

# Introduction to Evidence-Based Medicine: a student-selected component at the Faculty of Medicine, King Abdulaziz University

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**Background:** Evidence-based medicine (EBM) involves approaching a clinical problem using a four-step method: (1) formulate a clear clinical question from a patient's problem, (2) search the literature for relevant clinical articles, (3) evaluate (critically appraise) the evidence for its validity and usefulness, (4) implement useful findings into clinical practice. EBM has now been incorporated as an integral part of the medical curriculum in many faculties of medicine around the world. The Faculty of Medicine, King Abdulaziz University, started its process of curriculum reform and introduction of the new curriculum 4 years ago. One of the most characteristic aspects of this curriculum is the introduction of special study modules and electives as a student-selected component in the fourth year of study; the Introduction to Evidence-Based Medicine course was included as one of these special study modules. The purpose of this article is to evaluate the EBM skills of medical students after completing the course and their perceptions of the faculty member delivering the course and organization of the course.

**Materials and methods:** The EBM course was held for the first time as a special study module for fourth-year medical students in the first semester of the academic year 2009–2010. Fifteen students were enrolled in this course. At the end of the course, students anonymously evaluated aspects of the course regarding their EBM skills and course organization using a five-point Likert scale in response to an online course evaluation questionnaire. In addition, students' achievement was evaluated with regard to the skills and competencies taught in the course.

**Results:** Medical students generally gave high scores to all aspects of the EBM course, including course organization, course delivery, methods of assessment, and overall. Scores were also high for students' self-evaluation of skill level and EBM experience. The results of a faculty member's evaluation of the students' achievement showed an average total percentage (92.2%) for all EBM steps.

**Conclusion:** The EBM course at the Faculty of Medicine, King Abdulaziz University, is useful for familiarizing medical students with the basic principles of EBM and to help them in answering routine questions of clinical interest in a systematic way. In light of the results obtained from implementing this course with a small number of students, and as a student-selected component, the author believes integrating EBM longitudinally throughout the curriculum would be beneficial for King Abdulaziz University medical students. It would provide a foundation of knowledge, offer easy access to resources, promote point-of-care and team learning, help students to develop applicable skills for lifelong learning, and help the faculty to achieve its goals of becoming more student-centered and encouraging students to employ more self-directed learning strategies.

**Keywords:** student-selected component, evidence-based medicine, learning, curriculum

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## Introduction

Student-selected components (SSCs) are one of the more innovative recent developments in medical education. Initially established in the UK in the 1990s, in response

to the General Medical Council's recommendations in *Tomorrow's Doctors*,<sup>1</sup> they provide students with a significant element of choice and depth of study to prepare students for the long-term intellectual and attitudinal demands of a professional life that will be constantly challenged by growth of knowledge and changes of circumstance. SSCs have become an integral part of medical curricula throughout the UK and, to a limited extent, the rest of the world, as many medical schools have changed the design of their curricula and moved into a new framework comprising a core curriculum, which constitutes about two-thirds of a course, and the SSCs. In most cases, SSCs contribute to the delivery of learning outcomes broadly encompassing personal, professional, and research skills, whilst creating opportunities for students to explore future career options.<sup>2</sup>

Evidence-based medicine (EBM) is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients."<sup>3</sup> In practice, EBM involves approaching a clinical problem using a four-step method: (1) formulate a clear clinical question from a patient's problem, (2) search the literature for relevant clinical articles, (3) evaluate (critically appraise) the evidence for its validity and usefulness, (4) implement useful findings into clinical practice. Considering the vast amount of medical knowledge available today through various media outlets, it is essential that medical graduates have the skills to search for information, appraise that information, and apply the valid information to solve clinical problems (EBM practice).<sup>3</sup> The EBM four-step process is designed to: decrease the time between the discovery of medical conditions and implementation of effective medical treatments, sustain high standards of practice among physicians, and drastically reduce the time spent becoming informed about recent developments in medicine.<sup>4</sup> With its potential for bridging the gap between research and practice, for preventing decline in clinical skills, and for saving the busy practicing physician time, EBM is being integrated into medical school curricula across the world.<sup>5-8</sup>

The Faculty of Medicine, King Abdulaziz University, started its process of curriculum reform and introduction of the new curriculum 4 years ago. One of the most characteristic aspects of this curriculum is the introduction of a special study module and electives as a student-selected component in the fourth year. The SSCs are offered as 2-credit hour (1 credit hour is equivalent to 15 contact hours) courses, delivered over 2 weeks in both the fourth and fifth years of medical study. Students can select from among 20 SSCs on both basic and clinical science. Students can also choose to take their SSC as training in any hospitals recognized

according to the policy and procedures approved by the course committee. Assessment of students' performance is mainly self-evaluated using a standardized evaluation form designed by the course committee.

