

Deep medicine ... Navigating the intersection of technology, cognition and ethics in the digital age of medicine

P D Gopalan,¹ MB ChB, FCA (SA), Cert Crit Care (SA), PhD;

M Pienaar,² MB ChB, MMed (Paed), PhD (Paed), FCPaed (SA), Cert Crit Care (Paed) (SA); **S I Brokensha,³** PhD

¹ Department of Anaesthesiology & Critical Care, Nelson R Mandela School of Medicine, University of KwaZulu-Natal, Durban, South Africa

² Division of Paediatric Critical Care, Department of Paediatrics and Child Health, School of Clinical Medicine, Faculty of Health Sciences, University of the Free State; Interdisciplinary Centre for Digital Futures, University of the Free State, Bloemfontein, South Africa

³ Department of English, University of the Free State, Bloemfontein, South Africa

Corresponding author: P D Gopalan (deangopalan@gmail.com)

The digital expansion in medicine and healthcare has been immense and extremely valuable. The biggest concern in the face of this inevitable growth is how we manage to keep contact with our patients and preserve the human touch so essential in healing. Digital healthcare should not be about technology replacing clinicians. Instead, it should be about augmenting and supplementing healthcare providers to improve the ways in which we deliver personalised healthcare. It is vital that we focus on how we can revitalise the patient-clinician relationship in this digital age.

South Afr J Crit Care 2023;39(3):e1520. <https://doi.org/10.7196/SAJCC.2023.v39i3.1520>

The act of maintaining the physical, mental and spiritual health of human beings and caring for the sick is a powerful ritual that evokes a bond between healers and those under their care. This connection brings to bear deep knowledge, not only of the body, but also of human well-being and flourishing, and the deep relationship between humans and their environment. Throughout its history, this dynamic has included and been mediated by objects, substances, aids and various paraphernalia – technology.

The development of technology has accelerated over time, and modern biomedicine now includes an immense armamentarium of highly engineered molecules, complex machines, advanced diagnostic imaging, advanced pathology, omics and, more recently, advanced digital systems. The development and adoption of these technologies have been accompanied by a perceived hollowing out of the deep aspects of medicine. Such a critique points to technology as the key force in the hollowing out of the craft. The doctor is replaced by a screen. Laying on of hands and the caring acts of sitting and listening are replaced by advanced diagnostics used too easily, and often to the detriment of those subjected to them.^[1] The problem, as the eminent American physician, author and professor for the Theory and Practice of Medicine at Stanford University, Abraham Verghese, says:

We're losing a ritual that I believe is transformative, transcendent, and at the heart of the patient-physician relationship. The ritual of one individual coming to another and telling him things that she would not tell her preacher or rabbi; and then, incredibly, on top of that, disrobing and allowing touch.

The rise of the digital and artificial intelligence (AI) revolution has brought this critique to a new height. Justifiable concerns about the effect of these technologies, especially artificial intelligence in societies, and the implications of a progressively automated world and workplace, are a prominent concern in the discourse around medicine. There

exists a clear paradox. On the one hand, these technologies connect us into an almost shared consciousness. They connect us to each other as never before, where our ideas and identities do not simply belong to us but are part of a larger whole. Contradictorily, while living in the most technologically connected age in the history of civilisation, rates of loneliness have doubled since the 1980s. Loneliness is a growing health problem, especially in the workplace, where our current culture does not often foster social connections and meaningful relationships with our colleagues and with our patients.

These concerns have provoked loud calls to constrain and regulate these technologies. Beyond this, the concerns around the rise of general AI – ‘true artificial intelligence’ – and the increasing agency of machines loom large.

Does constraining these technologies and resisting technological progress resolve the hollowing out of medicine? The discourse around these issues is starkly dualistic in nature. ‘Will doctors ever be replaced by AI?’ is a pervasive question. There is a clear human ‘us’ and a clear inhuman ‘it’ (technology). This stark dualism sustains an untenable impasse in addressing this critique. Paleontologically and anthropologically, technology precedes language. If anything, technology made humans as much as we made technology. Technology is part of our nature – we are, more than any other species, technological creatures and our technologies and morality are intertwined.^[2]

Romantic appeals of a return to our natural state are simply not realistic – technology is our nature. When we write notes on a sheet of paper, our cognitive processes extend out from the arbitrary boundaries of ‘skull and skin’ and encompass the object.^[3] Similarly, when we use a medical device, that device not only acts on the body of our patient, but also (in a contingent way) forms part of the cognitive process of healing as a part of the mind of those using it.

If we accept the assertion that our technology is not dualistically separate from us, we must accept that the hollowing out of medicine

does not arise from the technology, but from ourselves. The use of a ventilator may save a life, or prolong an agonising, inevitable death – it is, however, not the technology that does so, but our own morality expressed through the technology. The hollowing out, therefore, does not necessarily arise from technology. We ourselves may have well become hollowed out. This stage has been long coming and at the confluence of many concerning events – the rise of medical paternalism with modernity, the commercialisation and monetisation of, not only medicine, but also academia, and the rise of managerial institutionalism among others. Those under our care are now ‘clients.’ Medicine is now a branch of government or business. The moral obligation is on us to regain what is lost – both individually and in terms of the politics of healthcare, technology and our times.

