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Implications and Consequences of Artificial Intelligence in Healthcare Quality and Medical Training

Jawahar (Jay) Kalra[1,2] and Patrick Seitzinger[3,4]

[1]Department of Pathology and Laboratory Medicine, College of Medicine, University of Saskatchewan, Saskatoon, Canada
[2]Royal University Hospital, Saskatchewan Health Authority, 103 Hospital Drive, Saskatoon, Saskatchewan, S7N 0W8, Canada
[3]Department of Pediatrics, College of Medicine, University of Saskatchewan, 103 Hospital Drive, Saskatoon, S7N 0W8, Canada
[4]Jim Pattison Children's Hospital, Saskatchewan Health Authority, 103 Hospital Drive, Saskatoon, S7N 0W8, Canada

ABSTRACT

Healthcare strategies require ongoing adaptation to deliver high-quality healthcare to populations with complex healthcare needs. The implementation of Artificial Intelligence warrants careful deliberation to ensure that implications are considered and consequences are mitigated. Artificial Intelligence systems incorporate and often amplify existing patterns of practice, including societal biases and inequitable healthcare practices. The momentum created by such innovations can lead to implausible optimism and unintentional consequences. Navigating the transition to an Artificial Intelligence-assisted era of healthcare delivery will require an appreciation of the opportunities and limits of each technology. Healthcare educators are tasked with preparing learners across all healthcare disciplines to function in an increasingly technological and rapidly evolving field of practice. This entails instilling learners with digital literacy to leverage new tools and acknowledge limitations. We suggest that using Artificial Intelligence correctly has the potential to enhance the efficiency and quality of healthcare delivery.

Keywords: Artificial intelligence, Healthcare quality, Medical training, Medical ethics, Patient safety

INTRODUCTION

Technology is playing an increasing role in the delivery of healthcare. The appropriate implementation of new technologies is a delicate balance of managing risk and meeting the needs of the population. Circumstances surrounding healthcare delivery are evolving through technological advances, demographic changes, and increases in the expectations of patients and society (Seitzinger et al. 2021). With the ever-increasing need for more accurate and precise healthcare delivery, the integration of Artificial Intelligence (AI) presents a promising opportunity to strengthen healthcare services.

Research into AI in medicine has grown exponentially in the past several decades. AI refers to the capacity of a machine to imitate intelligent behaviour. AI can be divided into several major subfields such as machine learning and deep learning, each with unique capabilities and potential applications in healthcare (Davenport and Kalakota 2019; Amisha et al. 2019). Machine learning refers to programs that use algorithms to modify themselves and extract data from unlabeled data. Unlike most modern machines that rely on predefined rules, machine learning can utilize an algorithm to learn new rules from large data sets and executive functions from the learned rules (Kalinin et al. 2018). Deep Learning refers to neural networks consisting of layered sets of algorithms that recognize patterns, modifying their algorithms independently.

The introduction of AI into healthcare services may be considered an innovative disruption, which with careful implementation, can strengthen healthcare quality. Transitioning into an era of AI-assisted healthcare services will have significant implications on the efficiency, quality, and justice of the healthcare system. Therefore, the implementation of AI warrants careful deliberation to ensure that impacts are considered and consequences are mitigated.

CURRENT STATE OF AI IN HEALTHCARE

Any path in healthcare development involves inherent advantages and drawbacks. Maintaining the status quo of healthcare delivery systems is no exception. Currently, healthcare relies primarily on humans to recognize patterns and diagnose disease. Our previous studies have shown an overall discordance rate of 12.7% between clinical and autopsy diagnoses (Kalra et al. 2020). More importantly, in 10.2% of cases, knowledge of the diagnosis post-mortem would have changed treatment to prolong disease or cure disease (Kalra et al. 2020). Previous studies have shown that 90% of diagnostic errors are attributable to cognitive factors, including faulty information synthesis and premature closure (Graber et al. 2005). Due to competing demands on physicians' time, the duration of physicians patient encounters is dwindling, contributing to poor patient outcomes and climbing rates of burnout among healthcare providers (Seitzinger et al. 2021). With increasingly complex healthcare systems, medical error and disclosure have become a considerable issue around the globe (Kalra et al. 2020). These findings suggest a need for innovative diagnostic tools in healthcare quality.

AI systems can increase workflow without compromising the accurate identification of abnormalities (Paiva and Prevedello 2017). The limitations of fatigue can be mitigated by using AI (Pesapane et al. 2018). Computerized systems are unbiased and are not affected by fatigue like the human body. Automated AI programs can continue to work 24 hours a day and 7 days a week, increasing the output of results and minimizing interpretation bias. These systems have shown promise in serving as a co-pilot for clinicians. By predicting and identifying potential medical errors, clinicians can be alerted to reevaluate and mitigate errors before they occur. By taking over some more mundane healthcare tasks, time can be freed up to allow clinicians to focus on

humanistic aspects of medical care, which may help reduce burnout (Kalra et al. 2021). As alluring as the potential benefits of AI may be, they also present logistical and ethical implications.

