Abstract

Background. The Institute of Medicine (IOM) has identified for healthcare practitioners 5 core competencies that are believed to improve the quality and safety of patient care. Practitioners must: provide patient-centered care (PCC), work in interdisciplinary teams (IT), employ evidence-based practice (EBP), apply quality improvement (QI) techniques, and utilize informatics. This literature review was conducted to assess the evidence that CME related to each competency translates into improved physician performance or patient outcomes.

Methods. Medline and the Research and Development Resource Base in Continuing Medical Education (RDRB-CME, University of Toronto) were searched for articles published between January 1995 and August 2003 that met the following criteria: (1) educational interventions were in the form of a certified educational activity, (2) educational interventions taught a core competency as defined by the IOM, and (3) physician performance or patient/healthcare outcomes were objectively measured.

Results. Of 105 papers selected for initial review, only 13 articles met the final inclusion criteria and form the basis for this analysis: 9 PCC, 4 IT, 0 EBP, 0 QI, and 0 informatics. Of these, 12 (8 PCC and 4 IT) reported positive outcomes for physician performance or patient care. Several articles overlapped competencies.

Conclusion. Although the search has revealed a paucity of published data that discuss the impact of educational interventions in the context of the 5 core competencies, it has supported the relevance of the competencies. The results of this literature search document a need for additional research and enhanced publication regarding the outcomes of CME interventions related to each of the IOM competencies.

Introduction

CME remains an essential avenue through which physicians obtain current information on advances in disease research and patient care. Theoretically, physicians who are educated about the latest therapeutic options for their patients will make more informed treatment decisions, which should result in improved patient outcomes.

However, a sobering statistic from the Institute of Medicine (IOM) indicates that up to 44,000 and possibly as many as 98,000 people die annually as the result of preventable medical errors, suggesting a serious flaw in this country's healthcare system [1]. Working toward a plan for improving the quality and safety of patient care, the IOM published the 2001 report Crossing the Quality Chasm: A New Health System for the 21st Century [1]. A year later, the IOM brought together 150 cross-disciplinary healthcare professionals for the Health Professions Education Summit to discuss how to integrate a set of core competencies—provide patient-centered care (PCC), work in interdisciplinary teams (ITs), employ evidence-based practice (EBP), apply quality improvement (QI) techniques, and utilize informatics (Table 1)—into health professions education [1].

Representatives from many organizations, including the North American Association of Medical Education and Communication Companies (NAAMECC), a nonprofit organization that advocates for medical education and communication companies (MECCs) [2] and promotes best practices in CME, were invited to attend the Summit and develop an action plan that would answer the question: “How can medical education help bridge the quality chasm?” To provide a foundation from which the CME community could begin to address this charge, NAAMECC decided to fund a research project to identify the outcomes of CME activities that teach the IOM’s 5 core competencies—activities that educate health professionals to deliver evidence-based, patient-centered care.
care in interdisciplinary teams using quality improvement and informatics as the foundation.

This article discusses the results of a literature review to identify certified educational interventions that taught a core competency as defined by the IOM and that objectively measured outcomes related to physician performance or patient health.

**METHODS**

NAAMECC issued a request for proposal, and a grant to conduct a thorough review of the literature was awarded to Nexus Communications, Inc. A planning committee including representatives of Nexus, the NAAMECC Research Committee, and NAAMECC's Board was formed to review the results of the literature search and write the article.

The evidence base on CME in the 5 core competency areas was assessed through a review of the literature. Two data sources were searched: Medline and the Research and Development Resource Base in Continuing Medical Education (RDRB-CME, University of Toronto). Search terms, identified through discussions with the planning committee and a medical librarian, included CME, specific formats of CME interventions (eg, lecture, Web cast, teleconference, workshop, video), each of the 5 skill areas (PCC, IT, EBP, QI, and informatics), outcomes, and combinations of these terms. Because of resource limitations, the search was limited to articles published between January 1995 and August 2003 (the time during which the research was being conducted).

