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DOES CME WORK? AN ANALYSIS OF THE EFFECT OF EDUCATIONAL ACTIVITIES ON PHYSICIAN PERFORMANCE OR HEALTH CARE OUTCOMES*

DAVE DAVIS, M.D.
University of Toronto, Ontario, Canada

ABSTRACT

Objective: To answer the question, "does CME work?" by reviewing the effectiveness of continuing medical education (CME) and other related educational methods on objectively-determined physician performance and/or health care outcomes. These interventions include educational materials, formal, planned CME activities or programs, outreach visits such as academic detailing, opinion leaders, patient-mediated strategies, audit and feedback, reminders, or a combination of these strategies. *Methods*: MEDLINE, ERIC, NTIS, the Research and Development Resource Base in CME and other relevant data sources including review articles were searched for relevant terms, from 1975 to 1994. Of those articles retrieved, randomized controlled trials of educational strategies or interventions which objectively assessed physician performance and/or health care outcomes were selected for review. Data were extracted from each article about the specialty of the physician targeted, the clinical subject of the intervention, the setting and the nature of the educational method, and the presence or degree of needs assessment or barriers to change. *Results*: More than two-thirds of the studies (70%) displayed a change in physician performance, while almost half (48%) of interventions produced a change in health care outcomes. Community-based strategies such as academic detailing (and to a lesser extent, opinion leaders), practice-based methods such as reminders and patient-mediated strategies, and multiple interventions appeared to be most effective activities. Mixed results and weaker outcomes were demonstrated by audit and educational materials, while formal CME conferences without

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enabling or practice-reinforcing strategies, had relatively little impact. *Conclusion*: Strategies which enable and/or reinforce appear to "work" in changing physician performance or health care outcomes, a finding which has significant impact on the delivery of CME, and the need for further research into physician learning and change.

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Key Words: continuing medical education, physician performance, health care and patient outcomes, effectiveness

INTRODUCTION

For more than two decades, the question, "Does continuing medical education (CME) work?" has plagued theorists in adult and continuing professional education, providers of continuing medical education, and health services researchers. The question, simple at first glance, is really two questions: "What do we mean by CME?" and "What do we mean by 'work'?"

WHAT DO WE MEAN BY CME?

The first sub-question, "What do we mean by CME?" garners a variety of responses depending on the source of the answer. Most physicians, the CME "industry," and the accreditation process focus our attention on CME as the short course or conference, a mode with which most physicians are familiar, given their undergraduate learning experiences. In contrast, this review defines CME as any attempt to persuade physicians to modify their practice performance by communicating clinical information. This may be achieved by strategies outlined below and in Table 1, methods which are persuasive in nature and which do not include those that are administrative. This more comprehensive definition has been used by adult educators who have indicated for two decades the importance of all learning resources to physician learning and change. Furthermore, health services researchers have indicated the effectiveness of community- and practice-based interventions such as academic detailing, opinion leaders, audit and feedback, and reminder systems.

WHAT DO WE MEAN BY "WORK"?

This second sub-question, in the context of CME and health care reform, is more problematic. While accreditation principles require only that physician perception of change or learning be documented, more important questions include the impact of CME on physician performance in the workplace setting,

Table 1. Categorization of Educational Interventions

(1) Educational materials (e.g., non-interactive printed materials, audiotapes, videotapes, computer-generated materials)
(2) Formal CME programs (e.g., by courses, seminars, rounds, meetings, lectures, conferences, workshops, small group sessions, traineeships, and teleconferences
(3) Outreach visits (e.g., by pharmacists (as in academic detailing), or by other physicians (peer mentoring), or other health professionals)
(4) Local, community-identified, opinion leaders or educational influentials
(5) Patient-mediated interventions
(6) Audit with feedback, including chart review with peers or supervisors
(7) Reminders
(8) Combinations of these activities

and on patient and/or health care outcomes, both of which have demonstrated deficiencies [4, 5]. Even the natural adoption of new information or techniques has sizable problems: for example, although clear evidence exists about the effectiveness of thrombolytic therapy in the management of myocardial infarction, few current texts and review articles reflect this treatment [6]. Thus, educational methods aimed at improving physician performance and the health status of their patients appear inadequate to respond to the urgent demands of primary care and health care reform [7], or to respond to the clinical imperatives related to mental health issues.

