Original Article

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Students' View of Evidence-Based Medicine: A Survey in Switzerland

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Abstract

Objective: Training in Evidence-based medicine (EBM) has been implemented in Swiss medical schools for the last 8 to 10 years. Still, there is little known about the undergraduates' perception of EBM and Medical Statistics.

Methods: Between February and July 2007, fifth- to sixth-year medical students during surgical clerkship at 15 adult surgical departments in German-speaking Switzerland were asked to participate in an anonymous survey. At the end of the surgical clerkship each student received a self-administered questionnaire on EBM. It included questions concerning the perception of the practical use of EBM, eight multiple-choice questions regarding the statistical literacy and 26 questions about the view of Science and Scientific Methods.

Results: A total of 185/344 (53.8%) medical students participated in the study. On a seven-point Likert scale, the importance of teaching and knowledge in EBM was rated as high (5.7±1.1 and 5.9±1.0). The subjective knowledge on EBM was considered moderate on a five-point Likert scale (3.4±1.0), corresponding with the median percentage knowledge score of 33 (range 0-47). The frequency of literature research and number of publications as co-author proved to be the only significant predictors for a higher knowledge in EBM and Medical Statistics of medical students (p=0.01). The attitude toward Science was good with a total score for the value of Science and research of 80.0 ± 8.3 out of a maximum of 130. The main impediments for using EBM were lack of time (57/165, 35%), ignorance (36/165, 22%), and difficulties in integration into everyday life (32/165, 19%).

Conclusions: Medical students in Switzerland were aware of their moderate knowledge in EBM and Medical Statistics and aimed for an improvement. More courses in EBM and journal clubs must be introduced and access to information resources must be ensured with an early introduction in search engines (i.e. MEDLINE, Cochrane Library, etc.). A general strengthening of the knowledge on EBM and Medical Statistics among medical students may be a good way of educating the critical number of academic physicians and establishing a foundation for their future academic environment.

Key words: *Evidence-based medicine, medical students, Switzerland, attitude, knowledge*

Introduction

Evidence-based medicine (EBM) is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" [1]. It was developed in the early 1990s to improve medical decision-making [2] and the term and concept originated at McMaster University. To practice EBM, physicians must be capable of critically appraising the validity of research evidence and applying the results of this

appraisal to their practice [3]. Basic prerequisites are a sound knowledge of methodological issues and statistical literacy [4].

EBM principles have been implemented in medical studies, mainly in the USA and to a lesser extent in Europe [5,6]. Although it has been shown that there is little evidence of effective interventions that can help change attitudes over time [7], Vujaklija et al. found that the attendance of a course on research methodology had a positive short-term effect on students' attitudes toward Science [8]. It is known that an introduction of EBM principles to medical students is feasible and that they can learn to practice EBM [9,10]. However, still lacking is evidence on the impact of EBM teaching on patient outcomes [11,12]. Insufficient knowledge and inadequate competencies in research methods are still commonplace; many patients do not receive appropriate care, or receive unnecessary or harmful care [13,14].

A Swiss study showed that EBM is not an important part of the residents' curriculum, especially not for General Surgery and Anesthesiology [15]. There is a lack of knowledge about the students' perception of EBM and Medical Statistics in Switzerland. Based on the official Swiss Catalogue of Learning Objectives for Undergraduate Medical Training, courses on EBM and Medical Statistics have been integrated in medical studies to varying degrees for the last 8 to 10 years [16].

The aim of the present study was to assess, on the one hand, the students' attitudes toward and knowledge about EBM and, on the other hand, impediments and improvements for using it.

Methods

This study is based on an anonymous survey of medical students during surgical clerkship in German-speaking Switzerland. In Switzerland, clerkships normally take place in the fifth or sixth years of medical school. By random selection, 20 out of 60 directors of adult surgical departments (U, A, B3, and B2 clinics, classified according to the Swiss Medical Association [FMH]) were contacted [17]. Randomization was carried out by computer-generated numbers. Once directors had agreed to participate in the study, they were asked to give the anticipated number of clerkship students for the time period between February and July 2007. Along with a survey about specialty preferences before and after the surgical clerkship to evaluate the latter's impact, each student received a self-administered questionnaire on EBM at the end of his/her surgical clerkship. The participants were advised to complete the questionnaire without any third-party support.