A 2-step process was used to select relevant articles for the analysis (Figure 1). First, abstracts of the publications identified through each database search were reviewed. Full-length articles were retrieved for abstracts that met the inclusion criteria—an educational intervention (considered likely to be CME) that included measurement of effect on physician behavior or patient/healthcare outcomes. Second, articles were categorized into each of the 5 core competencies. Reviewers (members of the planning committee) were assigned a core competency and its corresponding articles. Final criteria for inclusion were (1) the educational intervention was in the form of an activity certified for CME credit, (2) the educational intervention taught a core competency or a subset of skills within a core competency (as defined by the IOM) [1], and (3) physician performance or patient/healthcare outcomes were objectively measured. Results from each reviewer were discussed by the research committee to ensure the validity of the publications selected for inclusion. Papers were disqualified if the educational intervention was not certified for CME or if the defined outcomes were not measured.

**RESULTS**

Of the 202 publications identified, 105 abstracts met the initial inclusion criteria. Classification of articles into core competencies for secondary review was as follows: 35 PCC, 25 IT, 29 EBP, 27 QI, 11 informatics. Only 13 articles met the final inclusion criteria and form the basis for this analysis: 9 PCC, 4 IT, 0 EBP, 0 QI, and 0 informatics (Figure 2). Reviewing details of the identified stud-
ies is beyond the scope of this review; description of study design and results can be found in the cited articles.

**Patient-Centered Care**

Does participation in CME activities focused on teaching PCC improve physician performance or patient health outcomes? Nine of the 35 articles identified for the PCC category, presented in Table 2, [3-11] met the final inclusion criteria [5,6].

All but one of the studies [8] reported improvements in PCC as a result of a CME intervention. Improvements included scheduling more patient follow-up visits, asking patients more questions, and listening more attentively to their responses. Additionally, physicians in the studies changed treatment patterns, provided more guidelines for modifying patient therapies, and taught patients self-management techniques. One study [9] indicated that properly trained clinical support staff would facilitate and increase the implementation of new interventions in the office setting. Finally, 4 studies emphasized the importance of the utilization and development of communication skills as a mechanism to improve patient care [4-6,10]. One article [9] was pertinent to another IOM competency, IT (Table 2).

**Interdisciplinary Teams**

Does participation in CME activities focused on developing ITs improve physician performance or patient health outcomes? In an effort to determine whether healthcare outcomes, patient care, and practice patterns improved as a result of CME content focused on ITs, 25 published articles were evaluated based on the selection criteria. Of these, 4 met the final standards for inclusion (Table 3) [12-15] and each overlapped with the EBP competency.

The acceptable articles reported CME interventions directed at several members of the healthcare team simultaneously, including physicians, nurses, dietitians, basic scientists, and community caregivers. Outcomes were measured using questionnaires, surveys, focus groups, telephone calls, pre- and post-tests, and medical records review. In most cases, improvement was noted in office practice patterns, knowledge, skills, attitudes, cooperation, and medication compliance. None of these articles discussed how teams work more efficiently; rather, they focused on providing the same clinical content to several types of clinicians who work together.

**Evidence-Based Practice**

Does participation in CME activities focused on teaching EBP improve physician performance or patient health outcomes? Of the 29 articles obtained and reviewed for EBP based on the initial selection criteria, none met the final criteria of a certified CME intervention that taught EBP as measured outcomes. However, 14 articles supported one of the components of EBP as described by the IOM (Table 4) [4,16-28]. Those papers demonstrated either a relationship between EBP and outcomes [4,6,16-18,20-27,29-34] or a link between successful outcomes and participation in learning activities [4,6,11,17-21,23-40]. For example, the objective of the study by Gifford et al was to “evaluate an educational strategy to increase neurologists’ adherence to specialty society endorsed practice recommendations” [20]. The educational intervention included an enduring material, practice-based tools, an interactive evidence-based society-sponsored seminar led by local opinion leaders, and follow-up mailings. Results indicate that neurologists in the intervention group increased adherence to the 3 of the 6 recommendations that were promoted by the educational intervention. The study concluded that a “multifaceted educational program can improve physician adoption of practice guidelines” [20].
Similarly, Derebery and colleagues gave physicians a total of 8 hours of CME including a 2-hour didactic presentation, a low-back-pain manual promoting evidence-based treatment, a post-test, and practice management reports analyzing their individual practice data; participants were also encouraged to consult with one another on difficult cases [19]. Results showed that “physicians who participated in the intervention reduced the percentage of restricted work cases, reduced the percentage of lost-time cases, and shortened restricted workday duration and total case duration for female patients” [19]. This study provides preliminary evidence for the effectiveness of this type of training strategy in changing medical practice patterns and leading to better outcomes [19].