This article has three objectives. First, to review the nature and effectiveness of broadly-defined educational interventions targeted at clinical performance and patient outcomes, based on insights garnered from other reviews of CME effectiveness [4, 5, 8-11]. It also attempts to describe which educational interventions have been tested in what populations of physicians, in which settings and practice domains, especially in psychiatric topics relevant to primary care. Second, the article attempts to consolidate and further the theoretical knowledge base of changing health professional behavior. Third, it outlines areas in which knowledge about effective CME interventions does not match current practice in CME provision, thus indicating an agenda for the health professions.

METHODS

Several possible avenues of inquiry are open to those seeking to answer questions about the effectiveness of CME. Qualitative methods include interviewing or surveying physicians. Although these methods lend themselves to subjective bias, they may be of more applicability in the realm of primary care and mental health. Individual, more quantitative methods such as before-after, descriptive studies, while open to more objective and quantifiable evaluation, still suffer from volunteer bias, and "placebo" or Hawthorne effect: more reliable outcomes may be determined by the analysis of randomized controlled trials (RCTs), the particular method of this review.

Most of our previous reviews analyzed and drew from the computer bibliographic data base of MEDLINE, CINAHL, HEALTHLINE, EMBASE, and ERIC. In several of the studies [4, 5, 8], these data bases were searched in the broad area of continuing health professional education, using the key words described above and adding a search strategy [12] to identify randomized controlled trials. These reviews also employed manual searches of journals and the bibliographies of retrieved articles, and the input of key informants in the fields, and were entered into a computerized and retrievable format using REFERENCE MANAGER (TM). The data base is called the Research and Development Resource Base in CME (RDRB-CME) [13], and is housed at the University of Toronto.

Of particular interest in this review were those studies in the RDRB-CME which: 1) were randomized controlled trials (RCTs) or acceptable alternatives e.g., alternating allocation design, 2) adequately described educational interventions in the clinical domain, especially primary care and mental health, 3) studied learners who were either 50 percent practicing physicians or medical residents, 4) measured physician performance or health care outcomes in an objective and clearly described manner, subjected to tests of statistical significance.

The educational interventions were categorized following Oxman et al. [8] and included those indicated in Table 1.

Data Extraction

Data were extracted about the specialty of the targeted physician population, the performance domain targeted, the setting of the trial, the education method or "intervention" and the needs or "gap analysis" used, if any.

RESULTS

Overview

At the time of preparation of this review (1995), the RDRB-CME contained more than 6,000 articles and monographs on the broadly defined topic of CME.

Over 100 studies met our criteria for inclusion, ninety-nine of which form the major portion of this review [14-112] from 1975-94.

Types and Settings of Physicians Studied

Fifty-one trials focused on the patient outcomes or the performance of internists, thirty-five on family doctors or general practitioners (gp/fps), five on obstetrician/gynecologists, four on pediatricians, three on emergency room physicians, and two on surgeons and anesthetists. Fifteen studies did not specify the physician type. Residents (graduate trainees) were a part of the study physician population in one-third of the studies, either in conjunction with practicing physician-supervisors or by themselves. Three-quarters of the trials were located in ambulatory care or private clinic settings. The remaining quarter of the trials took place in either hospitals on wards, three in emergency rooms [51, 78, 79], labor and delivery floors [28, 53], the ICU [77], or in a long-term care setting [16]. No studies of psychiatrists were found, although several studies, indicated below, focused on psychological or psychiatric issues in primary and long-term care.

Interventions

There were a total of 160 educational interventions in the ninety-nine studies reported. Over half (62%) showed an improvement in at least one major outcome measure, while a third failed to change either physician performance or health care outcomes. Eight interventions (<1%) displayed mixed results [16, 25, 35, 36, 49, 74, 109]. Many interventions analyzed both physician performance and health care outcomes. Of the 145 interventions which focused on physician performance, 70 percent demonstrated change in at least one major measure, while 30 percent did not. There were forty-six interventions targeted at changing health care outcomes, slightly under half of these succeeded in doing so. The results were reviewed by number of interventions, type of interventions, and finally their success by needs or gap analysis.

Analysis by Number of Interventions

Single-strategy interventions were used in about half of the experimental arms of trials reported: 60 percent of these demonstrated change in at least one major outcome measure. Two effected change in physician performance without altering health care outcomes. Thirty-nine interventions employed two educational methods: twenty-five (64%) of these demonstrated a change in outcomes, twelve (31%) failed to change outcomes, and three (<1%) produced mixed results. When relatively effective single methods were used in pairs, positive changes were generally noted. On the other hand, when two less effective interventions were combined, such as formal CME activities and educational materials, a more

mixed picture was apparent: seven positive and five negative or inconclusive studies. When three or more educational strategies were combined, nearly 80 percent demonstrated positive changes.

