Specialty Corner

All things digital

By: Otto Schulze

SIIM Conference

In September 2006 the Western Cape Department of Health decided to digitise their medical imaging and image management services. A project committee was established to guide this process. Members of the committee, namely Ann Vlok (Radiographer, RXH), Jacques du Preez (Clinical Engineering, TBH) and Otto Schulze (Radiology Registrar, TBH/Project leader), recently attended the annual congress of the Society for Imaging Informatics in Medicine (SIIM), previously called the Society for Computer Applications in Radiology (SCAR). The congress was held in Providence, Rhode Island from 7 to 10 June 2007. Rhode Island is known as the ocean state and is the smallest state with the longest official name 'State of Rhode Island and Providence Plantations'. Fig. 1 shows a congress banner.

This society is devoted to advancing computer applications and information technology in medical imaging through education and research, and aims to bridge the gap between engineers and scientists who develop the systems and radiologists and technologists who use them. The congress was attended by a broad spectrum of delegates: (i) imaging physicians interested in learning more about implementing, integrating and upgrading PACS, speech recognition, or teleradiology systems to improve workflow and the efficiency of their practice; (ii) imaging informatics professionals interested in trends and learning about cutting-edge electronic imaging developments and staying abreast of technical innovations; and (iii) health care administrators at institutions that are considering enterprise integration strategies toward the image enabled electronic medical record. Thus the congress was for everyone involved with all things digital.

Fig. 1. SIIM 2007 Banner in Providence.

International personalities and leaders

The current SIIM chairperson, Curtis Langlotz, opened the congress and stated that informatics in medicine is a large field and imaging informatics is no longer the sole domain of radiology. The opening presentation given by John Glaser was titled 'The evolution of the role of imaging informatics in the health care delivery system'. He stressed that a PACS/RIS solution is just a tool to perform a certain task and that if the tool is not used or used incorrectly, all the proposed benefits will not be realised. A PACS/RIS solution is not a radiology toy but a clinical governance tool as the primary beneficiary is the patient, secondly the clinician, thirdly the hospital/practice management and lastly the radiologist. This raises the interesting question, who should pay for such an implementation?

Current leaders in the field include: Barton Branstetter (the first imaging informatics fellow), David Channin (IHE as a solution for integration), David Clunie (the DICOM expert), Steven Horii, Elizabeth Krupinski (the ergonomics of radiology based on evidence), Bruce Reiner, Eliot Siegel, Keith Dreyer (Vice Chairman of Radiology, Massachusetts General Hospital) and Paul Chang (Co-founder of Stentor PACS which was purchased by Phillips).

Thin client technology + server side rendering + wireless networking = pervasive or ubiquitous computing: As an example a radiologist was shown walking down the passage in a hospital, viewing a Cardiac CTA in full 3D on his PDA (personal digital assistants) and subsequently accessing all relevant clinical information and previous imaging examination results. It was mentioned that he could just as well have been lying on the beach in Florida. Fig. 2 shows how a Tablet PC is being used to view a chest X-ray. The number of vendors including 3D image manipulation software as part of their web-distribution package to the referring clinicians is increasing.

3D image manipulation: Routine 3D image manipulation techniques are migrating away from the radiologist's workflow and are being handled by 3D imaging laboratories. Consisting mainly of radiographers with some additional training in both medicine and computer software, they perform the routine 3D manipulations required on examinations. The radiologist then views these reconstructed images and if necessary enhances or adjusts them during his interpretation. An additional tariff is also being charged for the 3D reconstructions performed.


Fig. 2. Tablet PC displaying a chest X-ray.

Image compression: Almost all of the vendors supply some kind of compression technique; currently there are no standards dictating which compression algorithm and compression ratio should be used, so this remains a personal decision by the attending radiologist. Despite advances in archiving size and network speed, it is expected that the amount and the size of images will rise exponentially as do medical imaging advances; thus there will always be a need to compress imaging data. SIIM has launched a research project to determine what the accepted standard for compression should be. Although some compression techniques might be irreversible (lossy) with loss of image information, to the human eye they may appear not to have any image data lost and can thus be regarded as visually reversible (lossless) compression. The research project will aim to define this.

Ergonomics: The importance of ergonomics in the radiology reading room is receiving more attention, as research demonstrates the effect it has on the quality and quantity of cases reported. Computer vision syndrome and lens fatigue are two important pathologies affecting the eyes of the radiologist, this can be addressed by adjustable ambient lighting and the distance of computer screens from the radiologist. Wrist, elbow, shoulder and neck strain from abnormal body posture while reporting cases causes decreased efficiency.

Adjustable chairs moulding to the curvature of the back and adjustable tables with different levels for the input devices and display monitors are advisable. The comment was made that annual eye testing should be compulsory for radiologists as they have a higher chance of being farsighted at an earlier age. In recent years the advances in colour and LCD monitors have made them viable alternatives to B&W and CRT monitors. Figs 3, 4 and 5 demonstrate some variances in workstations.

Fig. 3. One colour monitor and one wide colour monitor.