The Introduction to Evidence-Based Medicine course was included as one of these special study modules. In this course, students are required to attend lectures and tutorials that give an introduction to the full EBM course, complete a workbook, involve their tutor in the construction of a focused clinical question and feedback session, and present a project (incorporating review of an article) on the final day of the course.

The purpose of this paper is to evaluate the EBM skills of medical students and student perceptions of the faculty member delivering the course and the course organization.

## Materials and methods

The course was based on Introduction to Evidence-Based Medicine, an online tutorial developed by Connie Schardt, Duke University Medical Center Library, Durham, NC, and Jill Mayer, University of North Carolina at Chapel Hill Health Science Library, Chapel Hill, NC. Students used the workbook developed by Lyndee Knox, University of Southern California, Los Angeles, CA. Permission from the authors of the online tutorial and the student workbook was obtained before the course started. Only 15 students out of 165 in the fourth year selected this course as their SSC, and this was their first experience of learning about EBM. This small number of students is explained by the large number of SSCs available that students may choose from. The course is delivered over 2 weeks in five theoretical lectures. It covers the principles of EBM, database searching (delivered in five practical sessions in a computer laboratory), the basic EBM steps, and also includes 15 self-directed learning hours during which students complete their workbook.

Immediately after the end of the course, the first student cohort was asked to evaluate anonymously how the course was delivered by the faculty member and rate the EBM project, content taught, and instructional handouts using a five-point Likert scale questionnaire. The students also self-assessed their confidence with EBM skills in the following areas: formulation of clinical question in "PICO" (Patient population, Intervention [or exposure], Comparison, Outcomes) format, literature searching, appraisal of articles, and application of this process to other clinical situations. Also, student performance was evaluated with regard to the five steps applied in their learning experience during the course. A five-point Likert-type scale was used in the questionnaires, with "strongly disagree" coded 1 and

“strongly agree” coded 5. The collected data were analyzed on the basis of descriptive statistics using SPSS (v 10.0; IBM Corporation, Armonk, NY).

## Learning experience steps

During the course, students were expected to undertake “learning experience steps.” These steps are outlined below.

1. Students individually selected a clinical problem to work on. The tutor then guided them in how to ask questions properly using the PICO approach. Clinical problems chosen varied; they included diagnostic, therapeutic, etiological, and those to do with harm (Table 1).
2. Students worked out their search strategy and developed a list of articles to screen, from which the ones most relevant to their clinical problem were selected.
3. Using the guidelines for appraising articles, students appraised the validity of the results presented in the articles under the guidance of their tutor.
4. Students then applied the new knowledge they had acquired to answer their chosen clinical question.
5. Students presented the whole process as a 5-minute presentation on the last day of the course.

## Results

Of the 15 students enrolled in the course, 14 completed the questionnaire. Tables 2, 3, and 4 show the results of this study. The students generally gave high scores to all aspects of the EBM course, including course organization, course delivery, methods of assessment, and overall. Students’ self-evaluation of skill level and EBM experience were also scored highly. The results of the faculty member’s evaluation of students’ achievement showed an average total percentage of 92.2% for all EBM steps including that of using PICO to formulate a focused clinical question (98.7%), conducting a search for evidence (91.5%), article appraisal (87.2%), and presenting the results (91.5%).

## Discussion

As part of the curriculum reform that took place in the College of Medicine, King Abdulaziz University, special

**Table 1** PICO (Patient population, Intervention [or exposure], Comparison, Outcomes) approach

Patient population	What group do you want information about?
Intervention (or exposure)	What medical event do you want to study the effect of?
Comparison	Compared with what? Better or worse than no intervention at all, or than another intervention?
Outcomes	What are the effects of the intervention?