Analysis by Type of Intervention

The following description of educational methods is clustered in three ways: by traditional means such as educational materials and formal conferences; community-based strategies such as opinion leaders and academic detailing or outreach visits; and practice-linked interventionist, e.g., reminders, audit and feedback, and patient-mediated strategies.

In the "traditional" cluster, relatively short (1 day or less) formal CME events such as conferences generally generated no change: six interventions demonstrated negative or inconclusive effects. More recent studies of conferences are indicated below. Only one study [74] using an in-depth "traineeship" model, demonstrated changes in physician performance in a manual skill (sigmoidoscopy) but not health care outcomes. In addition, educational materials were effective in four interventions [55, 58, 77], but more often failed to demonstrate an effect [15, 30, 32, 41, 82, 83, 90].

Academic detailing displayed positive changes [15, 92]. Similarly, opinion leader strategies displayed positive effects, albeit of low order, in all trials in which they were used [53, 94-95]. Better outcomes were seen when feedback was delivered in the form of chart review [41, 57, 76, 85]. More potent interventions included patient-mediated methods, such as patient reminders or educational materials (in 7 of 9 interventions [21, 54, 68, 75, 87, 103]). More mixed results were showed in audit and feedback: slightly less than half demonstrated positive outcomes. A final and effective single-method intervention was reminders: most (22 of 26) interventions effected change [17, 22, 26, 29, 34, 52, 63-66, 71, 75, 78, 79, 86, 87, 98-102, 104].

Effects of Needs/Gap Analysis

Several levels of needs analysis were reported in these studies (see Figure 1). Receiving a score of "0," twelve studies reported no mention of the clinical needs on which the intervention was based: less then half were positive. About one-fifth of the interventions achieved a score of "1," providing one to several references in the clinical area: slightly over half demonstrated a positive change. A further one quarter (41) of the interventions were based on already-developed clinical guidelines and received a score of "2." These guidelines were generally approved by a national body, and produced a positive change in over 60 percent of the interventions. Consensus processes which achieved a score of "3," attempting to secure "buy-in" of local health professionals, were employed by roughly a quarter (45) of the interventions. They effected a positive change in slightly less than 60

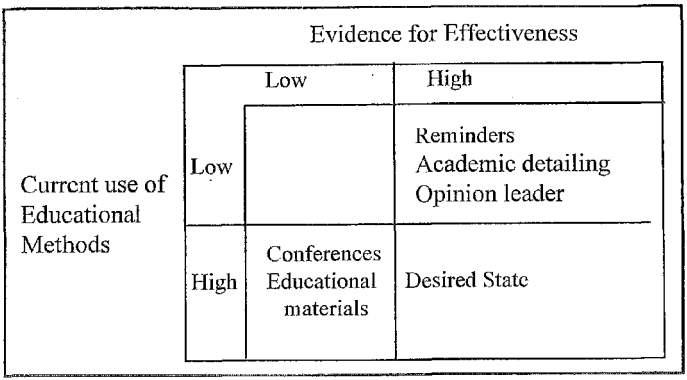

Figure 1. Implications for the profession: current state of CME program delivery versus evidence about its effectiveness.

percent of the studies. Finally, twenty-eight studies (<20%) achieved a full score of "4," indicating that they were targeted specifically at behaviors identified by a gap analysis technique such as an audit to determine suboptimal performers, and/or addressed specific barriers to change: 90 percent of these interventions exhibited a positive change.

Analysis by Domain of Behavior Change Targeted

There were two broad domains of behavior change targeted by these interventions; roughly one-third in the area of health promotion and disease prevention, and two-thirds in disease management (see Table 2).

In the former area, prevention and screening formed the focus of thirty-six interventions, of which thirty yielded positive results [21, 26, 29, 34, 39, 48, 52, 59, 66, 68, 69, 73, 75, 87, 98, 99, 102, 104, 110]. Examples of effective interventions in this category included patient-mediated strategies [21,87], reminders [26, 29, 34, 52, 66, 67[, and multi-faceted interventions [69]. Of the remaining eighteen lifestyle or educational counseling interventions, ten produced positive results [30, 33, 49, 55, 83, 109], five were negative [30, 33, 50, 83] and three were mixed [35, 36, 109]. Among the effective interventions, the use of peer discussion [e.g., 37] and "practice rehearsal" [e.g., 49], allowing physicians to rehearse certain communication skills in the setting of a formal CME event, produced positive change.

