

## Radiology: Does It Have a Sell-by Date?

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### Abstract

In a few years we are likely to see 3D images generated instantly, and with comparable resolution to today's 2D views. Inclusion of functional information, possibly at the molecular level, could also assist in clinical decision-making. Some specialist clinicians with intimate knowledge of their field of interest are likely to have a better understanding of the pathology and physiology of an organ system than a general radiologist. So given that the images will be presented in a more familiar format, why should clinicians and surgeons wait for a general radiologist to read them? If radiologists wish to retain their role as the experts in image interpretation, they will not only need a thorough understanding of imaging and radiological anatomy, but also a detailed understanding of pathology and physiology. It is clearly unrealistic to expect most people to gain that knowledge across a range of fields, hence the need for subspecialisation. There are already commercial moves to harness the expertise of superspecialist radiologists, using teleradiology, to provide expert opinions in particularly difficult cases. This is just the beginning of a major shift in the pattern of practice in radiology. The radiology community cannot ignore impending technological developments. If radiologists take no interest in the emergence of highly detailed, user-friendly images, then the clinicians and surgeons will organise their own department-based image interpretation. However, radiologists are very good at adapting to technological change and are very likely to rise to these challenges. Far from having a sell-by date, radiology has a bright future.

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Radiology is riding the crest of a wave. We have superb images, available immediately in all parts of the hospital. Fusion of functional and structural imaging modalities is a reality and molecular imaging is developing fast. Modern radiology increases the effectiveness of treatment, reduces the length of hospital stay and, appropriately used, allows the most efficient use of the healthcare budget. Radiologists see their specialty as a paragon of virtue and they are sometimes surprised when others take a different view. However, the reasons for this discrepancy are obvious: the high capital costs of radiology are all too visible, whereas its benefits are less easily apparent. Furthermore, the lack of patient contact results in the credit for the benefits of radiology accruing to the doctor treating the patient rather than to the specialist interpreting the images.

Radiology has the opportunity to become the discipline that determines the pathways for the management of most diseases and to become the specialty around which future hospitals will be designed. However, in order for these opportunities to be realised, radiologists have to meet a number of challenges: we must increase the spectrum of our knowledge, we must maintain an adequate workforce,

we must increase our research activity and we must make use of opportunities presented by advances in information technology, such as teleradiology and computer-assisted diagnosis. Let us look at each of these challenges in turn.

Radiology is currently facing an information overload. There is a rapid increase in knowledge in all the subspecialties of our discipline. Furthermore, in future, anatomical knowledge will not be sufficient for the interpretation of all diagnostic imaging. It will also be necessary to have a detailed understanding of the pathology and physiology of every organ system, as functional imaging will be an important part of our work. Two possible ways of increasing our knowledge are expansion of the curriculum and increasing subspecialisation. There is a limit to curriculum expansion as we have to avoid undue prolongation of training. Therefore, subspecialisation will become increasingly important. A recent survey has shown that approximately 76% of American radiologists subspecialise to some extent. The main subspecialties are cross-sectional imaging of the body, interventional radiology, breast imaging and neuroradiology. Of course, we have to maintain core knowledge in order to enable

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cross-cover between subspecialties. The American College of Radiology now plans to examine candidates in only a small number of fields and other radiological Colleges are likely to follow its example.

Maintaining an adequate workforce is a second challenge. Very high quality images that are easier for clinicians to interpret are becoming widely available. Many clinical teams now use diagnostic imaging in their work, such as in the planning of neurosurgical operations. In the future, clinicians who have a detailed understanding of the anatomy and physiology of a particular organ system may be able to interpret radiological image better than many “general” radiologists. There are lessons to be learned from what happened in the early 1980s with cardiac imaging: at that time, cardiac fluoroscopic equipment was non-existent and cardiac angiography was often performed “part-time” on radiological equipment, frequently by radiologists. Many arguments were advanced in favour of centralisation of cardiac imaging within radiology departments. It was said that fluoroscopic equipment was expensive and should be used efficiently, that radiographers could only work within radiology departments, that radiologists rather than cardiologists were the experts in image interpretation, and that radiation protection issues should be taken into account. Of course, none of these arguments proved effective in maintaining cardiac imaging within radiology. The battle was lost before it was even fought, partly because radiologists did not have adequate knowledge of cardiac electrophysiology, pressure measurements, pharmacology and clinical cardiology, but mainly because the number of radiologists was insufficient to cope with the workload. This story is being repeated today with cardiac computed tomography (CT). Radiological institutions around the world are responding in different ways to the challenge from cardiologists. The Royal Australian and New Zealand College of Radiologists has set up a conjoint committee for the recognition of training in CT coronary angiography. The American College of Radiology has set up an examination in cardiac CT, providing a certificate of advanced proficiency in this field. Time will tell whether such developments will help to maintain the role of radiologists in this area but one thing is certain: if radiologists want to be involved in cardiac CT, they have to have a detailed understanding of cardiac pathology and physiology. Radiologists have to subspecialise whilst at the same time maintaining sufficient all-round knowledge to ensure an adequate out-of-hours service.

