

Theory and Practice in Continuing Medical Education

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Abstract

Introduction: Continuing medical education (CME) represents the final and often most poorly understood stage of physician education. The understanding of contemporary theories of physician education and characteristics of effective CME interventions will help CME providers and physician learners to plan productive CME activities and improve learning. This article aims to provide readers with emerging evidences on effective CME, particularly in relation to theories of physician learning and their implications for CME planning. The article also summarises attributes of effective CME interventions. **Methods:** The data and evidence were collected from contemporary medical education journals and published books on medical education. Two electronic databases, Medline and ERIC (Educational Research Information Clearinghouse) were searched for suitable articles. **Results:** Physician learning is a distinct phenomenon with high inclination towards autonomy and self-directed learning. CME interventions are more likely to be fruitful if they are modelled with strong theoretical background, catered towards individual learning needs and preferences, and focused on the learning component of education. Many widely practised CME interventions fail to be effective as those are not based on the above principles. **Conclusion:** Evidence suggests that careful planning and evaluation of CME will improve the key measure of physician's performance and health care outcome.

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Introduction

A physician's education in medical science represents a continuum of several interrelated phases. It starts with medical school, passes through brief housemanship year, and continues throughout the professional career. The characteristics of education and expectations from learners in each of these stages are different. Continuing medical education (CME) represents the final and arguably the most complex stage of physician education. Unfortunately it is also the least understood phase. As we gain insight into how physicians learn in their own context, the methods of delivering education will continue to improve. It is now possible to design and implement high quality CME interventions based on strong theoretical background.

This article aims to provide an overview of understanding of contemporary theories of physician learning and their implications for CME movement. The first part of the article will provide background information, clarify common terminology used in CME literature, and establish the value of lifelong learning. We will briefly discuss 3 phases of physician education and concerns for these phases and their implications to CME. In the second part, we will critically examine evidences for effectiveness of

CME. Two basic types of outcome measures are used to document such effectiveness: change in physician behaviour and attitudes, and health care outcomes. We will trace history from the late 1970s, when CME movement had a major setback as a result of several randomised control trials (RCTs) that failed to document effectiveness of CME, to advancement of CME movement in late 1990s. In the next section, we will concentrate on factors that have been thought to have contributed to this advancement. In the final section, our focus will be on isolating the types of CME interventions that have proven to be effective and common attributes of such interventions. We will also examine why some of the commonly practised CME interventions are ineffective.

A variety of terms are used to describe CME. Some of the common ones include physician enhancement programme, knowledge dissemination strategies, and medical practice education. It is difficult to formulate a precise definition of CME but conceptually, it is convenient to identify some of its attributes. CME is primarily meant for physicians beyond their basic training stage. The fundamental aims of CME are to supplement knowledge acquired during medical school and to provide continuous enrichment programmes

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to keep physicians updated with recent medical advances. The implied goals are, as a result of this knowledge, physicians will change their behaviour or attitudes and this will ultimately improve health care outcomes. The format of CME interventions can be diverse, from formal seminar to informal readings; it can be individualised such as personal feedback or be directed to a group. Table I provides a list of types of CME interventions with examples.

The need for providing continuing education to physicians arises from several interrelated factors: concern of

TABLE I: TYPES OF CME INTERVENTIONS

Interventions	Examples
Formal CME	Didactic session, courses, conferences, ward rounds
Print materials	Newsletter, bulletin, text, journal
Academic detailing	Physician educator visit
Audio-visual and computer-aided	Audiotape, videotape
Enabling	Flow chart, algorithm, patient education material
Reinforcing	Reminder, feedback
Mixed or multi-potentials method	Opinion leader/educational influential, chart review

Modified from Davis DA and Fox R, editors. *Physician as Learner*. Chicago, IL: American Medical Association, 1996.

knowledge and performance decay, legislative pressure to safeguard patients, and emergence of new knowledge. In the absence of practice and stimulus, knowledge and performance continue to decay as a factor of time. Safety and standard of treatment rendered to patients and emergence of new medical knowledge are also major driving forces in CME. It is now firmly expected that a person who has graduated from medical school and become a practitioner should be prepared to be a lifelong learner. In addition, he/she should be able to direct his or her own learning and be able to maintain professional competence throughout the career. Although most physicians are able to do so, however, not every physician possess the ability or the inclination to direct their own learning.¹ CME is one way to ensure that physicians maintain essential professional vitality throughout their career.

