

*High-tech diagnostic imaging arrives, and Vanderbilt Medical Center says goodbye to film.*

# The X-Ray Goes

# Digital

By MICHAEL SIMS

YOU CAN SEE THE SCENE EVERY NIGHT ON TELEVISION DRAMAS. A physician runs into her office with a handful of X-rays and slaps them onto a fluorescent screen to determine if the celebrity guest star will live until the end of the program. Before long this kind of scene will look as quaint as eight-track tapes. The suspenseful buildup to the diagnosis will remain, in both reality and melodrama, but the technology will change. X-ray pictures of your insides aren't headed toward extinction, but the film of them is. Like so many other things, X-rays are going digital. This quiet technological revolution is occurring all over the country, and the process is nearing completion at Vanderbilt Medical Center.

"The major benefit you're going to get, for patients as well as for physicians, is the widespread accessibility of the image," explains Johnny Hendricks, assistant director of Information Systems for Radiology at Vanderbilt.

An X-ray on film is a large photographic negative—the original, crucial picture. It can be viewed in only one place at a time. With the old system, a single copy of film was carefully guarded and tracked. It had to be checked out like a library book, with a similar guarantee of its return.

"You're always worried about where a single copy of film is," says Hendricks. "That's your one record of the patient's status." Digital images, in contrast, can be consulted by numerous people simultaneously, in various locations. They free the X-ray images to go where

they are needed when they are needed. In this system, a device will burn the original images onto an ordinary CD which, like commercially available programs, will include its own viewing program. Then even the patient can take the CD home, pop it into a computer, and display it full-size without special technology.

Some distribution questions in the changeover process are still to be answered. Sending the image over the Internet requires proper security technology for both transmission and receipt. Privacy regulations prevent a patient's medical record, including all diagnostic images, from being available online. However, the digital image can be loaded onto a CD and simply handed over to the patient. "It's a single physical copy that's off-campus that you don't have to track," explains Hendricks. "But we do have an audit trail of who we made it for and which films went out on which date."

But Vanderbilt—or any other hospital—cannot guarantee how the image will be viewed after it leaves the hospital where it was cre-

ated. What will happen when a patient from outside Nashville takes home a CD with X-rays on it and delivers it to his local hospital? The answer to the question of follow-up interpretation depends partially upon the equipment available to the other physician. The image will be the original from which the Vanderbilt doctor made a diagnosis. The diagnosing physician, however, can't guarantee the circumstances under which the image will be viewed in the future.

As Hendricks explains, "As with film, physicians can refer to the report or call the radiologist for follow-up. They will have a choice between the film and the CD, and either is a viable alternative. We're still going to print film if someone says, 'I want film.'"

"It's meant to be a review tool," says Hendricks of the digital image that leaves the institution where it was created. "However, the next doctor will have the patient's records and the report we did, and he'll know what he's looking for. As is the case with film, whether any other doctor feels that he can use a particular digital image to make a diagnosis is up to him. We've started the careful process of putting the system through its paces. We're not too far away, but we're still in the process of being certain we meet all security outlines to protect patient data."

When CDs—burned with original diagnostic-quality images in standard format—become the common practice, they will permit any hospital to import such images into their own diagnostic technology. Importing an image from another institution would be the same as importing an image from the hospital's own archive. The image will have the same quality as the original diagnostic X-ray.

In 1997, when Vanderbilt Medical Center began converting to the digital Picture Archiving and Communication System (PACS), the hospital was in the vanguard of such innovation. Nowadays, most medical institutions around the country are moving toward digital imagery in radiology. "We've been doing PACS perhaps a little longer than the average," says Hendricks. "It's been a gradual process because there are a huge number of studies and a lot of technical challenges to overcome." He predicts that Vanderbilt will have replaced X-ray film entirely with digital imagery by early summer 2003. Digital is also taking over mammograms, ultrasound, and other visual diagnostic tools.

By using PACS instead of traditional film, both patients and technicians spend less time on each diagnostic survey. Because digital technology requires neither development time nor as many back-up images, the technician can evaluate the quality of the image immediately. Monitor resolution varies, but high-resolution stations are available for detailed diagnostic examinations. Physicians will find X-ray information more readily accessible, easier to share, and simpler to incorporate into research and teaching.

Hendricks says with pride, "What we see in patient care many times, especially with the accessibility of computers and work stations within the Medical Center, even in the exam room, is that by the time the patient is returning to the room, the image is coming up on that screen." ▼

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