The changing face of radiology: from local practice to global network

Julian Adler, Chris Yu and Mineesh Datta

ABSTRACT

- Rapid advances in communications and computing technology have opened up new opportunities for clinical teleradiology.
- The quality of teleradiology reporting, when carried out properly, is on par with onsite reporting, and offers the potential for increased accuracy and improved patient outcomes.
- Local and international industry organisations and professional bodies are creating standards, policies and protocols for every aspect of teleradiology in response to concerns about the use of this technology.
- The key factor for the long-term success of teleradiology has been identified as a commitment to ensuring duty of care to patients (encompassing high-quality service and patient safety) is the first priority.
- Evidence indicates that increased use of teleradiology will be a step forward if managed well, but requires a commitment to excellence, patience and perseverance.

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The world of information technology is advancing at an increasing rate, and the practice of medicine is not immune to the impact of these changes.

Although the basic medical skills of diagnosis, treatment and cure remain relatively stable, technological factors such as Internet bandwidth and rapid improvements in computer technology have opened up new horizons for the function of medical specialties such as clinical radiology. These advances offer the potential for better service and improved patient outcomes, but they also open up many questions and concerns about clinical standards, qualifications, medicolegal issues and duty of care that require careful attention.

"Teleradiology" can be defined as the electronic transmission of radiological images in digital form from one location to another by means of a data communication link provided by a third-party carrier. This usually implies sending images from a primary acquisition site to a secondary location where they are interpreted for the purpose of either official diagnosis or consultation.[1] The practice of teleradiology has moved out of the home office and is now an established and fast growing mainstream professional option for reading and reporting medical images and scans around the globe.[2-4] The opportunities and possibilities for improved patient care, efficient and economical use of resources, greater access to service in remote areas, reduced stress on health care systems, and improved workloads and conditions for radiologists themselves are now well supported.[2,3]

The Royal Australian and New Zealand College of Radiologists (RANZCR) has an established position on teleradiology, as do most professional radiology organisations internationally.[1,4] However, there are a number of questions and issues regarding the internationalisation of teleradiology that must be addressed for its success to continue.

The changing health care environment

The ageing population and rising health care costs are just two of a number of challenges for many health care systems around the world. When combined with the globalisation of health care, corporatisation and commercialisation of health services, a growing shortage of trained experts and rapid advances in technology, it becomes clear why clinical radiology is a particular area of medicine that is undergoing rapid change and adaptation.

Until recently, it was necessary for most medical practice — including radiology — to take place at the same location as the patient. However, with increasing use of radiology for emergency cases out of normal working hours and fewer radiologists to share the workload, this is becoming more difficult to sustain. Night-shifts have always been expected of radiologists. Now, however, demanding overnight shifts are causing staff retention rates to fall, and occupational health and safety concerns are emerging as sleep deprivation has been shown to reduce clinical performance, mood, and next-day effort.[5]

Developing teleradiology capabilities as a solution to this changing health care environment is often criticised because it is commonly associated with the need for cost-cutting. However, this new way of working can offer substantial advantages for patients in many cases. For example, patients may be able to have access to specialised analytical expertise that is not available from local specialists without the often burdensome physical and financial cost of travel.[6]

Provided that quality and standards are not compromised, outsourcing that has a focus on the "bottom line" can also have a beneficial impact on patient care.[6]

Keeping pace with technology

Rapid advances in information technology and communication bandwidth have spawned the equally rapid development of clinical teleradiology. Current computer technology and communication capability, such as picture archiving and communications systems (PACS) and virtual private networks (VPNs) over the Internet, now allow the easy transfer of diagnostic images, of any complexity, to almost any location around the world.[3]

Teleradiology has become a powerful tool that is available to complement the practice of clinical radiology, to make radiology more universally available to patients, to speed diagnosis and management, and to assist in obtaining specialist opinions.[3] International teleradiology is also expanding rapidly, and the possibilities are now only limited by our imagination.[3]

The RANZCR has recognised for some time that teleradiology has become, and will continue to be, an integral part of radiology in Australia.[1,4] The ongoing uptake and increasing reliance on teleradiology are testament to the fact that the quality of reporting (from the correctly selected provider) is at least on par with onsite

reporting, and often increases the efficiency of diagnosis of patients in rural and remote areas.[7]

Globalisation of health care

Health care in the wider context is becoming increasingly globalised,[8] and nowhere is this better evidenced than in international teleradiology. As health care becomes increasingly digitised and as Internet and computer technology advances, many activities such as diagnostic imaging are gradually being rendered borderless.[6]

Several hundred United States hospitals use overseas teleradiology services,[9] and global teleradiology facilities are appearing all around the world in countries such as Colombia, Australia, Canada, South Africa, Nigeria, India (Punjab), Russia (Tomsk), Pakistan, and even the small Pacific atoll of Tokelau.[10]

Unfortunately, those who need this type of technology most tend to have the least access. In sub-Saharan Africa, for example, 14 entire countries do not have a single radiologist,[10] but they would struggle to afford the services potentially on offer from an international teleradiology service provider.

