The Digital Age

How one healthcare system transitioned to digital mammography

Oncology Issues talked with Mary Hayes, MD, medical director of Memorial Healthcare System Women's Imaging Centers and Carina Marrero, RT(R)(M), clinical coordinator of Memorial Regional Hospital's Women's Imaging Center in south Florida, about the process of going to all digital mammography and here's what we learned.

Q. *When did Memorial Healthcare System first become interested in digital mammography?*

Dr. Hayes. Digital mammography came out around the 2004 summer Olympics, and we were very interested. However, when we looked at the resolution of the first digital mammography units as compared to film screen, we were not satisfied that the technology was quite ready for prime time. In mammography with film screen there is a certain number of line pairs per millimeter that is required for visualization of small lesions and micro-calcifications. When the first digital units came out, they could resolve down to only a size of 100 microns. Our radiology staff did not believe that was sufficient, nor did we believe digital mammography had drastically improved on film screen mammography. So we adopted a "wait and see" approach and waited for the technology to catch up.

One manufacturer, Hologic (then Lorad Hologic), released a digital imaging unit and then stopped production and started again from scratch because it wanted to use a platform that was going to be robust enough to take the technology into the future. After looking at Hologic's new technology, our staff was very satisfied with the image quality, the ease of use, and the speed of the image coming up on the screen, as well as the ability to use multi-plates to evaluate both small-breasted and large-breasted women.

In short, we like to use the analogy of a digital camera. When digital cameras first came out they were fun, but the cameras that used film still offered better quality—particularly for large and poster-size images. In time, digital mam-

Digital mammography technologist workstations.

Digital mammography patient positioning.

mography technology evolved like digital camera technology. Today, the resolution of digital mammography is excellent.

Q. *What were the anticipated programmatic benefits going from film screen to digital mammography*?

Dr. Hayes. Storing and finding films is problematic. Films get lost; films get damaged; and they are not retrievable. With comparison films we can notice new changes that are the early signs of cancer and biopsy sooner. Conversely, if we see changes that have been stable over many years, we can avoid an unnecessary biopsy. Of course, neither of these benefits can be realized if the film is missing and/or damaged. With digital mammography, patients can sign out their films either on hard copy or on disk, but the healthcare system retains the actual images. With digital technology we always have the comparison, and so are able to provide optimal treatment for our breast patients.

A second benefit is related to the age of our breast cancer patients. The age of these patients had steadily declined. Ten years ago our average breast cancer patient was in the early 70s. Then, in 2004, the average age of our breast cancer patients was about 51. We saw a similar drop in 2005 when we re-evaluated our screening program. At that time, the majority of our cancer patients were in the 41-year-old age group. So we've seen a tremendous push down in terms of the age. Our staff believed that digital mammography was a marked improvement—especially in patients with dense breasts. (Younger women tend to have denser breasts.) In other words, much like you do with a television screen, we are able to window and level through that density. The technology's not perfect, but we consider it an improvement. And the DMIST trial—although its results are still controversial—seemed to also show a benefit in pre-menopausal women with dense breasts.

The true winner in the whole transition is the patient—especially women with dense breasts. As the ACRIN trial demonstrated, digital images are more sensitive and are able to diagnose cancer a bit earlier. In addition, providers and patients do not have to worry about losing the film. We can always print a new set of hard copy images or provide a disk with prior images, so that's a huge benefit to patients. Bottom line: the benefit of having accurate comparison film should never be underestimated in mammography.

Q. *Has staff productivity increased?*

Dr. Hayes. It's a yes and no answer. The productivity of the radiologist goes down initially. Even worse, while the productivity of the radiologist goes down, the reimbursement for the radiologist stays the same, so it's a bit of a loss for the radiologist. Nevertheless, a hospital or community cancer center must look at the bigger picture. Memorial Healthcare System was a proponent of digital mammography because we felt it was an improvement in imaging, and our hope is that adequate reimbursement will follow. Now, more than a year later, there is still no change in reimbursement for radiologists.

Q. *Is the decreased productivity of your radiologists offset by an increased productivity in your imaging technicians?*

Carina Marrero. The technologist's efficiency is enhanced with digital mammography. Our screening patients can be scheduled at 15 to 20 minute intervals. Increased efficiencies in diagnostic digital mammography are also realized.

