DiscussionPaper.pdf, June 2018; 27-28.
- [6] Masters K. Artificial intelligence in medical education. *Medical Teacher*. 2019;41(9):976-80.
- [7] Bogusevicius A, Maleckas A, Pundzius J, Skaudickas D. Prospective randomised trial of computer-aided diagnosis and contrast radiography in acute small bowel obstruction. *Eur J Surg*. 2002;168(2):78-83.
- [8] Haenssle HA, Fink C, Schneiderbauer R, Toberer F, Buhl T, Blum A, et al. Reader study level-I and level-II Groups., Man against machine: Diagnostic performance of a deep learning convolutional neural network for dermoscopic melanoma recognition in comparison to 58 dermatologists. *Ann Oncol*. 2018;29(8):1836-42.

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