SESSION 8: Digital Practice Applications—RIS, PACS, and EMR

Distance Learning in the Digital Environment

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The expansion of radiology departments and divisions often can not occur in adjacent geographic locations. This leads to a greater separation of staff and residents, as well as workers in similar divisions. This makes traditional teaching difficult in academic institutions. The economic drive forcing many departments to investigate more isolated outpatient imaging centers has further hindered the ability to continue effective academic training at many facilities. The ability to easily share a digital environment across physical distance can greatly enhance the teaching experience, as well as be a valuable tool for consultation and case discussion with referring clinicians. The transition to a filmless environment with picture archiving and communication systems (PACS) can be utilized for distance learning in addition to the clinical arena. It is possible to take advantage of the digital transformation to PACS and case-viewing browser programs to conduct improved interactions with referring clinicians as well as radiologic teaching with relatively minimal hardware and software demands. The integration of web-based teleradiology programs with business networking software can be used for effective distance learning in the digital environment, sufficiently closing the distance on our rapidly expanding departments. This same technology allows for greater interaction with referring clinicians for real-time consultation and enhanced case discussion to entrench a supportive referral base for the radiologic community.

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AS RADIOLOGY DEPARTMENTS expand, geography often hinders traditional teaching in the academic environment. With the increasing time demands in this profession, it is often difficult to assemble in one place for a department meeting, much less a teaching conference. The common expansion of radiology departments inside a host institution, separate from the main department, can significantly hinder teaching, as well as multiple-facility groups in remote locations. The growing economic trends affecting academic institutions towards encouraging outpatient imaging has only amplified this problem.

The exponential growth of picture archiving and communication systems (PACS) and the increasing acceptance of the digital domain now offers a solution to this problem. The significant advances

in the digital industry, with increasing network speeds and improved compression algorithms have made teleradiology a reality. This same technology can now be repurposed for distance learning.

MATERIALS AND METHODS

The powerful cross-platform abilities of hypertext markup language (HTML) for use with web browsers is becoming increasingly utilized for digital teaching file storage and display, as well as basic teleradiology services for referring clinicians as well as radiologists.¹⁻³ This limited interaction with the main PACS network is often more than enough for referring clinician's basic imaging needs, allowing simple queries and viewing options. A dedicated web server with a relatively fast network connection can easily support the needs of a significant number of medical care workers outside of radiology, while the main PACS workstations are utilized for diagnostic interpretation of studies.

The integration of the web-based PACS-like viewing program, RadWeb viewer, by Marconi (Marconi Medical Systems, Cleveland, OH) with MS NetMeeting (Microsoft, Redmond, WA) allows for real-time sharing of desktop space, while manipulating a radiologic case. Current requirements include Windows 98/NT/2000/ME (Microsoft), Microsoft Internet Explorer 5.0 (with appropriate security settings to enable Active X components, and enabling cookies), and the installation of MS NetMeeting.⁴

This powerful combination of software allows

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for a case to be manipulated in real-time, while sharing desktop space, as well as being networked with audio and video, with relatively basic microphone and video camera options. This networking does require a relatively broadband local area network (LAN), such as asynchronous transfer mode (ATM).

After entering the uniform resource locator (URL) for the RadWeb viewer page, the user is allowed to choose between running the viewer in the browser window, full screen, or occupying the full window of the browser. The security log in page then requests the users user ID, password, and domain to access the web server. A query parameters window then allows the user to choose to search by variables, such as name, date, or type of study and location of an examination. The user can then choose the examination, as well as the compression technique utilized for transfer of images to the desktop computer.

The viewport and pictorial index screens allow the user to perform basic manipulations of data sets, including window/level settings, measuring distances and even cine use.

The additional installation of MS NetMeeting then allows a user to connect a computer to another by internet protocol (IP) addresses on the network and essentially share the desktop space. The further addition of a basic video camera and microphone allow the two users to then interact fully while both manipulating the images in a case. This allows a radiologist to more easily explain to another party in a different location the important findings on a case, and quickly and easily address any concerns

or questions of a referring clinician. The same software and hardware can be utilized for radiologic teaching occurring in different locations. A teaching radiologist can review an interesting case with residents in a separate location as easily as if they were in the same room.

RESULTS

The incorporation of popular video conferencing software with web browsers now allows a more rich and interactive interaction over the internet or an intranet. The combination of this software with web-based teleradiology programs creates similar increased interaction between the radiologist and the referring clinician. The incorporation of video cameras and microphones with the ability to share a computer screen while reviewing a case over great distances greatly enhances the relationship between radiologists and their referral base.

CONCLUSIONS

These technologic advances finally create effective distance learning through digital conferences. This web-based teleradiology and video-conferencing software allows for ad hoc conferences and significantly increased interaction in the academic environment over an appropriate broadband LAN. The greater interactivity allowed by this incorporation greatly enhances the academic experience, which is otherwise hindered by growing problems in academia with time and space constraints.

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