

## Teaching Evidence Based Medicine to Fourth Year Medical Students at Cyberjaya University College of Medical Sciences, Malaysia

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### ABSTRACT

**Background:** Recently many medical schools have incorporated Evidence Based Medicine (EBM) as part of their undergraduate teaching. The aim is to provide a firm base of EBM to the medical students early on, so that they can understand the importance of EBM. Medical schools are encouraged to teach EBM to students but yet the education setting, learner level, modes of instruction, skills covered and teaching methods are not standardised and varies worldwide. In Cyberjaya University College of Medical Sciences (CUCMS), EBM was incorporated in the curriculum since 2009. EBM concepts was taught formally to the MBBS students during four weeks Research and Evidence Based Medicine Course (REBM). Students were exposed to the various thinking processes, formulation of clinical questions, searching evidence, intermediate biostatistics, research methodology and critical appraisal. Besides that, Good Clinical Practice (GCP) and research proposal development also include in the course. The objective of this paper is to describe CUCMS experience of teaching EBM for undergraduate medical students. **Methods:** This report analysed students feedback using a questionnaire which included a Likert scale and open-ended questions. **Result:** Overall, three batches of students gave positive feedbacks regarding the course with constructive suggestions on room for improvement. **Conclusion:** From our first three years' experience in conducting the course, we concluded that the four-week EBM course offered was practical in instilling EBM principles.

**Keywords:** *Evidence-based medicine, Undergraduate, Curriculum, Medical education*

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## INTRODUCTION

Evidence Based Medicine (EBM) is defined as integrating clinical expertise in making decision on individual patient care based on current best evidence (1). It re-emerged as a distinct body of knowledge in 1990's and the purpose was to enhance the health care quality. Nowadays, healthcare practitioners in Malaysia are more alert and have good attitude with this approach (2, 3).

Clinician's positive attitude towards EBM is important for its application. These include lifelong learning and continuous updating of knowledge, as evidence evolves over time. Other than promoting optimal outcomes for patient care, EBM also helps to provide the best medical care at the lowest cost. Implementation of the principles of EBM, requires effort and commitment from medical school, physicians, professional associations and pharmacists. Unless EBM is taught systematically, it will remain difficult for doctors to appreciate its usefulness and more importantly how to utilise it in their practical life. Hence, many medical schools make efforts to expose students to EBM by preparing them with EBM knowledge and skills before they graduate.

The objectives of teaching EBM are to educate and train students in EBM skills so that they can apply it in their clinical training and in subsequent clinical practice. Introducing EBM as early as possible is an effort to train future doctors to be conversant and hopefully competent with EBM. Research has shown that exposure to EBM can improve student's knowledge, skills and attitudes towards learning and applying EBM (4). Study also reported that the introduction of EBM in the academic curriculum improves the physician residents' skills in critical appraisal (5).

Although it has been only a decade since EBM has been included in medical curriculum, because of its importance, many researches have been done to improve and help to develop the curriculum (6, 7). This

reflects the fact that the teaching of EBM is still not fully developed and lacks a universal approach especially at the undergraduate level. Generally, the incorporation of EBM in the curriculum differs among the various medical schools. Some medical schools introduced EBM during the pre-clinical years to encourage them to think critically at an early stage whilst others implement EBM in the clinical years or in postgraduate level (4, 8, 9). On the other hand, some medical schools started the initiative to integrate EBM throughout the curriculum (10, 11, 12). Furthermore, the course content, teaching methods, duration, and student's assessments varied between schools.

Cyberjaya University College of Medical Sciences (CUCMS) was established in 2005 and EBM was included in the curriculum from 2009 to the second cohort of students. This paper aims to describe our first three years' experience in teaching EBM to year four (penultimate year) undergraduate medical students at our institution to inspire other medical schools incorporate EBM in their curriculum especially in developing countries like Malaysia.

## METHODOLOGY

### Description of the Course

We incorporate the EBM in the Research and Evidence Based Medicine (REBM) course. This course generally has two main elements which were EBM and research. This four weeks REBM course was conducted at the beginning of the academic year and consists of 90 contact hours with four credit units. This paper only describes the first three cohort of students who took this course at CUCMS.