**Quality Improvement**

Does participation in CME activities focused on teaching QI enhance physician performance or patient health outcomes? In an effort to determine whether healthcare outcomes, patient care, and practice patterns improved as a result of teaching physicians QI skills in certified CME activities, 27 published articles were evaluated; none met all of the standards for inclusion.

One article [41] described an experimental study of different types of training: one group received “trainee-centered” instruction on QI techniques with a problem-solving methodology, while a second group received more traditional training and a third group received no training. Both training groups significantly increased their knowledge of QI compared with the control group that did not receive training. One year after the study, most participants in the groups that received training wanted more. The majority (72%) of group 1 participants and 29% of group 2 participants engaged in QI initiatives, compared with none from the control group. These results support the importance of training in the implementation of QI initiatives and suggest that the type of training received is also important. However, the impact of this education on physician performance or patient health outcomes remains to be evaluated.

**Informatics**

Does participation in CME activities focused on informatics improve physician performance or patient health outcomes? Eleven articles regarding informatics were obtained, but on review none met the criteria of certified CME interventions that taught informatics skills and measured outcomes. However, 9 articles identified the value of informatics as an important skill for physicians, supporting the inclusion of this competency in the list recommended by the IOM (Table 5) [16,26,42-48]. Several of these articles are pertinent to one or more of the other IOM competencies (Table 5) and show overlap between informatics and PCC, EBM, and ITs.

Balas et al [16,42] and Nilsson et al [46] were the only authors in this group to specifically mention educational interventions related to informatics. Interestingly, both groups of investigators reported modest positive results from using individualized physicians’ prescribing data as part of the educational intervention.

**DISCUSSION**

Of the 13 articles that met the inclusion criteria, 12 reported improvements in outcomes related to physician performance and/or patient care. The 9 PCC articles revealed positive learning outcomes as a result of educational interventions including both increased knowledge and acquired skill sets. For the most part, multiple educational interventions were employed to achieve these results, including small group discussion, demonstration, workshops, case studies, seminars, lectures, and role playing. Five of the PCC articles also focused on communication skills (a component of PCC as defined by the IOM) and ITs.

The literature is notably lacking in studies designed to assess the direct relationship between CME regarding ITs and improved patient health outcomes. The studies reviewed show that such interventions produce improvement in several outcome criteria among a variety of healthcare providers. Generally, carefully designed and evaluated CME programs were associated with improved knowledge, skills, attitude, and practice behavior. While researchers
offered additional uses for IT program format and content, the focus on development of IT CME programs needs to help clarify the benefits of IT CME to all members of the healthcare team as well as the patients. The dearth of publications on well-designed CME interventions on IT skills suggests an opportunity for planners and faculty to develop such activities and publish their outcome data. Activities that focus on IT skills may help identify and address important systems issues and barriers that typically hamper application of learning to practice.

Many of the articles reviewed support the IOM’s EBP competency. Interestingly, the majority of the articles, 27, evaluated educational interventions designed in an “evidence-based” manner (eg, their educational design was based on adult learning theory and data), and most found them to be effective in appropriately changing physician behavior. The importance of using clinical practice guidelines (perhaps a small component of EBP) and the need for educational initiatives to increase compliance were discussed. Clinical practice guidelines need to coincide with other sources of EBP that facilitate improved patient care and outcomes.

