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An Interactive Self-Paced Electrocardiography Electrode Placement Tutorial

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An Interactive Self-Paced Electrocardiography Electrode Placement Tutorial

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Key Points:

* Students need to understand ECGs
* Benefits of interactive learning
* ECG Learning Programs

Electrocardiography (ECG) is a frequently ordered diagnostic tool for cardiovascular disease and other physiological disorders. Therefore, it is crucial that healthcare providers demonstrate accurate ECG electrode placement in a swift and confident manner. Some nursing students, however, have difficulty understanding and remembering the anatomical placement of the electrodes for five-lead and/or 12-lead ECGs. Students are known to recite rhymes, such as, "Clouds over grass (white over green), smoke over fire (black over red) and ground (brown)," to remember electrode placement for testing purposes. In this mode, the students are demonstrating memorization of specific colors of the electrodes versus critical thinking about the human anatomy and electrophysiology of the cardiac system.

To enhance nursing students' knowledge and selfefficacy in the demonstration of ECG (electrocardiogram) electrode placement, dysrhythmia analyses and interpretation of ECG rhythms, three Web-based multimedia programs were designed: a five-lead ECG placement tutorial (http://www.maagnursing.com/ecg_demo/5lead.php), a 12-lead ECG placement tutorial (http://www.maagnursing.com/ecg_demo/12lead.php), and a program with case studies and a game (http://www.maagnursing.com/flash/ecg_activity.html). The programs, which are Open Source, are registered with the Multimedia Educational Resource for Learning and Online Teaching (MERLOT: http://www.merlot.org/Home.po). All are accessible via the author's personal Web site.

The ECG tutorials are aimed at nursing students learning ECG electrode placement and analyses of dysrhythmias. Based on the premise that people learn by interacting and "doing," a cognitive constructivist approach was used to develop the online ECG electrode

placement tutorials. Jonassen et al 1 delineate five mutually supporting features of meaningful learning: it is active, constructive, intentional, authentic, and cooperative. Technology can support each of these features, thus can facilitate student engagement in meaningful learning. Baruque and Melo 2 have found constructivism to be an appropriate learning theory for professional education because it prepares novices to think critically, solve problems, and work collaboratively. Jang et al 3 discovered staff nurses' knowledge of ECG interpretation acquired via Web-based instruction to be more effective than by classroom-based instruction. Keeping in mind students' learning styles and Mayer's 4 theory of multimedia learning, the author developed MP3 audio files and included them in the ECG tutorials. An MP3 audio recording is a digital computer file compressed by a factor of about 10 that delivers high audio value to users via a desktop computer or a portable player.

HOW DO THE TUTORIALS WORK?

To use the ECG tutorials, the user requires access to a computer with speakers, a Web browser, and Macromedia Shockwave Player (Macromedia is now owned by Adobe Systems, San Jose, CA). Shockwave is a free download and can be found at the URL http://sdc.shockwave.com/shockwave/download/download.cgi. The ECG fivelead and 12-lead tutorials have learning objectives listed to the left of the screen and on the right an image of a human chest wall that was drawn by a professional Web designer. Audio, which provides basic instructions for electrode placement and information about the uses for each type of ECG, begins when the learner logs in to either tutorial. If learners wish to repeat the audio, clicking on the "refresh" button on their browser will replay this file. In both programs the user has the opportunity to "drag and drop" (developed with Macromedia Flash animation) an electrode from a docking station located on one side of the computer screen to the correct anatomical position on the chest wall illustration. If the lead is placed in the wrong spot, the "lead" reverts back to its original location on the left side of the screen. By interacting with the tutorial, students have the opportunity to practice electrode placement at their own convenience without embarrassing themselves in front of peers or instructors. This enhances students' self-efficacy and motivation to learn before a test demonstration.5

The five-lead ECG tutorial provides a case study for a patient for whom a five-lead ECG could be ordered. The user is then led to place each electrode properly. To assist students to understand the term "12-lead ECG" when actually there are only 10 electrodes present for placement, the 12-lead ECG tutorial presents information about the three "augmented" unipolar leads that do not have specific electrodes. The 12-lead ECG program also provides an opportunity for the user to drag the lead to the

appropriate anatomical location.

Informal student feedback regarding the tutorials was positive. "It was very systematic, and I could take my time in placing the electrodes." Another student's response was: "I like how you may drag and drop the appropriate electrodes onto the correct anatomical areas. It is fun! The audio recording may be played over again if you do not understand it the first time."

MORE ECG LEARNING

The research of Jang et al 3 inspired me to design a Web-based multimedia ECG dysrhythmia analyses and game (http://www.maagnursing.com/flash/ecg_activity.html) for junior-level nursing students studying the interpretation of ECG rhythms. This program contains case studies and a chance for students to analyze an ECG as well as play a game. In the ECG analyses, users select the rhythm that they wish to study from the right side of the screen. They then can read about it on the screen as they both hear it and see the moving waveform. The case study presents a case with a multiple-choice question that asks the user to identify the type of heart variation that the patient is experiencing. In the game users are presented with a waveform and asked to identify it. They are given two chances, and if their answers are incorrect, the correct answer is provided. A running score is kept. For all the choices there is a mute button so the sound can be turned off.

CONCLUSION

Today's innovative distance education technology is providing many opportunities for nurse educators to learn and share with colleagues and students a multitude of electronic learning objects. This sharing is in keeping with the spirit of the Open Knowledge Initiative (http://web.mit.edu/oki/learn/whtpapers/OKI_white_paper_120902.pdf), a project spearheaded by researchers at the Massachusetts Institute of Technology. Open Source multimedia learning objects provide learners an opportunity to learn and refresh skills necessary for competent patient care. The learning objects may be used in instructor-led classrooms, self-paced e-learning situations, and/or in the clinical setting.

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