

The role of the radiologist in the year 2040: Discuss

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“There are two options: Adapt or die”

Andy Grove

The future of radiology has been the hot topic at many radiology conferences and is viewed both with enthusiasm, by those looking forward to what advances will be made, and trepidation, by those who are concerned that they may find themselves prematurely redundant.

I believe that the first main difference seen in the radiologists role in 2040 will be the change that artificial intelligence (AI) will have made on the diagnostic role that radiologists currently perform. In 2007 even technological optimists would not have predicted that the commercial application of driverless cars would only be a decade away and yet Google’s driverless cars have currently over 700,000 miles of testing on public roads (1). Computer aided diagnostic systems are already in use throughout radiology and can accurately diagnose breast cancer with a higher degree of accuracy than their human counterparts (2) and this use will only increase. A recent case study of AI radiology reporting in action is Entlic, a deep-learning machine system that is engineered for medical image recognition. A trial, which involved analyzing a computerized tomography (CT) scan of a patient’s lungs against three expert human radiologists, found that Enlitic’s system was 50% better at classifying malignant tumors and had a false-negative rate of zero, compared with 7% for the humans (3). If this is where we are at already, it is not unreasonable to imagine that in 23 years AI will be capable of reporting imaging studies (CT or magnetic resonance imaging (MRI)) with a higher accuracy than humans and that these reports will no longer be routinely reported by human radiologists out of hours. Legal aspects will need to be clarified if unsupervised AI reports are to start being issued.

Also demands on radiologic services will continue to increase. As we have seen from the past 30 years, imaging has become more powerful, with resolutions continuing to improve whilst radiation doses have simultaneously dropped, and these advances will continue. Add to this an ageing population, an increased prevalence of comorbidities (4) and that modern medicine is practiced in a more defensive way than in the past and it is easy to see why there will be no slowdown in the burden placed upon radiological services.

Another difference in 2040 will be the continued growth and utilisation of interventional radiology (IR). There will be more elderly patients who may not be fit for anaesthesia but could undergo an IR procedure which would provide them benefit. Concurrently, more and more IR techniques will be perfected to treat conditions and

negate the need for invasive surgery and these procedures will be improved by the increased power of the guiding imaging. AI could play some role here also, as we are already seeing AI lead robotic surgery being developed (5) and it would be well suited to this type of delicate work.

Given the rate of advancement, does this mean there will be no human radiologists in 2040? No. There are several protective factors, the first being that radiologists do much more than just report scans. They will still play a vital role in advising other doctors which scan would be the most appropriate to answer their clinical query. They will also still play a vital role in multidisciplinary team (MDT) meetings and contribute to image analysis and operative planning discussions. It is likely that they will lead clinic with patients to discuss their imaging, as already happens in some hospitals. They will also be needed for performing studies which require operator skill, such as ultrasound and IR procedures.

Dr Strickland (the current head of the Royal College of Radiologists) speaking in 2015 said, "Radiologists need to behave as doctors, not just imagers who issue a report and then go away without any interaction.....radiologists need to make themselves indispensable in order to survive, both by adding to patient care and also adding to our clinical colleagues". I am inclined to agree with these comments and the sentiment that, in order to keep a vital clinical role, radiologists must become and stay actively involved with their colleagues and their patients.

Other factors will also delay any rapid change from the status quo. Even if a fully functional "digital radiologist" was available tomorrow it would still take years for any realistic change to be seen. Whilst AI run systems, once set up and running smoothly, will save costs, the initial start-up costs will be huge. The £11.4 billion wasted on the failed "Lorenzo" IT project (6), whose goal it was to digitise the medical records of the country's 62 million people and allow any hospital to access the medical records of any patient in the country, is a good example that the NHS does not excel at seamless integration of complex IT projects.

New nanotechnologies may soon allow targeted and molecular imaging of tumours and other conditions. Nanoparticle-based contrast agents have already been developed for single-photon emission computed tomography (SPECT), positron emission tomography (PET), MRI, ultrasonography (US), CT and optical imaging. (7). By 2040 nanotechnology will likely be being used to enhance diagnostic accuracy and in IR, in applications which include improved pain control with transdermal local anaesthetics, sustained-release antimicrobials for treatment of infection, and the use of nanocapsules and liposomes as haemoglobin carriers in the development of blood substitutes (8).

In 2040 radiologists will probably be much more like information specialists, having a deeper and broader understanding of diagnoses and treatment pathways than that provided by AI systems. It is the merging of imaging physics and disease biology that will allow radiologists to interpret images in a clinical context and so help guide

clinicians, with correspondingly less involvement in only a single phase of the process. We are already seeing this in today's medical care, where the most valued radiologists are those who solve the problems of clinicians and patients. This will still be the case in 2040 and as Dr Strickland says, "we must add value or become replaceable".

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