

Choosing digital X-ray equipment

Kathleen M. Dallessio

As radiology workloads continue to increase and the staffing shortage shows no signs of abating, the choice of X-ray and other imaging equipment becomes an important factor in determining how effectively and productively a radiology department can function. When purchasing new equipment, the stakeholders in the imaging department must carefully consider many factors, including workflow, image quality and consistency, ease of use, connectivity, quality assurance, service, maintenance, and acquisition and usage costs.

“In any equipment purchase, you need to look at the clinical utility of what you are trying to achieve. Then you must brace that against the quality of the product and the quality of the outcome you are trying to achieve: in this case, images and imaging,” said Steven Metcalf, BS, CRA, Manager of Radiology Services, Altru Health System, Grand Forks, ND.

“In our department, when it came time to purchase new X-ray equipment, we weighed the image quality versus the utility of the equipment versus the overall cost of the equipment. Then, given our budgetary restraints, we decided what would make the most sense,” said Russell E. McWey, MD, Chief of Medical Imaging, Virginia Hospital Center, Arlington, VA. “Then we made on-site visits and looked at the individual pieces of equipment to help us decide what we liked and did not like.”

Ms. Dallessio is the Technology Correspondent for Applied Radiology.

Workflow efficiencies

For many radiology departments, workflow efficiency is the primary consideration when purchasing new X-ray equipment. “Generally, workload trends are always on the increase in radiology. I do not think that is unique to my service. It is a well-identified national trend,” said Metcalf. “In addition, I believe the radiologist shortage will continue to plague us for some time to come. Certainly, the implementation of digital technology and picture archiving and communications systems (PACS) is a benefit because of the way they improve efficiency.”

The issue of workflow was also an important consideration for Radiology Manager Mark Brown, BA, RT(R)(M) and his coworkers when they were asked to purchase X-ray equipment for Memorial Health Systems’ new Memorial Hospital North in Colorado Springs, CO. “The first consideration was how we could decrease the number of full-time equivalents (FTEs) and still offer state-of-the-art imaging,” said Brown, “because I knew we were going to have a limited number of FTEs available for the new hospital.”

“In today’s digital world,” said Metcalf, “there are efficiencies that a particular product may bring to your department, and with digital radiology (DR) products that is certainly a factor. Workflow is a major concern, particularly as it relates to the implementation of DR, specifically what this technology can do based on the fact that the user is not handling cassettes and the technologist does not need to be involved in processing images.”

“With DR,” explained Brown, “the technologist does not have to touch the

cassette or process anything. The machine does it automatically. The images are immediately transferred to a monitor, where the user can manipulate them and prepare them for the radiologist. DR gives you all the information at one time. The technologist can position the patient on the table, take the exposure, and, by the time he or she is ready to position the patient for the next exposure, the first exposure is ready to be reviewed and manipulated.”

Connectivity

How well the new equipment interacts with a facility’s information infrastructure is critical to the purchasing decision. “Connectivity was a huge issue for us as well,” said Brown. “With our last system, we had several connectivity issues and concerns. The biggest factor in this is the PACS because it is system-wide and everyone is affected by it. When we first implemented PACS in 2000, connectivity was a nightmare. We ended up buying black boxes to place everywhere when we had been under the assumption that the system was just ‘plug and play.’”

“The implementation of PACS was a driver in our purchasing decision,” added Metcalf. “In the PACS world, you want to move all equipment into the digital modality. With radiographic services, that means the implementation of computed radiography (CR) or DR. In our facilities, we used a combination of CR and DR and placed DR systems into each of our 3 main facilities where we have the highest volume. In the other locations, it made more sense for us to put in CR. In our main hospital, we have

a DR suite, as well as single-plate reader systems in our intensive care unit (ICU) and other high-usage areas among the nursing floors.”

The issue of connectivity was also very important at Virginia Hospital Center, according to McWey. He noted that they considered how the data would be processed and stored and which processing algorithms can be applied to the image at the reading station when it is retrieved on the PACS.

Learning curve and the user interface

Along with connectivity, when migrating to digital systems, the consistency of the user interface and the learning curve should be considered. It takes time for technologists to become proficient with a new system. “When you move the technologist from the traditional world of analog imaging to digital, it’s not as easy a transition as people think it might be,” explained Brown. “It is important to be sure that the technologists are prepared for the change,” he advised. “If the new system takes them out of their comfort zone, then they will be a bit more apprehensive. There is a large learning curve that can’t be ignored.” When the user interface is consistent and familiar, the transition can be easier and, said Metcalf, “your staff training is more uniform, and you have fewer errors with those functions.”

“When we switched to DR at our institution, there was certainly a learning curve in understanding the exposure differences between analog imaging and DR and CR,” said Metcalf, “but the technologists transitioned quite smoothly.”

“I think it was easier since the interfaces were similar to what the technologists had been using before,” added McWey. “So even though it was a new product and had to be learned, our new DR system has the same look as the old CR systems in terms of how patient information is input and the protocols are selected.”