Q. *Can you explain the difference between screening and diagnostic imaging?*

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A Snapshot of Memorial Healthcare System

In 2006 Memorial Healthcare System, a six-hospital system in south Florida, enhanced its comprehensive breast care program by transitioning to all digital mammography. Today this technology is available in the following locations: Memorial Regional Hospital, Memorial Hospital West, Memorial Hospital Miramar, Memorial Hospital Pembroke, Memorial Regional Hospital South, the Esther L. Grossman Women's Health and Resource Center, and on the mobile mammography van. With Women **[sic]** Diagnostics Imaging Centers at Memorial Regional Hospital in Hollywood, Memorial Hospital West in Pembroke Pines, and Memorial Hospital Miramar in Miramar, dedicated fellowship-trained breast radiologists now diagnose approximately 700 new patients with breast cancer each year and perform over 300 breast biopsies under MRI guidance annually. These dedicated breast imaging centers offer a spectrum of services that include screening and diagnostic mammography, breast ultrasound, stereotactic breast biopsy, ultrasound biopsy, MRI of the breast, and MRI breast biopsy.

In 2008 the healthcare system opened an Image Recovery Center at Memorial Hospital West. The space features two beauty salon stations and services such as acupuncture, massage, and aromatherapy. In addition, patients have access to an array of wigs, prosthesis and products to enhance or maintain the image the patient had prior to starting cancer treatment.

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Carina Marrero. With screening, the patient has no symptoms and the technologist is simply taking four pictures, verifying the pictures are of quality, and then moving on to the next patient. With diagnostic mammography, the workflow is different. Diagnostic mammography patients are performed for symptomatic patients or as problem-solving examination. The technologist takes additional digital images of specific areas of interest or concern in the breast.

Q. *So, overall, digital mammography can potentially increase staff productivity because it's faster than analog?*

Carina Marrero. Yes. Because technicians are not actually taking the pictures, going to the dark room, processing the film, waiting for film to come out of the dark room, looking at the film, and then going back to reimage whatever area of concern needs to be worked up, digital mammography does save time on that end. However, you simply cannot increase your diagnostic volume the same way you can for screening. That said, digital mammography has helped significantly, especially with needle localizations, because the patients are in the room. For example, a pre-op needle localization used to take our staff about 90 minutes to complete, and now we've cut that time down to 60 minutes, so that's a significant time-savings.

Q. *Are you finding with digital mammography that staff is doing fewer repeat images and are reducing recall rates?*

Carina Marrero. There is a learning curve when converting from analog to digital mammography. We have seen that multiple hospital systems that do a large volume of screening and diagnostics have been able to lower their recall rate. We anticipate a decrease in our recall rate. Remember, radiologists initially take longer to read digital images because they're almost doing a diagnostic exam on every screening patient.

Q. *Once the decision was made to go totally digital, how did you roll-out the transition from film to digital?*

Dr. Hayes. Our situation may be unique to other community cancer centers in that we have six different sites.

In 2005 Memorial Hospital Miramar went digital, and we were able to make a really good "apples to apples" comparison of film versus digital images. Once we verified that the digital image quality was excellent, the decision was made to upgrade the entire healthcare system. By implementing digital mammography technology at all of our locations, we were able to maintain a high standard of care at all facilities. We were installing at least one unit in each facility on a weekly basis. Today, we have 13 digital mammography units at the six sites and a brand new mobile digital mammography van.

Q. *Can you talk more about this decision-making process?*

Dr. Hayes. Memorial Healthcare System had been looking at digital mammography since about 2001. But it was not until 2004 that we actually put together a task force to do ROIs and cost-saving analysis. This task force looked at all aspects of digital mammography: growth opportunities, eliminating our patient backlog, the cost of the technology, staffing requirements, potential cost savings for the future, potential increases in revenue, etc.

Q. *How did your workflow change?*

Carina Marrero. The workflow changes have been huge. When we first started the process, we were performing both analog and digital. Today we are happy to say that we are 100 percent digital throughout all the facilities in the [Memorial] Healthcare System. But it all depends on the facility and how the staff work. At Memorial Healthcare, we established a workflow task force. This group looked at issues such as how to compare the digital image to the film screen. For example, you could hang the analog film on a mammography viewer and then do a comparison using a workstation for the digital image or you could actually digitize the priors into a PACS system and view them on a five-megapixel workstation for a true "apples to apples" comparison.

