Radiology in the hospital of the future

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Radiology was born in 1895 with Röntgen's discovery of x-rays, a discovery that had an immediate and significant impact on our ability to diagnose and treat trauma and disease. Since then we have seen other major technological advances such as ultrasound, MRI and PET, which have also produced sharp changes in healthcare delivery— and the rate of these changes is speeding up.

Within hospitals, almost every patient admitted will have some sort of imaging procedure. Modern hospital designs have accommodated this by placing radiology departments centrally and more recently providing imaging closer to the patients with CT scanners in emergency departments and point-of-care ultrasound units. At the same time, networked digital imaging has moved the radiologist closer to our clinical colleagues, often in real time—virtually, if not geographically.

Today, the 'buzz' is all about artificial intelligence (AI), with the debate on this technology replacing humans, not just in radiology but throughout the economy. But how realistic is it to think about doctorless hospitals?

As a clinician, I instinctively know patients need to trust they are being looked after by people who care about them. That's why 'healthcare' contains the word 'care' (and why we never hear about 'bankingcare' or 'legalcare'). Health systems of the future will always depend first and foremost on the work of the health professionals who work within them, whether or not they are using augmented reality, teleradiology, convolutional neural networks, robotic radiosurgery or a host of other innovations to practise their medicine.

However, if Stephen Hawking was right when he said robots may replace us entirely,[1] there will be no need for hospitals anyway—just workshops, garages and recharge stations. So why are we hearing that AI will be the end of radiologists?

Many of the stories we read and hear about AI are propagated by the technology makers themselves. These companies are adept at using hype to generate interest in their latest products, which are often only incremental improvements to existing products. This may help them gain more funding and influence, but the hyperbole distracts us from the real benefits new technology brings, which are better tools to aid in faster and more accurate diagnoses. We should 'forget the hype' and concentrate on how we can best use technology in healthcare for those who need it.

For example, the field of radiomics uses sophisticated algorithms to extract clinically valuable data from medical images. With continuing gains in data processing speeds, and software able to learn from experience, the field is growing fast in capability. This is particularly evident in oncology, where we are seeing increasingly automated processes to: segment images into 'areas of interest'; select, extract and analyse tumour features such as size, shape, texture and density; and aid in the prediction of clinical outcomes. Such advances do not spell the end of radiologists. However, it is clear radiomics is likely to change the nature of our work, taking us further away from the interpretation of images and towards the curation of databases on disease processes.[2]

I believe it is crucial all stakeholders work together on the ground rules for the application of any new technology. Many issues arising from discussions about the application of AI in medicine are not fundamentally scientific or even medical in nature. The thorniest issues are the ethical and moral questions raised by the interface between humans and machines. I have already mentioned the importance of trust in healthcare, but there are others.

As machines become more intelligent they will be allowed increasingly to choose between two (or more) non-ideal clinical outcomes, both of which carry a risk of harm. The choice will sometimes depend on human values such as dignity, respect for others and quality of life. Just because the decision is made by a machine doesn't change that. The machine will need some sort of moral code built in, but who will write the code and what biases will be embedded in the decision algorithms as a result? The issue has arisen already in the development of driverless cars[3] and I have no doubt the problem will soon emerge in medical applications of AI.

The same problem arises in legal settings too. If an intelligent machine makes a poor decision in determining a course of treatment for a patient, who is legally liable? The manufacturer? The IT support team?

It is therefore evident governments and health regulators need to be reassured that hospital patients will reap the benefits of technological advancements without being exposed to increased risk or sub-standard care.

Radiologists will continue to embrace these advancements and incorporate them into their work, which is one of the reasons why the professionals our College helps develop are world-class and highly sought after in their field. The future of hospitals and the future of radiology within them will require greater cooperation and interaction among all healthcare professionals to consider not only the development of specific treatments, but also how we can enhance our patients' ability to make choices about how they are looked after while preserving their dignity and respecting their wishes. All the technology in the world cannot replace the human aspect of this.

References

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3. Strang E 2017. How do we navigate the moral compass of machines?. Idealog, 31 January, at idealog.co.nz/casestudies/how-do-we-navigate-moral-compass-machines.

Dr Lance Lawler will be talking about the hospital of the future at 11:45am on Friday 12 October 2018 during day 3 of the World Hospital Congress.

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