PERSPECTIVES

Toward *Continuous* Medical Education

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While traditional continuing medical education (CME) courses increase participants' knowledge, they have minimal impact on the more relevant end points of physician behavior and patient outcomes. The interactive potential of online CME and its flexibility in time and place offer potential improvements over traditional CME. However, more emphasis should be placed on continuing education that occurs when clinicians search for answers to questions that arise in clinical practice, instead of that which occurs at an arbitrary time designated for CME. The use of learning portfolios and informationists can be integrated with self-directed CME to help foster a culture of lifelong learning.

KEY WORDS: continuing medical education; Internet; distance learning; library services.

Perhaps more than any other professionals, physicians are expected to keep current with the latest developments in their field. In 1872, the German surgeon Bernhard von Langenbeck noted:

> It has become increasingly difficult to keep abreast of and to assimilate the investigative reports which accumulate day after day. [My colleague]. . .was ill at ease because he felt unable to control even the area of his own discipline; one suffocates, he once told me, through exposure to the massive body of rapidly growing information.[1]

Physicians in the 19th century likely had little idea of how overwhelming the challenge of keeping up to date would become. Computers, and the Internet in particular, enable physicians to manage more of this massive body of information more efficiently than ever before. Here I describe the effectiveness of traditional continuing medical education (CME) and the potential benefits of online CME. I focus on how CME can be improved so that it fosters a culture of lifelong self-directed learning.

Effectiveness of Traditional CME and the Potential of Online CME

Although CME has been mandated for decades in the United States, only recently have we begun to rigorously evaluate its effectiveness. While CME has been shown to increase participants' knowledge, a meta-analysis by Davis et al. showed that didactic interventions have no impact on the more relevant end points of physician behavior and patient outcomes.[2] Bero et al. also found that didactic educational meetings are ineffective at promoting physician behavior change.[3] In contrast, interactive educational interventions, such as case solving, discussion groups, and role play, can improve physician behavior and patient outcomes.[2–4] Examples of improved end points cited were colo-rectal cancer screening rates and hypertension control. While the Accreditation Council for Continuing Medical Education requires only that effectiveness of CME activities be measured in terms of "satisfaction, knowledge, or skill," they recognize that "exemplary" CME will be effective in terms of "practice application and/or health status improvement."[5]

Increasing interactivity in traditional CME courses is thus one approach to making CME more effective. However, an important limitation of traditional CME courses is that they are bound by time and place. In contrast, CME based on enduring materials such as printed journals or online content allows users to participate at the time and location of their choice. Learners generally have the option of completing the activity in different sittings and viewing content at their own pace.

Online CME is particularly attractive, not only because it can be accessed from anywhere with Internet access, but because of its potential for the type of interactivity that characterizes effective CME. While learning and camaraderie that result from interacting with peers is generally not available, online CME can facilitate interactivity over time that is not possible with traditional CME. This is demonstrated by a course on type 2 diabetes in England in which participants log in regularly to study interactive modules, engage in online discussion, and collaborate in the management of sample cases presented via an online medical chart and streaming video.[6] Davis et al. found that the use of such longitudinal learning is one of the characteristics of successful CME.[2]

While online CME has been shown to be effective at increasing physician knowledge, there are no published studies evaluating its effect on physician behavior or patient outcomes. We can hypothesize that the effect of online CME on these more meaningful outcomes will depend on the degree to which its content is interactive.[2,7] The types of instruction most used by online CME providers are described by Sklar[8] and summarized in Figure 1. Most existing online CME activities are equivalent in format to their nononline predecessors. Instead of attending a live presentation, participants hear lectures or view slides on their computers. Instead of reading the hard copy of a monograph or journal article, participants read electronic versions via the Web. Some online CME, however, does utilize the unique characteristics of the Internet. As of January 2004, 23% of online CME sites consisted of interactive case-based learning.[8] However, effective CME requires

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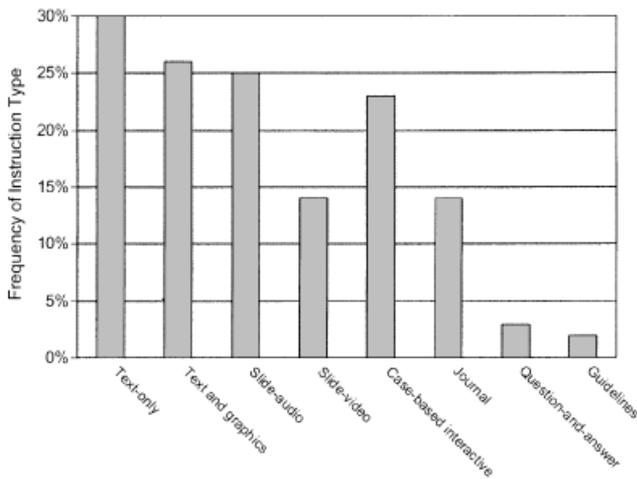
FIGURE 1. Instruction type used by online CME sites. Each of the following instruction types comprise < 3% of sites: Board review/self-assessment; correspondence; games; streaming video; and self-directed search. Many sites have more than one type of instruction.[8]

not only increased interactivity, but also improved applicability to users' specific learning needs.