Ultimately what our workforce task force chose to do is digitize the last two years of prior film images along with images from 4–5 years prior. If the patient had cancer, we went back to the year the patient was diagnosed with that cancer and digitized all the images going forward from that year.

In fact, one of our biggest challenges in going to digital mammography has been arranging adequate staffing to digitize the prior film images.

Q. *Have you developed formal protocols or standards for digital related to the workflow process?*

Dr. Hayes. Absolutely. In addition to our workforce task force, we established a separate task force to handle implementation and conversion to full-field digital.

Q. *Did you experience challenges in terms of push back from staff in making this transition?*

Mammography technologist staff were enthusiastic about digital mammography.

Dr. Hayes. No. The staff embraced the new imaging technology. Digital mammography has benefits for the technologist because it eliminates file processing in the darkroom. The digital technology provides for image review in seconds to ensure quality images are obtained before the patient leaves the room.

Going to all digital mammography impacts quality assurance (QA). At least at first, the QA for digital imaging takes much longer than it does for analog. The physicist conducts an annual survey and inspects the unit. In addition, staff must do daily, weekly, and monthly QA—not only on the workstations that the radiologists read on but also on the digital units themselves. This additional QA time was a big hurdle for our staff.

Q. *Any advice for other community cancer centers that are thinking about making the transition from film to digital?*

Dr. Hayes. One of the immediate, and probably one of the biggest challenges programs will face is deciding whether they want to digitize their prior films and how they want to do so. When making the switch to digital imaging, some facilities try to live in both worlds. Living in both the analog film screen world and the digital world is difficult for your radiologists. Going back and forth from analog to digital during the transition period puts eye strain and stress on your radiologists. Our advice would be to make your transition like a quick cut.

Establish a mechanism for digitizing your prior comparison images. When we went to digital mammography in 2006, we digitized 2005, 2004, and 2001. We also digitized diagnostic studies or biopsies that were done in between those years. Even though the task of digitizing film images was cumbersome and very labor intensive, it's been a huge asset for our radiologists and for our program. Once we get those images in the system we can send the film back to the warehouse. Today, we have multiple years in our system for comparison studies.

Work closely with your IT staff to figure out how much FTE time in the file room is required and how much memory is required to hold the digitized images. Ensure that all your connectivity issues are ironed out in advance because when you go digital you want everything to work well. While storage prices have been coming down, you do need to anticipate your storage needs. For example, if we do one screening mammogram, we need storage for the 2006 screening mammogram, but we also need storage for the 2005, 2004, and 2001 prior mammograms, so your storage needs are multiple.

Q. *Are all the digital units dedicated for mammography?*

Dr. Hayes. Yes. The old film units were only doing mammography as well. We elected a one-for-one replacement because our growth has been exponential.

Q. *Switching to digital mammography, did you have to increase the number of radiologists at your program?*

Dr. Hayes. It's very challenging to staff radiology in women's imaging, specifically in mammography. There is a real shortage of breast imagers throughout the country. However, we currently have 10 dedicated breast imaging radiologists.

Q. *And how about your staff of radiology technicians?*

Carina Marrero. That staff has stayed the same. Programs that are looking to increase their radiology technicians are looking to increase volume.

Q. *Why did you decide to purchase all your units from one manufacturer?*

Dr. Hayes. Our task force made the decision to stay with one vendor: Hologic. Memorial Healthcare System had participated in a screening trial with Hologic during the time the ACRIN trial was going on. We screened approximately 900 to 1,000 patients on the Hologic system, making sure we were satisfied with the images, that our radiologists would be satisfied with the workflow, and that our IT staff would be able to make the required connectivity. In other words, we did a "test drive" of Hologic units prior to making the big purchase. Smaller community cancer centers that are buying one or two units likely will not be able to do that, but we were going to buy more than a dozen units and we needed to do it right the first time.

And we've been very happy with the Hologic platforms. The company's next generation will be digital tomosynthesis, and that technology will hinge on the success of digital mammography. So it's not a question of "if" but rather a question of "when" community cancer centers will make the transition to digital.