Technological Innovations to Help Solve the Global Healthcare Crisis

Mike Dodsworth
Editorial Assistant

GLARING truths are beginning to emerge and challenge the healthcare sector. Where once it was the prerogative of local and international healthcare systems to focus on facilitating personalised doctor–patient relationships wherein care could be administered through direct consultation, we now are beginning to witness these same bodies struggle to cope with a burgeoning global population and similarly rising costs. Technological innovation could hold some of the answers to these significant logistical hurdles, yet it is important to realise that these exciting new technologies arrive in the healthcare sector accompanied with their own complexities and nuances.

Hard statistics are perhaps the best way to put into context the challenges facing the global healthcare community: 50% of the global population do not have access to essential healthcare services often taken for granted in economically developed countries,[1] including screening colonoscopies and mammograms. The USA alone is predicted to be some 100,000 physicians short of providing optimum care to its population in 2030,[2] whereas from a financial perspective, global healthcare spending is set to rise from an estimated $8 trillion in 2013 to $18 trillion by 2040.[3] By the year 2035, the global shortage of healthcare professionals needed to provide optimum care could reach 13 million.[4] These findings from the World Health Organization (WHO) highlight global healthcare exposure on a scale not previously seen in our time, however this message need not be one of despair, but one of opportunity for innovation.

When speaking at the 2020 Israel International Colorectal Disease Symposium, Dr Wael K. Barsoum, CEO and President of Cleveland Clinic Florida, proclaimed: "We do not have enough healthcare providers in the United States, here in Israel, all around the world, to take care of every patient that needs healthcare; we have to be more thoughtful around how we use our resources." One such resource is the smart phone; it's thought that of the 5 billion individuals with restricted healthcare, around 60% have access to a smart phone.

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Whilst this fact may at first glance seem insignificant, the door smart phones open towards tapping into remote healthcare delivery cannot be understated. The 'True North' concept when applied to healthcare comprises three pillars of optimum management: improving quality, lowering costs, and increasing access. Whereas the last 10–20 years have seen these pillars supported through the innovation of improved tools and products in the surgical and general healthcare industries, looking towards the future this strategy has shifted. Concepts such as big data, artificial intelligence (AI), telemedicine, and augmented reality are leaving their respective induction phases and finding appropriate adoption across a huge number of therapeutic disciplines.

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AI in particular is already offering tangible benefits to healthcare providers. Researchers at Google have recently detailed the design of AI models to pinpoint four findings on human chest X-rays: airspace opacities, nodules and masses, fractures, and pneumothorax. By using thousands of images across data sets with high-quality labels for evaluation, expert radiologists are claiming that the technology demonstrates "radiologist-level" accuracy in identifying these pathologies, as well as at unprecedented speed.[5] Other innovators are following suit: Nvidia have now developed an AI platform that can produce synthetic scans of brain cancer,[6] DeepMind are claiming 94% accuracy in the recommendation of treatments for more than 50 eye diseases using a machine learning algorithm they have created,[7] and Houston Methodist Research Institute researchers have developed software that can accurately diagnose a patient's breast cancer risk 30 times faster than doctors using mammogram results and personal medical history.[8]

This is not to say, however, that opening the floodgates to AI adoption in the clinic is prudent. Whilst AI has developed to a stage at which it can deeply analyse patterns and gain inferences from these patterns, the capacity for cognitive reasoning, i.e., the ability to think independently and make decisions, is some way away yet. Take the management of diabetic patients as an example: although wearable AI devices can monitor blood glucose levels accurately and provide recommendations for changes in insulin dosage,

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these devices cannot take into consideration extenuating circumstances that directly influence clinical decision making, for instance the fact that the patient may live alone and as such could run the risk of unattended dosing complications like diabetic ketoacidosis.

Elsewhere, different technological innovations are in the midst of their own respective debates. Big data platforms such as electronic health records offer highly comprehensive sets of information to the physician and allow predictive analysis based on consideration of multiple lifestyle and medical risk factors, however important questions regarding privacy and confidentiality need to be asked.[9] Telemedicine allows patients to access specialists and information that they might not readily have access to otherwise and massively improves the efficiency of routine processes such as prescription ordering. However, complete buy-in across the patient spectrum will likely be a long process and fears exist as to whether doctors will too-readily resort to telemedicine communications with their patient as opposed to, in certain scenarios, better-suited direct consultation.[10] And augmented reality can help transform the training programme of young surgeons and give them the confidence to perform complex operations; however, there is undoubted risk surrounding conflicting capabilities across hardware platforms and operating systems, not to mention the costs associated.

Regardless of these questions, the healthcare sector is becoming better equipped with an arsenal of technological innovations. Although there are evidently practical considerations to be made regarding digital integration and to what extent this can feasibly occur across the international stage, it is hard not to be impressed by the promising results emerging from clinical studies spanning numerous therapeutic disciplines. Now is a more important time than ever for researchers, innovators, and clinicians from across healthcare to hold constructive discussion with regulatory bodies and governments; only by doing this can we determine the best ways for these developments to translate into better care for the global population.

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