

TELERADIOLOGY BETWEEN AFGHANISTAN AND PAKISTAN: ONE YEAR EXPERIENCE

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ABSTRACT

Teleradiology, one of the oldest branches of telemedicine, is now being practiced as a routine between a 90-bed Child health hospital in Afghanistan and a 500-bed tertiary healthcare hospital of Pakistan. Behind this successful story of teleradiology model, there were different kind of challenges faced by the team of professionals who worked to make this project a reality. This article summarizes those challenges and the key factors that helped in integrating teleradiology between the hospitals of developing world.

Introduction

Teleradiology is one of the most extensively developed areas of telemedicine. There are no doubts about its added value to distant healthcare, particularly in reference to diagnostic imaging consultations. Teleradiology can help ensure secondary consultation and improve medical education. When used in established setups, teleradiology can help building the environment with new opportunities, making it possible to share diagnostic expertise distantly.

Teleradiology, by its definition, is a mean of providing the diagnostic services for radiological image acquired at distant location. Back in June 2007, same kind of setup was established between French Medical Institute for Child health (FMIC), Kabul (Afghanistan) and Aga Khan University Hospital (AKUH), Karachi (Pakistan).^{1,2,3} The model is being used for diagnostic services for CT scan studies and medical education. For making this project a sustainable model, various organizations contributed from technical, financial and logistic ends. These organizations include Roshan⁴, a member of Aga Khan Fund for Economic Development⁵, CISCO⁶ and Al-Moyed. Now with an average of two CT studies a day and one tele-education session a month, Radiology department (AKUH)⁷ is providing services to Radiology department at FMIC.

Challenges

While establishing reliable tele-link across an international border, much emphasis was placed on the technological aspects involved, but we realized this project was much more challenging than just overcoming physical distance. From the technical linking to the clinical use, we came across many challenges that probably had not been mentioned in literature focusing on developing world.

As anticipated, logistic support for the equipment transfer to the site in Afghanistan was not that difficult, than to configure the system while sitting in Karachi. Besides, shortage of local technical expertise to properly hook-up the gadgets and reliable support structure was another difficult task.

The real challenge, after establishing the tele-link, was to successfully integrate teleradiology information into workflow of different professionals working thousands of miles away. These professionals were primarily radiologists and transcriptionists from both the sides. Few questions which arose were, how one can know that new study has been forwarded for reporting? Where is the clinical information of this CT study? What is the surety of patient data integrity and security? What steps do radiologists need to do for authentic reporting? Who will prepare and send the report? How will the radiologists and other technical professionals exchange information timely and flawlessly? How will audits and financial billing be managed? How radiologist in FMIC will timely know the report arrival?; While it was obvious that these questions were ever-present

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in the field of diagnostic reporting, the new scenario of teleradiology brought them to fore-front because of physical distance not only among radiologist but patients also.

Organizing the workflow

It was extremely helpful to get agreed upon the protocols to govern the complex relations between FMIC and AKU. Both institutions decided on the way to standardize all protocols so that timely action may be taken to rectify any ongoing issues. Workflow protocols that were settled include: The manner to manage the information update about study transfer, urgency and reporting, the nomination of professionals who will be responsible for routine work, the reporting protocol and the report turnaround time. Moving beyond the traditional concept of teleradiology, Radiologists of the both the institutions developed new ways to further communicate and utilize the tele-link for real-time education, training and case discussions.

Technical team as central support

The teleradiology link was developed, configured and supported by an interdisciplinary team of informatics experts with a sound knowledge of both technology and medicine. Based on the foresaid challenges and workflows, the team studied and established the supporting structure with the help of in-house developed software.

The teleradiology model had to be developed that was comprehensive, flexible and scalable. The model incorporates the hub-spoke model where relatively developed remote sites act as their local hubs with further remote sites acting as spokes. Studies are sent from the spokes to the hubs in an asynchronous manner in a store and forward setup. The hubs forward these to the central sites for reporting. The primary communications are direct links but the model may be modified to utilize other communication modes to handle the information interchange.

Using microwave and optic-fiber technology (Figure 1), the team established an end-to-end dedicated link which serves as a backbone for all types of communications between Kabul and Karachi. With bandwidth of 02 mbps, an average CT study can be transferred in 20-30 minutes duration. From the transfer of study till the report availability back to FMIC, AKU's

in-house developed software manages each and every single step (Table 1).

