

*Key Questions for Training and Practice***How do I effectively use electronic continuing medical education?**

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VIGNETTE

A 20-year-old man presents to a community hospital emergency department (ED) with a spontaneous pneumothorax. The treating emergency physician (EP) inserts a chest tube and admits him to the hospital. The same physician, who follows the Twitter feed of a local emergency medicine residency program, receives a tweet later that day announcing an upcoming live webcast on Heimlich flutter valve insertion for pneumothorax. She receives an e-mail that confirms the time and Internet location of the live event. It also includes a brief pretest regarding the indications, contraindications, techniques, and complications of this procedure.

BACKGROUND

Over the past decade, electronic continuing medical education (CME) has made the transition from mere curiosity to mainstream. Although electronic CME can be loosely defined as any computer-based CME activity, the biggest growth in electronic CME has occurred with Internet-based learning through activities that involve downloading and live streaming of materials from online sites. Although the majority of physicians still prefer traditional formats of CME, such as live conferences and seminars, the percentage of physicians engaged in Internet-based CME continues to grow. Accreditation Council for Continuing

Medical Education statistics reveal that Internet-based CME accounted for 41% of all physician participants in 2008, up from only 1% in 1998.¹ In fact, the number of physician participants in these activities now exceeds those who participate in live conferences. Internet-based CME is here to stay.

Electronic CME has benefits over traditional formats. It allows physicians to participate in activities on their own time and in the setting of their choice. But merely using new technology does not eliminate long-standing concerns about CME, namely, that it fails to change physician practice or to improve patient-oriented outcomes.^{2,3} In addition to studies demonstrating that Internet-based CME is equally effective to traditional formats in imparting knowledge,⁴ some demonstrate that it may be more effective at changing physician behaviour.^{5,6}

The promise of new technologies will ultimately rest on their ability to adapt to our emerging understanding of how physicians in practice learn and to the inherent heterogeneity of practitioners' learning styles. Moreover, technology, no matter how sophisticated, will never supplant the need for quality content and skilled educators; poorly conceived content designed or delivered by an ineffective facilitator will be just as ineffective when dressed up in the veneer of technology.

PUSH TECHNOLOGIES

The vignette above illustrates some of what we are beginning to learn about Internet-based CME. "Push" technologies that passively remind participants about upcoming learning activities appear to enhance

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engagement with the activity.⁷ If such reminders engage the participant to think about a challenging clinical scenario or answer a short question, it can draw them in by highlighting a knowledge deficit or a novel approach to a difficult problem. Whereas electronic mail is most commonly used for this purpose, newer messaging systems, such as Twitter, have the advantage of easier accessibility because the recipient can receive short text-based messages (“tweets”) automatically without the need to log on to a server. Really Simple Syndication (RSS), a technology used by web- and podcasts, allows the easy and rapid dissemination of text, audio, or video content directly to the end user as soon as the producer creates and uploads the file. RSS has revolutionized media distribution and allows niche groups to publish content directly to the preferred device of the target audience (hand-held, laptop, or desktop computers). These can be organized for rapid access on aggregating programs such as iTunes, which enable the user to easily search for, label, and cross-reference materials by placing them into one or more virtual folders.⁸

SYNCHRONOUS VERSUS ASYNCHRONOUS INTERACTION

Back to our vignette: the online video presentation commences and is followed by an energetic interactive discussion among the faculty present at the live event. The EP has a question regarding one of her concerns about the procedure (the risk of reexpansion pulmonary edema) and sends the question via the chat room feature to the speaker. The speaker reads the question to the live audience and answers the question. During the presentation, the speaker shows video of the techniques of Heimlich valve insertion.

One of the biggest drawbacks of electronic CME is the loss of physical “face-to-face” time among facilitators and participants. This limitation has been shown to negatively impact on participants’ perceptions of the effectiveness of Internet-based CME.^{9,10} The interactive component of online CME is a critical ingredient of successful programs, one that is vital to the learning that leads to changes in practice. This concept is not new and is supported by research from the pre-electronic era.¹¹ Interaction during Internet-based activities may be facilitated in many ways. Most frequently, this is asynchronous, where there is a time delay between the comments and questions of participants. This is also known as transactional distance. Some degree of asynchrony may be acceptable when

participants are already very familiar with the material in question or wish only to exchange simple questions and comments. When new or complex ideas are being discussed, however, it can lead to frustration and the potential for misunderstanding among learners and facilitators. As in the current vignette, real-time (or synchronous) interaction is preferred and should be sought whenever possible. It allows the exchange that may be required to clarify difficult concepts and procedures. Synchronous interaction may take several forms, including real-time chat, audio, or video communication, as well as the two-way transmission of text, audio, or video files. Importantly, synchronous interaction can also provide real-time verification by both parties that the learner and instructor are “on the same page,” increasing confidence that the material is being understood.

