

# INTERACTIVE WEB APPLICATION FOR EVIDENCE-BASED MEDICINE TRAINING

Lorentz JÄNTSCHI<sup>1</sup> and Sorana-Daniela BOLBOACĂ<sup>2</sup>

<sup>1</sup>Technical University of Cluj-Napoca, Cluj-Napoca, Romania, <http://lori.academicdirect.org>

<sup>2</sup>"Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania, <http://sorana.academicdirect.ro>

**SUMMARY** - The education in spirit of practicing evidence-based medicine represents the first step in implementation of the concept in daily activity. Two educational strategies in evidence-based medicine education, a directed intervention and a self-directed one, for fourth-year undergraduate medical students at the Faculty of Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy, Romania, were studied. The methodologies used and the comparison between the intervention strategies on evidence-based medicine training are presented.

**1 INTRODUCTION**

The evidence-based medicine (EBM) concept, introduced by Guyatt & all in 1991 [1] and define as *conscientious, explicit, and judicious use of the best evidence in making decisions about the care of individual patients* [2], imposes the translation of knowledge resulted from research in daily individual decisions. Evidence-based medicine education represents the first step in implementation of the concept into practice [3]. Comparing with no intervention, short EBM educational strategies proved to be able to transfer knowledge and sometimes to improve critical appraised skills for medical students [4], residents [5] and physicians [6].

**2 AIM**

The aim of the research was to evaluate two educational strategies in evidence-based medicine education, a directed intervention and a self-directed intervention, for fourth-year undergraduate medical students at the Faculty of Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy, Romania.

**3 MATERIAL**

Two interventions in evidence-based medicine training were studied: (1) a traditional intervention (a mini-course, two-hours), and (2) a self-directed intervention (interactive web curriculum; three month self-directed training [http://vl.academicdirect.org/medical\\_informatics/EBM\\_Rom/EBMRom.htm](http://vl.academicdirect.org/medical_informatics/EBM_Rom/EBMRom.htm)) [7]. Both educational interventions covered the steps of practicing evidence-based medicine; computer-assisted curriculum enclosed deepen knowledge, clinical problem with or without solutions, links to evidence-based medicine resources in native languages and in English.

**5 RESULTS**

The characteristics of the students included into the study, summarized by intervention group are in table 1.

**Table 1.** Characteristics of students included into the study

Characteristic	Group		Total (n = 96) Percent (%) [95% CI]	P-value
	Directed (n = 56) Percent (%) [95% CI]	Self-directed (n = 40) Percent (%) [95% CI]		
Gender				.743 <sup>1</sup>
Female	64.29 [50.03-76.75]	67.50 [50.06-82.44]	65.63 [55.22-74.99]	
Age (years old)				.235
21	19.64 [10.75-32.11]	32.50 [17.56-49.94]	64.58 [54.18-73.95]	
22	69.64 [55.39-82.11]	57.50 [40.06-72.44]	10.42 [5.22-18.74]	
23	10.71 [3.60-21.40]	10 [2.56-22.44]	25 [16.68-34.36]	
Previously heard about EBM	25 [14.32-37.47]	55 [37.56-69.94]	37.5 [28.14-47.91]	.003
Access to computer				.713
Easy	44.64 [30.39-58.90]	42.50 [27.56-59.94]	43.75 [33.34-54.16]	
Relative easy	19.64 [10.75-32.11]	32.50 [17.56-49.94]	25.00 [16.68-34.36]	
Difficult	30.36 [17.89-44.61]	20.00 [10.06-34.94]	26.04 [17.72-36.45]	
No access	1.79 [0.03-8.90]	2.50 [0.06-12.44]	2.08 [0.01-7.28]	
I don't know	3.57 [0.03-12.47]	2.50 [0.06-12.44]	3.13 [1.05-8.32]	
Access to Internet				.676
Easy	33.93 [21.46-48.18]	27.50 [15.06-44.94]	31.25 [21.89-41.66]	
Relative easy	25.00 [14.32-37.47]	45.00 [30.06-62.44]	33.33 [23.97-43.74]	
Difficult	35.71 [23.25-49.97]	22.50 [10.06-37.44]	30.21 [20.84-40.61]	
No access	1.79 [0.03-8.90]	5.00 [0.06-17.44]	3.13 [1.05-8.32]	
I don't know	3.57 [0.03-12.47]	0.00 [n.a.]	2.08 [0.01-7.28]	

<sup>1</sup>Chi-square; <sup>2</sup>Mann-Whitney U test; n.a. = not applicable

**Table 2.** Results of educational evidence-based medicine knowledge assessment

Number of questions (type)	Group	
	Directed (n = 56) [95%CI]	Self-directed (n = 40) [95%CI]
Average	11.11 [10.59-21.70]	37.90 [37.21-75.11]
Standard Deviation	1.91	2.15
Median	11	38
Minimum	7	32
Maximum	16	42