Features	Details
Operating system	Windows
User groups	Radiologist, Transcriptionists and System administrator
User management	LDAP and Self
DICOM ⁸	Sending, Receiving
Email	Microsoft Exchange Server
Programming language	ASP.net
Database	Microsoft SQL Server
Report management	Adobe PDF format

Table 1: Web-based teleradiology management system: feature and technical details

The software is developed with a thought process of full customization and as per internal workflow demands that might not be available in commercial or open-source products. All required feature such as, automation using alert system, patient data privacy and authenticity, electronic signature and audit reports are incorporated. Currently, this web-based software is managing each and every step required to ensure the highest quality of service possible in a given scenario (Figure 2).

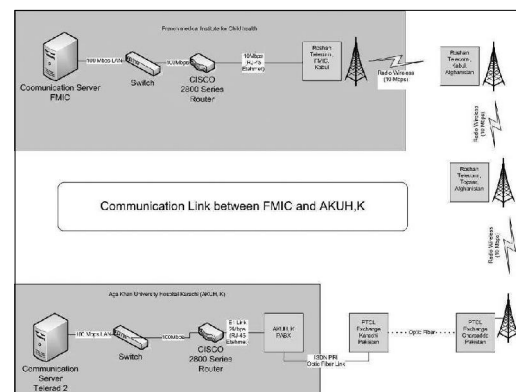


Figure 1: A dedicated communication link of 2mbps bandwidth.. Using a combination of microwave and optic fiber , communication servers are connected for CT study and report transfer between the radiologist sitting at FMIC, Kabul and AKUH Karachi. Same link is used for teleconference and tele-training and tele-education sessions.

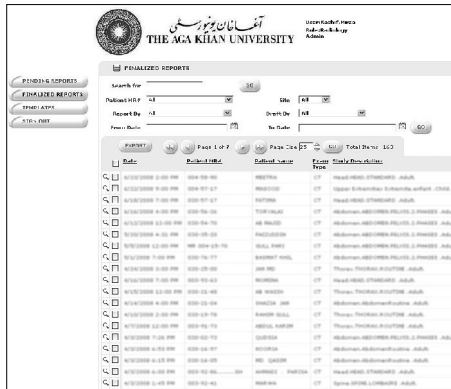


Figure 2: Web-based teleradiology management system. Silent features include (automatic alert system, Electronic signature, User authentication and authorization for reporting and extensive searching).

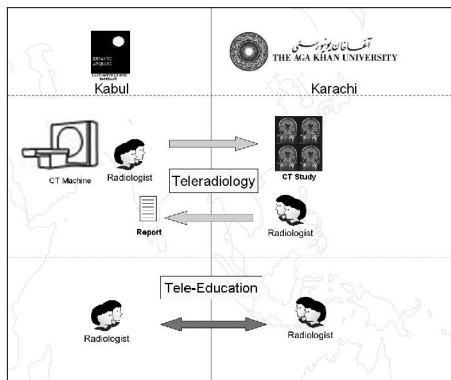


Figure 3: Schematics presentation about the use of tele-link. Currently, departments of radiology are exchanging CT images and reports with turnaround time of 24-48 hours. Radiologists are also engaged in tele-education and tele-discussion sessions for clinical cases and sharing of images in real-time interactive mode.

The reporting workflow

Effusive and optimistic collaboration among FMIC and AKU professionals was the key factor that made this teleradiology project a successful story. With a constructive thought process, each and every workflow step was agreed and implemented as a standard protocol. Now with a one year of experience, the workflows have reached to their mature level. (Figure 3).

Clinical perspective

The biggest obstacle for the newly opened FMIC, Afghanistan was the lack of availability of local highly qualified medical specialists. Same was the case with radiologists. AKUH with formal agreement with FMIC

took a constructive step towards building up local clinical expertise in Afghanistan. That is why, two of Afghani doctors were trained at department of radiology AKU. With a background of understanding, now radiologists sitting at Karachi are collaborating with radiologists in FMIC.


With 150+ cases to date, radiologists in FMIC are sending cases of all age groups, with more frequent cases of chronic illness history. For further face-to-face case discussions, radiologists at both the ends have a facility to contact anytime and have discussion in live real-time-mode. This tele-discussion has a provision of sharing and manipulating (window leveling etc) CT images in live mode.

After getting the diagnostic quality CT images, Radiologist receive email notifications and report them in a filmless environment using DICOM Viewer on diagnostic a workstation. Consequently report is finalized by electronic signature and sent back either on same day or very next day. Agreed turnaround time between AKU and FMIC is 24-48 Hours. Understanding the need of expert opinion for FMIC, AKU Radiology is also taking all sent cases as 'priority' work. A video conference environment is also made available for consultant radiologists that further supplement the teleradiology framework. This may be utilized by the radiologists to discuss the cases interactively in real time.

With successful completion of first year, teleradiology project is already in the next phase of expansion and in near future the model will be expanded to other parts of Afghanistan.

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