Survey instrument

The questions included in the survey were derived by reviewing the literature and by holding informal discussions with students and were divided into four parts. Part 1 included socio-demographic data (age, gender, academic year, family background, career aspiration, top three specialty preferences). Part 2 addressed the perception of the practical use of EBM. Respondents were asked to rate the importance of teaching and knowledge in EBM on a seven-point Likert scale, ranging from 1= "not at all important" to 7= "extremely important" and their personal skills in EBM on a five-point Likert scale, ranging from 1= "poor" to 5= "excellent". Furthermore, they were asked about the frequency of reading medical publications, performing literature research on scientific issues, and applying EBM during patient contact. Two questions dealt with the number of publications as first/senior or co-author, respectively, and the participation in courses in EBM and Medical Statistics. Two free-response items evaluating the impediments for using EBM and the main improvements to dismantle these obstacles were embedded in the multiple-choice questions. Part 3 of the survey consisted of eight multiple-choice questions regarding the statistical literacy. The test items were chosen from a previously published Vade Mecum for surgeons [18] and addressed the following: the goal of double-blinding (1 point), the parameters influencing the power of a study (4 points), factors on which the p-value depends (3 points), the caveats of multiple testing/subset analyses (2 points), the definition of a type I error (2 points), the effect of different confidence intervals (1 point), the definition of a positive predictive value (1 point), and the definition of "number needed to treat" (1 point), resulting in a total score of 0-15.

Part 4, consisting of 26 questions regarding the attitudes toward Science and Scientific Methods, used a five-point categorical scale from "completely disagree" to "completely agree". The questions concerned the potential value/problem for human beings (7 items, score range 7-35), of Science and Scientific Methods (8 items, score range 8-40), and for Medicine itself (11 items, score range 11-55), resulting in a total score of 26-130. Questions are shown in the Appendix table.

As the survey addressed healthy people on a voluntary basis, no further ethical provisions were made. The survey was pre-tested for comprehension among 10 students of the Uni-

versity Hospital Basel, who were subsequently excluded from further study analysis.

Statistical analysis

Continuous data were expressed as median (range) and mean (SD), respectively. Dichotomous data were expressed as frequencies and percentages. Data were analyzed based on the Mann–Whitney U test [19]. Dichotomous variables were analyzed by the Chi-square test or Fisher's exact test [20]. A multiple linear regression was performed to evaluate the influence of different factors on the knowledge of EBM and Medical Statistics. Collected data were analyzed by using SPSS version 17.0 (SPSS Inc.; Chicago, IL). P values ≤ 0.05 were considered to be statistically significant. All tests were two-sided. Results

Of the 344 surveys distributed, there were 185 responses, for a response rate of 53.8%. Replies were received from 115 (62%) females and 70 (38%) males.

Respondents' characteristics

The median age of the respondents in our survey was 26 (range 22-37) years. The majority of participants (124/184; 67%) were sixth-year medical students, of whom 16 (9%) were repeating their sixth (final) year. As career aspiration, 67/185 (36%) indicated a clinical career in a hospital, 50/185 (27%) a clinical career in a general practice, 46/185 (25%) were undecided concerning their future career, 18/185 (10%) aimed for an academic career, and 1/185 (1%) for a career in the industry. Demographic details are shown in Table 1.

Knowledge about EBM and Medical Statistics

On a seven-point Likert scale, the importance of teaching and knowledge in EBM was rated as high (5.7±1.1 and 5.9±1.0). The subjective knowledge on EBM was considered moderate on a five-point Likert scale (3.4±1.0).

Table 1. Respondents' characteristics

Characteristic	Value (n=185)
Age, median (range), y	26(22-37)
Gender ratio (M:F), No.	70:115
Academic year at medical school, No. (%) (1 missing value)	
Year 5	60 (33)
Year 6 (with 16 repeaters)	124 (67)
Career aspiration, No (%) (2 missing values)	
Hospital career	67(36)
Private practice	50(27)
Don't know	46(25)
Academic career	18(10)
Career in industry	1 (1)
Other	1 (1)
Physician as progenitor, No. (%) (1 missing value)	
Yes	69(37)
No	115(62)
Number of publications, median (range) (20 missing values)	
As first or senior author	0 (0-6)
As a co-author	0 (0-5)
Participation in a course in EBM or Medical Statistics, No. (%) (10 missing)	
Yes	143(82)
No	32(18)
Time since last EBM or Medical Statistics course, median (range), months (69 missing)	24(3-60)

Table 3. The impact of interest in General Surgery on medical students' view of EBM and Medical Statistics

	In all (n = 185)	General Surgery not as top three specialty choice (n = 146)	General Surgery as top three specialty choice (n = 39)	P Value
Value of Science for Medicine (range 11-55)	32.3±4.6	32.3±4.3	32.3±5.5	0.93
Value of Scientific Methods (range 8-40)	25.0±3.1	25.0±2.9	25.1±3.6	0.45
Value of Science for human beings (range 7-35)	22.6±3.0	22.6±3.0	22.6±2.9	0.87
Value of Science and research (total score) (range 26-130)	80.0±8.3	80.0±8.0	79.9±9.3	0.92

P Values were determined by use of the Mann–Whitney U test; values are mean ± (SD).