Table 2. Description of Positive, Negative, and Mixed Studies

"Positive" studies—those that demonstrated a statistically significant change in at least one major outcome measure at the level of $p < .05$
"Negative" studies—those that showed no important change, despite sufficient statistical power to do so, or those studies which failed to demonstrate a change but lacked the statistical power to demonstrate or exclude a clinically important difference
"Mixed" studies—those that improved physician performance, but not health care outcomes

Under the category of clinical management, there were fifty-eight interventions which undertook to study the broad range of patient management, from history-taking, diagnosis and investigation to treatment and follow-up. Slightly over half demonstrated positive changes. Examples of effective strategies include reminders [63, 64, 71], double interventions (e.g., reminders and patient mediated strategies) [27], or intensive conferencing methods and educational materials [48]) and multi-faceted interventions [14, 23, 51, 60, 61]. In the sub-category of hypertension, many interventions yielded negative results [38, 40, 43, 82, 113]. However, Callahan and colleagues [25] improved the diagnosis and treatment (but not the clinical outcomes) of late-life depression by using depression rating scales to assess the presence or level of depression in elderly patients and by forwarding recommendations to the responsible primary care physician.

Four interventions were found which focused solely on diagnosis: two were positive, in which reminders were the effective change agent [78, 79]. Twenty-four interventions were found in the area of lab and radiology utilization: most (17) produced significant change in outcomes [19, 20, 28, 31, 37, 41, 56-58, 77, 85, 100, 101]. Reminders [100, 101], audit and feedback (either as a single method [31, 58] or with another intervention such as a conference [57]), and multi-faceted interventions [20, 28, 56, 77] were effective. Fourteen interventions studied prescribing behaviors, three-quarters (11) of which were positive [15, 16, 22, 42, 46, 62, 70, 84, 91, 92]. An effective tool in this area was the academic detail visit [15, 16, 62]. Finally, interventions designed to produce enhanced procedural skills such as sigmoidoscopy or pap smears demonstrated negative results in three of four interventions [24]. Three interventions which employed audit and feedback were ineffective, while a clinical traineeship or preceptorship experience produced a change in the rate of sigmoidoscopy [74] in one study.

DISCUSSION

The body of research from which this review is drawn, focusing on objective outcomes of physicians' clinical and ongoing education, is clearly robust and growing. Continuing education, long seen as comprising short courses only, now appears to be the subject of valid and important study. It may be said to lay claim to a variety of models well beyond the traditional short course model. These include academic detailing, opinion leaders, audit and feedback, and reminders. Physician performance may be altered to a considerable extent by many of these CME interventions, and to a lesser extent, so may health care outcomers. The reasons why changes in physician performance do not translate automatically into health care outcomes have been explored elsewhere [5, 8] and include issues in the area of population health and patient compliance.

Although few studies focused directly on mental health issues in primary care, there were many, however, which addressed of relevance in this domain. These include lifestyle counseling, the diagnosis and treatment of conditions with more adherence to guidelines, and prescribing skills. Findings about why and how successful CME interventions "work" may be based on several theoretical constructs already formulated in the literature. Three clusters of theory are drawn together in this discussion: those which are practice-based, those which are community-based, and those which may be termed "physician-based." The last of these focuses on adult learning theory and reflect on traditional CME methods and the physician as individual learner.

In the practice setting, reminders, academic detailing, and patient mediated strategies may support Green's PRECEED model [114] derived from the health promotion literature. This work suggests that interventions which employ practice-enabling strategies (office facilitators or patient educational methods, for example), or reinforcing methods (feedback or reminders), in addition to predisposing or disseminating strategies, appear to be more successfully change performance or health care outcomes. In the community setting, the seminal work of Rogers [115] on the adoption of innovation is relevant. Among other change strategies, the role of the opinion leader in permitting colleagues to observe the outcomes of a particular innovation may create an atmosphere conducive to its adoption on a community basis.