Increasingly, an evidence-based approach is being used to document the effectiveness of educational interventions that aim to increase compliance with clinical practice guidelines. However, physicians are not being trained in how to discern and evaluate the quality of evidence and to apply that knowledge to their own practice. This clearly demonstrates a need for educational programs on the topic of EBP. However, this is a simplistic approach to a complex problem, and while this can be one strategy, it is clearly not the only approach to encouraging compliance with practice guidelines.

Continuing education providers are not reporting research demonstrating that CME in QI—activities designed specifically to identify and reduce unnecessary variation in work

Table 2. Results of Literature Search for Patient-Centered Care (PCC) Competency

<table>
<thead>
<tr>
<th>Author, Year/Therapeutic Area</th>
<th>Study Design/ Educational Intervention</th>
<th>Results/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellamy et al, 2000 [3]/Joint infection</td>
<td>Small group interactive learning session followed by live injection-technique demonstration and practice.</td>
<td>Clinicians were successfully trained to apply a safe and effective intra-articular therapy in patients with osteoarthritis of the knee.</td>
</tr>
<tr>
<td>Blackstien-Hirsch et al, 2000 [4]/Asthma</td>
<td>Medical grand rounds, 2 newsletters, a workshop with discussion of case studies and introduction to patient-centered interventions, academic detailing, patient-centered education materials.</td>
<td>Interventions were extremely or very effective in teaching patients self-management techniques. Statistically significant improvement in patients’ quality of life.</td>
</tr>
<tr>
<td>Clark et al, 1998 [5]/Pediatric asthma</td>
<td>Randomized controlled study to examine effects of an interactive seminar for pediatricians and patients with asthma.</td>
<td>Physicians reported improved treatment of newly diagnosed patients and better adherence to guidelines for modifying therapy.</td>
</tr>
<tr>
<td>Clark et al, 2000 [6]/Asthma</td>
<td>Same as above.</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Gerrity et al, 1999 [7]/Depression</td>
<td>Randomized control trial involving interactive workshops, lectures, discussion, audiocassette review and role-play.</td>
<td>Interventional physicians improved their communication skills and scored higher on a patient satisfaction scale.</td>
</tr>
<tr>
<td>Pill et al, 1998 [8]/Type II diabetes</td>
<td>Randomized control using discussion, demonstration of technology and role-play.</td>
<td>Failed to find significant clinical improvements in the experimental group.</td>
</tr>
<tr>
<td>Ockene et al, 1996 [9]/Nutrition*</td>
<td>Randomized control trial comparing usual care, physician nutrition counseling training, and physician nutrition counseling plus a structured office practice environment for nutrition management.</td>
<td>Training plus a facilitative office environment are required to create situations in which physicians devote time and attention to an intervention. Training without an office support structure may be counterproductive.</td>
</tr>
<tr>
<td>Roter et al, 1998 [10]/Communication skills</td>
<td>Quasi-experimental study using audio tapes and pre/post testing.</td>
<td>After training, physicians are less likely to dominate the visit verbally; they listen more and talk less, used more open-ended questions, and use more emotionally responsive talk.</td>
</tr>
<tr>
<td>Sanci et al, 2000 [11]/Youth health problems</td>
<td>Randomized control trial of multi-faceted program for on principles of adolescent healthcare, followed by case discussion and debriefing.</td>
<td>Intervention group showed significantly greater improvements in most outcomes at 7 months; most improvements were sustained at 13 months.</td>
</tr>
</tbody>
</table>

*This article also related to interdisciplinary teams (IT).
Outcomes measured 1 year after attendance at a 19-hour CME course. Significant changes in all measured categories, including patient management and medication compliance.

Two-week program for primary care physicians, nurses, community workers. Focus groups and telephone surveys used to measure outcomes. Improvement was shown in care of patients at system, county, local, individual levels.

Pre- and post tests were given to healthcare providers, and medical records were audited. Significant changes were shown in knowledge and care-giving patterns and practice.

