CR Digital Mammography: An Affordable Entry

By Cathy Fischer, MHSA

EXECUTIVE SUMMARY

- CR full-field digital mammography (FFDM) has been used extensively in other countries, and it was one of the 4 digital mammography technologies employed in the Digital Mammographic Imaging Screening Trial. Affordability and easy integration with pre-existing mammography systems makes CR FFDM an attractive way to secure the advantages of filmless mammography imaging.

- CR mammography is true digital mammography—it is merely a different way of acquiring the image. The FDA has recently approved the first CR FFDM system for sale in the United States.

- At Gundersen Lutheran Health System (La Crosse, Wisconsin), CR FFDM is the most practical technology for realizing the potential everyday clinical benefits of filmless mammography imaging.

Photostimulable phosphor-based computed radiography (CR) is employed throughout the world to acquire digital x-rays. Outside the United States, CR technology has also been successfully applied to mammography.

Screening centers and breast cancer clinics in the United States now have the opportunity to try this proven technology because the US Food and Drug Administration (FDA) has just approved the first CR FFDM system for use in this country. This event should hasten the adoption of this relatively affordable technology. With CR FFDM, it is possible to use existing mammography equipment for digital mammography simply by substituting CR cassettes for film cassettes.

In our case, at the Norma J. Vinger Center for Breast Care of the Gundersen Lutheran Health System (La Crosse, Wisconsin), the existing CR imaging plate reader was enabled to perform mammography for a nominal cost. In the future, all new CR readers purchased for sites performing mammography will be installed with both the general radiography and the mammography
The FDA approval of a CR FFDM system comes at a time when interest in digital mammography is running high among both clinicians and patients—partially fueled by the October 2005 publication of the results of the Digital Mammographic Imaging Screening Trial.

One might view the need to walk cassettes to a CR reader as a disadvantage, but not when you consider that fixed detectors are fragile and have a high replacement cost.

At the Norma J. Vinger Center for Breast Care, we are preparing to deploy the CR FFDM system in our screening practices. This technology, which according to our cost comparisons is considerably less expensive than other types of digital mammography, will allow us to explore the advantages of filmless mammography imaging in a stepwise, modular fashion.
Gundersen Lutheran Health System serves western Wisconsin, southeastern Minnesota, and northeastern Iowa. Our flagship hospital, Gundersen Lutheran Medical Center, is a 325 bed tertiary care and teaching institution. Gundersen Lutheran provides mammography services at 5 sites in addition to the La Crosse campus. Mammography and radiology interpretive services are provided for the main clinic and hospital, 19 regional clinics, and 6 regional hospitals by 22 radiologists. The reading of images throughout such a geographically dispersed area is facilitated by the system’s electronic infrastructure: An established PACS, a mammography and radiology information system, a voice recognition dictation system, and a home-grown electronic medical record system. The widespread PACS deployment enables extensive offsite reading and workload balancing. Overall, Gundersen radiologists perform 200,000 imaging examinations per year.

The multidisciplinary Norma J. Vinger Center for Breast Care has a national reputation for excellence of care and leadership in technology innovation. We have been pioneers in the use of magnetic resonance (MR) imaging of the breast for planning surgery and monitoring the effects of chemotherapy. We not only employ dedicated clinical breast radiologists—a new medical subspecialty with training in the early detection and efficient diagnosis of breast cancer—but also breast surgeons, medical oncologists, plastic surgeons, radiation oncologists, pathologists, breast geneticists, and nurse breast-care specialists. Our ability to serve as a single source for rapidly coordinating medical services helps our patients move more efficiently through diagnosis into treatment than they would in more fragmented systems. Patients have a much better experience of care and understand their treatment plans better as documented in a recent patient survey, and we believe that outcomes are improved.

Mammography screening is provided throughout the Gundersen Lutheran Health System. In 2005, we conducted approximately 18,000 screening mammograms. A mammography information system helps us track patients and sends out timely reminder notifications for screening dates.

The CR FFDM system, our first digital mammography system, will be implemented at the new regional clinic in Decorah, Iowa. The Decorah Clinic will be staffed by certified breast imaging technologists, and the screening images will be sent electronically to our breast clinic in La Crosse for interpretation at one of our PACS workstations utilizing FDA-approved 5 megapixel monitors. The FDA classifies display devices as Class II, requiring 510(k) clearance for use with FFDM. The CR reader can process 80, 18 x 24 cm imaging plates in 1 hour. At first, there will be 1 mammography unit at Decorah together with 1 CR reader. But because the CR FFDM system is scalable, as demand for screening at Decorah increases, additional mam-
mography machines can be added for the same CR reader. Our multi-plate reader has a throughput of 80, 18 x 24 cm imaging plates per hour. This translates into a maximum throughput of 20, 4-view screening exams—ample capacity to accommodate the exam volume of 3 mammography units. The CR reader can also be used for general digital x-rays at Decorah.

The flexibility associated with CR FFDM—the capability of the basic technology to meet the needs of a single screening room or, equally, a large facility with multiple screening rooms—will make the new system cost-effective for Gundersen Lutheran Health System as we leverage the initial investment over time. Digital mammography systems based on other technologies—largely available for purchase only in preset unit packages—do not offer comparable scalability.