The fact that international teleradiology is growing, despite such issues with inequity of access, is largely the result of the very nature of the concept — that it takes place between countries and continents. A key benefit is the ability to capitalise on time-zone differences, so that radiologists are reading scans during their normal waking hours.[6] For example, American radiologists working in Sydney are reading scans in real time from overnight accident and emergency shifts in the US, while Australian-registered radiologists working from a purpose-built centre in London are reading scans in real time from overnight accident and emergency shifts in Australia.

A radiologist is required to be present for some medical interventions, and in other instances because of regulatory obligations. However, teleradiology prevents the need to wake a radiologist during the night to report on out-of-hours medical images and offers increased reporting capacity to sites where onsite radiologists are overwhelmed with interventional and other responsibilities.

International teleradiology: adoption and challenges

So why does the adoption of international teleradiology differ so greatly around the world,[7,11,12] and what are the challenges preventing the potential benefits of teleradiology being realised? Some common concerns with teleradiology are shown in Box 1.

Both in Australia and overseas, industry organisations and professional bodies are working on creating standards, policies and protocols for every aspect of teleradiology, from staff training and quality assurance to minimum technology standards, insurance and accreditation guarantees, and minimum key performance indicators (KPIs) for reporting accuracy and turnaround time.

RANZCR has formally highlighted the need for establishing a robust foundation of quality and safety principles as an essential first step when developing standards for the use of international teleradiology.[4] Both the American College of Radiology and RANZCR recommend that radiologists who perform distant readings be board-certified and carry licences and malpractice coverage in the state where the image was obtained, as well as appropriate credentials at the source facility.[1,9]

On the global front, the International Radiology Quality Network (IRQN) has developed a set of international clinical teleradiology principles to guide quality care and ensure patient safety. In short, these principles emphasise that the implementation of international clinical teleradiology must be based, first and foremost, on what is best for the patient.[8]

In many cases, teleradiology will actually allow greater efficiency than traditional onsite radiology services, because sharing facilities and specialist expertise among many institutions brings with it increased opportunity for specialisation, centralisation, standardisation and reproducibility.[16]

Growth in size can, however, be a double-edged sword. An objection often raised is the tendency for large radiology companies and health care providers to treat teleradiology as a commodity instead of as a community service. There is no doubt that it would be highly undesirable if teleradiology were viewed purely as a technical exercise, driven by the need for cost-saving and convenience for the medical practitioner, with little consideration given to quality of service or patient safety.[17] If this pitfall can be avoided by, for example, ensuring the availability of real-time telephone contact between the teleradiologist and the referring physician, specialist radiologists can still make a pivotal contribution to clinical decision making and management.[8]

The need to look past cost-saving when deciding on teleradiology solutions has also been highlighted in a "white paper" on teleradiology developed by the European Society of Radiology (ESR) for the European Union. The ESR Board said it is "essential that the provision of teleradiology is primarily developed in the best interest of patient care and not as a solution for the shortage of radiologists or as a cost-cutting measure . . ."[17]

There is also some reluctance to adopt a solution that takes radiology services away from the local workforce.[11,14] When the chief executive officer of the Canadian Association of Radiologists suggested teleradiology as a solution to Canada's alarming shortage of radiologists and lengthy radiology waiting lists, the Association called for his resignation, and a campaign was launched asking members to cancel their Association memberships.[11]

The key rebuttal to such reactions, and for addressing many of the concerns and issues raised above, is for radiologists and health care administrators to ensure their duty of care to patients is maintained above all else, and that high-quality service and patient safety are in no way compromised when changing to new systems or modes of practice.[14]

The Australian situation

Teleradiology in Australia — ranging from the simple transmission of images from one part of a hospital to another, to the delivery of full-service offsite image reading and reporting — is one of the

1 Issues commonly raised in arguments against the adoption of teleradiology[2,9,11,13-15]

- Patient consent
- Privacy concerns
- Data protection
- Medical liability and legal issues
- Insurance coverage
- Language barriers
- Technical compatibility
- Infrastructure
- Standard and quality of training and experience ◆

2 Teleradiology use in Australia in 2006[2]

- 67% of radiologists used teleradiology
  - 92% of these operated within their own state
  - 22% of these used teleradiology between states
  - 2% of these used international teleradiology
- Productivity was increased in 77% of patient cases ◆

most widely used technologies for day-to-day service delivery, management of patients, and mentoring of rural and remote doctors and nurses through interaction with specialist colleagues.[18] Some facts about teleradiology use in Australia are shown in Box 2. The benefits of teleradiology within Australia are attractive, not only because of our geography with far-flung country towns and regional centres, but because our local radiology workforce is dwindling in comparison with demand.

