Introduction

 \mathbf{F}^{or} too long, physicians have relied on tradition, anecdote and textbooks to guide patient care. But nowadays EBM encourages a healthy skepticism of every practice in medicine and culture of inquiry ¹. EBM is defined as "the conscientious, explicit, and judicious use of current best evidence in making decision about the care of individual patients". Or "the integration of best research evidence with clinical expertise and patient values" ². EBM requires that clinicians learn to appraise findings in literature critically to determine their validity and importance ³. The need for incorporating EBM with the medical curriculum will become more pressing in this age of accountability and increased population expectations.

The number of medical journals has increased from about 100,000 during 1990 to more than 250,000 in 2000 and the number is continuously increasing. The half life of medical information was estimated to be about ten years ⁴. By learning how to search for the best available evidence and developing their skills efficiently, medical students will be able to cope with the heavy and rapidly changing information explosion. The regular practice of EBM is also associated with rekindling of student's curiosity and therefore becoming up to date.

Medical schools' module in critical appraisal of the literature varies in content, timing and intensity of training, and relevance to patient care. The teaching of EBM has been increasingly integrated into curricula at all levels of medical education ^{5, 6}. In some four years medical schools' programs, EBM teaching occurred predominantly with the third and fourth year ⁷perhaps because of students' increased

experience with patient care studies ⁸. On the other hand, the basic skills in critical appraisal and clinical epidemiology took place during the first 2 years of medical school ⁷. It has been shown that a medical school curriculum led by educators on EBM can be standardized and successfully delivered in multiple community campus setting ⁷, ^{8,9}.

The national surveys conducted annually the Association bv of American Medical Colleges (AAMC)¹⁰ showed that more than 50% of medical school graduates reported inadequate training in critical appraisal skills for evaluating the medical literature or medical research. It was shown that clinically integrated teaching of EBM improves attitude, skills and behavior of EBM learners in the undergraduate and postgraduate levels ^{11, 12}. A study showed that the research technique skills and literature analysis skills were superior in the 3rd year students who were taught EBM module compared with those who were not taught the module7. The introduction of new ideas in the undergraduate curriculum, like EBM teaching module, was perceived by the majority of students (96%) of some benefits in their future works ¹³.

A comprehensive literature review failed to find any literature reporting or describing undergraduate EBM teaching in Saudi Arabia or the nearby countries. In the view of the many newly opened medical schools, present study was undertaken to:

- i. describe King Saud University (KSU) experience of teaching EBM for medical students
- ii. explore students' satisfaction with the module, their practice of what was learned and obstacles faced.

Module description

The curriculum of KSU Medical School is traditional and consists of five years plus the premedical year Table 1. In the last two years of the curriculum, students go through clinical rotations in different clinical departments. During the Family Medicine (FM) rotation that lasts for six weeks, the EBM module is taught. We started to teach EBM, introducing initially, by critical appraisal of a scientific paper in 1992; on two sessions that focus on a checklist to appraise a paper. Later on, the module was developed to include the five steps of EBM, based on the principles developed at McMaster University and published in the "Users' Guides to the Medical Literature" ^{14, 15}. In the last five years, the module consists of five sessions:-

1st **session**: Introduction to EBM including its definition, importance and the five Steps' process for the practice of EBM, i.e.:

- a. formulating a clinical answerable question
- b. searching for the evidence to answer the question
- c. critical appraisal of the evidence
- d. applying the evidence
- e. analyzing the practice

2nd **session:** Critical appraisal skills I, in which an article on therapy given before hand (as it appears more frequently in the literatures)¹⁶.

3rd **session:** Critical appraisal skills II, another article on therapy is given before hand and students are instructed to formulate a question from their daily clinical works and follow the other steps of EBM to find out the answer to present it later to the group (in sessions 4 and 5).

In the first three sessions, the teaching is in the form of interactive lectures where maximum students' participation is aimed for. Each session lasts for around two hours.