Continuous Medical Education with Context-based Learning

Medical trainees are expected to read about issues relevant to their patients' care, so that the learning process is connected to specific, hopefully memorable, patients. Many have noted the need for better training in self-directed and context-based learning for busy clinicians in practice.[9–11] Two tools that may help fulfill this need are learning portfolios and informationists.

Tools to Facilitate the Asking of Questions: The Learning Portfolio. In a typical clinical learning portfolio, a user enters a question and its context, how the question is answered, and whether having answered it will cause a change in practice. Theories of adult learning emphasize the importance of a learner identifying an educational need and planning to meet that need.[11,12] Furthermore, structured reflection about proactive learning experiences is more likely to result in meaningful learning than is didactic education.[12,13] Although most of the data supporting the use of clinical portfolios are qualitative,[14] a crossover comparison demonstrated that clinicians applied portfolio-based learning, and not traditional CME, to their clinical practice.[12]

A learning portfolio in widespread use is the Web Diary, created by Canada's Royal College of Physicians and Surgeons (RCPSC) and used to track members' CME activity.[9,15] Its predecessor, the PCDiary, has been positively received by users in clinical practice.[16,17] While busy seeing patients, an option is to record the question in the learning portfolio when the learning need arises and attempt to answer it later. At the end of the day or at another time designated for study, the physician can review recent learning needs and search for answers. Learning portfolios can encourage such study both by tracking questions and by providing CME credit for self-directed learning, as occurs with the Web Diary in Canada.

The questions, answers, and self-perceived effects on the physician's practice recorded in the Web Diary are collected in a database. A learner can survey his or her database to review and reinforce learning that occurred, and view a compiled database to survey what colleagues are asking and learning. Portfolios have been shown to be an effective way for medical students to learn how to reflect on their learning, and thus may help shape their habits for lifelong continuing education.[13]

Tools to Facilitate the Answering of Questions: The Informationist. Two important limitations of learning portfolios are that physicians may not find time to answer questions they record, and many physicians are not well trained to search and critically appraise information resources. It is here that clinical medical librarians can play a key role. Their primary function has been described as locating and providing quality-filtered, patient-specific information to physicians at the point of care.[18] Davidoff and Florance discuss the need for these professionals, who they call informationists, and describe them on rounds with the clinical team or present in the office setting.[19] An example of an existing program is the Clinical Informatics Consult Service at Vanderbilt University, where clinical librarians search and synthesize the literature in response to questions asked by clinicians in the intensive care unit.[20] Based on surveys of participating physicians, such programs can increase physician knowledge, affect clinical decisions, and improve outcomes such as length of stay.[18,21] Questions could also be posed to an informationist asynchronously, via a question tracking tool such as the Web Diary. In addition to providing answers to questions, informationists can offer clinicians feedback about how to formulate answerable questions and how to pursue answers themselves.

Unfortunately, most physicians practice in settings where they do not have access to an informationist. However, these professionals may have their biggest impact if used in training programs, the setting where they are most likely to be available. We can hypothesize that if informationists help teach trainees skills for lifelong learning, these trainees are more likely to become clinicians able to answer questions that arise in their practice.

Reevaluation of How CME Is Awarded

I have suggested that physicians need better training and tools to answer questions that arise in clinical practice, and that answering such questions comprises a key part of continuing education. In cases where a physician recognizes that a topic requires general review, he or she may find a CME activity online or in a journal that reviews that topic. More commonly, however, answering a specific question requires using resources that do not comprise an official CME activity, such as reading a passage in a textbook or a journal abstract. Awarding CME credit for such self-directed learning would serve as an additional incentive for physicians who might otherwise leave questions unasked or unanswered.[22]

Continuing medical education in the United States is currently awarded on the basis of hours. States that mandate CME for relicensure require between 12 and 50 hours per year.[23] Most online CME providers award CME credits by approximating the hours users require to complete the CME activity. UpToDate, an online evidence-based database, now offers CME credit as a result of its participation in the

