



Medicine for Managers

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Artificial Intelligence and Healthcare

Artificial Intelligence (AI) is perhaps the most powerful and transformative element of computer science ever conceived. It has the potential to revolutionise the delivery of healthcare and to fundamentally transform the practise of medicine. Roy Lilley once wrote; “If you can imagine it, it will happen”. Perhaps AI is unique in being the first area in science where its developments will extend beyond even that which it is possible to imagine.

AI is already influencing healthcare by improving diagnosis and the speed at which it is achieved, by reducing paperwork and by providing customised treatments.

It will rapidly impact on the practise of medicine, the hope is that it will improve the health of the population and make the receipt of care more efficient.

Many believe that AI will rescue healthcare from its most major challenges by addressing the problems of the aging population, acting on the pressures of chronic illness, managing the costs of service provision and creating new methods of healthcare delivery.

Healthcare staffing is a major challenge because of the issues of staff costs and the shortage of appropriately trained staff for many of the health roles. The King's Fund has signalled alarm about the potential future shortages of medical staff but it may well be that AI is able to bridge

the gap between the deficit in supply and demand.

AI is developing at speed at a time when innovative computer technology will provide major facilitation. Cloud computing¹ in particular will drive the safe and effective creation of AI systems in mainstream healthcare delivery

Satya Nadella, Chief Executive of Microsoft, said;

“AI is probably the most transformational technology of our time, and healthcare is perhaps AI’s most pressing application”.

In essence, AI involves manufacture of intelligent machines which can mimic a human’s cognitive functions. Such systems can learn and problem solve. In healthcare, AI will learn from huge existing datasets and continue to learn as further data becomes available. System algorithms will enable AI systems to further

learn and adapt. For example, a patient with symptoms can be compared with a huge group of other patients with similar patterns of illness to provide a differential diagnosis and to identify the most likely disease and how it can be confirmed and treated.

Similarly a radiograph showing a tumour may be compared with vast numbers of radiographs of known tumours to identify and quantify the pathology.

The sixty-four thousand dollar question is how, as AI increasingly comes on stream, it will integrate with the existing medical services, both clinical and administrative.

The optimists laud the benefits of AI and explain that will not replace essential elements of human interaction in medicine but will improve it by making those interactions more accurate, and more effective.

They expect all provisional AI diagnoses to be integrated with human rationalisation and understanding to verify the findings and mark out the appropriate medical pathway.

The skeptics might argue that a glorified computer, armed with almost infinite databases, the ability to ask questions and compare answers, and to create and compare pictures of (say) physical lesions, will be able to find the

most accurate diagnosis for any presented set of symptoms and signs. Any shortcomings in diagnosis or management will be quickly eliminated as the databases grow exponentially.

The result would not be an integrated system but one where the human interactions would be progressively phased out.

Currently AI is not perfect and still makes mistakes, but, as those errors are eliminated, the time will come when any error is vanishingly unlikely.

Of course, the process of involving AI with medical diagnosis, care and management is still in its relatively early stages.

Comparison with traditional methods of investigation and diagnosis is still essential to identify, not only the benefits, but also any potential harm and any ethical or other implications.

Central to its operation will also be the incorporation of systems to evaluate the information and parameters by which the systems operate and to validate the accuracy and appropriateness of all the data provided.

Clearly the goal is to construct systems to ensure that the systems operate statistically more clinically effectively and that appropriate cost savings are made.

Those objectives will be extremely challenging. Furthermore, the monitoring will need to be ongoing and continuous to ensure that no errors, risks or adverse outcomes develop within the operation with ongoing use.

The monitoring provided will have to incorporate data obtained concerning the performance of the system together with any clinical, or safety-related risks and any adverse outcomes from advice, decisions or recommendations made.

In the short-term AI could be introduced to provide healthcare support in reproducible tasks such as, for example, monitoring retinal deterioration in various types of ocular disease, or planning patient management in respect of investigations or chemotherapy or radiotherapy programmes following diagnosis.

Over time, as the system develops, AI will supersede traditional clinical inputs and can be expected to be quicker, more reliable and cheaper.

In the long term AI systems will become increasingly intelligent to provide more accurate and precise patient holistic care.

If the system is as effective as the protagonists propose, diagnosis could become more accurate, healthcare less inefficient, and the patient flow more effective. It could overcome the longstanding criticisms of the current health

provision relating to the fragmented nature of delivery of primary care practice, secondary care consultation facilities, general hospitals and specialist units, which could be linked by a single digital data infrastructure.

AI may be able to transform the delivery of all types of healthcare and, most challenging will be how the existing person-driven systems integrate with the new technology and whether the outcome is one of synergy or substitution.

It may be that a difficulty is reassuring the doctors, nurses and the various clinical staffs that AI should be seen as a means of providing increased skills to be embraced rather than systems to threaten and intimidate .

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1 [Cloud computing is the on-demand delivery of computing services (security, storage, databases and networking, software and payment facilitation). Providers such as Google Cloud and Amazon Web Services will provide computing services with remote data centres and all supporting technology. The use of hard drives etc. will not be required.]