4th and 5th sessions: These sessions are in the form of small group seminars whereby each 10-15 students sit in a class room with two teachers. The exercise includes a seven minutes presentation from each student for the work that has been prepared under the instructors' supervision. Their reports are then submitted for making as a part of their continuous assessment. Each session last for around three hours. Therefore the total number of hours of face to face teaching in the classroom is around twelve hours.

Medical students have access to the internet in the school campus in the library. At the time of the study in 2002, the university has electronic subscription to a large list of databases, none of them is evidence based.

EBM Module assessment: During the time of the study, the assessment is based on students' appraisal of a paper or part of a paper on therapy, the checklist is provided during the examination.

Methodology

Six months after completing FM rotation where the students usually receive EBM teaching, а questionnaire was distributed to 43 female students. The study took place in the year 2003. The questionnaire consists of three parts. The first part focused on student selfevaluation of their English language level and computing skills. The evaluation is based on a five-points rating scale starting from excellent and ending with poor. The second part asked about their experience in the EBM module, their opinion,

willingness and attitude towards practicing EBM and the difficulties they faced. This part is scored using the four points' "Likert scale", strongly agree, agree, disagree and strongly disagree. The third part explored the application of the EBM in other clinical rotations, and if they have registration in any scientific database. Data were analyzed using the Systat statistical package¹⁷. The X^2 statistical test was employed to compare categorical variables. P value of <0.05 was considered significant.

Premedical	Chemistry, Physics, Biology, English and Biostatistics		
Year 1	Anatomy – Physiology – Biochemis	try	
Year 2	Anatomy - Physiology - Biochemistry - Pathology - Pharmacology and Microbiology		
Year 3	Pharmacology – Forensic Medicine – Community Medicine – Medicine/Surgery.		
Year 4	Family Medicine/ Orthopedics	Obstetrics/ Gynecology	ENT Dermatology Ophthalmology Psychiatry
Year 5	Medicine	Pediatrics	Surgery

Table 1: Medical school King Saud curriculum	L
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Results

Forty students completed the questionnaire representing a response rate of 93%. The majority of the students (98%) found the EBM module helpful in their clinical practice, and 90% favored its inclusion in the FM rotation. About 78% of the students found that the six weeks duration was enough for the module and thought that EBM is

important for their career. Only 45% of the students practiced EBM in other clinical rotations **Table 2**.

About 38% of students found difficulty in searching for information and one third of them had registration with a scientific database. Among the students who had difficulty in searching, it was either access related (37.5%) or difficulty with the appliances (17.5%) or time shortage (7.5%) as shown in **Table 3**.

Table 2: Students' attitude and pr	ractice of evidence based medicine
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Statement	No (%) Who Agreed
EBM module helped me in clinical practice	39 (97.5)
EBM to be taught within the Family Medicine rotation	36 (90)
Six weeks duration is enough	31 (77.5)
Faced difficulty in searching for article	15 (37.5)
EBM is important	31 (77.5)
Had registration to data base	13 (32.5)
Used EBM in other clinical rotation	18 (45)
Learning EBM depends on who teaches it	37 (92.5)
Computer skills affect the ability to search	33 (82.5)

Difficulty	No (%)
Access related	15 (37.5)
Appliance related	7 (17.5)
Time related	3 (7.5)
No difficulty	15 (37.5)

Table 3: Searching difficulties faced by students (n=40)

There is a statistically significant relationship between the students' perceived computing skills and their efficiency in searching for the evidence based information (p = 0.01). Eighty three percent of the students agreed that computing skills affect their searching ability.

Discussion

Many international scientific authorities considered EBM skills and computing skills (generic skills) ^{7, 18, 19} as one of the essential competencies required of the medical school graduates. This is the first report in Saudi Arabia and the Middle East that describes the teaching of EBM among medical schools. The main aim of this report is to describe and share KSU experience of EBM teaching. The current pilot study sets the scene for future studies. Therefore, the small sample size of the study and the inclusion of only female students do not invalidate the result.