Education of the physician evolves through 3 distinct phases. The first phase starts at medical school. This phase is characterised by well-structured educational environment, defined curriculum, defined expectations and guided education. Concerns for this phase are it is probably *too* rigid and *too* structured, that teaching rather than learning is the primary mode of education, and it is teacher-dominated

and passive. The second phase is the housemanship or internship year, with expectations that the transition between theory and practice will take place. In contrast to the well-structured medical school years, the third and final phase of physician education is inherently disorganised, unstructured, and typically extends from 25 years to 60 years. It is also a time of competing interests: patient care, teaching, research, and family. Learners in this phase are extremely heterogeneous in their primary areas of work and interest, and also in their learning needs and preferences. A major concern among medical educators is that medical school often fails to educate physicians on how to learn and does not prepare individual physician for this final stage of lifelong learning.

Understanding how physicians learn is a relatively recent progress. In the very early phase of medical education, conceptualisation of how medical students and physicians learn was derived directly from studies on school age children. Some of the concepts from these studies are important, especially in understanding instructional methods, curriculum planning and evaluation, and teaching component of education. Later came increasing awareness and realisation that adults learn differently. Typically adults prefer to learn only what is relevant to them, want to apply the knowledge immediately, and prefer to learn at their own pace and style. Physicians, being adult learners, prefer autonomy in their own learning and their education is highly goal-directed and need-based. These characteristics of physician learning will be elaborated further in the later section of this review and are important in the understanding of the progress in CME movement.

Evidence for Effectiveness of CME

The progress of CME movement is not always smooth. Although CME is generally believed to improve physicians' knowledge at least in the short term, literature are less conclusive about the effectiveness of CME interventions in improving physician behaviour and attitude, or health care outcomes. CME movement had a major setback in the late 1970s when Sibley et al² conducted a RCT to document whether CME interventions can affect quality of clinical care. The authors chose volunteer family physicians from Ontario, Canada and randomly assigned them either to control or to intervention group. As a mode of delivering CME, the intervention group received sequential mailing of selected topics of their interest. The control group received none. Over the ensuing 6 months period, blinded observers reviewed patients' charts using predetermined objective criteria. The intervention group had somewhat better knowledge acquisition in those topics but remarkably, there was no significant difference in measurement of clinical outcomes between the 2 groups. They concluded that CME was ineffective in changing either physician

behaviour or in improving health care outcome.

What went wrong? Why did such a well-intended intervention fail to produce desirable effect? This perplexing revelation can be explained in part by our failure to understand the complex relationship between knowledge acquisition and patient care outcome. Traditional views of CME are based on certain presupposition: experts (CME providers) know better, physicians (learners) are rational, education should be directed, and medical practice is easily changeable. Under this traditional paradigm, the relationship between knowledge delivery and patient care outcome is simple and linear: a physician participates in CME programme, applies the knowledge in practice, and as a direct result of this, patient care outcome improves. In reality, the relationship is much more complex and non-linear. New model of CME tries to make sense out of this complex relationship and contradicts old paradigm in a number of ways (Fig. 1). There is now more acceptance towards physicians' autonomy in their own education, increasing realisation that learning is better if it is facilitated, and learning, not teaching, should be the principal focus of continuing education.

