

Residency Education

Teaching Evidence-based Medical Care: Description and Evaluation

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Background and Objectives: *This paper describes and evaluates several years of a seminar series designed to stimulate residents to seek evidence-based answers to their clinical questions and incorporate this evidence into practice. **Methods:** At the first session, 86 of 89 (97%) residents completed a baseline needs assessment questionnaire. Post-course self-assessment questionnaires measured change from the first to the final seminar session in six domains of interest and skill, as well as residents' preferred sources of information for clinical problem solving up to 2 years after the course. **Results:** Before the seminars, 48% of residents reported that textbooks were their most important source of information for solving clinical problems. A total of 58 of 75 (77%) residents completed the first post-course questionnaire. Residents reported significant increases in skill at formulating clinical questions and searching for evidence-based answers, appraising reviews, and deciding when and how to incorporate new findings into practice. Use of secondary sources of information such as "Best Evidence," moved up in importance from before the course to after the course. **Conclusions:** First-year family practice residents who completed our seminar series have reported increased skill at blending consideration of a clinical problem with the use of secondary sources of information to access evidence to support their health care decisions.*

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Despite many barriers and challenges to the implementation of evidence into primary care practice, family practice training programs have long recognized the importance to patient care of teaching residents basic skills in using the medical literature. As a result, over time, the curriculum for family practice residents has shifted from a focus on understanding research methods¹ to learning how to find brief synopses of the most relevant literature.²

This apparent shift away from teaching the methods of critical appraisal toward a focus on the use of tools for finding information is driven by the pedagogical objective to create evidence users in clinical practice.³

This paper describes and evaluates evidence-based medical care (EBMC), a teaching initiative implemented within our family practice residency program. The curriculum was conceived as a method of creating

evidence users, by stimulating residents to seek out answers to their clinical questions and incorporate new evidence in practice. This curriculum is distinct from others in that it extends the teaching of critical appraisal skills to directly address the needs of clinical practice through a comprehensive focus on time-efficient methods of finding evidence-based answers to solve clinical problems.

Methods

EBMC has been taught in small groups since 1996 to first-year family practice residents at McGill University in Montreal. The experience is 8 weeks long. In each 8-week block, residents on rotation in family medicine attended a maximum of eight 1-hour problem-based weekly seminars. Table 1 outlines the curriculum, which consists of two didactic interactive seminars, followed by six resident-led small-group seminars.

Instruction in seminars 3–8 follows a model of evidence-based practice successfully implemented at McMaster University (B.G. Hutchison, personal com-

Table 1

Summary of the Format, Content, and Objectives
of Evidence-based Medical Care

<i>Seminar</i>	<i>Format</i>	<i>Content and Objectives</i>
1	Didactic, interactive lecture	Orientation to principles of information mastery, ^{4,5} its relationship to evidence-based medicine, ⁶ and relevance to clinical care.
2	Didactic, interactive lecture	Transforming clinical problems into well-built clinical questions that can be answered. ⁷ Since 1998, demonstration of "doctor friendly" secondary sources of information available on-line (eg, InfoRetriever, ⁸ Best Evidence, ⁹ and Cochrane Library. ¹⁰
3-8	Small-group discussions	Five-step approach described in article.

munication) and is based on principles of self-directed adult learning using a standardized five-step approach.

Description of Five-step Approach

Step 1: Selecting a Topic and Building a Clinical Question

Each week, one resident chooses a topic of personal interest to stimulate self-directed problem-based learning from a problem encountered in clinical practice. From this topic, the group sets out to formulate a well-built clinical question.⁷ At this step, residents are taught how to build clinical questions they can answer by specifying the characteristics of the patient population, the intervention (and its comparison), and the outcomes of interest to them and their patients.

Step 2: Review of Current Clinical Management/Practice

Having settled on a focused question of interest to the group, a roundtable review of residents' current clinical management/practice is conducted. Residents are asked, "How are you currently managing/diagnosing this condition?" This moment of clinical reflection helps to unmask knowledge gaps and uncertainty, as well as reveal variation among doctors in approaches to diagnosis or treatment.