Digital and AI systems also offer us new ways of thinking and knowing. They allow us to extend our minds into vast repositories of data and to share and understand these data in new modes. When considering metacognition (thinking about thinking), a new kind of thinking is now possible – thinking *through* or *in* the machine. AI allows us to wield – in our coupling with it – magnificent brute force in our thought now. Vast pools of complex information and relationships can be made sense of with incredible speed. It allows us to think better and think faster. It also allows a new way of learning – every interaction and data point aggregates our knowledge – a learning healthcare system.^[4] In this way, it may also be a tool that allows us to return to the roots of our craft – giving us *Time*.

The rapid development of AI technology is also exploring other novel ways in which thinking may be improved. Inspired by Kahneman’s behavioural psychology framework distinguishing between fast and slow thinking,^[5] and in an attempt to address limitations in AI systems, IBM in partnership with academics is currently working on SOFAI, a cognitive architecture that mimics fast (limbic) and slow (executive) thinking. This process is, in part, intended to scaffold human decision-making processes, taking into account dimensions such as metacognition and ethics, for example.^[6,7]

Focusing on how we think may help to revitalise the patient-clinician relationship in this digital age. Better awareness of our different types of thinking may help to challenge the clinicians’ insufficient presence, given what Bain refers to as ‘the absence of time and the centrality of technology [as] key drivers in medical encounters.’^[1] Trimble and Hamilton urge clinicians to ‘[think] about thinking’ and to get back to the notion of ‘intelligent kindness.’^[8,9] This type of intelligence is not synonymous with being ‘nice’, but ‘inspires and directs the attention and efforts of people and organisations towards building relationships with patients, recognising their needs and treating them well.’^[10] One way to achieve intelligent kindness is for clinicians to place greater emphasis on metacognition, the importance of which is well established in the field of medicine. This necessitates deliberation

which in turn affects performance and may help to re-humanise the clinician-doctor relationship.

Various concerns have been raised with regard to human rights in this digital and AI era of healthcare. Patient’s profiles can be used to assess eligibility for healthcare with real-world inequalities often reproduced within algorithms. AI systems often cannot yet capture the complexity of human experience and need. These systems create centres of power and, if unregulated, pose risks. Digital technology can be used to monitor, categorise and influence; and data are being digitised, monetised and politicised. It is crucial that these technologies be equitably accessible and beneficial to all people and not reflect the inequalities and injustices that have been many centuries in the making. To this end, initiatives such as the adoption of the Viennese Manifesto on Digital Humanism in May 2019 encompassing ten key principles^[11] and, more recently, the development of relevant legislation in the European Union have been key.

Eric Topol in his book *Deep Medicine* gives readers a deep dive into how AI will not only transform the practice of medicine, but also reshape health systems and impact biomedical research.^[12] ‘We currently live in a world of shallow medicine,’ Topol writes. ‘Patients exist in a world of insufficient data, insufficient time, insufficient context, and insufficient presence.’ To counter ‘shallow medicine,’ Topol lays out the three components of what he calls the ‘deep medicine’ model: deep phenotyping, deep learning and, perhaps most importantly, deep empathy and connection.

Perhaps, as some authors suggest, it is time for a new digital Hippocratic Oath!^[13]

1. Bain LE. Revisiting the need for virtue in medical practice: A reflection upon the teaching of Edmund Pellegrino. *Philos Ethics Humanit Med* 2018;13:4. <https://doi.org/10.1186/s13010-018-0057-0>
2. Latour B. Morality and technology: The end of the means. *Theory, Culture & Society* 2002;19(5-6):247-260. <https://doi.org/10.1177/026327602761899246>
3. Clark A, Chalmers D. The extended mind. *Analysis* 1998;58(1):7-19. <http://www.jstor.org/stable/3328150>
4. Budrionis A, Bellika JG. The learning healthcare system: Where are we now? A systematic review. *J Biomed Inform* 2016;64:87-92. <https://doi.org/10.1016/j.jbi.2016.09.018>
5. Kahneman D. *Thinking, fast and slow*. New York: Farrar, Straus & Giroux, 2011.
6. Thinking fast and slow in AI. <https://sites.google.com/view/sofai/home> (accessed 5 September 2023).
7. Tech Talks. <https://bdtechtalks.com/2022/01/24/ai-thinking-fast-and-slow/> (accessed 5 September 2023).
8. Trimble M, Hamilton P. The thinking doctor: Clinical decision making in contemporary medicine. *Clin Med* 2016;16(4):343-346. <https://doi.org/10.7861/clinmedicine.16-4-343>
9. Ballatt J, Campling P. Intelligent kindness: Reforming the culture of healthcare. RCPsych Publications 2011;125-138. <https://doi.org/10.7861/clinmedicine.16-4-343>
10. Campling P. Reforming the culture of healthcare: The case for intelligent kindness. *B J Psych Bull* 2015;39(1):1-5. <https://doi.org/10.1192/pb.bp.114.047449>
11. The Digital Humanism Initiative. <https://dighum.ec.tuwienn.ac.at/wp-content/uploads/2019/05/manifesto.pdf> (accessed 5 September 2023).
12. Topol E. *Deep medicine: How artificial intelligence can make healthcare human again*. New York: Basic Books, 2019.
13. Meskó B, Spiegel B. A revised Hippocratic oath for the era of digital health. *J Med Internet Res* 2022;24(9):e39177. <https://doi.org/10.2196/39177>

Accepted 1 October 2023.