Focus

New standards hasten move to teleradiology

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Introduction

What is teleradiology?

Teleradiology is the process of sending digital radiographic images from one location to another via computer-assisted transmission. The image is normally sent via standard phone lines or over a local area network (LAN). Through teleradiology, images can be sent to another part of a hospital, across the country or around the world. The teleradiology process normally involves image acquisition and transmission at one location, and image reception and viewing at another.

The benefits of using teleradiology

The use of teleradiology has increased dramatically over the last several years. Underscoring the need for teleradiology is the health system's new emphasis on efficiency as a response to limited funding and a changing environment.

Teleradiology provides both practical and economic benefits. It essentially allows the radiologist to be in all places at all times for the interpretation of diagnostic images.

More specifically teleradiology:

- Allows for the provision of services to remote or less populated regions. A service can now be economically provided to those regions where it has been uneconomic in the past.
- Provides for timely access to a skilled service. There are no delays while waiting for the radiologist to travel or for the films to arrive. The diagnostic images are transmitted to wherever the radiologist is within minutes.
- Allows full utilisation of radiologists. One radiologist can easily service several remote sites. It is no longer necessary to have radiologists travelling from one small site to the next to read studies, or to have radiologists idle at under-utilised facilities.
- Provides all the benefits of electronic digital radiology. Images can be enhanced to achieve specialised diagnostic objectives. Many copies of an image can exist at once. Images cannot be lost.
- Allows for efficient consultation with other experts. A difficult study can be discussed with another expert who could be located anywhere in the world.

Historical development of teleradiology

Teleradiology is a system that is technologically demanding and this has been the main hindrance to its development. The technology required to make teleradiology possible has been available for the last decade, but it has only been in the last year or two that it has become fast, reliable and inexpensive enough to make it feasible for mainstream use.

Early attempts at providing diagnostic image interpretation via teleradiology involved digitising an analogue image or filming an x-ray with a TV camera. The data was transmitted very slowly over conventional phone lines to another location where a specialist would view the images on a TV screen. The early systems were only useful in a very limited number of cases and evaluation of these systems regarding their use for primary diagnosis of radiographic images revealed many technical shortcomings. The image resolution was too low, transmission time too long, storage and retrieval of images was too slow and expensive and the image could not be enhanced while viewing.

The US Department of Defense was quick to realise the potential of tele-radiology and was responsible for much of the early development. Of equal importance were the guidelines they developed defining system specifications and the level of functionality required to support primary diagnosis of radiographic images this way.

With the advent of high resolution film scanners, very fast modems and high brightness/high resolution viewing monitors, all of which are available for use with the personal computer, technology is no longer a barrier to development.

Where are we today and what of the future?

With a basic teleradiology system, the network is just a couple of modems connecting to the public phone system. In some cases, where more elaborate data circuits are not available, this is still a good option. A typical application would be to have a film digitising workstation located in an area not serviced by a radiologist. It will be used to send images to a viewing station in a larger centre. The images are sent over the public phone system by the film digitising station dialling the image viewing station, using modems. Often, with a basic teleradiology system, the transmission method can be proprietary _ it is often not possible to use one vendor's sending station to connect to another vendor's viewing station. The speed of transmission is variable depending on line quality but will be about 30,000 bps (bits per second) over a standard phone line. At this speed, a full size chest x-ray with 10: 1 compression will take about 2.5 minutes to send.

All the technological demands of tele-radiology can now be addressed with readily available and relatively inexpensive hardware and software. Rapid technological developments point to teleradiology systems with higher image resolution, greater speed and more functional viewing platforms.

The development of the DICOM 3 (Digital Image Communication in Medicine) standard by the American College of Radiology (ACR) and the National Electrical Manufacturer's Association (NEMA) has hastened the move to digital technology both for teleradiology and storage of images. DICOM 3 is a standard that provides a framework for medical imaging communication. It has strong support among radiology equipment vendors, with most new equipment offering communication to the DICOM standard. Two of the main benefits to arise from this are:

- increased equipment compatibility among vendors
- the ability to capture digital images directly from the imaging modalities in a common format.

A DICOM Imaging Network can be operated over the public phone system but is more likely to operate over digital data lines and ethernet networks. The transmission speeds can be anywhere from 33,000 bps (Modem), 64,000 bps (ISDN) to 100,000,000 pbs (fast network).

The first teleradiology system installed in New Zealand was in Whangarei by Northern Radiology, with a link between Whangarei and Kerikeri. Northern Radiology now has three teleradiology units, which provide a fast and efficient service within Whangarei and to peripheral areas.

Christchurch Radiology Group has been using teleradiology since June 1996. Initially it was employed in Greymouth and this year the facility was expanded to include Timaru. Images of all modalities except mammography are digitised and sent via dedicated telephone lines. They are received on high definition monitors in the Christchurch branches.

Referring doctors in Greymouth and Timaru now have immediate access to a radiologist's report on those days when a radiologist is not available in their city.

There is also the opportunity for consultation with an appropriate sub-specialist in Christchurch. Images from the Greymouth CT scanner can be transmitted and assist in rapid decision making as to whether to transfer a patient to Christchurch.

With the trend for radiology to move from a film to a digital medium, the use of teleradiology will become widespread. It will no longer be thought of as a separate procedure requiring special equipment. It will become standard procedure in any diagnostic imaging department/practice to send radiographic images outside the practice as a matter of course.

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