Telemedicine delivery of CME to providers in rural settings. Outcomes were measured with evaluation of diagnostic procedures, cost comparisons, medical records review, focus groups and questionnaires. CME delivered via telemedicine proved as effective as more standard methods in improving patient care in a rural hospital setting.

*All articles also related to or discussed evidence-based practice (EBP).
Table 4. Results of Literature Search for Evidence-Based Practice (EBP) Competency*

<table>
<thead>
<tr>
<th>Author, Year/Therapeutic Area</th>
<th>Educational Intervention/Study Design</th>
<th>Results/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balas et al, 1998A [16]/Nephrology</td>
<td>Reports of practice data, evidence from literature reviews and a randomized controlled clinical trial.</td>
<td>Linking published evidence to actual practice statistics can facilitate the use of practice guidelines and influence treatment decisions.</td>
</tr>
<tr>
<td>Bernal-Delgado et al, 2002 [17]/Pharmacology</td>
<td>Experimental group: 1 group educational outreach visit and printed material; placebo group: 1 nonstructured educational session; control group: no intervention. Pragmatic, simple-blind trial.</td>
<td>Evidence-based educational outreach visits are more effective than conventional educational sessions. Both are more effective than no intervention.</td>
</tr>
<tr>
<td>Brooks et al, 1999 [18]/Surgery</td>
<td>Educational symposium, prospective single-blind analysis of data.</td>
<td>Video-recorded resuscitations are an effective educational tool, allowing for analysis of compliance with protocol. Symposium effectively altered attitudes and behaviors.</td>
</tr>
<tr>
<td>Derebery et al, 2002 [19]/Occupational medicine</td>
<td>Two-hour didactic lecture, training manual, provision of regular feedback, and reinforcement regarding individual outcome data.</td>
<td>Preliminary evidence indicates this type of training is effective in changing medical practice patterns.</td>
</tr>
<tr>
<td>Malach et al, 1998 [21]/Cardiology</td>
<td>Dissemination of guidelines, ongoing educational meetings and conferences.</td>
<td>Effective educational intervention reduces the rate of unnecessary right heart catheterizations.</td>
</tr>
<tr>
<td>Sarasin et al, 1999 [23]/Cardiology</td>
<td>Large group educational meetings, placement of guidelines in patients' records, bimonthly general reminders. Before-after trial.</td>
<td>Literature-based guidelines appropriately developed and implemented by local experts may modify prescribing decisions.</td>
</tr>
<tr>
<td>Searle et al, 2002 [24]/Gynecology</td>
<td>Problem-based, interactive workshop facilitated by an opinion leader to disseminate evidence-based guidelines and laminated algorithm and guidelines. Randomized, controlled trial with 6-month follow up.</td>
<td>Clinician behavior changed when applied to theoretical cases, but not in practice.</td>
</tr>
<tr>
<td>Toews et al, 1997 [25]/Cardiology</td>
<td>Three-part educational intervention: large group lectures, small group discussion, CD-ROM of cases, and newsletter reminders.</td>
<td>The intervention did not result in anticipated adoption of the guidelines.</td>
</tr>
<tr>
<td>Tu et al, 2002 [26]/General practice</td>
<td>Review of published data on randomized controlled trials for physician educational interventions.</td>
<td>Educational interventions improved physician follow-up of patients with hypertension, but were ineffective in changing blood pressure levels.</td>
</tr>
<tr>
<td>Wright et al, 2003 [27]/Primary care [asthma/angina]</td>
<td>Interactive education meetings, educational outreach visits, dissemination of guidelines by mail, reminders. Non-randomized Latin square.</td>
<td>Improvements in all outcome criteria and increases in quality markers. National initiatives may have more influence than local initiatives.</td>
</tr>
<tr>
<td>Zwar et al, 1995 [28]/General practice</td>
<td>Randomized trial.</td>
<td>Group educational approaches were effective in influencing prescribing behavior.</td>
</tr>
</tbody>
</table>

*These papers did not meet the inclusion criteria but are summarized here because they support the role of CME content in 1 or more of the components of evidence-based practice as described by the Institute of Medicine. CME indicates continuing medical education.
*†This article also related to PCC.
One might conclude from this research that CME providers are not conducting research relevant to the IOM competencies and/or that CME activities relevant to the competencies are scarce or nonexistent. Thus, CME stakeholders should be encouraged not only to include content related to the 5 IOM competencies in their educational activities, but also to present and publish the results of their work for the benefit of the entire CME enterprise.

