Computer-assisted learning—teaching clinical skills in cardiology

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Cardiology is a diverse and ever-expanding field of medicine. Medical trainees must master a wide variety of skills and knowledge in order to become proficient at managing patients with cardiovascular conditions. Computer-assisted learning has the potential to enhance medical teaching in cardiology by providing students with an enriching interactive learning environment.

During medical school, students are expected to develop a strong foundation of clinical skills. In many centers standardized patients are used to teach and evaluate students as they have been shown to be an effective teaching method. Cardiology, like many areas of medicine, is a diverse and ever-expanding field. Advances in technology have made many tools available to clinicians to diagnose and manage patients with cardiovascular conditions. Despite the availability of equipment such as electrocardiograms (ECG), echocardiograms (ECHO), physicians still rely heavily on basic clinical skills such as history and physical exam to determine the nature of a patient’s illness\(^1\). While traditional teaching methods are helpful for teaching students basic clinical skills, multimedia computer technologies provide students in the 21\(^{st}\) century with an opportunity to refine their talents.

Advantages of CAL in Cardiology Clinical Skills Teaching
CAL applications are of particular value in cardiology teaching due to their ability to provide students with information in an interactive manner. In a traditional teaching setting, students may be taught during a didactic teaching seminar (and subsequently memorize) that an aortic stenosis murmur is a systolic crescendo-decrescendo murmur. This information may be reinforced in a clinical methods teaching seminar. However, without actually hearing the sound themselves, can students truly appreciate the sound of such a murmur? Furthermore, will students be able to apply this knowledge to a patient that presents to them during their training or in their future practice?

CAL allows students to learn in a truly enriched self-directed learning environment. Physical findings such as auscultation may be conveyed as they would naturally be observed by the student. Heart sounds from patients with real findings may be recorded with electronic stethoscopes and then can be incorporated into the CAL program. Additionally, the programs may make use of other tools such as ECHO and ECG findings to allow the learner to correlate a patient’s findings into a broader picture and help reinforce the content.

The Current Use of Multimedia Teaching Tools
Medical educators already utilize multimedia computer technologies to provide students with increased exposure in their respective fields. The Computer-Assisted Learning in Pediatrics Program (CLIPP) has already been implemented to augment medical education in pediatrics.\(^2\) CLIPP is a computer-assisted learning (CAL) program that provides students with a multimedia experience to case-based learning. Programs like CLIPP are gaining popularity, as they allow students to learn at their own pace. This can allow for students to learn at a time and location that is convenient for them, as long as there is a computer available to work at.
Costs of Implementation
While the multimedia approach that CAL offers is exciting, as with any new technology, cost can be concerning. Nevertheless, widespread use of CAL modules can be very cost-effective. For example, in 2005, the average development cost per CLIPP case session was approximately $6. This amount will decrease as the number of students using the program increases. Replacing traditional teaching methods with CAL has the potential to free up the time of medical school lecturers to teach in other capacities, such as small group sessions. Furthermore, CAL has the potential to enhance teaching at distant locations such as satellite campuses, rural settings and in developing nations.

CAL and Other Learning Methods
Adults have been shown to learn optimally in self-directed learning environments. As a result, there has been a shift away from traditional lecture and seminar-based teaching and towards the implementation of more self-directed learning in medical schools. In addition to the use of multimedia modalities, CAL can help guide learning through other features such as quizzes and learning games. In fact, many informal forums for CAL have already been created by students and instructors. For example, it is possible to find video instructions for various aspects of the clinical examination on YouTube and personal webpages. A more professional forum would allow students to better capitalize on CAL's advantages. Currently, there is debate as to the effectiveness of CAL as a teaching modality. Several studies have compared the use of CAL to other modes of learning. Some of these studies show that there is no significant difference in knowledge and skill retention between those taught didactically or by seminar when compared to those taught by computer teaching modules, while some studies suggest that other forms of teaching (e.g. didactic lecture) are still superior.

The Future of CAL
While research continues to assess the effectiveness of CAL in medical education, this new learning tool is a rising form of medical teaching. The Association of American Medical Colleges (AAMC) has established MedEd Portal, a peer-reviewed collection of online teaching tools. This resource contains a database of learning resources that include tutorials, virtual patients, and case-based learning among other medical education resources. Not only does the MedEd Portal provide easy access to CAL modules, but it also provides incentive to academic physicians to create more CAL tools through recognition as a peer-reviewed publication. Initiatives such as this will likely increase the production of CAL modules. The use of computer-based teaching in medicine has the potential to change the way medicine is taught to both current and future generations. Between the multimedia capabilities of CAL, enhancements over current learning modalities and increased recognition for publishing CAL modules, there appears to be a bright future for computer-assisted learning.

References