

Computers In Teleradiology

¹Anand Ramdhumal, ²Juber Shaikh

^{1,2}Master of Computer Application, IMCOST, Mumbai University, Mumbai, India

Abstract: With the widespread use of the Internet, standard browsers are widely available in radiological and clinical departments. So far the limited speed of the Internet has made teleradiology via the Internet too slow for practical use, but many hospital LANs are now connected to the World Wide Web through high speed access. The new JavaScript technology has made it possible to view examinations with web browsers as simple images instead of sending the full examination data. The full data from the examination remains on the server in the radiology department. If changes in window, level, size, zoom factor etc. are required, corrections are made locally in the web browser with JavaScript, and a new simple image is sent from the server. Web browser technology is now offered by most PACS companies and a new de facto standard for image viewing is emerging. © 2001 Elsevier Science Ireland Ltd. All rights reserved.

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I. INTRODUCTION

- Teleradiology is a tool for sending images obtained by a modality of radiology and for viewing them at a distance.
- Inside the hospital, images can be viewed in other departments, by clinicians or even in the radiologist's own office only a few meters away from the department
- Between hospitals, teleradiology can be used for teleconsulting, getting old images for comparison or for illustrating a reported finding.
- It can be used for on duty reporting from the radiologist's home or for sending images to rare users like specialists in remote locations.
- Initially, transmission of images was slow and limited to a relatively low definition . one of CT studies but now large dataset of MR and high-resolution studies such as chest radiograph can be transmitted without significant loss of data.
- Commercially available products Web browser technology is already offered by many PACS companies as well as some manufacturers of MRI and CT units.

II. JAVASCRIPT LIBRARY

3. The Java Script Java is a computer language for open crossplatform environment programming. It was first announced by SUN Microsystems [3] and Netscape [4] in December 1995, and later endorsed by most major players of the Internet industry including Microsoft [5]. JavaScript enables programmers to integrate Java-based programs, so called applets, into WWW home pages so they may be run from any Internet browser. An applet can give the end user the full interface of the Java program that takes over the entire screen. The program is not running in a frame in the browser, but it is using the whole monitor area, although it is in fact running over the Internet connection. Java technology makes it possible to view examinations with web browsers as simple images instead of sending the full examination data. Java lets one view the examination first as small and fast transmittable thumbnails. Selected images can then be requested in full size but still sent as simple images of low data size. The full data of the examination remains on the server in the radiology department. If changes in window, level, size, zoom factor, etc. are required, corrections are made locally in the web browser by a Javascript procedure, and a new simple image is sent from the server. Distance and region of interest (ROI) measurements are also possible.

III. ADVANTAGES AND DISADVANTAGES OF TELERADIOLOGY

- **Teleradiology save money:** Teleradiology solutions eliminate the need for travel and allow radiologists to work from anywhere that is most convenient and cost-efficient. Hospitals of all sizes can benefit from the strategic use **teleradiology solutions**. Reduced [radiology costs](#), immediate imaging results, and improved access all make a hospital more competitive and better able to serve the needs of their patients.
- **Teleradiology saves time:** Teleradiology solutions enable radiologists to have immediate access to medical images over the internet via secure telecommunication links. The result is faster access to highly specialized medical imaging reports and consultative services, all while limiting costs and overhead.
- **Teleradiology improves access to care:** Teleradiology means access to subspecialty radiologists in regions where health care disparities arise.
- **More efficient use of radiology infrastructure.** Hospitals that are focused on general radiological services can use Teleradiology to send images of complex problems to major medical centers for evaluation. In addition, via Teleradiology a clinical radiologist may seek a second opinion from a specialist without transferring the patient, thus minimizing patient discomfort and improving efficiency of service delivery.
- **Improved access to care.** This technology is predicted to play a significant role in improving service to rural areas, and has the potential to alleviate the current shortage of radiologists. Teleradiology means access to subspecialty radiologists in regions where healthcare disparities arise.
- **After hour service.** Teleradiology allows medical facilities to provide around the clock coverage while relieving the radiologists from the burden of being on-call at night.

Disadvantages

- **Speed :**
- **Security :**
- **Image Quality :**

IV. GUIDELINES FOR THE DEVELOPMENT AND USE OF TELERADIOLOGY

- (1)The principle that the patient is best served by a close liaison between the patient, the clinicians and the clinical radiology department should be paramount. The provision of teleradiology services should not diminish the strength of the local provision of radiology services close to the patient.
- (2) Teleradiology referrals should be in the majority of cases organised between clinical radiologists and the teleradiology centre. It is important that the local radiologists act as practitioners under the EU Euratom directive in order to ensure that appropriate investigations are performed and to justify any further investigations suggested by the reporting radiologist.
- (3) The agreement and full acquiescence of local radiologists should be obtained in order for the development of teleradiology services to be implemented.
- (4) Teleradiology services developed for rural areas should be linked to the nearest substantive radiology department and the service should be managed by that department. The radiologists involved in providing the service should have close communication with the referring clinicians and patients and should understand any particular local disease and cultural factors.
- (5) The radiologists providing the service must be properly accredited and registered within the European Community. They should be formally registered in the country in which the teleradiology services are being provided, and should also be registered and subject to quality and revalidation requirements of the EU member state for which they wish to provide teleradiology services.
- (6) Under no circumstances should teleradiology reports be made by radiologists in training and the implementation of teleradiology should not be to the detriment of the training in the originating centre.

- (7) The use of subspecialty services should be for the benefit of a second opinion or for the immediate transfer of patients to specialist centres and not for the centralisation of subspecialty reporting away from general hospitals.
- (8) The reporting radiologist of the teleradiology service must be able to communicate directly with the referring radiology department and clinicians in order to discuss the clinical background and unexpected diagnosis which may be relevant to the timely management of the patient. The contact phone number of the reporting radiologist should be provided on the report.
- (9) The equipment used to undertake the whole process of teleradiology must be of a quality and standard that provide diagnostic quality images at all times.
- (10) Proper audit procedures should be in place in order to check the quality of the teleradiology service, the accuracy of the radiological reports and the overall therapeutic and clinical impact of the service.

V. CONCLUSION

Teleradiology is already being used around the world and will become commonplace, as information transfer networks increase in capacity and extent. Teleradiology must be used for the benefit of patient care and should raise not diminish quality. Teleradiology should not be developed simply to provide a low-cost reporting service through cross-border service provision. Radiological reports are more analogous to clinical consultations than simply numerical biochemical results. Teleradiology services should be managed by referring radiologists in order to preserve multi-disciplinary care for the benefit of patients and to support radiologists to improve the quality of diagnosis in complex or specialist problems. There must be clearly defined and agreed processes of image transfer, prioritisation of reporting, reporting styles, interaction with host departments, host hospitals and primary care doctors and agreement protocols. The legal framework and patient safeguards under which teleradiology services develop must be robust. The teleradiology literature has mainly consisted of technical evaluations. There have been few economic and clinical impact assessments (38, 39, 40, 41, 42, 43, 44). Prospective comprehensive cost benefit analyses need to be undertaken to determine its appropriate applications. Population/hospital effects as well as individual benefits need to be measured

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