The Process of Transitioning to Digital Operations in a Clinic Setting

Mary Freeh, James McFall, and Alex Nieves

Transitioning to digital imaging operations in a department of radiology is often difficult for many radiologists, but it is a change that many have made effectively. Transitioning to digital operations in a clinic setting is even more difficult for the referring physician operating a business in the clinic. This paper will discuss our experience with transitioning several off site clinics to digital imaging operations. We will discuss the process followed to identify the physical equipment required to support clinic operations in a digital imaging environment, the process followed to help the physicians adjust their work patterns to allow them to practice in a digital imaging environment, and the benefits and pitfalls of implementing digital imaging in an off site clinic. Four off site clinic locations will be evaluated: 1. cancer clinic located immediately adjacent to the main hospital that relies heavily on CT and MRI images in their practice, 2. small clinic located about 60 miles from the main hospital that acquires xray images on site, 3. larger clinic located about 20 miles from the main hospital that acquires xray, MRI and CT images on site, 4. sports medicine clinic located about 2 miles from the main hospital that acquires xray images on site. Each of these clinics has a very different patient clientele and therefore operates differently in nearly all aspects of their daily operations. The physician's need for and use of film and digital images varies significantly between the sites and therefore each site has presented different challenges to our implementation process. As we explain the decisions that were made for each of these sites and reveal the methods that were used to help the physicians make the transition, the readers should be able to draw information that will be helpful to them as they make their own transition to a digital operation.

Copyright © 2001 by W.B. Saunders Company

AT THE UNIVERSITY of Utah Hospitals and Clinics, the transition to digital imaging operations is purposefully being scheduled in phases as a means to mitigate the impacts on all involved: operations within the department were changed first, several clinics outside the hospital were transitioned next, and, finally, internal hospital clinics and units are transitioning as film is discontinued in each area.

This report will focus on our experience with the second phase, transitioning outside clinics to the digital, filmless method of operating. Our discussion will include information on equipment that should be considered when transitioning a clinic, methods to adjust the operations within the clinic

that will reduce the impact on the people involved, and a brief discussion of benefits and impacts to transitioning a clinic.

EQUIPMENT

Deciding to "go digital" at any location is an expensive proposition, especially given that plain film operations very seldom break-even let alone make a profit. We based our willingness to invest in the necessary equipment for outside clinics on several factors:

- the volume was fairly high at the clinic, so we were able to offset the equipment expense within 2 to 3 years, or
- the location of the clinic made it impractical to send film to the hospital and would require having a radiologists work on site, or
- there were many problems with the current situation that would be solved by transitioning to digital (film was being transported, often lost, dictations were being delayed, file room personnel were greatly impacted trying to locate film from the clinic, etc).

Once the decision was made to transition a clinic to digital operations, we identified the type of equipment that would be needed based on examination volume and the needs of the clinicians at the clinic. In all cases we provided acquisition, printing, and viewing equipment.

Acquisition

- Computed radiography (CR) reader to capture diagnostic images with modality worklist interfaced to the radiology information system (RIS), which may require Health Level 7 (HL-7) interface equipment (picture archiving

From the Department of Radiology, University of Utah Medical Center, Salt Lake City, UT; and Marconi Medical Systems, Cleveland, OH.

Address reprint requests to Mary E. Freeh, Department of Radiology, University of Utah Medical Center, 50 N Medical Dr, Salt Lake City, UT 84132. E-mail: Mary.freeh@hsc.utah.edu.

Copyright © 2001 by W.B. Saunders Company

0897-1889/01/1402-1045\$35.00/0

doi:10.1053/jdim.2001.23856

and communication system [PACS] Broker, (Mitra, Mississauga, Ontario, Canada)

- Quality-assurance (QA) station to resolve any image problems and demographic discrepancies before images are sent to the archive (Radworks QC, Marconi Medical Systems, Cleveland, OH)
- Plain film digitizer (Lumisys, Sunnyvale, CA)
- RIS connectivity for scheduling examinations, with printer, as appropriate
- Conversion equipment, if required, to assure capture of images from other modalities, like magnetic resonance imaging (MRI) and computed tomography (CT), that may not send Digital Imaging and Communications in Medicine (DICOM)-compliant data (Merge Technologies, Milwaukee, WI)

Since the examination volume at the rural clinic is low, a desktop CR provided the most cost-effective solution (ACR2000, Lumisys). The quality of the images is acceptable for preliminary diagnosis and the images are able to be quickly sent to the main hospital for interpretation.

The greater volume at the urban clinic and the presence of an urgent care facility determined the need for a larger CR reader (ADC Compact, AGFA, Belgium). We went with an AGFA Solo in the lower volume clinics such as the cancer clinic.

Printing

Although the idea is to eliminate the need to print, we have found it is always essential to have the capability to print. Our objective was to reduce the cost of printing as much as possible. We decided to go with a medical DICOM printer (NP-1660M, Codonics, Middleburg Heights, OH) at all our clinic locations.

Viewing

All clinicians need to be able to view the images for examinations ordered. We provide two options for viewing access: through the internet (Radweb, Marconi Medical Systems) or through a dedicated PACS station (Radworks, Marconi Medical Systems). The advantage of using the Internet is that it can be provided to the physicians with little hardware expense. The disadvantages are:

- the physician has to search for the images they need from a full list of all images sent to the webserver and may need to pull images from the archive
- the image resolution may not be as good as on the dedicated PACS station

The advantage of the dedicated PACS station is the ability to send current and priors automatically to the station and even set up physician worklists. The disadvantage is the cost of the dedicated station.