Step 3: Hunting Down the Evidence

The resident is next challenged to find the best evidence to address the clinical question and to distribute this evidence to all group members at least 48 hours in advance of the next session, which is held 1 week later. In the process of hunting down the best evidence, residents confront the significance of why well-built clinical questions are so important.

Prior to the search, suggestions are offered to the resident to facilitate rapid retrieval of the evidence. When appropriate, residents are encouraged to search for evidence in secondary sources of information, such as InfoRetriever,⁸ Best Evidence,⁹ and the Cochrane Library,¹⁰ as opposed to a search of MEDLINE. Along with a concern for time efficiency, residents are again

reminded of principles of information mastery, such as the need to seek out POEMs (papers with outcome measures that exemplify "patient-oriented evidence that matters") as opposed to DOEs (papers presenting "disease-oriented evidence" that focus on surrogate or intermediate outcomes).^{4,5}

Step 4: Presentation and Discussion of Evidence

In the fourth step, residents are first asked to describe their experience in finding the evidence. This discussion provides faculty with an opportunity to acknowledge and normalize the difficulties frequently experienced by new users of computer-based information tools.

Following this process review, residents tell the group why they chose the particular evidence and what the evidence says to them. Attempts at assessing validity often lead to more questions, and some residents will seek guidance from a group leader prior to their presentation. Residents have sometimes structured their presentation with guidance from one of the *Users' Guides to the Medical Literature*.¹¹ Discussion of critical appraisal concepts, such as differences between narrative and systematic reviews, relative versus absolute risk, and the clinical use of the "number needed to treat" often occurs at this point.

When evidence is not found to answer a particular question, the opportunity is not lost to discuss the limits of evidence-based medicine. In particular, it becomes clear at this time, and in the following step as well, that evidence is not a panacea but merely one factor to be considered in the process of clinical decision making.

Step 5. Closure: Incorporating New Information Into Clinical Practice

Given evidence that is clinically useful, the discussion then centers on the challenge of incorporating this information into practice. As advocates of the patient-centered clinical method, time is devoted to techniques of presenting new information to patients. This serves to keep group discussion relevant to patient care, although time may also be devoted to discussing research methods, depending on the wishes of the group.

Program Evaluation

Pre-course Evaluation

Beginning with the first 8-week block in 1996, a baseline needs assessment was conducted by asking all residents attending their first session to complete a two-page questionnaire. Residents were asked to describe their past training in research methods, their expecta-

tions of the seminars, and any special requests with regard to learning objectives. Residents were also asked to rank their most important sources of information for solving clinical problems.

First Post-course Evaluation

The first post-course questionnaire was developed and implemented after year one, during blocks 3–11. This self-assessment was conducted at the end of the eighth and final session. Separate five-point scales measured self-reported pre- to post-course change in six domains: Level of Interest in Critical Appraisal (where 1=low interest and 5=high interest), Level of Skill at Formulating a Clinical Question, Searching for Answers, Appraising Original Research, Appraising Reviews, and Incorporating New Evidence Into Practice (where 1=beginner and 5=advanced level of skill). Change within each domain was assessed using the Sign test for a comparison (within-resident) of pre- and post-course scores. A single global measure of satisfaction was obtained by asking residents to rate their overall assessment of the seminars on a five-point scale (where 1=poor and 5=excellent).

Second Post-course Evaluation

To determine if the seminars influenced the post-course source of information used by the residents for clinical problem solving, we mailed a second questionnaire to all 38 residents who completed the course from 1998–2000. These 38 residents were chosen because these residents were in the program during a time when we taught a revised curriculum that focused on the use of secondary sources of information for solving clinical problems, as opposed to the original curriculum that focused on literature found through MEDLINE. This second post-course questionnaire again asked residents to rate their use of information sources for solving clinical problems on a scale from 1 to 5 (where 1=the least important source of information for solving clinical problems and 5=the most important).