From the perspective of adult learning theory and the more traditional domain of CME (e.g., the formal conference, course, or reading), those activities which include problem-based, peer discussion and role-playing would appear to support the theories of Nowlen [116] which emphasize the role of the group in adopting new information. In addition, Bandura's Social Learning Theory [117] stresses the importance of three factors in learning—personal, environmental/situational, and behavioral. A further review by the Cochrane Collaboration on Effective Professional Performance on formal CME, such as conferences, confirms the effectiveness of interactive CME, and the relative ineffectiveness of didactic

teaching methods [118]. Finally, the positive effect of sequenced, multi-faceted interventions may re-create the process outlined by Fox, Mazmanian, and Putnam [119] in which learning and change are accomplished by several impactors or learning resources. That the effect of the interventions is, however, not consistent across providers may be due to the individual's readiness to change. Physician-learners may progress through stages to change at their own rates, depending upon their own knowledge and skills and those needed [119, 120]. The importance of readiness to change was reflected in this review: when barriers to change were addressed, or where significant performance gaps were demonstrated, and resources deployed to help the learner bridge that gap, change appeared to occur with relative frequency.

Limitations

There are at least five cautions to the interpretation of this overview. First, relative to the methodology of this review, the screening criteria are relatively strict and may exclude valid and informative studies. The search process may have been inadequate. Further, among those studies that are "positive" there are many in which only one or two outcome measures of several are positive. In addition, the concentration on randomized controlled trials has undoubtedly favored quantitative over qualitative research methods. The latter would provide insights into physician behavior change, especially in the area of mental health. Second, regarding the publication and authoring of these studies, one notes that they are, for the most part "positive," possibly indicating that authors less frequently publish negative trials. Furthermore, the reporting of information is incomplete or vague. For example, many authors did not provide complete descriptions of the type of physician or educational intervention. Third, many of these reviews may suffer from a "ceiling effect," inasmuch as they use volunteer physicians, often in teaching settings and frequently operating optimally at pre-intervention. In this instance, changes to practice, especially those which achieve statistical significance, may be made only with great difficulty. Fourth, most of these trials operated under often optimal circumstances, like those in teaching centers or wards. Community-based "effectiveness" studies, such as those of depression in primary care, are thus more difficult to perform, and not well represented in this review. Further, these studies often use endpoints or outcome markers which may be selected because they are readily measurable (e.g., blood pressure). More complex, and/or more socially relevant subjects, such as dementia in HIV patients or depression in children and the aged, are thus neglected. Fifth and finally, discussions about the relevance of this review to the practicing North American physician are also handicapped by the fact that the types of physicians selected as the focus of these studies do not match the profile of today's U.S. physicians [121]. No studies were found, for example, which studied the clinical work of psychiatrists, and few of these studies discussed the

role or impact of funding mechanisms such as managed care on the feasibility of the interventions.

Implications

What are the implications of these trials to the provision of CME specifically, and the profession and its commitment to societal good which it represents? There is clear evidence that CME offerings today in North America consist mostly of the less effective change strategies such as conferences [121] compared to relatively infrequent attempts to use more effective methods such as academic detailing or reminder systems (see Figure 1). As a result, there is ample opportunity for the development of effective interventions on the part of CME providers. Developing these interventions based on objectively-determined needs is clearly outside the realm of the provision of most registration-fee supported CME. New linkages and funding sources for CME providers will need to be found. One may surmise that they may come from initiatives in health services research at federal, state, or provincial levels, in hospital, provincial, or state-generated data sources, from insurance carriers, and within managed care systems. Interventions which derive from these linkages need to pay attention to rigorous evaluations, and the use of more qualitative methods to elucidate physicians' perceptions and realities in learning and change, especially in the area of psychiatric disease from the primary care perspective.

To advance this process, the field requires building on others' previous work. This includes building more consistent design and reporting templates, with a collaborative attempt to determine the interplay of the domain of change, the setting, the type of health professional, and the intervention. Mutually informing and collaborative multicenter designs are one way in which this process may be accomplished. By paying attention to objective needs assessment, effective intervention design and both quantitative and qualitative study principles, true strides can be made. In this fashion, the effort to improve the performance of North American physicians and the health outcomes of their patients will advance in a co-operative, proactive, and evidence-based manner.

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Direct reprint requests to:

Dave Davis, M.D.
Associate Dean, C.E.
Professor, Departments of Family and Community Medicine, and Health Administration
Faculty of Medicine, University of Toronto
150 College Street, #121
Toronto, Ontario M5S 3E2