American Medical Association's (AMA) Self-Directed/Self-Initiated (SDSI) Internet CME Pilot Project.[24] Users can receive credit for hours they log while using the UpToDate website or CD-ROM. This approach does reward self-directed learning but values time spent searching over the quality of questions posed and whether searches resulted in actual learning. The AMA has noted that with the emergence of self-directed Internet CME, it will be important that they award CME credit other than on a "seat time" basis.[25] Skolar MD, a collection of multiple online resources that can be searched simultaneously, is also participating in the AMA's SDSI Internet CME Pilot Project.[26] Its users do not receive CME credit merely for hours of use, rather they must state their question or learning objective and identify articles or pieces of literature that led to an answer. It would be a step forward if the AMA adopted the learning portfolio model for self-directed CME. The challenge of evaluating learning portfolios can be addressed by auditing a small percentage of entries, as is done by both Canada's RCPSC and Skolar MD.[26,27]

Finding High-quality Online CME

Though online CME has not yet proved to be more effective than traditional CME, its rapid proliferation and wide accessibility merit discussion of how users can find high-quality resources. Table 1 describes examples of the largest online CME providers in terms of number of CME activities and hours,[8] as well as more comprehensive electronic knowledge resources discussed above that offer CME credit. The most complete list of online CME available is the Annotated List of Online CME maintained by Sklar (www.cmelist.com/list.htm). The Annotated List is regularly updated and has links to over 270 online CME sites that offer over 12,000 courses and 21,000 hours of CME credit. The description of each site includes the type of instruction (e.g., case-based interactive), target audience, organization that awards the CME, financial support, date material was last updated, and cost. Medical Matrix is a subscription-based medical search engine and directory (www.medmatrix.org; $89 per year). All sites in the search engine, including approximately 100 CME sites, are reviewed by a team of physicians and medical librarians who rate them based on qualities such as clinical relevance, peer review, currency, and use of multimedia.

Conclusions

While the didactic lectures of traditional CME courses can increase physician knowledge, they have been shown to have no significant impact on the more meaningful end points of changing physician behavior and improving patient outcomes. We can expect the same of the majority of today's online CME, as it takes the same noninteractive form as traditional CME. Fortunately, interactive online CME activities are increasingly available. We await studies to determine whether this type of CME can change physician behavior and improve patient outcomes, as has been shown of interactive traditional CME.

Of course, physicians more often use the Internet to answer questions that arise in clinical practice than to obtain CME credit. The skills required to do so successfully have not generally been taught in medical school and residency training. Learning portfolios can serve an important role in helping learners pose relevant questions and reflect on how answering such questions impacts their practice. The use of such tools by medical trainees could help teach them that self-directed, context-based learning is an integral part of continuing education. Clinical medical librarians, or informationists, can promote a culture of self-directed learning by finding answers to questions posed by clinicians and trainees and teaching them

Table 1. Online CME Providers

Examples of the Largest CME Providers

Name and URL	CME Cost	Description
eMedicine CME cme.emedicine.com	$7.50 per 1.5 hours	Text-and-graphics instruction with outline-style articles on specific diseases. Offers over 9,000 CME hours which users earn by answering multiple-choice questions after reading articles.
Medscape www.medscape.com	Free	Instruction types include text-only, text-and-graphics, slide-audio, and slide-video lecture. Activities include reading articles about major medical conferences, specific topics, or clinical trial results. Approximately 250 courses for 400 CME hours.
mypatient.com www.mypatient.com	$100 per year for unlimited CME credit	Fifty-nine highly interactive cases which include learning objectives, feedback on users' decisions, and reinforcing quizzes and teaching points. Physical exam and diagnostic test results often include photographic images.

Other Knowledge Resources That Provide CME Credit

Name and URL	CME Cost	Description
UpToDate www.uptodate.com	Individual subscription: $495 per year ($395 renewal; $195 for trainees); includes unlimited CME credit	Evidence-based electronic textbook covering multiple specialties and subspecialties. Provides regularly updated, well-referenced reviews by experts in the field. Reviews focus on synthesizing available evidence and answering questions that come up in clinical practice. Accessed online or on desktop or handheld computer.
Skolar MD www.skolar.com	Institutional subscription only; includes unlimited CME credit	Simultaneously searches multiple resources, including textbooks, drug information resources, Cochrane systematic reviews, National Guideline Clearinghouse, and Medline.

CME, continuing medical education.

to better answer their own questions. The use of these professionals during medical school and residency may be a particularly good investment, as they can help trainees acquire lifelong learning skills. Further study is warranted to define what role portfolios and informationists should play in CME.

Education should not be viewed as separate from patient care. Rather, questions about patient care should provide the context for learning. It is an important step that CME regulatory bodies are evaluating how physicians might receive CME credit for self-directed learning. We must support physicians' continuing education by teaching them to use high-quality information resources, and giving them credit for doing so.

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