Results

From 1996 to 2000, 89 first-year McGill family practice residents have been exposed to

Table 2

Characteristics of 86 Family Practice Residents Attending Evidence-based Medical Care (1996–2000)

Characteristics	Female (62.9%)	Male (37.1%)	
Gender:			
Medical school	McGill (32.6%)	Other (North American) (56.2%)	Other (not North American) (10.1%)
Any studies at the graduate level	9% (95% CI 3.1-14.9)		

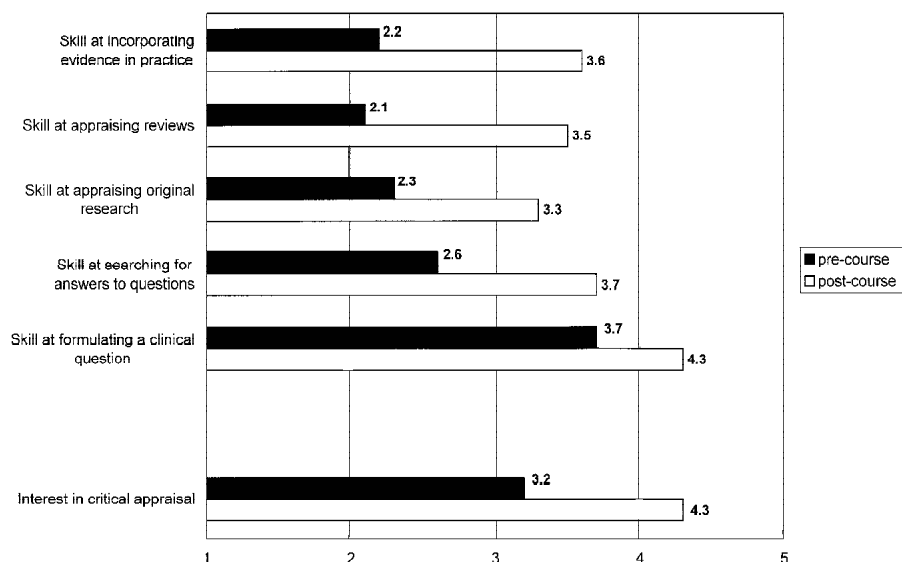
CI—confidence interval

evidence-based medical care in 11 8-week blocks of six–nine residents per block. On average, residents attended six of eight possible seminars, with absences related to post-call days, sick days, and vacation.

The baseline needs assessment was completed by 86 of 89 (97%) residents. Residents' background was highly variable in terms of past training in research methods, since the group was comprised of graduates

Figure 1

Impact of Teaching Evidence-based Medical Care: Self-reported Change in Level of Interest and Skills



of 24 different medical schools from around the world.

A total of 58 of 75 (77%) residents completed the first post-course questionnaire in blocks 3–11. Nonrespondents were residents who did not attend the final session. The residents' global evaluation of the seminar series was 4.2.

First Post-course Evaluation

Figure 1 shows statistically significant improvements, as reported by the residents, within each assessed domain of interest and skill ($P < .0001$). For example, residents reported increases in skill at searching for answers to clinical questions, appraising reviews, and deciding when and how to incorporate evidence into practice.

Second Post-course Evaluation

When asked before the course, "What is your most important source of information for solving clinical problems?" residents reported the use of traditional paper-based sources, such as textbooks (48%) and journal articles (19%). Data from the second post-course survey conducted in 2001 were received from 27 of 38 (76%) residents. No change was reported for the mean rank of textbooks as sources of information, from before to after the course (Figure 2), but secondary sources of information for solving clinical problems were ranked as more important after the course.

Discussion

Family physicians face multiple challenges in trying to operationalize "evidence" in clinical practice.¹² These can be summarized as challenges related to finding, assessing, interpreting, and applying best evidence. In addition, a number of barriers further impede easy implementation of research evidence in clinical practice. First, some clinicians may not question their practice often enough. Second, evidence does not yet exist to answer some of the questions that are raised. Third, even if the evidence exists to answer the question, time may be too short to track it down using traditional methods of information retrieval, such as MEDLINE. Fourth, even when useful information is found, many family physicians lack critical appraisal skills. Finally, relevant evidence may be difficult to retrieve months later in a busy