In the knowledge test about basic principles of scientific research, the median percentage score of correct answers was 33 (range 0-47). On the basis of a logistic regression model, the frequency of literature research and number of publications as co-author proved to be the only significant predictors for a higher knowledge in EBM and Medical Statistics of medical students (p=0.01) (Table 2). No significant impact was found in terms of aspiration for an academic career.

However, the monthly frequency of reading medical publications and the weighting of knowledge in EBM on a seven-point Likert scale was significantly higher among participants aiming for an academic career (3.7±1.5 vs. 2.5±1.1; p<0.01 and 6.4±0.5 vs. 5.8±1.0; p=0.02, respectively). Overall, 19/147 (13%; 18 missing values) of the respondents read at least one publication per week, compared to 9/15 (60%; 3 missing values) of the ones aspiring for an academic career.

The knowledge in EBM and Medical Statistics was significantly lower when General Surgery was indicated as a top three specialty preference (24±15 vs. 29±15% correct answers on knowledge about EBM and Medical Statistics; p=0.03).

Table 2. Multiple linear regression analysis to predict the knowledge on EBM and Medical Statistics

Characteristic	Beta Coefficient	P Value
Participation in a course in EBM or Medical Statistics	0.06	0.64
Reading frequency of medical publications	-0.03	0.30
Frequency of literature research	0.06	0.01
Frequency of using EBM during patient contact	-0.02	0.31
One or more publications as first or senior author	-0.01	0.72
One or more publications as co-author	0.05	0.01
Aspiration of an academic career	0.03	0.40

Attitude toward EBM and Medical Statistics

The students' total score for the value of Science and research was 80.0 ± 8.3 out of a maximum of 130 (Table 3). Based on a logistic regression model, no significant impact on this score was found in terms of gender, academic year at medical school, career aspiration, top three specialty preferences, physician as progenitor, and kind of environment (i.e. size of the town) when growing up.

Regarding the three attitude subscales (value of Science for Medicine and human beings and value of Scientific Methods), neither General Surgery as a top three specialty preference nor an academic career aspiration had a significant effect. The participants' gender had an impact in terms of value of Scientific Methods only, which was scored significantly higher by men (25.6±3.2 vs. 24.7±2.9; p=0.03).

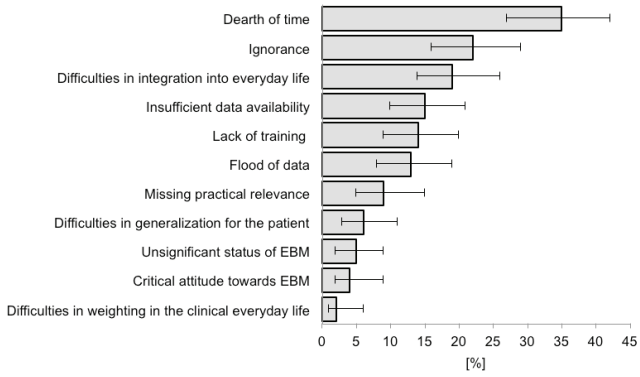

Figure 1. Main impediments for using EBM during patient contact (multiple answers possible) (n=165)
EBM = Evidence-based medicine. Frequencies of nominations and 95%-confidence intervals.

Impediments for using EBM

The three main impediments were lack of time (57/165, 35%), ignorance (36/165, 22%), and difficulties in integrating EBM into everyday life (32/165, 19%) (Figure 1). The impediments did neither differ significantly for participants indicating General Surgery or a surgical subspecialty as a top three career choice, nor for those with the intention of an academic career. Among the 11 impediments listed in Figure 1, the only difference in terms of the participants' gender was found regarding difficulties in generalization for the patient, which was named significantly more often by men (7/70 vs. 3/115; p=0.03).