Students enrolled into this course have previously been exposed to the basics of biostatistics and research methodology during Public Health course in their Year Two. In the Year Three, they had the opportunity to apply the knowledge while performing community survey and Health

Intervention Programme (HIP) during Community Medicine posting. There was also exposure to some aspects of scientific writing during the first year under the 'English for Special Program' (ESP) module.

By the end of the course students were expected to be able to define what is EBM, discuss the steps in EBM, formulate clinical questions, able to search for scientific evidences, critically appraise scientific papers, and apply the result to clinical practice or to patients. They were also expected to be able to apply research methodology and biostatistics concept in developing a research proposal and appreciate the importance of EBM in decision making.

The teaching methods applied were mainly of interactive lectures. Others were small group discussions, student seminars, practical, tutorials and Student Centred Team-based Learning (SCTL).

### Content of the Course

Students learnt both EBM and research elements in this REBM course which included all the EBM skills and the fundamentals of doing research.

Students learnt about the various thinking processes to stimulate and encourage them not only to think laterally, but to think critically and analytically to apply the knowledge gained in performing literature review, scientific reading and in writing a research proposal.

Students also learnt about the epidemiology and biostatistics such as study designs, randomisation, screening and diagnostic tools, qualitative study, multivariate analysis, number need-to-treat, introduction to medical informatics, and sample size calculation.

Regarding EBM skills, they were stressed on how to formulate clinical question using the Population, Intervention, Comparison and Outcomes (PICO) concept, searching literature on MEDLINE and PUBMED

efficiently and doing critical appraisal. In the critical appraisal sessions, the students were required to appraise six journal articles from different types of studies (diagnostic, prognostic and therapy study) using worksheet from centre for evidence based medicine. And later they had sessions with their respective facilitators.

Good Clinical Practice (GCP) is one of research element included in this course. GCP curriculum is based on a standard guideline for clinical trial study worldwide. In Malaysia, it is compulsory for clinical investigators to attend a GCP course and to pass the GCP examination before conducting any clinical trials. GCP certification is important to ensure clinical trials are conducted properly and ethically.

All the classes were interactive lectures by invited speakers who were directly involved in GCP training in Malaysia. The students were given a test and should score at least 80% to pass. This was the first time GCP was introduced and assessed among undergraduate medical students in Malaysia.

Other research element included in this course was research proposal development. Students were guided and trained on how to develop their research proposal. They were divided into small groups consisting of three to four students per group with one or two lecturers as their supervisor/s. The selection of research topics was decided by the students themselves under their supervisors' guidance and they had to present their proposal in a formal oral presentation session to the whole class. Lecturers (both supervisors and non-supervisors) were present during the presentation and structured assessment were done by designated assessors among the academic staff. Students were strongly encouraged to implement the proposed research at the end of year four and about 30% implemented the research projects proposed.

## Student Assessment

Students were formally assessed at the end of each week. Seventy five percent of assessments were written test consisting Single Best Answer Questions (SBAQ) and Short Answer Question (SAQ) while the rest were group presentations and scientific report. A student would be barred from taking formal assessment if their attendance was less than 80%. The passing mark for the whole four-week course was set at 50%.

## Course Feedback

A log book is available for each student to give them guidelines, student feedback and faculty input. At the completion of course, to assess the student's self-perception on their EBM skills, attitude and behaviour. All the students in the three cohorts (who did REBM between 2009–2011) were asked to complete a self-administered questionnaire in their logbook. The course feedback consists of three sections with one of those sections consisting of an open-ended questionnaire. The questionnaire was developed to focus on students' perception on the teaching-learning activities, course objectives, content of the course, students' perception on their skills, attitude and behaviour towards research and EBM.

The questionnaire was checked by faculty members in terms of content and face validity. A mean score was calculated for the close ended questions which comprise of a four-point Likert scale which ranged from 4 (strongly agree), to 1 (strongly disagree). The 'unsure' response was excluded from analysis. The mean scores of 3 and above indicate that they were agree with the corresponding statements.