There are some limitations in the current study. The fact, that the study was conducted six months after the module, makes it less suitable for module evaluation than to assess the impact of the module on the EBM practice. Students expressed their satisfaction and perceived benefit from the EBM module. The experience was highly rated and the module was found useful for their subsequent clinical rotations, this is consistent with others' findings ^{7,14.}

New definitions and specifications for core (essential)competencies of the EBM practice to be mastered by the medical students are needed ²⁰. The finding that about 38% of students had faced difficulty in searching for information indicates the need for more emphasis on the searching skills and the students' orientation to the available resources. The pre-evaluated medical been used elsewhere¹⁹ or in written information resources are particularly useful. This has been advocated earlier by others^{20, 21}. Eighty three percent of the students agreed that computing skills affect their searching ability. The finding that more than half of the students did not use EBM in other rotations demonstrates the need for а longitudinal EBM curriculum ¹² over the six years of the school and to involve other specialties in teaching these aspects of EBM. The inaccessibility of databases was the main perceived obstacle for the application of EBM. Currently, the university has subscription to "ovid

gateway" database which includes as has been used elsewhere²⁴ or in written format or assignment. The skills can be assessed by presenting a clinical scenario and asking the student to form focused, answerable question, а searching, and retrieving appropriate evidence, critical appraisal of evidence for validity and clinical importance and application of appraised evidence to practice ²⁵. In the OSCE exam, interaction with a patient after reading supplied evidence could be used ²⁴. In the report assignment, the student is requested to describe his or her experience in the application of the EBM Cochrane Data Systematic Reviews, the American College of Physicians journal

club, Database of Abstracts of Reviews of Effects and the Cochrane Central register of controlled Trials. It is advisable for the medical school to subscribe to other credible EBM resources. Other studies had similarly concluded that the availability and accessibility of prescribed or free databases and knowledge of how to search for and assess the literature are important preconditions for successful implementation of EBM 22, 23 Furthermore, a visit to the library whereby a well versed librarian informs the students of the available databases is recommended. This finding is in line with an earlier report which found that FM educators can lead а new curriculum in EBM and maintain consistent standards 7. Assessment should be in line with the module objectives and teaching strategy. The assessment should be in Computer based OSCE format in five steps. The candidate should reflect on how well these activities were performed and what conclusions and lessons were learned. We hope that the present study will encourage other medical schools in Saudi Arabia and elsewhere to teach EBM teaching in order to better prepare the graduates for future job. It is recommended to use a validated questionnaire in future studies to assess students' knowledge, attitude and behavior 26

References

- Sloane PD, Slatt LM, Ebell MH, Jacques LB. Essentials of Family Medicine. Philadelphia, PA: Lippincott Williams and Wilkins, 2002.
- 2. Sackett DL, Stratus SE, Ricbardson WS, Rosenberg W, Haynes RB.

Evidence-Based Medicine. How to practice and teach EBM. New York, NY: Churchill Livingstone; 2000.

- 3. Schwartz A, Huper J. Medical students' application of published evidence: randomized trial. **BMJ** 2003; 326: 536-8.
- 4. Candy PC. Preventing "information overdose" developing informationitrature practitioners. J Contin Educ Health Prof 2000; 20(4):228-37
- Srinivasan M, Weiner M, Breitfeld PP, Brahmi F, Dickerson KL, Weiner G. Early introduction of an Evidence-based medicine module to preclinical medical students. J Gen Intern Med 2002; 17: 58-65.
- Muller S. Physicians for the twentyfirst century: Report of the project panel on the general professional education of the physician and college preparation for medicine. J Med Educ 1984 Nov; 59(11):127 – 128.)
- Wadland WC, Barry HC, Farquhar L, Holzman C, White A. Training Medical students in Evidence-based medicine: A community campus approach. Fam Med 1999; 31 (10): 703-8.
- Medical Informatics Advisory Panel. Medical School Objectives Project: Medical Informatics Objectives. Washington DC. American Association of Medical College; 1999: 1-11.
- 9. Geyman JP. Evidence-based medicine in primary care: an overview. **J Am Board Fam Pract 1998**; 11 (1): 46-56
- 10. Association of American Medical Colleges. AAMC 1997 medical school graduation questionnaire, summary report for all schools. Washington, DC: Association of American Medical College, 1998.