The salutary effects under this new paradigm are readily evident now. In 1992, Davis et al³ published a review of 50 RCTs on the effectiveness of CME. Wide-ranging CME interventions were used and a number of different outcome parameters were measured. Of these, 43 studies examined physician behaviour, 18 studies examined health care outcomes, and 11 studies examined both. Of the 43 studies that examined physician behaviour, the majority showed improvement in intended direction. Among the studies that measured health outcome, 8 studies demonstrated improvement in at least one area. The authors concluded that CME interventions were effective. It is surprising and satisfying to witness that in a span of 2 decades, CME movement has progressed so much. In the next 2 sections,

we will elaborate on 2 critical factors that have contributed to this achievement: understanding the nature of physician learning and effective CME interventions.

Physicians' Learning Theories

*"CME, like any educational process, involves complementary activities of teaching and learning. Traditionally, CME has emphasized those aspects of the process that relates to teaching, but it is now beginning, along with continuing education in other profession, to focus more its attention on aspects on learning. Because learning is sine qua non of any educational process, this shifts represents a rational, evolutionary development."*⁴

Understanding how physicians learn is fundamental for effective planning of CME interventions. In recent years, a number of theories have emerged that try to explain physician learning. Unfortunately, there is no unifying theory that can explain every aspect of teaching and learning among physicians. Each of these theories tries to explain part of this complex phenomenon. Also, it is not advisable to view each of these theories as competing—there is no best or worst theories. In the following sections, we will discuss 2 representative theories of physician learning and their influences on CME.

Learning among physicians takes place in an orderly manner. The steps involved are simple: the individual physician learns about the topic, is forced to think about the topic, decides to try it, evaluates the outcome, and based on this evaluation, decides whether to continue or discontinue using it. Later, it is realised that although the sequence of learning is well maintained from one physician to another, there are considerable variations in individual ability to carry out this task. Each of these steps is vulnerable to multiple factors. Each individual physician varies greatly in ability to self-motivate his/her learning, in decision-making capacity, and in inclination and skill to self-evaluate outcome. Thus, depending upon interplay among these factors, a physician can be a *fast adapter* or a *slow adapter* of the learning process. The relationship between fast adapter and slow adapter is rather dynamic. An individual physician, to a certain extent and under the influence of different factors, possesses the capacity to convert himself from a slow adapter to a fast adapter and vice versa. Thus, with good CME interventions, it is possible to nurture an individual to become a fast adapter of his/her learning. Unfortunately, the reverse is also true—in the absence of a supportive environment and self-motivation, a fast adapter can become a slow adapter.

Certain characteristics are also associated with a fast adapter and a slow adapter. A physician is more likely to be a fast adapter if he/she is associated with institutional practice, holds important academic appointment, has

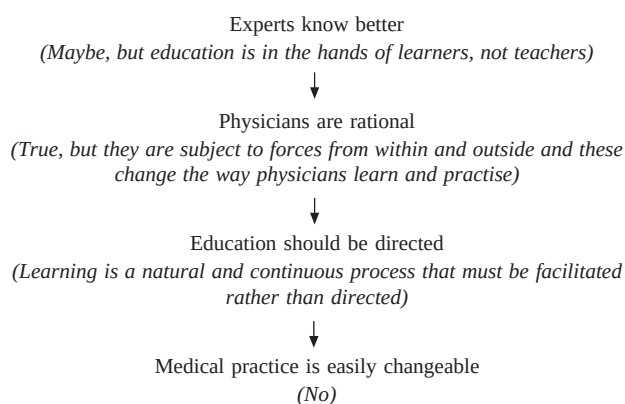


Fig. 1. Comparison between old and new paradigm of CME. The new paradigm is in italics.

extensive personal and professional ties, board certified, serves in a major committee, and is less than 50 years of age. Conversely, a physician who is in solo practice, practises in isolation, and lacks experience with similar innovations is more likely to be a slow adapter. Although many of these factors are “unmodifiable”, critical analysis of these factors guides us to identify vulnerable or priority target group for CME interventions.