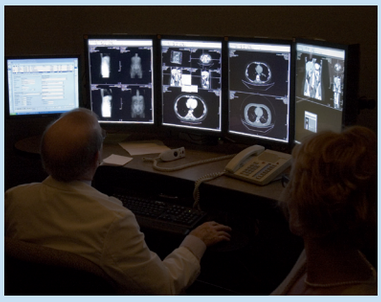

Fig. 4. One colour monitor and four black-and-white monitors. Note the differences in height between the displays and the input devices (mouse and keyboard).

Fig. 5. Height-adjustable and tiltable table with chair mouldable to curvature of back.

Optimising the interpretation process: Research is now focusing on optimising the interpretation process, including how to manipulate and display multiple images to quickly and clearly demonstrate the pathology. Options evaluated include: different display techniques e.g. 3D monitors; different detection techniques, e.g. CAD; and different input devices, e.g. multiple button computer mouse and multifunctional keyboards. Once identified, correctly diagnosing the lesion with decision-support tools related to the patient and the suspected pathology must be easily accessible. Access to related information systems is not enough; the automatic display of only relevant information in a user-friendly manner should be expected, e.g. blood assays, histology reports, operation report and discharge note. This also refers to the intuitive display of previous imaging examinations and results in such a way that with one glance you have an overview of the patient's imaging examinations (see Fig. 6). Pathology-related decision support refers to having access to reference libraries with images and information available for comparison, e.g. StatDx, and electronic textbooks. All forms of decision-support must be available on the same computer as you are using to access the PACS.

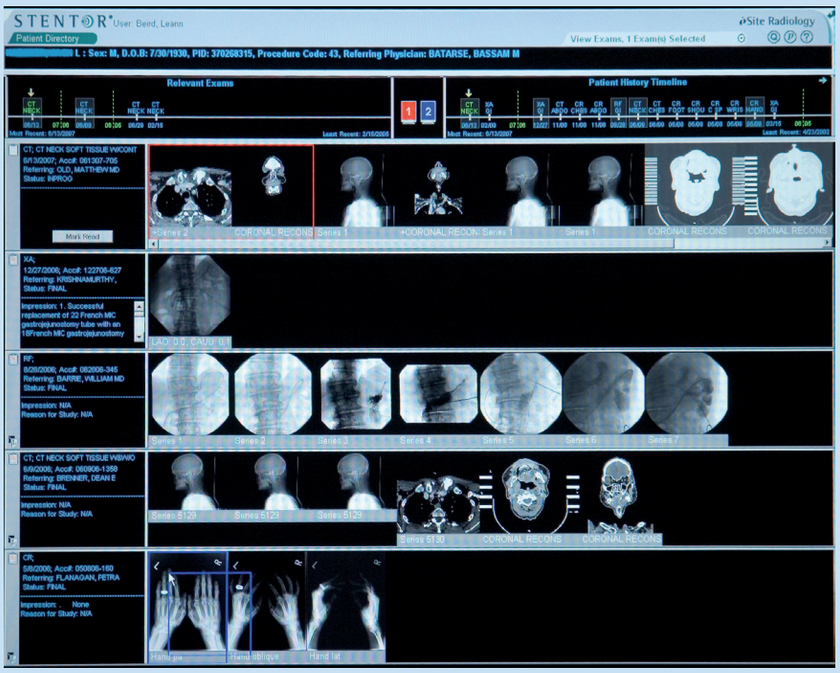

Fig. 6. Intuitive display of previous imaging examinations and conclusions of reports.

Creating the digital chain: The biggest advantage of having digital information is integrating it with other information systems, but as different information systems are provided by different vendors, how do you ensure they integrate? Fortunately there are industry standards such as DICOM and HL7, but standards are like languages. Although English is regarded as a standard, the English spoken in India, Alabama, Liverpool and Polokwane is not the same. IHE (Integrating the Healthcare Enterprises) have addressed this issue by establishing a list on commonly occurring clinical situations (commonly used phrases to continue with the analogy). Using the IHE integration profiles as guideline for equipment and information system purchases will enable a modular approach within a limited budget, while ensuring integration.

Hospital visits in the USA

After the congress we were joined by Revere Thomson (Medical Superintendent, TBH) and we visited 5 hospitals (Albert Einstein Hospital, Rochester General Hospital, VA Ann Arbor, Alamance Regional Medical Centre and Palmetto Health) throughout the USA, using different PACS/RIS solutions. The aim of the site visits was to make contact with the implementation teams and gain some insight into their process, experience and skills. We investigated the changes in workflow and associated practicalities and finally also had a look at the difference the vendor makes to the situation. All of the hospitals were happy with their product. Seeing that the vendors chose the sites, we expected this. None of the PACS/RIS solutions was a clear market leader, but there were desirable features within each system. **The important difference came firstly in the level of commitment from both the vendor and management and secondly the degree of technology penetration attained and the redesigning of workflow.** I will expand on this subject in a later article.

I found the trip to be tremendously interesting and learned a large amount. I also made enough contacts to learn from their mistakes, hoping not to repeat them. I think the South African market has matured enough to embrace this technology and with the correct vision, broad-based participation and commitment from management, a PACS/RIS solution can make a significant contribution to patient care.