**Table 2** Course evaluation by students (n = 14)

Questions	Mean	SD
Course objectives were clearly explained from the start	4.2	0.40
The course design was easy to use	4	0.54
The course followed a logical, well-organized sequence	4.1	0.30
The information was clearly presented	4.3	0.79
The examples made sense and supported the information	4.4	0.69
I learned enough to better understand the evidence-based medicine process	4.1	0.53
Assessment methods were clearly explained	4.1	0.70
Overall, this course was a good course	4.1	0.40
I will recommend this course to my colleagues	3.8	0.75
Total	4.1	0.19

**Abbreviation:** SD, standard deviation.

study modules and electives were introduced in the fourth and fifth year as 2-credit hour courses in both years. The Introduction to Evidence-Based Medicine is one of the special study modules first introduced in the academic year 2009–2010. This report is the first assessment of the efficacy

**Table 3** Self-evaluation score of skill level and evidence-based medicine experience

Questions	Mean	SD
Before this course, I was exposed to the concepts and skills of evidence-based medicine	2.2	1.0
Prior to this course, I searched for and used research literature in addressing patient issues	3.1	1.3
I understand the concept of evidence-based medicine	4.0	0.45
I feel capable of critically appraising articles dealing with issues of therapy and prevention	3.6	0.8
I feel comfortable using evidence-based medicine skills in day-to-day patient care responsibilities	3.8	1.0
I believe critical appraisal skills have value to me as a fourth-year student	3.5	0.82
I am more likely to use the literature to support my clinical decision making	3.6	0.80
I am more likely to appraise critically the articles I read	3.7	0.77
I am more likely to search the primary literature available on my patients’ problems	3.8	0.60
The medical clerkship is an appropriate time to learn the concepts of evidence-based medicine	3.9	0.70
I felt that my clinical question was resolved through identification and appraisal of the literature	4.2	0.40
My appraisal of the literature benefited my patient in some way	3.6	0.93
My evidence-based medicine project increased my sense of involvement in the clinical decision made regarding my patient	3.9	0.57
The five-step approach to the presentation of critically appraised literature was easy to learn	4.1	0.74
The five-step approach to presentations is a practical way to impart information concisely to colleagues	4.0	0.82
I am likely to use the evidence-based medicine process again during my medical training	4.0	0.67

**Table 4** Results of faculty member's evaluation of students' achievement

Evidence-base medicine steps	Mean score out of 25	SD	Score (%)
Using PICO to formulate a focused clinical question	24.7	0.7	98.7
Conducting a search for evidence	22.9	0.9	91.5
Appraising an article	21.8	1.1	87.2
Presenting the results	22.9	1.4	91.5
Total (out of 100)	92.2	3.1	92.2

**Abbreviations:** PICO, Patient population, Intervention (or exposure), Comparison, Outcomes; SD, standard deviation.

of the EBM course taught in this faculty. Self-evaluation by medical students showed that they were capable of completing the EBM steps. Students showed significant improvement of their EBM skills. This was confirmed by the high marks students attained for individual EBM assignments. Following the conclusions of several authors, to further measure students' competencies, a performance-based examination or objective-structured clinical examination (OSCE) is planned to be implemented next year.<sup>9,10</sup>

Successful teaching in EBM has been reported earlier by Ghali et al.<sup>11</sup> The three key elements were active student involvement, clinical relevance of exercises, and integrated teaching that targets each of the component skills of EBM. A detailed evaluation of the success of the EBM course at King Abdulaziz University has yet to be undertaken. Reports evaluating the teaching methods of EBM continue to be published.<sup>12,13</sup> One conceptual framework for evaluating the teaching of EBM has been advocated by Straus et al,<sup>14</sup> who suggest that instruments for evaluating different methods of teaching EBM must reflect the different learners, interventions, and outcomes that can be assessed.

The present evaluation was done immediately after students finished the course. It remains to be determined whether the expertise gained will be practiced and sustained in their careers. The ultimate goal for teachers at the authors' university is for students to use EBM in their daily medical practice. Toward this goal, further follow-up research of this first cohort of students is required. Although this study is rather concise and preliminary, it has shown promising results that have motivated course teachers to improve their teaching for undergraduates as well as postgraduates in the near future.

## Conclusion

This study was limited by the relatively small number of students. However, the results of students' evaluation, besides

their self-assessment, showed a highly significant correlation between the course evaluation by students and their self-assessment, which may signify the emerging need to integrate EBM teaching in the clinical years, with all clinical departments offering it rather than it being delivered as a special study module to a small number of students. The author believes integrating EBM longitudinally throughout the curriculum will provide a certain degree of success for King Abdulaziz medical students, helping them to answer questions of clinical interest in a systematic way in their daily practice.

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## Disclosure

The author reports no conflicts of interest. The author is responsible for the content and writing of this article.

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