The clinicians based at the clinic are key to determining what viewing equipment will best meet the needs of that particular clinic. Our discussions with the clinicians determined that the cancer clinic required two dedicated PACS stations to meet the needs of the physicians using CTs and MRIs to do cancer treatment planning. We also decided the sports medicine clinic needed one dedicated station so they could get easy access to all related priors. Figure 1 shows the equipment installed and the flow of the images at the sports medicine clinic.

CLINIC OPERATIONS

Changing how people work poses a significant challenge when implementing new operational processes, especially one as extensive as PACS. A

Fig 1. Equipment and workflow for a Sports Medicine Clinic: Red Butte Clinic, University of Utah Hospitals and Clinics.

method that has worked for us in our transition to PACS has been to proceed slowly; keeping operations as close to normal as possible even after new equipment has been installed, providing a lot of training and following up extensively to help the physician and staff become familiar and comfortable with the new equipment and new processes.

When we transition, we move from film print to paper print, continuing to deliver some print for all studies in the initial phase. Then, working with the physician, we identify studies no longer needing to be printed and turn those off. We listen closely to the clinicians to determine any necessary adjustments to the workflow. Gradually we get them to incorporate new methods into their day to day routines. Listed below are some specific activities that have worked for us:

- Meet with the medical director and the clinic manager early in the process. Introduce the concept of PACS to these individuals and the intentions of the Radiology Department. Use this meeting to “sell” the idea of PACS and its advantages to the clinical setting. Explain your plan to them and be willing to make adjustments, given their input.
- Arrange for the medical director or a representative to visit a site that has a fully functioning PACS system. Give them a chance to see it in operation and to talk with the users about workflow and operational changes.
- Connect the clinician with the radiologist who interprets his/her images so the radiologist can help the clinician see the advantages of using the PACS and can establish the process for consultations. Invite the clinicians to attend conferences where PACS is being used to introduce them to other advantages to the system.
- Visit the clinic to observe the normal workflow. Understand the type of clinic (orthopedic, cancer, family practice, etc) and design your plan around that clinic’s particular workflow processes. Understand what prior images are used in the clinic when a patient is seen and be sure you have a method to continue to make these images available to the clinician. This may require a manual process of pulling the film and digitizing it so it is available on the PACS or it may require a process to transfer the digitized priors from the archive to the local station the clinician will be using.
- Be sure you are providing enough access points to the images so all the clinicians can easily view images when they need to. If there is only one dedicated PACS station, be sure there are PCs available for viewing images through the internet.
- Do not attempt to change the workflow immediately. Design the new process to mirror the existing process as much as possible and introduce changes as they become comfortable with the new media.
- Meet directly with all clinic staff and physicians. Do not rely on the medical director to communicate what is coming. Hold meetings and introduce all of the staff to the plans and changes. Allow them all time to get used to the idea of the new process. Demonstrate the internet access software and the use of the dedicated PACS station so they see how images look digitally. Bring samples of print images that are similar to what they will be getting.
- Do not forget the technologists working at the clinic. Be sure they know the plan for the clinic and are trained on viewing images, retrieving images from the archive, digitizing outside film, and printing from PACS. The technologist can become the “clinic expert,” the one the staff goes to for assistance when problems arise.
- Send the technologist to another site that has the digital system. In our situation, we were fortunate to have a fully operational system at our main hospital and all the technologists working at the clinics could spend time working at the hospital to get acclimated to the new way of working.
- After installation, keep an expert on site for a few days. Observe, assist, and resolve problems as they occur. Doing this really builds the user’s confidence and trust that help will be there when needed.
- Provide access to help quickly and easily through a help-line process. Users are willing to wait for assistance if they know how to get a hold of the right people to help.
- Do not forget the importance of hands on training and access to job aids for quick reference when a new user is stuck. Train on

location if possible and be willing to do mostly one-on-one training so each person gets his or her individual needs met. Training should be provided for the physicians, the nurses, and the clinic staff so all know how to use the part of the system they may interface with. This process is time-consuming but well worth it in the long run.

The benefits of transitioning to PACS have been well documented in many articles. The benefits of transitioning outside clinics to PACS are also well known. Some obvious benefits would be:

- eliminating the need for onsite radiologists at the clinic
- providing for consultation with specialists on difficult cases
- eliminating the ongoing problem of lost film
- providing a means to quickly and easily get access to any images taken on a particular patient
- improving report availability to clinicians

PITFALLS TO AVOID

The possible pitfalls are not always as well documented. Two we would like to prepare you for are discussed.

Equipment Does Not Always Work as Promised

Although it is nearly impossible to do, it would be ideal to install the equipment and fully test it before having to actually use it on location. We have discovered CR readers that would not print to the printers we had, modality worklists that would not gather the RIS data correctly, CR readers that would separate two images of the same study into two studies, and the list goes on. The smoothest

transition we were able to make was when we left all the existing analog equipment in place while we installed the digital equipment, made all necessary adjustments to the digital equipment, tested it thoroughly, and only then removed the analog equipment.

Equipment Will Temporarily Fail and a Solid Downtime Procedure Will Be Needed

If you are lucky enough to have a fully functioning back-up process then the possibility of failure should not bother you. But since this is usually not possible due to the high cost of maintaining two systems, be sure you have a commitment from the vendor for quick servicing response time that is acceptable to the clinic personnel. At some of our sites, our only really solid back up if the systems are going to be down for any length of time, is to send the patients to the main hospital or to another clinic if one is closer. Luckily most of the equipment is fairly stable and we have not experienced downtime of any significance.

SUMMARY

Transitioning a clinic that is outside the main hospital to the PACS system used by the hospital has its own unique challenges. The cost of the equipment may make the proposition, to convert to digital, not possible for smaller clinics. Choosing the right equipment to meet all the needs of the clinic is one important step in the process. As with any transition to a new way of operating, adjusting the work habits of the people involved is probably the greatest challenge and successfully handling this challenge will really reflect on the success of the entire project.