

## **TELERADIOLOGY: A REVIEW ARTICLE**

### **Abstract:**

Teleradiology is the process of the transmission of radiographic images from one location to another. The demand for diagnostic and image interpretation services in radiology is growing rapidly all over the world. Teleradiology has made it possible to use the Internet for accessing images and patient findings, to view and write radiological reports on any computer in any location. It may also provide a platform for timely interpretations and secondary consultations to users in different locations. Fast communication and image transfer systems are used to draw on the expertise of distantly located radiologists. If appropriately utilized, teleradiology can bring about positive changes in improving access to radiologic interpretations and thus significantly improve patient care.

**Keywords:** Teleradiology, CT scanners, data transfer teleradiology, Teleradiology Solutions.

### **Contributors:**

1. Dr. T. Sridhar, MDS
2. Dr. M. Pavani, MDS
3. Dr. B. Karthika, MDS
4. Dr. Naina Sam, BDS

### **Department and Institution:**

Department of Oral Medicine and Radiology,  
Priyadarshini Dental College and Hospital, Thiruvallur city, Tamil Nadu

### **Corresponding Author:**

Dr. M. Pavani, MDS

## Introduction

Telemedicine is a broad term which includes all methods where the doctor-patient interaction is not direct and some form of telecommunication is used. Also called telehealth, online health, or e-health, telemedicine has evolved a long way since it began. Teleradiology is a branch of telemedicine in which telecommunication systems are used for the transmission of radiological images from one location to another. Interpretation of all radiographic images, imaging studies, such as X-rays, CT, MRI, and ultrasound.

The earliest efforts in teleradiology were made back in 1929, when dental x-rays were transmitted with the help of telegraph to a distant location. [1] The potential for image transmission is virtually limitless which results in major changes to the way radiological services are provided. This change has advantages but also has potential disadvantages regarding the quality of care provided to patients and to the radiologist's interaction with their clinical colleagues. It is important however, that the quality of radiological services provided for the patient, are of a high standard. [2, 3] For data transfer teleradiology uses the Global System for Mobile Telecommunications (GSM), General Packet Radio Service (GPRS) and 3G systems, which allow the transmission of multimedia content at high speed. [4] Another reason for the growth of teleradiology is that most parts of rural India do not have good radiological services and personnel. With teleradiology, this deficiency can be overcome by using the help of more experienced personnel in the larger centres in the cities. Also, even in the cities, not all imaging centres have subspecialty expertise; difficult cases in specific areas of radiology can be sent to experts for their opinion.

The technology factors holding back teleradiology all changed dramatically in the past 10–12 years with the introduction of lower-cost communications systems such as the Internet, incredible improvements in price versus performance for computers, and wide adoption of

picture archiving and communications systems by radiology practices. At the same time, medical imaging underwent a transformation from image recording and viewing on film images to the potential for direct digital capture and computer work station viewing of images through all modalities. [5, 6]

### **Benefits of teleradiology**

The benefits of teleradiology are: modernization of the radiology centre; digitalization of radiological apparatus; the possibility of obtaining text information, radiological images, video or moving images, their interpretation and sending back to determined destination via Internet; mutual consultations between remote radiologists and other specialists about received information such as x-ray images, US, CT, MRI, PET scans and other biomedical signals; tele-education of radiologists and other medical staff as an additional possibility for improvement in medicine, radiology and other fields of medicine; interactive use of electronic medical records; medical monitoring and alarm connecting patients on home care and emergency centre; transfer of radiological research data; improving health care; reduction and limitation of the growth of costs in radiology; maintaining the quality of radiological services etc. [7, 8]

Advantages for patients from teleradiology usage are: the availability of top radiologists for the interpretation of findings; radiological findings are obtained without the travel costs and accommodation in one of health care institutions; absence from work and uncertainty of the patient are minimized because the radiologic findings or other opinions are obtained in a very short notice etc. [10]

## **History of Teleradiology in India**

The practice of teleradiology in India occurred not more than a decade ago. The first successful use of teleradiology in India was in 1996 by a private-sector imaging centre called Jankharia Imaging in Mumbai. A simple system for transferring images from the imaging centre to the homes of the individual doctors was set up, primarily, to report emergency CT scans. The first public demonstration of teleradiology in practice was made by Siemens at the Annual Congress of the Indian Radiology and Imaging Association (IRIA) in 1997, where they demonstrated the transfer of radiological images from a Siemens AR.C scanner to the conference site. Subsequently, Wipro GE demonstrated teleradiology capabilities for their entire range of scanners.

The first teleradiology company in India, Teleradiology Solutions, was set up in 2002 with its base in Bangalore. Dr Arjun Kalyanpur and his colleagues, all US board-certified radiologists, read scans for hospitals in the USA; these services were offered for places in Singapore and India as well. Wipro Technologies has been an early mover in providing nighthawk and 3D reconstruction services. Many companies have announced their intentions to enter this market and some small enterprises provide services for preliminary reads. [11]

## **Disadvantages of teleradiology**

The barriers for successful implementation of teleradiology include: problems with telecommunications, energy problems, high price and unavailability of the Internet.

Meeting the goals of teleradiology ultimately, is by off-site image interpretation is to provide better and faster delivery of patient care.

