Recent advances in technology have resulted in an ever-expanding body of medical literature. While this growth faces physicians and medical trainees with a challenge in keeping up to date, the technologies that have facilitated the expansion may also provide doctors and students with new methods of learning. Computer-assisted learning has the potential to enhance medical teaching.

Technology and communications have facilitated the tremendous growth of medical literature in recent years. This has left medical professionals with an ever-expanding library of knowledge to be familiar with. While the wealth of new medical information presents challenges for physicians in keeping up with their respective fields, the technologies that have facilitated the recent expansion may also provide an improved means for physicians to learn. Computer-assisted learning (CAL) may hold an important place in the future of medical education in undergraduate, post-graduate and continuing medical training.

In Canada, undergraduate medical education (UME) takes the form of three or four year curricula. In this time, medical students must acquire the knowledge necessary to pursue post-graduate medical training in both general and specialized residency programs. As a result, medical students are forced to acquire vast knowledge in a short timeframe. Time restrictions in medical training are not limited to education at the undergraduate level; post-graduate programs face similar time constraints. Residency training programs range from two years in family medicine to six years for cardiac and neurosurgery. At the end of residency, medical trainees are expected to feel comfortable as physicians, as they move to practicing medicine independently.

The Current Use of CAL in Medical Education

Medical educators already make use of CAL to provide students with increased exposure in their respective fields. For example, the Computer-Assisted Learning in Pediatrics Program (CLIPP) provides medical students with a case based approach to learning in pediatrics. Programs like this 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.

In addition to the implementation of CAL in UME, there has been a shift toward the use of CAL for continuing medical education (CME). By 2003, there were over 11,000 online CME courses available. Practicing physicians are required to obtain 400 CME credits over 5 years. There are six categories of learning that can be used to obtain CME credits. Up to 25% of this requirement may be met through the “Other Learning Activities” category which includes activities such reading simple learning materials like journal articles or using unaccredited online courses. Additionally, accredited CAL modules may be used to obtain credit when they meet the requirements of the “Structured Learning Projects” category, which has no cap for credit hours.

Advantages of CAL

CAL applications are of particular value for highly visual content, such as demonstrations of surgical procedures and technical skills. These skills typically require spatial and visual coordination. While print-based learning materials are mainly limited to text and image based information, CAL can additionally utilize multimedia capabilities. CAL can be designed to incorporate not only text images but also video to enhance student learning. Interactive features of CAL, such as quizzes and learning games, can augment the learning process by providing feedback in a manner that makes students feel comfortable.
Costs of Implementation

While the convenience of CAL is attractive, as with any new technology, cost is often a concern. 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, and this amount will decrease as more students continue to use each case. In addition, replacement of teaching 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 when their learning is self-directed. This has resulted in a trend away from traditional lecture and seminar-based teaching and towards the implementation of more self-directed learning in medical curricula. In self-directed learning, the learner identifies the knowledge in which they are deficient and then attempts to learn based on their individual needs. Computers may be able to assist in this process by providing interactive tools such as quizzes and learning games to aid the student in determining what information to pursue.

Currently, there is debate as to the effectiveness of CAL as a teaching modality. There are several studies that have compared the use of CAL to other methods of education. Many 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, but there are some studies suggesting that other forms of teaching (e.g. didactic lecture) are still superior.

The Future of CAL

While research is still ongoing into the effectiveness of CAL for medical education, this new learning modality 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 by providing their work with 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 conveniences afforded by 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