The second important model that describes physician learning is self-directed learning. Studies have shown that this is the principal mode of learning among physicians. Self-directed learning takes place in a variety of context, such as self-initiated reading activities, solving clinical dilemmas, and self-evaluation of performance. Unfortunately, most of such activities are informal or semi-formal, and traditionally did not concern CME providers. There is renewed interest in self-directed learning and many successful interventions in CME are based on this model.

The fundamental premises of self-directed learning dictate that physicians are responsible for their own learning (Fig. 2). The initiative for learning starts with the individual. Often, it is the perception of *need*, the difference between desired performance and present performance, that becomes a major driving force for the learning process. The burden of identifying appropriate and specific learning goals and objectives depends on individuals. Subsequently, individual takes responsibility of identifying suitable resources on the topic and determines the best learning style to achieve the goals and objectives. Finally, the whole learning process ends with self-evaluation of performance. These characteristics of self-directed learning are in sharp contrast to traditional teacher-centred approach where initiation, goal setting, provision of teaching materials, and evaluation are done by CME providers and not by individual learner.

Self-directed learning is more effective in individuals with certain characteristics. The ability to identify that a *need* exists for a specific performance is often an important factor in initiation of learning. This will lead to *goal setting*.

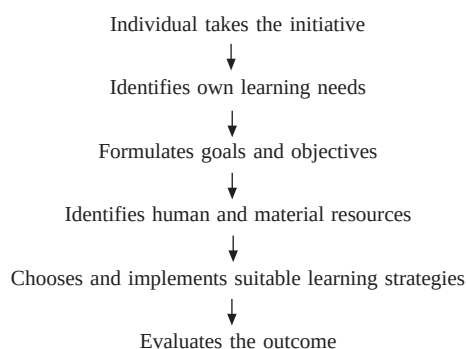


Fig. 2. Cycles of self-directed learning.

For effective learning, these goals and objectives have to be specific and well-targeted. Also, chance of success improves with pragmatic goals that are neither too difficult nor too easy. An effective self-directed learner also demonstrates *forethought capability*—he/she has capacity to hold events symbolically in future. For example, a physician facing difficulty in managing a patient with certain clinical conditions should have the capacity to picture himself/herself in a similar situation in the future and to identify what changes in knowledge and thinking process should have to take place to manage the patient successfully. Curiosity strongly influences self-directed learning and is one of the prime operating factors in the adult learner. Other important attributes of effective self-directed learners are the ability to execute a specific task and previous success with self-directed learning.

In conclusion, recurring themes that emerged from the analysis of physician learning are: physician learning is self-initiated, sequential and sustained, and learner-dominated. There is tremendous variation in each individual's ability to carry out his/her learning and this ability can be improved with appropriate CME interventions.

Effective CME Interventions

The effectiveness of different types of CME interventions is not the same (Table II). Some of these CME interventions have proven to be very effective in improving outcomes while others failed to do so. The evidence for effective CME interventions comes from a systematic review by Davis et al in 1995.⁵ This review includes 99 RCTs on CME interventions where at least 50% of study participants were physicians with objective documentation of outcomes. One hundred and sixty different interventions were described, and almost two-thirds of the interventions displayed improvement in at least one area. Of these, 70%

TABLE II: DIFFERENCES IN EFFECTIVENESS OF CME INTERVENTIONS⁵

Most effective
• Reminders and feedback
• Patient-mediated interventions
• Outreach visit
• Opinion leaders
• Multifaceted activities
Intermediate effectiveness
• Audit with feedback
• Educational material: solicited
Least effective
• Formal CME conferences, seminars, company-sponsored activities <i>without</i> the above type interventions
• Unsolicited materials
• Didactic session without audience participation

demonstrated change in physician performance and 48% demonstrated change in health care outcome. The best results were noted with the following interventions: reminders and feedback, patient-mediated interventions, outreach visits, opinion leaders, and multifaceted activities. Ironically, some of the widely practised CME interventions were proven to be least effective. Among those were formal CME conferences, seminars, and company-sponsored activities without other interventions, and delivery of unsolicited materials. However, some formal CME interventions with substantial audience participation, such as role playing, group discussion, problem solving and case solving demonstrate significant change in physicians' performance.⁷