Successful mammographic reporting must bring together current and prior images, reports, orders, and other clinical information, as well as the reporting or dictation systems used to create the reports.
recovery, and a single set of system administration procedures. Workflow and reporting are easily and efficiently integrated.

The use of our current PACS for CR FFDM also makes possible enterprise-wide distribution of the images. Although referring physicians do not often need to see screening images, to be able to do so is a great help for clinical breast radiologists, surgeons, and pathologists when they are planning and undertaking surgical procedures.

Our current electronic infrastructure is able to manage the large data sets associated with FFDM, and the space requirements for storing FFDM images are well within the capacity of our current PACS archive. As the volume of digital mammography expands at Gundersen Lutheran Health System, the storage capacity of the PACS archive will need to be monitored and expanded, but doing so is seen as an administrative task rather than a technical problem. With this system in place, we will begin the process of digitizing a selection of our prior film mammograms.

In recent years, we have been upgrading our mammography equipment with the intention of making the transition to CR FFDM by the simple substitution of digital for film cassettes. But we have not ruled out the possible acquisition of other types of digital mammography systems, possibly for installation at the Norma J. Vinger Center for Breast Care Diagnostic and Interventional Center, if specific diagnostic benefits become associated with them. For now, CR FFDM represents the most mature of all the filmless mammography technologies, with the largest number of installations worldwide and the greatest clinical experience. At Gundersen Lutheran Health System, CR FFDM is clearly the most practical technology for realizing the potential everyday clinical benefits of filmless mammography imaging.

References


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Questions

Instructions: Choose the answer that is most correct.

1. In some areas of the world, half of all mammographic examinations are now performed by:
   a. Ultrasonography
   b. Film/screen procedures
   c. CR full-field digital mammography
   d. None of the above

2. Photostimulable phosphor-based computed radiography can be used to acquire digital x-rays.
   a. True
   b. False

3. Recently, the US Food and Drug Administration approved the first:
   a. CR FFDM system for use in this country
   b. Sonography system dedicated to mammography
   c. Film/screen mammography system
   d. All of the above

4. With CR full-field digital mammography, it is possible to use existing mammography equipment for digital mammography simply by:
   a. Substituting CR cassettes for film cassettes
   b. Adjusting the size of the digital field
   c. Replacing the existing computed radiography plate reader
   d. None of the above

5. There is no similarity between the CR FFDM systems and CR systems currently used to produce digital x-rays.
   a. True
   b. False

6. The CR FFDM system can be installed for about one half the cost of a(an):
   a. Sonographic unit
   b. Direct digital mammography unit
   c. Film/screen unit
   d. None of the above
7. A mammography information system can be used to track patients and send out timely reminder notification for screening dates.
   a. True
   b. False

8. For many facilities that now use PACS, the adoption of filmless mammography imaging will complete the total:
   a. Digital-to-analog transformation
   b. Analog-to-digital transformation
   c. Computed radiography system
   d. All of the above

9. What was the Digital Mammographic Imaging Screening Trial?
   a. Compared CR FFDM systems to other digital systems
   b. Compared normal vs abnormal film/screen mammography
   c. Compared digital mammography with film mammography
   d. None of the above

10. Results of the DMIST study indicated that digital mammography is more accurate at detecting breast cancer than film mammography for:
    a. Women under the age of 50 years, no matter the level of breast tissue density
    b. Women of any with extremely dense breast tissue
    c. Premenopausal women of any age.
    d. All of the above

11. Only certified breast imaging technologists will be used to operate the CR FFDM system identified in this study.
    a. True
    b. False

12. Of the categories identified in the DMIST study, what percent of women screened fell into at least one those categories?
    a. 15%
    b. 45%
    c. 65%
    d. 85%

13. One of the digital mammography systems used in DMIST was the CR-based FFDM system just approved by the FDA.
    a. True
    b. False

14. The CR FFDM system replaces the traditional screen/film combination with a storage-phosphor-imaging plate contained within a cassette that can be used in a standard mammography unit:
    a. With major modifications
    b. With minor modifications
    c. Without modification
    d. None of the above

15. After exposure, the CR FFDM imaging plate is scanned by a 50-micron laser to:
    a. Clean the surface of the imaging plate
    b. Produce a digital image
    c. Adjust the image contrast
    d. None of the above

16. How does the cost of CR FFDM compare to other types of digital mammography?
    a. It is considerably less expensive
    b. It is about the same price
    c. It is somewhat more expensive
    d. None of the above

17. What is the new medical subspecialty with training in the early detection and efficient diagnosis of breast cancer?
    a. Medical oncologists
    b. Breast surgeons
    c. Clinical breast radiologists
    d. Breast geneticists

18. The facility in this study will monitor and expand the storage capacity of the PACS archive as the volume of digital mammography expands.
    a. True
    b. False

19. When compared to other types of digital mammography systems, CR FFDM offers:
    a. Flexibility of scale
    b. Errorless reporting
    c. Both a and b
    d. None of the above

20. Using the current PACS system for CR FFDM makes possible the enterprise-side distribution of the images.
    a. True
    b. False
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