For Brown, the opening of a new campus was an opportunity to bring in new technologists and train them immediately on the new technology. “All of

Questions to ask when purchasing digital X-ray equipment

- How will the implementation of this new system help achieve the goals of my radiology department?
- Will it improve workflow?
- Will it provide top-quality images?
- Will it provide consistent image quality?
- How will it integrate with my current information infrastructure?
- Will it provide better images for the radiologist?
- Will it be user-friendly for the technologist?
- Will it improve patient diagnosis?
- What maintenance will the system require?
- What type of service will the manufacturer provide?
- How responsive will they be in the event of equipment problems?
- How much will this system cost?
- What will the ongoing costs of usage be?
- How will the acquisition of this new system improve my radiology department?

the diagnostic radiology equipment at our outpatient facilities is DR-based,” he explained. “So I thought this was a great opportunity for us to go totally DR at the new campus and to move the newly hired technologists to DR from the start. That way we wouldn’t have to retrain them on DR once we upgraded.”

Image quality and consistency

The main function of any radiology department is to provide clear, easy-to-read images that help the physician make an accurate diagnosis. Therefore, the quality and consistency of the images produced should be of prime importance when choosing new radiology equipment. “Image resolution is extremely important,” said McWey.

One of the advantages of DR in terms of image quality, he noted, is the fact that DR is a closed system; therefore, the risk of artifacts due to contamination with dirt or dust is reduced. “Since DR is a contained system,” he said, “there are very few issues with artifact contamination.”

“There is not a lot of Quality Assurance (QA) work required for this system,” continued McWey. “It’s all integrated in the system. The only maintenance we

perform is to erase the receptors daily. Routine maintenance is performed by the manufacturer.”

“In the applications training process for the technologists, quality control was addressed,” added Metcalf. “The technologists were taught how to ensure—by looking at the data screens when they capture an image—that they have the correct exposure and that the image is of proper quality.”

At Memorial Hospital North, they decided to institute a new QA program when they installed their new DR system. “Every morning we image a phantom to make sure that when the radiologists pull images up, they are consistent,” explained Brown. “We use the same technique, the same density, and the same resolution to be able to check the images.”

Cost and service concerns

“There are other factors that also come into play when choosing new equipment,” said Metcalf, “including the support of your regional sales and service force and costs. Certainly a lower cost was important to us, although it wasn’t a huge issue.”

“For us, service was a huge concern,” said Brown. “If the manufacturer doesn’t have adequate service, it doesn’t do us

Who are the decision makers?

While each department's or center's specific needs and organizational structure will vary, in general, the following staff members may be among those involved when new radiology equipment is to be purchased:

- Chief of radiology
- Radiologists
- Radiology manager
- Radiology administrator
- Head of information technology
- PACS administrator
- RIS administrator
- Lead technologist

any good. We can't function effectively if the machine goes down."

In addition to the acquisition cost, the ongoing cost of consumables is also a consideration in choosing the right equipment for your facility. With DR, there are fewer consumable costs than with analog equipment. "You don't have to purchase film or the chemistry products and equipment that are needed to process the film,"

said Metcalf. "In addition, there are no cassettes to be replaced either."

Making the right decision

When it comes to making the final purchase decision, all of the stakeholders in the process should be involved. "At our facility, the radiologists were very involved when it came to the PACS decision, primarily from the aspect of selecting the workstations and understanding the functionality of the workstations, because they are their tools," said Metcalf. "The DR decision, on the other hand, was pretty much left to the technical staff. For vendor selection, we primarily used our technical staff and technical supervisors," explained Metcalf. "I was more involved in the financial analysis and assessing quotes and bids to ensure that they were competitive in the market."

"We have a committee that made the final decision regarding which PACS system we purchased," said Brown. "After that, the radiology management team sat down and decided which equipment would fit best in the areas we manage. Most of the time, it's a team effort through which we poll the staff to see what they need. Then the managers and

directors have their input. No single individual makes the final decision."

In Virginia, the decision was made by McWey and the radiology administrator. "We had some input from the general radiologists, but it was primarily the two of us, our PACS administrator, and our radiology information system (RIS) administrator who were involved in the decision-making process."

"We narrowed the choice down to 2 or 3 vendors," concluded Metcalf. "The FUJI SpeedSuite (FUJIFILM Medical Systems USA, Stamford, CT) was a very attractive product for us in that it bridged the gap when it came to comparing CR to DR in the workflow. It also bridged the gap for us in relation to the cost comparison with the more traditional type of DR system with the amorphous flat-panel sili-cone detector. In fact, when we began our selection process," he said, "we did not think we were going to choose DR. We expected to implement CR throughout the facility. However, this particular product gave us the opportunity to think about our DR decision again. The decisive factor was that we could improve our workflow process with DR in our 3 high-volume areas. Once we realized that, it became a very good and obvious choice for us."