MammoWeb Continuing Medical Education (CME): A Web-Based Breast Imaging CME Program

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The ubiquity of the world-wide web allows unique educational opportunities for continuing medical education (CME). We have designed a comprehensive breast imaging CME curriculum to permit individual physicians in their homes or offices to use personal computers to ease the burden of this process. Category 1 CME credits can be earned off-hours without having the physician travel out of town. In addition, since the course is computer-based, the overall costs to the participant are substantially reduced. The program can be updated on an ongoing basis to include new technology or to provide additional information requested by the users.

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RADIOLOGISTS, like all licensed physicians, must keep up to date of the newest trends and technology in their field. To maintain licensure, this usually requires obtaining a significant number of category 1 continuing medical education (CME) credits annually. This is especially important for radiologists since the American College of Radiology (ACR) and Mammography Quality Standards Act (MQSA) requires 15 category 1 CME credits every 3 years to interpret mammography. Maintaining accreditation is a time-consuming and expensive process. We designed an interactive computer program, MammoWeb CME, to offer web-based CME to individual physicians at their leisure using personal computers.

MATERIALS AND METHODS

Hardware Considerations

The program resides on a Sun Sparc 5 server computer (Sun Computer Corp, Mountain View, CA), which is connected to the internet by an ethernet network. The computer has three GB of hard-disk storage and 64 MB of RAM. Digital images were obtained either from film using a Kodak DCS 420 digital camera (Kodak Corp, Rochester, NY) or directly from an Agfa PACS sever (Agfa Corp, Mortsel, Belgium).

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Software Considerations

Our goals were twofold: to create (1) a comprehensive web-based CME breast imaging education program with integrated high-quality images, hypertext markup language (HTML) text information and quiz cases, and to (2) develop server computer software to coordinate teaching archives, handle billing, and award CME accreditation.

In regard to the first goal, planned CME curriculum includes nonsurgical breast biopsy techniques; and problems associated with the nipple-areolar complex, including galactography, breast ultrasonography, breast magnetic resonance imaging (MRI), and evaluation of asymmetric densities. The project educates users by a case-based teaching method. Educational information includes didactic text and appropriate diagnostic imaging information. Quiz cases provide an objective validation of the learning process.

Uncompressed digital images were ported to a 210 MHz Macintosh clone computer (PowerCenter Pro; PowerComputing Corp, San Antonio, TX), where they were resized and compressed using Photoshop 4 (Adobe Corp, San Jose, CA) and Debabelizer 3 (Equilibrium Corp, Sausalito, CA) software programs. Images were compressed to Joint Photographic

Fig 1. Basic logic pattern of the web program.

Fig 2. Introductory web page on nonsurgical breast biopsy techniques from MammoWeb CME. The course material is broadly separated into categories and descriptive text.

Expert Group (JPEG) standard, usually less than 50 kB, to ease downloading by modem internet connection. Text files were created on PC and Macintosh computers using Microsoft Word (Microsoft Corp, Redmond, CA), which was converted to HTML format.

In regard to the second goal, the server computer uses two UNIX-based software programs: the SuiteSpot Server (Netscape Corp, Mountain View, CA) and the Practical Extraction and Report Language (PERL) programming language. The SuiteSpot server is a readily available web-server program suite that handles the web-based interactions between the user's browser and the server. PERL is a free software programming language that runs on the server and is used to organize and present the course data, maintain the user information during and between sessions, track the user's responses to the questions, calculate

CME credits, and generate billing information. A simple database is also maintained by a PERL program running on the server, which is used to store information about the text and images, and maintain the user data in a secure environment. In addition, Javascript is used to validate certain user information forms before submission, and to facilitate the image window management. The teaching course can be obtained using any world-wide web-accessible computer with appropriate browser software (eg, Netscape Communicator or Microsoft Explorer).

RESULTS

We have developed 5 credit hours of CME content as a demonstration project covering nonsurgical breast biopsy techniques. The web accessible

Fig 3. Linked images are displayed on a separate window. Additional images can be navigated by toggling the button bars at the bottom of the web page.

program is available at <http://www.drad-cme.umaryland.edu>. Entering a unique user name and password on the initial web page allows the server computer to track individual users progress through the course material and accreditation. The overall program process is demonstrated in Fig 1.

The introductory web page on nonsurgical breast biopsy techniques separates the course material into categories and descriptive text (Fig 2). Linked images within the text are displayed in separate windows (Fig 3). After the user reads the course material, interactive questions are available to validate knowledge. Correct response to the questions permits category 1 CME credit from the University of Maryland. By offering this service

on-line, instant accreditation can be awarded on line if the user provides payment. The user cost per CME credit hour is currently \$15 per credit hour, less than most conventional CME courses.

CONCLUSIONS

Current computer technology allows creation of a web-based breast imaging CME curriculum. This program can be systematically expanded to include other body sections and modalities. By maintaining the course on the web, the overall costs to the participant can be substantially reduced compared to traditional CME courses. In addition, course participation is fostered by the ability to use the course on an individual schedule and pace.