RANZCR expects the demand for radiologists and diagnostic imaging services in Australia to exceed supply at least until the middle of the next decade. Coupled with this is the ever-increasing complexity and diagnostic ability of imaging technology, requiring greater reading time and technical skill. In many ways, modern radiologists are the victims of their own success.[14]

From a delivery point of view, it is concerning that it has taken over 10 years for remote teleradiology services to become generally available.[18] The uptake figure of 67% (quoted in Box 2) covers all types of teleradiology, including the simple transfer of images from one part of a hospital to another, and "load-sharing", where images are transferred between different nodes within one health care group.

When it comes to using a complete offsite teleradiology reporting solution, Australia has been relatively slow to embrace the full offering, particularly in the public health system, even though such a solution offers cost-effective relief for crippling workforce shortages. Some say this lack of uptake points to a need for a connection between the conduct of studies, evaluation of the technology, and the activities of health planners and administrators to ensure the rapid implementation of communications systems that will improve quality health care.[18] Others argue that the main barrier to teleradiology in Australia is the cost of uplink bandwidth. While it is true that bandwidth availability is lower in Australia than in other countries, and teleradiology would be improved if data lines were cheaper and faster, this is not a major barrier to uptake.

Rising to the international challenge

In order for the international teleradiology model to work, acceptance and approval will be required, not only from the radiology community, but also from referring physicians and their patients.[15] Key factors when considering international teleradiology are shown in Box 3.

There are national radiology-specific accreditation programs in many countries, yet a set of internationally developed standards for radiology does not yet exist, let alone an international standard for teleradiology.[12]

During the International Society of Radiology-sponsored World Leadership Council meeting in 2004, a resolution was passed that the profession should work towards a set of uniform international standards for clinical teleradiogy.[12] As a result, the IRQN has developed a "Top 10 Principles of International Clinical Teleradiology", which was approved by members in 2008. While this is an evolving document to be refined over time, it goes some way to setting up a formal international standard for teleradiology practitioners.

3 Key factors in considering international teleradiology

- Shortages of radiologists and increasing demand for services, often 24 hours a day, as a result of the ageing of the population, better disease management and improved health services[11,19,20]
- Growing reluctance of radiologists to provide after-hours services
- Regulation and standards[17,21]
- Registration and insurance[8,12]
- Language barriers[17]
- Varying local medical standards
- Access to technology
- Staff resistance to adopting new technology[11,22] ◆

Conclusion

The ability to transfer digital images seamlessly around the world has globalised a previously localised medical specialty. There are few areas of medicine that could adapt to such a change so readily. Radiology is showing that it can not only cope with this transition, but can actually embrace new technology and harness it to improve speed of delivery, accuracy, reporting quality, cost-effectiveness and patient outcomes.

An important factor in the success of quality teleradiology services will be maintaining open channels of communication. Radiologists must ensure they maintain relationships with referring clinicians and practice staff that are the equal of those that would occur in the onsite environment.[7]

Using radiologists and diagnostic imaging wisely will reduce the burden on the entire health care system by improving diagnosis and management.[8] Indeed, much of the evidence indicates that an increased use of teleradiology will be a great step forward if managed well; however, success will require long-term commitment to excellence, patience and perseverance.[8]

Competing interests

Julian Adler is a director of the Australian-based teleradiology company Imaging Partners Online. Chris Yu and Mineesh Datta practise in the Australian public health care system and are employed as consultant radiologists with Imaging Partners Online.

Author details

Julian Adler, MB BS(Hons), FRANZCR, Clinical Director[1]
Chris Yu, MB BS, FRANZCR, Radiologist[2]
Mineesh Datta, MB BS, FRANZCR, Radiological Anatomy Lecturer and Radiology Tutor,[3] and Radiologist[4]
1 Imaging Partners Online, Sydney, NSW.
2 Imaging Partners Online, Wollongong, NSW.
3 University of Melbourne, Melbourne, VIC.
4 Western General Hospital, Melbourne, VIC.
Correspondence: jadler@imagingpartners.com.au

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