MCQs = multiple choice questions; 95% CI = 95% confidence intervals

**4 METHOD**

The aim of the study was presented to a series of fourth-year undergraduate medical students at the Faculty of Medicine. All students had possibility to choose one of the presented interventions on evidence-based medicine education. The students were considered to be eligible for the study if: (1) attended to the presentation; (2) complete the baseline characteristics form; (3) Complete the consent form for participation at a least one educational intervention in evidence-based medicine. The consent form for the participants to the interactive web evidence-based medicine training imposed the access to an individual computer with CD-ROM. Knowledge and skills about evidence-based medicine concepts, searching techniques and critical appraisal of evidence was measured in both intervention groups at the end of the intervention using:  $\leq$  a paper-based questionnaire of eighteen true/false questions (with five problem-based questions) for the group which participate at the mini-course;  $\leq$  a tutor-assisted online forty-five multiple-choice questionnaire (fifteen problem-based questions) for the group which participate at self-directed intervention. The participant's characteristics were summarized and the comparisons of the two groups were performed according with the type of variable and its distribution by the use of t-test, Mann-Whitney U test, Statistica 6.0, at a significance level of 5%. The 95% confidence intervals for proportions were calculated with a method based on the binomial distribution hypothesis [8]. Ninety-six fourth-year medical students decided voluntary to enroll into the study: fifty-six students enroll to the mini-course on EBM and forty students enroll to follow the interactive curriculum on EBM.

## RESULTS

The characteristics of the students included into the study, summarized by intervention group are in table 1.

The statistics of correct answers gave by the two group of directed and self-directed educational interventions in evidence-based medicine are in table 2. Note that all students previously received training in research methodology, epidemiology, and statistics.

The average of the proportions of correct answers in self-directed group (0.844, n = 40) was significantly greater ( $P = .0174$ ) compared with the average of the proportions of correct answers in directed group (0.617, n = 56). The results of analyzing the number of students which give a specified number of correct answers, for directed and self-directed interventions according with the following criterions: more than or equal with correct answers:

- (1) 50% ( $\geq 9$  for directed intervention,  $\geq 23$  for self-directed intervention);
- (2) 60% ( $\geq 11$  for directed intervention,  $\geq 27$  for self-directed intervention);
- (3) 70% ( $\geq 13$  for directed intervention,  $\geq 33$  for self-directed intervention);
- (4) 80% ( $\geq 15$  for directed intervention,  $\geq 36$  for self-directed intervention) are in table 3.

**Table 3.** Results of comparison between directed and self-directed interventions in evidence-based medicine

Criteria	Group				P - value
	Directed (n = 56)		Self-directed (n = 40)		
	No.	95% CI <sub>1</sub>	No.	95% CI <sub>2</sub>	
$\geq 50$	51	[0.8039-0.9640]	40	[0.9006-1.0000]	.0552
$\geq 60$	32	[0.4289-0.6961]	40	[0.9006-1.0000]	< .001
$\geq 70$	11	[0.1075-0.3211]	39	[0.8756-0.9994]	< .001
$\geq 80$	4	[0.0182-0.1783]	36	[0.7756-0.9744]	< .001

95% CI<sub>1</sub> = 95% confidence intervals for proportion of students which gave more than x% correct answers

**6 CONCLUSIONS**

The study reveals that the interactive web approach was efficient and effective in undergraduate students' education, suggesting that may be an alternative method for teaching evidence-based medicine. However, more research comparing the proposed method with other educational models applied on residents and practitioners are necessary. Also, critically appraisal skills on searching the best available evidence and evidence assessment, as well as evaluation of the professional behavior in spirit of inclusion of the best available evidence into daily medical decision, and long-term effects on patient outcomes are necessary to be investigated.

**7 ACKNOWLEDGEMENTS**

Research was partly supported by UEFISCSU Romania through the project ET46.

## REFERENCES

- [1] Guyatt GH. Evidence-based medicine. ACP J Club 1991;114:A-16. [2] Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence-based medicine: what it is and what it isn't. Br Med J 1996; Jan 13;312(7023):71-72. [3] Alper BS, Vinson DC. Experiential curriculum improves medical students' ability to answer clinical questions using the Internet. Fam Med 2005 Sep;37(9):565-569. [4] Schilling K, Wiercha J, Polinent D, Khalil S. An interactive web-based curriculum on evidence-based medicine: Design and effectiveness. Fam Med 2006 Feb;38(2):126-132. [5] Nicholson LJ, Shieh LY. Teaching evidence-based medicine on a busy hospitalist service: Residents rate a pilot curriculum. Academic Medicine 2005 Jun;80(6):607-609. [6] Bloom BS. Effects of continuing medical education on improving physician clinical care and patient health: A review of systematic reviews. Int J Technol Assess Health Care 2005 Summer;21(3):380-385. [7] Bolboacă S, Jantschi L. Computer-Assisted Training and Evaluation System in Evidence-Based Medicine. Proceeding of the 11th International Symposium for Health Information Management Research, July 14-16, Halifax, Nova Scotia, CA, 2006, p. 220-226. [8] Binomial distribution [online software]. URL: [http://vl.academicdirect.org/applied\\_statistics/binomial\\_distribution/](http://vl.academicdirect.org/applied_statistics/binomial_distribution/) [accessed 2006 March 21]