The findings from the above review appear to be counter-intuitive and somewhat contradict current practice in CME. However, careful analysis of the results reveals that the best CME interventions, such as reminders, personalised feedback and problem solving are based on strong theoretical foundations of individualised learning, and are supported by the new paradigm of physician learning. These contrast sharply with the characteristics of least effective CME interventions. Least effective CME interventions, such as didactic seminars or unsolicited print materials, are based on the old paradigm of physician learning and fail to take into account an individual's learning needs and preferences, and are not sequential in delivery.

Let us examine in detail 2 examples of CME interventions from published literature: one resulted in significant change in physician behaviour and patient outcome and the other failed to do so. McMillan et al⁷ conducted an interventional study to determine whether CME improved physician performance as judged by adherence to a published protocol. The intervention was in the form of clinical recall interview, where the patients' charts were audited and any deviation from published guideline was brought to the attention of the particular physician. Following such intervention, there were demonstrable improvements in physician behaviour (e.g. test ordering) and patient outcome (e.g. the need to initiate phototherapy). It is important to note that this intervention is a form of personalised feedback and is directly linked to physicians' need and patient care. In contrast to the above study, which demonstrated objective improvement in outcome, Evans et al⁸ conducted a RCT among primary care physicians to document effectiveness of mailed educational material. The intervention group received mailed continuing education programme on hypertension and the control group received none. Although the intervention group demonstrated some improvement in knowledge area in the short term, the effect was not sustained. More importantly, this specific intervention did not have any influence on lowering blood pressure among

patients. As eluded earlier and evident once again from the study, knowledge acquisition of a topic, although a prerequisite, does not automatically translate into improvement in patient outcome or change in physician behaviour and attitude.

Conclusion

Crucial to evidence-based practice in medicine or in medical education is availability and credibility of evidence. The movement for effective CME is well supported by high quality evidence derived from both qualitative and quantitative researches. The evidence suggests physician learning is a distinct phenomenon and tends to be individualistic and self-directed. It is important to educate, prepare and support each individual physician to be a lifelong self-directed learner. Evidence also suggests that simple CME interventions grounded in strong theoretical foundations can bring about desired changes in physician behaviour or health care outcome.

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REFERENCES

1. Mawby R G. Lifelong learning and the professional. *Mobius* 1986; 6:35-39.
2. Sibley J C, Sackett D L, Neufeld V R, Gerrard B, Rudnick K V, Fraser W. A randomized control trial on continuing medical education. *N Engl J Med* 1982; 306:511-5.
3. Davis D A, Thomson M A, Oxman A D, Haynes R B. Evidence for effectiveness of CME: A review of 50 randomised trials. *JAMA* 1992; 268:1111-7.
4. Premi J. Individualized continuing medical education. In: Davis DA and Fox R, editors *Physician as Learner*. Chicago, IL: American Medical Association, 1996:203-16.
5. Davis D A, Thomson M A, Oxman A D, Haynes R B. Changing physician performance: A systematic review of the effect of continuing medical education strategies. *JAMA* 1995; 274:700-5.
6. Davis D, O'Brien M A T, Freemantle N, Wolf F M, Mazamania P, Taylor-Vaisey A. Impact of formal continuing medical education: Do conferences, workshops, rounds, and other traditional continuing medical education activities change physician behaviour or health care outcome? *JAMA* 1999; 282:867-74.
7. McMillan D, Magnan L, Lockyer J, Akierman A, Parboosingh J. Effect of educational program and interview on adoption of guidelines for the management of hyperbilirubinemia. *Can Med Assoc J* 1991; 144: 707-12.
8. Evans C E, Haynes R B, Birkett N J, Gilbert J R, Taylor D W, Sackett D L et al. Does a mailed continuing medical program improve physician performance? Results of randomized control trial in antihypertensive care. *JAMA* 1986; 255:501-4.