The 3 factors that determine who does what in medicine are expertise, the number of practitioners in a particular discipline, and clinical control of patients. Expertise has to be sufficient for radiologist to “add value” to the contribution of the treating physician. The number of radiologists is already increasing in order to meet the demands of subspecialisation.

In future, radiologists will have to focus on clinical practice. Contact with patients and with referring clinicians is an essential part of modern radiology. It is not sufficient to

react to requests for imaging. It is important to be proactive, guiding the clinician through the various options and to interact appropriately with patients, organising further investigations and providing timely information.

High quality research in radiology has always been a challenge. After all, the fundamental developments in that discipline were made by non-radiologists, starting with the discovery of X-rays by a physicist and continuing with the development of ultrasound by an obstetrician and the invention of CT and magnetic resonance imaging (MRI) by more physicists. Radiologists are still not doing sufficient clinical research, when compared to many other specialties. For example, most of the publications in cardiac CT and cardiac MRI are by cardiologists. There is a need to increase the number of academic posts in radiology and to create partnerships with clinical teams to facilitate research.

Developments in information technology are presenting radiologists with challenges and opportunities at the same time. Computer-assisted diagnosis promises to make an important contribution in large-scale screening and is likely to prove a useful adjunct to expert radiological interpretation. Teleradiology also offers many advantages, which include the ability to offer a radiological service to remote communities, superspecialist consultations, remote supervision of trainees’ work and better out-of-hours services. However, there are also challenges and difficulties relating to teleradiology including the need to monitor the quality of teleradiologists, the importance of providing relevant clinical information to those interpreting radiological images remotely and the difficulties of organising follow-up investigations. Appropriately used, teleradiology should improve the quality of radiological services rather than proving a serious threat to radiology as a specialty.

If radiology does not rise to the challenges ahead, image interpretation by clinicians will increase. If this were to happen, the market would be unlikely to meet the cost of the work of radiologists, when other specialists can interpret the images, making it necessary for radiologists to focus on areas in which there is no significant interest from other specialties, such as plain film interpretation. This scenario is unlikely, because radiologists have always risen to the challenges facing them and have embraced change and progress. Imaging is likely to be used with increasing frequency by non-radiologists. For example, hand-held ultrasound machines are now inexpensive and widely available. Future medical students are likely to learn how to use them and future doctors will incorporate them into their practice. This is a good thing: it is anachronistic to be trying to determine whether ascites is present by palpation and percussion rather than by using a rapid and straightforward ultrasound examination. However, such changes pose no threat to radiologists; a clinician who is focusing on other matters is unlikely to gain sufficient expertise to interpret complex images. Instead, simple imaging by clinicians is

likely to generate more work for radiologists and increase referrals. We should guard against paranoia and should recognise that other specialties are also feeling threatened. For example, in an article in the *Annals of the Royal College of Surgeons*, one of our surgical colleagues called for breast surgeons to embrace diagnostic techniques, warning that, if they did not, “radiology departments may make major inroads into symptomatic breast clinics and that their role in this specialty may become attenuated to that of surgical technicians”.

The basic requirements for a successful radiology service are that it should be clinically relevant, cost-effective and timely. At present there are many examples of inefficiency in the service we provide, partly related to the historical and outdated view of radiologists as technicians who are not directly involved in patient care. Let us consider a patient with haemoptysis presenting to his general practitioner. He is referred for a chest radiograph which shows a “coin lesion”. The report goes to the GP who then refers the patient to the chest clinic. The chest physician arranges a CT which confirms the presence of a nodule in the lung. The case is discussed at a multidisciplinary meeting which decides that a biopsy is indicated. A further delay occurs whilst appropriate

arrangements are made but a biopsy is eventually carried out and confirms the diagnosis. The histology result gets sent to the multidisciplinary meeting where the patient is discussed again. A staging CT is arranged. The result is again discussed at the multidisciplinary meeting and a surgeon is eventually involved. In some cases, the pathway is even longer and can involve PET-CT or mediastinoscopy. There is no excuse for this inefficient use of time and resources. Radiologists should have a proactive role in the investigation of many conditions and arrange further imaging tests as appropriate, without the need for reports to be bounced backwards and forwards between various clinics. It is important for the radiologist to undertake true clinical responsibility and to communicate closely with general practitioners and patients. Such a change, coupled with further subspecialisation will bring many benefits.

I am extremely optimistic about the future of diagnostic imaging. We live in an age in which the information from radiological images has a pivotal role in patient care. There is a need for radiologists to adapt their pattern of practice to the needs of modern medicine. I am confident that they will do so, and believe that the future of our specialty is bright. Radiology has no sell-by date.