- Geoffrey R. Norman; Susan I. Shannon, PhD Effectiveness of instruction in critical appraisal (evidence-based medicine) skills: a critical appraisal. Can Med Assoc J 1998;158; 177-81
- 12. Coomarasamy A, Khan KS. What's the evidence that postgraduate teaching in evidence-based medicine changes anything? A systematic review. **BMJ 2004**; 329:1017-9.
- 13. Burrow S, Moor K, Arriaga J, Plaulaitis G, Lemkau HL. Developing an "Evidence-Based Medicine and use of biomedical literature" component as а longitudinal theme of an outcomebased medical school curriculum: Year 1. J Med Libr Assoc. 2003; 91 (1): 34-41.
- 14. Guyatt GH, Sackett DL, Cook DJ for the Evidence-Based Medicine Working Group. Users' guides to the medical literature: II. How to use an article about therapy or prevention: A. Are the results of the study valid? **JAMA 1993;** 270:2598 – 2601.
- 15. Guyatt GH, Sackett DL, Cook DJ for the Evidence-Based Medicine Working Group. Users' guides to the medical literature: II. How to use an article about therapy or prevention: B. What are the results and will they help me in caring for my patients? JAMA 1994; 271:59 – 63.
- 16. Brassey J, Elwyn G, Price C, Kinnersley P. Just in time information for clinicians: a questionnaire evaluation of the ATTRACT project. **BMJ 2001;** 322: 529-530.
- 17. Systat software version 11. Systat software Inc (SSI), San Jose, California, USA

- General Medical Council (GMC) 1993, 2003 Tomorrow's doctors. Recommendations on undergraduate medical education. General Medical Council "1993"
- 19. Medical school objective project writing group. Learning objectives for medical student education – guidelines for medical schools: report 1 of the medical school objectives project. Acad Med 1999; 74: 13-18.
- 20. Shanghnessy AF, Slawson DC, Bennet JH. Becoming an information master. A guidebook to the medical information jungle. J Fam Pract 1994; 39:484-99
- 21. Lam W W T, Fielding R, Johnston J M, Tin K Y K & G M Leung. Identifying barriers to the adoption of evidence-based medicine practice in clinical clerks: a longitudinal focus group study. **Med Edu 2004;** 38(9):987
- Euler U et al. Implementation of Evidence-Based Medicine in clinical practice-external offers to search for and critically assess medical literature. Z Arztl Fortbild Qualitalissich 2002; 96 (5): 325-31.
- Leung GM, Johnston JM, Tin KYK, Wong IOL, Ho L, Lam WWT, Lam. T Randomised controlled trial of clinical decision support tools to impvore learning of evidence based medicine in medical students. BMJ 2003; 327: 1090.
- 24. Bradlley P, Humphris G: Assessing the ability of medical students to apply evidence in practice: the potential of the OSCE. **Med Edu 1999, 33:** 815-817.
- 25. Fliegel JE, Frohna JG, Mangrulkar RS: A computer-based OSCE station to measure competence in evidencebased medicine skills in medical students. Acad Med 2002, 77: 1157 -

1158

26. Johnston JM, Leung GM, Fielding R, Tin KYK, Ho LM. The development and validation of a knowledge, attitude and behavior questionnaire to assess undergraduate evidencebased practice teaching and learning. **Med Edu 2003;** 37: 992-1000