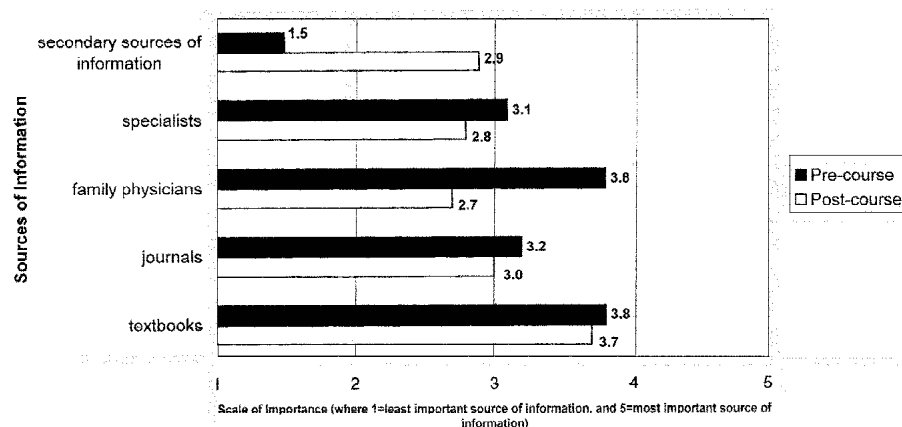
office setting when answers are needed in a hurry. In part, these barriers may explain why observational studies have revealed that family physicians do not pursue answers to most of their questions.¹³ Yet another contributing factor may be inadequate training in medical school and residency, if programs have not sufficiently fostered student self-confidence to develop the necessary skills to quickly find answers to their clinical questions.¹⁴

In this paper, first-year family practice residents have reported increased skill at searching for answers to clinical questions using electronic tools to support their health care decisions. Post-course, residents in this study have also reported that secondary sources of information are becoming more important to them for solving clinical problems, and, if this is true, they have started to become evidence users.³ These findings support our attempts to teach modified EBM techniques that focus on a more time-efficient strategy for the family practice setting.

Our analysis of EBMC is based on combining the results of more than 3 years of data for nine groups of residents. Year-by-year analysis revealed markedly similar findings, suggesting that the success of this curriculum is sustainable over time. Further, we believe that our results should be generalizable to other residency programs. If others wish to implement this curriculum in their setting, we recommend doing so within the family medicine rotation during a protected academic half day.

Figure 2

Impact of Teaching Evidence-based Medical Care: Self-reported Change in Use of Information Sources for Solving Clinical Problems



Limitations

A number of challenges and unanswered questions remain. First, the outcome measure we used, self-reported changes in behavior and skill, is a surrogate marker for actual changes in behavior and skill. In addition, self-reports are subject to information bias if residents were merely trying to "please the teachers." This bias would tend to exaggerate the magnitude of self-reported benefit. As of 1998, only four controlled trials had evaluated curricula in medical school or residency programs with regard to critical appraisal skills;¹⁵ the measured benefit of the curricula ranged from no effect to a 23% net absolute improvement. No studies, however, have yet evaluated whether the teaching of skills related to evidence-based medicine actually improves clinical practice. While we have observed residents continuing to access information on the computer using the various tools to which they have been exposed in our seminars, this may reflect a Hawthorne effect. Further research to evaluate the extent to which actual clinical skills and behavior are altered is clearly desirable. However, assessing the impact of any curriculum using objective measures of clinical behavior and patient health status presents a large and expensive undertaking.

Lessons Learned

We believe that the small number of seminars (six) attended by the average resident further limits the impact of EBMC. Expanding the time allotted to teaching skills related to EBMC should be considered but would require more teaching manpower and decisions about deleting other seminars. In the long run, faculty development is crucial to create a larger number of evidence-based role models to positively affect the medical students and residents of the future.¹⁶

Evidence from this study suggests the need for faculty development and enhanced teaching of evidence-based medicine in medical school, since 48% of first-year residents reported the use of textbooks as their most important pre-course source of information for solving clinical problems. This frequent use of traditional paper-based sources of information to solve clinical problems is not a new finding^{17,18} and likely represents an attitude generated in medical school. This may be problematic, if the textbooks that are used present information that is dated and/or not evidence based.

Conclusions

In conclusion, our findings support the continued teaching of EBMC to first-year family practice residents. Further initiatives at the medical school and in residency are needed to promote a curriculum in which all future graduates can become evidence users.

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