IMPORTANCE OF ENDURING MATERIALS

One day later, the EP receives a summary of the CME event via e-mail and completes an interactive posttest that is linked to the summary. She now feels that she is sufficiently confident about the procedure to attempt it the next time she sees a patient with a similar presentation.

Two months later, another patient presents to the ED with a spontaneous pneumothorax and the EP decides to proceed with her first Heimlich valve procedure. She realizes that she has forgotten how to secure the Heimlich apparatus once it is inserted. To refresh her memory, she accesses the CME website on her personal digital assistant and reviews the speaker’s notes from the presentation, which include a step-by-step guide in pictorial format. She then proceeds with the procedure and discharges the patient home with close follow-up.

Adult learners require frequent repetition of new information in different venues and in different formats. Moreover, materials or information that is no longer available or not easily accessible is of limited value. Thus, we expect any successful CME to be available at anytime after initially accessed as long as it remains valid information.

SOCIAL NETWORKING

The EP logs onto a social networking community page covering EM topics. She finds a vibrant discussion

regarding the various treatments of spontaneous pneumothorax used by practitioners around the world. During these interactions, she discovers a new device that is superior to the one in her ED and sets about the process of acquiring it for her department.

Social networking sites and other venues for online collaboration are increasingly being used for information exchange. A “wiki” is a collaborative website that contains “open” content that can be modified by any individual user. A “blog” or weblog is a website that contains material posted by a single user or group of users that can be added to sequentially over time. Both formats are at risk for abuse and for the dissemination of misinformation. However, the open nature of these formats is also their greatest strength, particularly for “wikis” that involve broad participation from a group of appropriately qualified users that share a common goal. With software safeguards and monitoring, the quality and clarity of the material can be rapidly and continuously refined and improved, a process that has been described as “darwinian” because of its similarity to natural selection.¹²

SUMMARY AND FUTURE DIRECTIONS

So what is the bottom line for EPs? Our specialty demands knowledge and skills that span virtually every field of medicine. Moreover, the nature of our work frequently mandates that we be able to immediately recall and access information. Whether accessing

traditional or electronic formats (or a combination of both), we should insist on CME that is of the highest quality, is designed by facilitators who are skilled and experienced, and is enduring. Although evidence is still limited, EPs should seek electronic CME that incorporates reminder or “push” techniques to introduce material, active real-time participation, posttests to reinforce learning, and easily accessible and searchable archives that allow for review whenever it is needed. Table 1 summarizes some of the new technologies discussed in our vignette.

Electronic CME has opened up incredible new vistas for EPs that would never have been possible using traditional approaches. The “holy grail” of CME is finally within reach, one where CME becomes a continuous and seamless process of practice-based learning happening intercurrently with patient care.

One electronic educational technique that holds great promise is artificial intelligence—the ability of a computer to “learn” about the strengths and weaknesses of its user and incorporate that information into the way that curriculum is presented and its comprehension assessed. Although this and other advanced techniques may prove efficacious as measured by instruments typically used in educational research, we must strive to incorporate patient-oriented outcomes whenever possible. Lastly, when applying the results of future research, we must acknowledge the heterogeneity of practitioners. Even optimal individual learning will differ depending on the various technologies,

Table 1. New technologies in continuing medical education

Technology	Pros	Cons	Notes
E-mail	Ubiquitous, archived, passive on registrant's part	Overused	Short video and audio files can also be sent via e-mail
Twitter	Mass transmission to telephone and Internet	Two-way communication more difficult	Excellent choice for reminders and short text-based messages
Streaming video	Real time	Requires high-speed Internet access	When linked with chat, allows feedback in real time
Archived video	Not time dependent	No live interaction	Able to be viewed on multiple occasions from multiple devices
Archived audio	Extremely portable; not time dependent	No live interaction	Ubiquitous access on compact disc, MP3 players, etc.
Social networking	Interaction with colleagues	Wide variety of platforms available	Older physicians may have less exposure to and be less comfortable with technologies

styles of learning, practice environments, our age, and the stage of our career. Ultimately, education must adapt to our needs and our ability to learn.

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