The advent of AI in healthcare carries many ethical and accountability issues. There can often be a conflict between an AI and the ethical principles of medicine including autonomy, justice, beneficence, and non-maleficence. AI systems incorporate and often amplify existing patterns of practice, including societal biases and inequitable healthcare practices. The momentum created by such innovations can lead to premature optimism and unintentional consequences. AI systems incorporate and often amplify existing patterns of practice, including societal biases and inequitable healthcare practices.

A growing body of literature has been exploring the issue of moral accountability and AI (Habli et al. 2020; Oshana 2004; Beil et al. 2019). The complexity of AI systems limits the ability of patients to provide informed consent. AI systems generating a result are unable to explain their process, limiting a physician's ability to detect any error that might have occurred. This can make accountability difficult in the case of any potential or unwanted outcomes (Felländer-Tsai 2020). AI systems are programmed to function within pre-set parameters, leading to different conclusions for each patient. As a decision-making tool, AI is only as accurate as the data with which it is provided. Transparency in healthcare practice plays a significant role in patient decision-making, and the lack thereof can make decision-making more complicated.

Many who oppose the implementation of AI argue that the system cannot provide holistic care due to the lack of emotion and ability to detect contextual cues needed in clinical situations (Loder and Nicholas 2018; Parks 2010). This can make it difficult for patients receiving care as it often lacks empathy, which is necessary when delivering specific outcomes. If implemented incorrectly, these technologies may exacerbate health disparities, disempower patients, and reduce the humanity of medical practice (Kalra et al. 2021).

MEDICAL EDUCATION

Healthcare educators are tasked with preparing learners across all healthcare disciplines to function in an increasingly technological and rapidly evolving field of practice. This entails instilling learners with digital literacy to leverage new tools and acknowledge limitations. The Institute of Medicine report in 2001 indicated that to increase the quality of healthcare provided, health clinicians required the ability to utilize technology in healthcare settings (Weber 2006).

Many healthcare providers have not been educated on the use of advanced technology, which adds to their hesitation when using complex systems like AI to deliver patient care. Much of the current medical education is outdated and lacks the training necessary for the ever-evolving changes in healthcare practices (Paranjape et al. 2019). The curriculums at medical schools should be reevaluated and structured to allow students to gain a better grasp in terms of digital literacy. Many healthcare providers are reluctant to adopt AI systems in the workplace due to a lack of knowledge and fear of imperfections in AI (Chan and Zary 2019).

The rapid advancement of technology in healthcare systems requires an educational model that can be accessed by current healthcare providers. Empowering healthcare providers with knowledge will improve efficiency in the workplace and increase the quality of care delivered to patients (Holt et al. 2020). Traditionally, medical trainees would require hands-on experience with patients to gain the necessary competencies. With growing technological advances in virtual reality and augmented reality, new opportunities have been presented to allow learners to practice skills in simulated clinical environments. Incorporating AI into virtual reality provides real-time medical tutoring to guide learners through situations that mimic real-life clinical scenarios. Studies have found that AI-assisted virtual reality teaching technologies improve the competencies of medical trainees and accurately evaluate their skills levels (Winkler-Schwartz et al. 2019). A modern educational curriculum is necessary to keep up with the advancing technology in the healthcare field.

A STRATEGIC PATH FORWARD

The potential of AI makes it an essential component of healthcare in the future. Healthcare providers must be ready for the change in practice that AI will bring before it arrives. The next step in the AI system will be to incorporate more human distinctions such as ethics, morality, and emotion to better mimic human healthcare providers (Noorbakhsh-Sabet et al. 2019).

The goal of AI in the future should be centred on addressing the patient's needs while maintaining the best quality of care practice. We suggest that using AI correctly has the potential to enhance the efficiency and quality of healthcare delivery. The future of AI should aim at creating a system that can work beyond the pre-determined data and carve an independent path when completing tasks. To uncover the true potential of AI, current practices should incorporate AI into the industry to better assess and understand the system.

Although missteps cannot be eliminated from health processes, medical training programs worldwide must remain diligent and persistent in improving the quality of education in a context relevant to current and future healthcare practice. Healthcare providers will need to find a mutually beneficial balance between the use of AI and humans in the healthcare industry. For AI to be appropriately utilized, the legal, ethical, and accountability issues must be addressed by implementing regulations at both the level of practice and governing oversight. A framework for medical colleges to prepare learners to practice in an era of AI-assisted medicine will determine the quality of education that they deliver and the sustainability of their practices. Continuous revaluation of the current state and directions of medical training quality will allow current systems to grow and adapt while creating opportunities for excellence and innovation.

CONCLUSION

Technology is playing an increasing role in the delivery of healthcare. The appropriate implementation of new technologies is a delicate balance of

managing risk and meeting the emerging needs of the population. Healthcare providers will need to be prepared for the age of AI and find a mutually beneficial balance between the use of AI and the use of humans in the healthcare industry. If implemented incorrectly, these technologies may exacerbate health disparities, disempower patients, and reduce the humanity of medical practice.

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