**Lessons for Practice**
The evidence base for the outcomes of CME related to the IOM competencies is scarce to nonexistent. However, the awareness of the competency areas is strong, thereby reinforcing a role for CME in addressing each. The IOM competencies, although described as distinct entities, may in fact be overlapping skill sets and thus difficult to report individually.

CME providers are encouraged to publish their results so that the educational community has access to data on best practices, especially data that demonstrate a relationship between CME and outcomes relative to the IOM competencies.

The results of this literature search imply the need for CME in the context of the IOM competencies.

### Table 5. Results of Literature Search for Informatics Competency*

<table>
<thead>
<tr>
<th>Author, Year/Therapeutic Area</th>
<th>Educational Intervention/Study Design</th>
<th>Results/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balas et al, 1998B [42]/Endocrinology‡</td>
<td>Review of published data regarding computer-ized management of diabetes.</td>
<td>Computers will play an important role in enhancing patient participation in the care of patients’ chronic illnesses; computer-patient interactions lead to improved outcomes.</td>
</tr>
<tr>
<td>Branger et al, 1998 [43]/Endocrinology§</td>
<td>Small controlled interventional study.</td>
<td>Electronic data exchange may be a powerful tool in managing patient information and improving quality of care.</td>
</tr>
<tr>
<td>Friedman et al, 1999 [44]/NA</td>
<td>Partially randomized, controlled study using diagnostically challenging case studies.</td>
<td>Use of diagnostic decision-support systems can positively influence clinicians’ reasoning.</td>
</tr>
<tr>
<td>Mullett et al, 2001 [45]/Infectious disease (pediatrics)§</td>
<td>Prospective control with follow up intervention; participant survey.</td>
<td>Use of a computerized decision support tool reduced medical errors and improved attainment of therapeutic drug level targets and reduced drug costs.</td>
</tr>
<tr>
<td>Nilsson et al, 2001 [46]/General practice (cardiology, gastroenterology, psychiatry)</td>
<td>Randomized study with 3 intervention groups evaluating problem-oriented outreach.</td>
<td>Feedback on individual prescribing patterns, combined with problem-oriented educational outreach, improves prescribing behavior; combinations of educational interventions (including data from electronic patient records) are more effective than single interventions.</td>
</tr>
<tr>
<td>Revere et al, 2001 [47]/Ambulatory care</td>
<td>Literature review of randomized controlled studies of computer-generated health behavior interventions as extensions of face-to-face care.</td>
<td>Some studies demonstrated the effectiveness of “clinical encounters in absentia,” but few incorporated sophisticated technologies; &gt;90% showed improved patient outcomes.</td>
</tr>
<tr>
<td>Tewfield et al, 2002 [48]/Multiple therapeutic areas and preventive care</td>
<td>Literature review of randomized controlled trials of computer-generated patient information.</td>
<td>Computer-generated patient educational materials have a small positive effect on professional practice and patient outcomes.</td>
</tr>
<tr>
<td>Tu et al, 2002 [26]/Cardiology†</td>
<td>None/literature review of randomized controlled trials.</td>
<td>Multi-faceted educational interventions, including computerized decision support systems, may improve compliance with guidelines.</td>
</tr>
</tbody>
</table>

*These papers did not meet the inclusion criteria but are summarized here because they identified the value of informatics skills for physicians. †This article also related to evidence-based practice. ‡This article also related to patient-centered care. §These articles also related to interdisciplinary teams.
REFERENCES