The open-ended questions asked students' opinion about the course and on how to improve the course. The answers were analysed based on the themes and sub-themes. This analysis followed the principles of qualitative data analysis. All answers were compiled and broadly categorised as per the themes of the course objectives,

such as faculty related, curriculum related and miscellaneous issues. In the results section, the thematic findings of open-ended questions were integrated with the main findings of the questionnaires for in-depth understanding on the areas that were the most liked, things they did not like much and suggestion to improve the course in future.

## Integration of EBM

Students were given choice either to do the research that they have proposed (research elective) or to do clinical elective in hospitals to complete their credit unit at the end of Year Four. One research project consists of three to four students with at least one lecturer as supervisor. Research grants were available to supervisors. Ethical approval would be applied by the students from respective ethical committee depending on the site of their study before the research could be implemented.

For students who chose not to do research elective, they had applied their knowledge and skills of EBM into practice during their clinical elective with one objective was to full fill writing an evidence-based case summary. This is achieved by requiring them to submit their elective report with EBM application where they have to generate relevant clinical question about the patients, searching for evidences, critically appraised the evidences and suggest the best decision for the patients that they reported on.

Apart from the above, application of EBM was also done in students' case write up during their clinical postings throughout the rest of their clinical years. They also applied the skills in the journal club sessions in the clinical years.

## RESULTS

Three hundred and twenty-two (322) students took the course over the three years duration (Table 1). However, only 296 (92%) students completed the

questionnaire. The results of the self-administrated close ended questions are shown in Tables 2 and 3.

In general, students agreed on the four weeks duration and placement of the course which was at the beginning of Year Four. They also agreed this course had helped them to increase their knowledge and improved their attitude and behaviour toward research and EBM. They felt that the GCP sessions were most beneficial to them (Table 2).

The main issues that emerge during analysis of open ended questions were categorised into themes and sub-themes. We also outlined the suggestions to be considered to improve the course in future (Table 3).

The faculty related issues which arose were the lack of lecturers' guidance on critical appraisal and research proposal development. Students also commented on curriculum related issues which included that they did not like lengthy lectures and certain biostatistics topics.

**Table 1:** Students' characteristic

	Year 2009 (n = 77)	Year 2010 (n = 123)	Year 2011 (n = 122)
Gender			
Male	33 (43)	49 (40)	46 (38)
Female	44 (57)	74 (60)	76 (62)
Race			
Malay	69 (90)	103 (84)	108 (89)
Chinese	4 (5)	7 (6)	7 (6)
Indian	2 (3)	9 (7)	6 (5)
Others	2 (3)	4 (3)	1 (1)

**Table 2:** Mean Likert Scalebscores of REBM course feedback (n = 296)

No	About The Course	Mean	SD
1	The objectives and contents of the course were reasonable for the duration	3.3	0.61
2	The current duration for the course should be maintained (i.e. four weeks)	3.4	0.64
3	I think, the R and EBM course is rightly placed (i.e. at the beginning in Year 4)	3.3	0.73
4	The 'Thinking week' was beneficial	3.3	0.7
5	The 'Bio-statistics week' was beneficial	3.4	0.57
6	The 'Good clinical practice week' was beneficial	3.8	0.43
7	The teaching-learning activities throughout this course have been enjoyable	3.2	0.6
8	The teaching-learning activities helped to increase my knowledge of clinical research & EBM	3.7	0.48
9	The teaching-learning activities helped to improve my skills in clinical research & EBM	3.6	0.52
10	The SCTL workshops have been beneficial	3.4	0.58

(continued on next page)

**Table 2:** (continued)

No	About The Course	Mean	SD
<b>Perception on Students' Knowledge, Attitude and Behaviours Towards Clinical Research &amp; EBM</b>			
1	The teaching-learning activities have helped improve my behaviours and attitude as a future doctor	3.3	0.58
2	I think, the research proposals prepared in this course should be implemented	3.3	0.64
3	The lecturers have guided my learning adequately	3.4	0.57
4	I think, the course instilled professionalism as a clinical researcher in myself	3.5	0.52
5	I think, I would choose to specialise as a Clinical Researcher	2.9	0.8

