The Process of Converting to a Near Filmless Operation at the University of Utah, Department of Radiology

Mary Freeh and Donald Baune

The Department of Radiology at the University of Utah Health Sciences Center has made the transition from a traditional film-based department to a near filmless operation. The University of Utah is a large teaching hospital and the transition from film in an educational facility will be discussed. This transition has had its difficulties and its success is dependent on the support of departmental leadership and hospital administration. We have had more than 100 years of experience with film, and current procedures were efficient given the limitations of the medium. While motivated by the traditional reasons for moving to a picture archival and communications system (PACS), such as film savings, unavailable films, and faster reports, we found the intangibles to be the larger issue, as well as a source for the largest benefits. This report will discuss the implementation process and the affect it had on all areas of the hospital, including its impact on hospital physicians, radiologists, file room personnel, and technologists. Procedure changes to the flow of patients, film, and electronic images will also be described. This process cannot be viewed as a one-time change, but must be viewed as a continuous process as areas of improvement are identified and new and improved technologies are developed.

Copyright © 1999 by W.B. Saunders Company

AT THE UNIVERSITY OF UTAH Hospital and Clinics, we are in the process of converting to digital imaging with the implementation of our version of picture archival and communications system (PACS). We currently have the capability to capture all computed tomography (CT), magnetic resonance (MR), computed radiography (CR), and nuclear images in our archiving system. We are currently implementing the necessary hardware and software to video frame capture angio and fluoro images and pass them to the archive, and will begin the process to link ultrasound into the archive in the near future. Soon we will have nearly all of the images taken at the hospital and clinics available digitally for review and interpretation.

Review stations are available in all our reading rooms in the department. We have provided diagnostic stations for use by the radiologists and consult stations for use by the referring physicians. We have consult stations in a few clinics and in our Emergency Department. In addition, all our archived images are sent out to a web server, where they remain for approximately 2 days. There is a plan to expand the size of the image cache as the demand/need is demonstrated.

However, converting to digitized images is far larger than simply installing the hardware and software to support the system. Converting to digitized images has affected our basic work processes and has required extensive effort in many areas, including identifying any unique work flow requirements and establishing routing and prefetching rules that meet these requirements; revising procedures for handling images and providing ongoing training for all involved in the new procedures and systems; and providing system support to the users as they transition to a new way of doing business. In addition, we have discovered that the individual users can be the greatest stumbling block to a quick conversion. The users need time and support to adjust their work habits to efficiently use the new tools provided to them.

This report will discuss our experiences with the conversion process, identifying issues we have encountered and providing solutions as we have identified them.

IDENTIFYING WORKFLOW REQUIREMENTS

The workflow processes for delivering images to the radiologists for interpretation had been in place, and working well, before the conversion to digital imaging. It was important to us to maintain and improve the efficiency of this workflow process with the conversion to digital imaging. On the other hand, the delivery of images, or image interpretations, was not working particularly well to areas outside of the department, such as the hospital clinics, the Emergency Department, etc. It was an important goal of the conversion to improve on this delivery as much as possible.

The data management component of our archive system has provided us the means to automate the
image delivery process by establishing rules for autorouting and prefetching. Autorouting is the process of identifying where the image is to be delivered so no human intervention needs to occur to get the digitized image to the radiologist for interpretation. Prefetching is the process of identifying images in the archive that are needed by the radiologist for comparison and delivering those images to the appropriate view station. For prefetching to work, there must be integration between the archive and the radiology information system (RIS), allowing for scheduled patient visits to be known by the archive before the completion of the patient examination.

To be able to use the data management system most efficiently and meet our goals of improving the delivery of images, we asked ourselves a series of questions that would help us to create the rules we needed for autorouting and prefetching.

1. Who Does the Primary Interpretation of Each Examination Type and Where Does That Person Work?

Early in our planning process, we decided to route images to specific view stations, rather than to a specific radiologist. This decision was due in part to the structure of our department and our resident training program. We are set up by sections, Bone, Chest, Neuro, Nuclear, etc, with one or more view stations available for use by the radiologists and residents in each section. Each resident spends a period of time with a staff radiologist in a section learning to read that type of examination. It is necessary that we route the correct examinations to the view stations that are being used by the staff and residents of that section.

2. Where Else Outside the Department Will View Stations be Located and What Images Need to be Routed to Those Stations?

Initially, we were only installing view stations within the department, but this plan changed early on. Because of the need to improve delivery of images to locations outside the department, it was decided to locate view stations in a few clinics that are high-volume users of Radiology services and in the Emergency Department. With this decision came the need to identify which images would be routed to these view stations and to establish routing rules to automate the delivery.

3. Do the Images Need to Go to Different Locations During the Night and/or on Weekends?

In our department, we use residents and on-call radiologists to support the needs of the department 24 hours a day, 7 days a week. To improve efficiency, we have established one view station as the off-hours work location. All images taken during off-hours need to route to the one view station being used during the off-hours.

The data available to perform the autorouting and prefetching functions are the data delivered from each modality to the archive data management system. Two issues identified early in our conversion were that the data were not consistent and standard for every examination, and that some of the critical routing data were not being sent to the routing fields on the archive data management system. For our data management system, we needed both the image source (the modality on which the image was taken) and the examination description. The image source was consistent and was being delivered to the correct routing fields. But, we soon discovered that the examination description information was not standard, since it was being input free-form by the technologists and, from some modalities, it was not even being put into the correct Digital Imaging and Communications in Medicine (DICOM) field in the data management system. For example, the GE (Milwaukee, WI) MR scanner placed the examination description into DICOM Tag 0008 1030, while the Picker (Cleveland, OH) put the examination description into DICOM tag 0018 1030 by default, and did not have a way to fill in 0008 1030. After some research and a software upgrade on the scanner, the Picker was then able to fill in the DICOM tag 0008 1030. This was an important discovery for us, as it then allowed the possibility of using this description as a key to routing images in the archive. To solve the routing issues, we needed to develop a method to obtain a specific, consistent examination description for every examination completed that could be used in our routing rules.

We knew we had a unique examination code for each unique type of examination already established for use by our RIS (IDXRad, Burlington, VT). By consulting with the radiologists, we were able to identify the viewing locations for each examination code. We were also able to identify some special routing codes we would need to use to route to locations outside the department. For