Improvements for using EBM

Independent of the participant's gender or career aspired to, the main possibilities for an improvement in using EBM were seen in terms of improved training (i.e. journal club) (46/165, 28%), introduction and increased teaching in EBM (43/165, 26%) and better data availability (24/165, 15%).

Discussion

Medical students perceived the importance of teaching and knowledge in EBM as high, whereas they considered their

knowledge only moderate. A significant predictor for a higher knowledge was found in terms of frequent literature research and number of publications as co-author. The main impediments for using EBM were dearth of time, ignorance, and difficulties in integrating EBM into everyday life. The main possibilities for an improvement in using EBM were seen in improved training, introduction and increased teaching in EBM, and better data availability.

Similarly to Weberschock et al., who found that the implementation of an EBM seminar for Year-3 medical undergraduate students was well accepted [6], the participants in our study supported the view that it is essential to learn EBM principles. However, the perceived subjective knowledge on EBM was only moderate, corresponding with the objective knowledge score in our study. The frequently named gap between respondents' confidence in their competence in various domains of critical appraisal of literature and EBM and their effective performance on the instrument could not be confirmed by our results, thus [21,22].

In contrast to others, we could not find a positive impact on the knowledge in EBM and Medical Statistics due to a specific course [3,6,23], but we found a significant higher knowledge in the presence of a greater number of publications as co-author or a higher frequency of literature research. Regarding the impact of the latter two factors, it is striking that the aspiration of an academic career had no influence, as the frequency of reading medical publications and the weighting of knowledge in EBM were significantly higher among these participants.

When General Surgery was indicated as a top three specialty preference, the knowledge about EBM and Medical Statistics was significantly lower. Siegrist et al. showed that teaching of EBM among residents in General Surgery along with those in Anesthesiology had the lowest values [15]. Nevertheless, we could not confirm a significant impact of the students' top three specialty preferences on the total score for the value of Science and research, nor of the career aspiration or the academic year at medical school. By contrast, Khan et al. found an improved attitude toward health research with increasing years of education at medical school [24].

Despite rather poor knowledge scores on EBM and Medical Statistics, students generally had positive attitudes toward Science. The level of the total score for the value of Science and research in our study is almost identical with results from a similar questionnaire of Southeast Europe [25].

The three main impediments for using EBM were dearth of time, ignorance, and difficulties in integrating EBM into everyday life (limited access to the Internet and journals, missing role models, firmly established principles of superiors and guidelines of hospitals, rare patient contact, foreign language and specialist terms, multimorbid patients with special regulations). The same technical barriers of insufficient time, poor searching skills, and limited access to information resources have been found for practicing physicians and residents [26]. These results are corroborated by a Norwegian study of undergraduate medical students, who observed that insufficient access to appropriate technology and time management may act as a barrier to integrate EBM principles in daily life [27]. In another study, students were more likely to rely on non peer-reviewed material, if access to Internet-based medical databases and journals was limited [27].

Although, as described above and in contrast to others, we did not find a significant positive impact of the attendance of EBM courses on the knowledge of EBM, the students participating in our study saw the main possibilities for improvement in improved training (i.e. journal club) and a better data availability in an introduction and increased teaching in EBM. Indeed, Dorsch et al. showed that students used the journal literature significantly more frequently after an EBM course, although textbooks remained the number one resource for information [28]. Furthermore, Ilic et al. found that students were more likely to adopt EBM principles with higher clinical experience [29].

A limitation of this study is the reflection of mainly the critical appraisal of EBM. Other important components, such as formulating an answerable question, searching of literature for evidence and its critical evaluation, were ignored. The intention was to keep the survey brief to optimize response rates. In the same sense, the number of questions of the knowledge test was kept low. We are aware of the resulting limited objective validity. As the survey was only administered at 15 surgical departments in German-speaking Switzerland, there may be selection bias in the subjects. The main strength is the large sample size, including medical students from a variety of working arrangements.

In conclusion, Swiss medical students were aware of their moderate knowledge in EBM and Medical Statistics and aimed for an improvement. In order to achieve this objective, more courses in EBM in general and journal clubs during clerkships must be introduced and the access to information resources must be ensured. As the frequency of literature re-

search was a predictor for a higher knowledge in EBM, an early introduction to search engines (i.e. MEDLINE, Cochrane Library, etc.) seems to be important. Students aiming for an academic career did not differ from the others regarding their knowledge. Therefore, a general strengthening of the knowledge on EBM and Medical Statistics among medical students may be a good way of educating the critical number of academic physicians and establishing a solid foundation for their future academic environment.

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Conflict of interest statement

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