Artificial Intelligence and Humanistic Medicine: A Symbiosis

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Abstract. Medicine is a human endeavor aided by a sophisticated set of diagnostic tools. Healthcare systems are challenged with incorporating new and unfamiliar technology into existing systems of practice. As diagnostic tools such as artificial intelligence have entered the realm of clinical practice, new opportunities have arisen to optimize healthcare delivery. Overreliance on AI may lead to the dehumanization of medicine. However, with appropriate implementation, AI can free up time and resources to allow healthcare providers to focus on aspects of care that are unique humanistic. Effective medical practice requires availability of data, application of information, and appropriate clinical judgement. A large portion of modern patient care takes place without the presence of the patient. AI has shown the potential to synthesize and summarize vast amounts of data from medical records, clinical trials, and best-practice guidelines. By tailoring all available data to each case, AI can serve as an asset in enhancing diagnostic accuracy and increasing the efficiency of healthcare delivery. However, clinical decisions made between patients and their physicians cannot be reduced to a set of parameters, code, or logic trees. Clinical judgment and the implementation of available information remains necessarily human tasks. Only through a strong therapeutic relationship built on trust and empathy can shared decision making and compliance be attained. We propose a framework through which AI and humanistic medicine can build on one another to create a symbiosis of the highest possible caliber of patient care and healthcare quality.

Keywords: Quality improvement · Artificial intelligence · Healthcare delivery · Machine learning · Healthcare optimization

1 Introduction

As diagnostic tools such as artificial intelligence (AI) and machine learning have entered the realm of clinical practice, it has created unique opportunities for healthcare systems

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to optimize the path forward. The human brain is a complex data processor. However, time and attention are in limited supply in most instances of healthcare delivery.

Administrative tasks, information gathering, and documentation have been cited as reasons for the dwindling focus on the humanistic aspects of patient care [1]. AI systems have shown their ability to outperform humans in an increasing number of areas [2].

Success in these areas tend to rely on rapid data synthesis and analysis [2]. Certain functions of human brain including emotional intelligence, empathy, critical thinking, and scientific creativity, cannot successfully replicated by machine learning [3]. AI may present an opportunity to alleviate some of these strains on our healthcare system, allowing us to focus on the aspects of clinical care that are uniquely humanistic. Effective medical practice requires availability of data, application of information, and appropriate clinical judgement [4]. We propose a framework through which AI and humanistic medicine can build on one another to create a symbiosis of the highest possible caliber of patient care and healthcare quality.

2 Availability of Sufficient Information

Data processing is becoming increasingly prioritized in modern medicine. Diagnostic decision making relies on sufficient availability and quality of information [4]. A large portion of patient care takes play without the presence of the patient [5]. Away from the bedside, information gathering includes past medical records, recent evidence and best-practice guidelines. Gathering adequate information in a timely fashion is an essential component healthcare quality. The advancements in knowledge and research have long exceeded the capacity of the human brain. Limitations in the data available about a patient's past medical history and the most recent evidence that pertains to the patient's case, creates challenges for physicians to provide the best possible care. With the implementation of electronic medical records, preoccupation with keyboards and screens during clinical encounters has taken valuable time and attention away from direct patient care, limiting the observational components of the diagnostic process. Approximately 80% of clinical notes are copied from previous entries [6]. AI systems have shown their ability to outperform humans in an increasing number of areas. Among the most important advantages offered by the use of AI in medicine, include the time savings [7]. AI has shown the potential to synthesize and summarize vast amounts of data from medical records, clinical trials, and best-practice guidelines [8, 9]. By converting medical documents, laboratory findings into usable, concise and relevant information, AI can serve as an asset in improving the efficiency of healthcare delivery.

3 Clinical Care Beyond Data Points

The availability of information required for sound clinical decisions extends beyond the objective information gathered through a patient's words, medical file and test results. At the bedside, information gathering requires the power of observation gained through verbal communication, body language and physical exams. Understanding a patient's story requires clinicians to read between the lines of their history of presenting illness.