**Table 3:** The issues emerged from open-ended questions and suggested measures

Category (themes)	Main issues (sub-themes)	Suggestion
Faculty-related issue	Lack of lecturers' experience in critical appraisal	Strengthen faculty development in critical appraisal and research
	Students' expectation for supervisor student interaction was not fulfilled	Motivate the lecturers to be enthusiastic to guide students during proposal preparation
Curriculum-related issues	They liked GCP workshop, preparing research proposal and thinking skills	This course should be maintained
	Long and lengthy lectures	Teaching methods such as SCTLs and workshops to replace lectures
	They did not like the repeated topics on biostatistics and research methodology	To have more practical sessions for sample size calculation topic
		Reduce or eliminate some topics on biostatistics and research methodology to replace with critical appraisal session
	Difficult to focus on research proposal presentation	Split the students into two groups
Other issues	They enjoyed the course and feel 'research is fun'	Course should be maintained for future to provide exposure to clinical research

## DISCUSSION

EBM knowledge and skills need to be learnt before it can be practiced on patients. This four weeks course is just a formal introduction on application EBM to the students. They had actually been introduced to the EBM concept informally at the beginning of their MBBS student life during preclinical years by including elements of EBM in the 'triggers' of their Problem Based Learning (PBL) materials, followed by patient case write ups in Year Three clinical posting. Students were expected to be able to apply what they have learnt in this course throughout the clinical years and could suggest the best clinical decisions on the patient they clerked based on evidence.

To ensure its application in clinical practice, it needs to be repeatedly emphasised and evaluated throughout the medical course. As part of our efforts to evaluate the student's ability in the clinical application of EBM principles, in clinical postings, students were asked to submit case write ups incorporating evidenced based critique on the cases they clerked. This enabled the lecturers to assess the student's ability to apply the principles of EBM which has been learned during the REBM course.

Besides that, throughout the clinical years, EBM skills were integrated into student-centred journal clubs to enhance their EBM knowledge, attitude and skills. This is probably more effective than stand-alone workshops (13). One study also has shown that EBM skills significantly improved after students were involved in a series of evidence based journal clubs (14).

Faculty members had recently suggested to make it compulsory for CUCMS undergraduates to execute the research proposal during their elective period rather than leaving it as an option to encourage them to become clinical researchers in the future. We believed that it is important to encourage them to generate evidence which will enhance evidence based practice

towards better clinical outcome in their future patient care.

Based on this feedback, majority of the students agreed that the duration of this course should be maintained. It shows that the four weeks duration is appropriate for our students. They felt that their attitude towards EBM after completing the course was improved. Nevertheless, the results also suggested that a big effort is needed to internalise what they learnt, as only about 61% of them wanted to be a clinical researcher in the future.

Some issues arose from the open-ended course feedback. Students commented on the difficulty to understand the concept of sample size calculation. Calculation of sample size depends on type of outcome measures, power of study and effect size. It needs a good understanding on biostatistics as well as practice. Students also reported they need more sessions on critical appraisal. Since the duration of this course is only for four weeks, some suggested replacing biostatistics with more critical appraisal sessions. This is because they felt that they have had enough exposure in biostatistics from the first three years of the medical programme.

There were also barriers that we should acknowledge in this course. As REBM is a new course introduced in the university, there was a lack of trained lecturers to facilitate group session on critical appraisal as highlighted in the course feedback. The lecturers themselves need to be trained and be provided with support to facilitate students on critical appraisal. To overcome this, a series of workshops have been conducted internally to improve lecturers' skill on EBM and train lecturers to be good research supervisors.

One limitation of this report is the effect of teaching EBM in the long term cannot be evaluated because we only measured the students' perception at the end of the course. Follow up study should be done among our graduates assess the persistence

of their understanding and appreciation of EBM principles during their working life.

## CONCLUSION

Based on our three years' experience of conducting this course and from the students' feedback, we conclude that the four week REBM course offered at the beginning of Year Four was practical in instilling EBM principles in our students. It should continue for future students and lecturers should encourage students to practice EBM beyond the completion of the course.

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