Maintaining the manpower requirements to provide immediate attention to potentially critical patients during these situations can be very inefficient for the vast majority of time. This can be true for small departments where even a single radiologist is not needed for most of the

overnight hours and for larger departments where a single radiologist may have difficulty keeping up during the busiest times, but 2 radiologists would be unnecessary most of the time. [13] Teleradiology should not result in weaker relationships between radiologists and colleagues in other fields. If referring physicians do not see a teleradiologist's face, effort should be made to ensure that they are teleradiologist's voice and identity.

### **Current situations and issues:-**

#### **International outsourcing**

1. Cost: An MRI in India, performed on a state-of-the-art scanner, costs Rs. 6000 (approx. 150 USD). The professional fee component is usually 10-15%, i.e., 15–25 USD. At these rates, having an Indian radiologist report outsourced scans can offer a significant monetary advantage.
2. Cheap labour: The salary of an Indian radiologist working in the field of CT and MRI, 5 years post-MD (Indian board certification), would usually be close to or less than Rs. 2 lakhs per month (i.e., approximately 5000 USD per month or 60,000 USD per year) [12]; in contrast, a comparably qualified radiologist in the USA would be earning approximately 350,000 USD per year [14].
3. Time difference: The time difference between the USA and India is a distinct advantage, especially for nighthawk services. When it is night in the USA, it is daytime in India; this means that it would be possible for an Indian radiologist, working during the daytime, to interpret images with better quality and a greater accuracy than would the US radiologist in his night shift hours.

4. Skilled support staff: India also has a distinct advantage in the form of high-calibre information technology (IT) and business process outsourcing (BPO) manpower, as also a great number of engineers trained in the basic skills required for off shore jobs.

### **National Teleradiology**

The main issues affecting the growth of teleradiology within the country are the following:

1. Cost: Radiology studies in this country have low cost, and centres can find it difficult to afford the services of teleradiologists.
2. Quality issues: Many rural and semi urban centres do not have qualified radiologists but they do not mind the lack of quality of reporting and often leave it to the referring clinicians to read the images themselves.

The need of teleradiology though is considerable. Many district hospitals have CT scanners, but qualified and competent radiologists are very few. Most such hospitals are government and municipal facilities, and it has been difficult to get them to go in for teleradiology solutions from private practitioners. This is despite the request by ex-President Dr Abdul Kalam, who advised those concerned to take advantage of the benefits of telemedicine for helping the poor and needy in the rural areas in a cost-effective manner [15].

### **Other potential applications of teleradiology:-**

#### **1. Research**

Many research groups or clinical research outsourcing (CRO) practices need radiology images to be reported. Here there are very few entry barriers therefore significant scope for teleradiology outsourcing in this area.

## 2. Teaching

Using multiple Web-based applications that allow real-time display of presentations, lectures can be now taken for audiences across the globe.

## Conclusion

Teleradiology has grown into a global service with almost unlimited possibilities. The realization of this concept of teleradiology includes having appropriate hardware and software resource and the use of modern radiological equipment. Teleradiology has potential as a business model. However, numerous issues have prevented its growth in India. Teleradiology today forms the future of radiology.

## References

1. Sending dental X-rays by telegraph. *Dent Radiogr Photogr.* 1929; 2:16.
2. Berlin L. Communicating findings of radiological examinations: Whither goest the radiologist's duty? *Am. J. Roentgenol.* 2002; 178: 809-815.
3. Dalla Palma L., Stacul F. et al. Relationships between Radiologists and Clinicians: Results of three surveys. *Clin. Radiol.* 2000; 55: 602-605.
4. Telemedicina. Institut za onkologiju Vojvodine. Sremska Kamenica, Srbija. [www.onk.ns.ac.rs/telemedicina2.htm](http://www.onk.ns.ac.rs/telemedicina2.htm) (Last: 12. May 2015.)
5. Thrall JH. Reinventing radiology in the digital age. I. The all-digital department. *Radiology* 2005; 236:382–385.
6. 12. Thrall JH. Reinventing radiology in the digital age. II. New directions and new stakeholder value. *Radiology* 2005; 237:15–18.

7. Teleradiological Alfa imaging. Ostalo. Teleradiologija. [www.alphaimaging.rs](http://www.alphaimaging.rs) (Last: 12. May 2015.)
8. Telemedicine. Data control. First telemedicine site of Serbia <http://www.telemed.co.rs> (Last: 12. May 2015)
9. Teleradiology: The Indian perspective Nishigandha Burute and Bhavin Jankharia
10. Mobilnaradiologija. Infomedica. <http://www.infomedica.hr> (Last: 12. May 2012.)
11. Teleradiology: the Indian perspective Nishigandha Burute and Bhavin Jankharia  
[www.ncbi.nlm.gov/pmc/articles/PMC2747412](http://www.ncbi.nlm.gov/pmc/articles/PMC2747412)
12. Perednia DA, Allen A. Telemedicine technology and clinical applications. JAMA. 1995; 273:483–488.
13. Levy F, Yu KH. IPC. Massachusetts Institute of Technology; 2006. Offshoring radiology services to India; p. 3. (Working Paper Series).
14. Some U.S. hospitals outsourcing work. Shortage of radiologists spurs growing telemedicine trend MSNBC news. 2004 Dec 6;
15. Kalam Urges for Using Tele-radiology to Help Rural Poor. News on IT in Healthcare. Med India. 2007. Jun 30, Saturday