Emotional intelligence is essential to understanding a patient's perception of the illness and in turn their compliance with recommended treatment plans [10]. AI has shown some potential to recognize basic human emotions based on facial expressions but this capacity remains rudimentary [11]. The information that a patient is willing to share depends largely on the strength of the therapeutic relationship. Empathy is an underappreciated yet necessary component of effective medical care. It entails understanding the person behind the pathology as well as the person's unique experience of the malady. Empathy has been shown through meta analyses to be an attribute that can be cultivated [12]. As illustrated by a systematic review of 964 studies empathy has a significant positive association with patient satisfaction, compliance with treatment recommendations, and better clinical outcomes [13]. Strong therapeutic rapport entails a sense of comradery and trust between patients and physicians that allows patients to feel heard, understood and cared for. Only with trust, empathy, presence will patients reveal the hopes, fears and contextual factors that are required for genuine shared decision making and effective goals of care discussions [10].

4 Clinical Decision Making

Clinical judgment and the implementation of available information remain necessarily human tasks. Therefore, clinicians and patients have been hesitant to incorporate AI into medical practice [14]. This reluctance stems largely from a fear of the unknown and the lack of clarity of what a transition entail [14, 15]. While AI systems may serve as assets in collecting and summarizing information, they are most valuable when used in combination with other forms of information collection and decision making. AI algorithms use complex mathematical approaches to reach a decision. Though the results of such algorithms may have tremendous face value, the accuracy and applicability of their findings is difficult to determine. These systems lack gestalt and require large amounts of high-quality data in able to achieve accurate results limiting use in novel situations and those in which limited information is available [15]. Attempts to reduce clinical decisions to a set of parameters, code, or logic trees present a considerable risk of dehumanizing medicine.

Human cognition is also fallible in different but important ways. Patient care can be affected by exhaustion, distraction and variety of cognitive biases. Between 75% and 90% of diagnostic errors can be attributed to cognitive biases such as premature closure and confirmation bias [16, 17]. If a clinician has a presumed diagnosis, they will often overlook data points that do not align with their hypothesis [18, 19]. This diagnostic momentum is perpetuated when clinicians exclusively search for evidence that confirms their presumption [20]. AI can serve as a method of redundancy and quality assurance in diagnostic decision making to mitigate such biases.

5 Moving Forward Together to Attain the Highest Possible Caliber of Patient Care

As diagnostic tools such as artificial intelligence have entered the realm of clinical practice, new opportunities have arisen to optimize healthcare delivery. With appropriate

implementation, AI can free up time and resources to allow healthcare providers to restore the human component of healthcare interactions. The capabilities of AI systems to act as digital scribes, consolidate a patient's medical records and provide clinicians with succinct summaries show promise in increasing the efficiency and cost-effectiveness of healthcare delivery [21]. AI shows considerable potential to identify future risk of developing certain pathologies to help guide screening and preventative strategies [22, 23]. AI can serve as a consultation service to facilitate idea generation and ensure quality assurance in each clinical encounter. Using evidence from Randomized Control Trials, AI can calculate risk scores, make investigation recommendations and quantify the probability of each diagnosis given the available information [8, 9]. By identifying medication error and mitigating medical error, implementing AI has shown to be a cost effective and worthwhile endeavor [24]. In the foreseeable future these systems will likely gain the capabilities to identify trends in practice in hospitals and suggest interventions before issues become prevalent.

In regard to research AI has shown immense potential to efficiently conduct literature reviews and meta analyses [25]. Given the vast amounts of data interpretation required for genetic associations of various disorders, AI has shown the potential to be a strong ally in early detection of cancer [23, 26]. For pharmacological research it can harness the power of molecule generation and simulation trials to guide drug development initiatives [23]. Through hypothesis-free discovery, identifying new associations and guiding research toward areas that that warrant further study, the benefits of AI in medicine are likely to grow exponentially.

6 Conclusion

Healthcare systems are challenged with incorporating new and unfamiliar technology into existing systems of practice. It is a delicate balance to hold on to traditions that have endured the test of time while also incorporating new tools and capabilities to ensure the best possible quality of care for our patients. AI will change medical practice, but its effects are not all positive nor all negative. In the meantime, it is our duty to ensure the safety and best available care for our patients. By tailoring all available data to each case, AI can serve as an asset in enhancing diagnostic accuracy and increasing the efficiency of healthcare delivery. We can use AI to facilitate optimize the flaws in our healthcare system, while freeing up time, resources and brainpower to aspects of medicine that require humanism. The ability to contextualize the available information and apply it to the complexity of the human experience requires an empathetic clinician with the best available information and tools at their disposal. The appropriate application of AI in medicine requires the clinical judgement and understanding that to date, only human cognition can provide. AI and humanistic medicine are not opponents. They are both essential pieces that make unique contributions to patient care.

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