Embedding trials in evidence-based clinical practice
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CHAPTER 8

HOW TO CONFIDENTLY TEACH EBM ON FOOT

DEVELOPMENT AND EVALUATION OF A WEB-BASED E-LEARNING COURSE

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ABSTRACT

Background  Scarcity of well-trained clinical tutors is a key constraint in integrating teaching of evidence-based medicine (EBM) into clinical activities.

Objectives  We developed a web-based educational course for clinical trainers to confidently teach EBM principles in everyday practice. Its e-learning modules defined the learning objectives and incorporated video clips of practical and effective EBM teaching methods for exploiting educational opportunities in six different clinical settings.

Methods  We evaluated the course with clinical tutors in different specialties across six European countries using a questionnaire to capture learning achievement against preset objectives.

Results  Among 56 tutors, 47 participants (84%) improved their scores from baseline. The mean pre-course score was 69.2 (SD=10.4), which increased to 77.3 (SD=11.7) post-course (p<0.0001). The effect size was moderate with a Cohen’s D of 0.73.

Conclusions  An e-learning approach incorporating videos of applied EBM teaching and learning based on real clinical scenarios in the workplace can be useful in facilitating EBM teaching on foot. It can be integrated in the continuing professional development programs for clinical trainers.
INTRODUCTION

Evidence-based Medicine (EBM), an approach to clinical practice, encourages looking up and appraising research evidence for solving patient’s problem instead of just following the wisdom handed down by seniors. Over time, EBM has evolved into a powerful tool for well-informed decision-making integrating the best research evidence with clinical expertise and patient values. Since EBM’s inception, its principles have been taught in undergraduate, postgraduate and continuing education, but incorporating teaching into everyday clinical practice has always been a challenge.

Clinically integrated EBM teaching improves knowledge, skills, attitude and behaviour, while the effect of traditional standalone teaching does not extend beyond changes in knowledge. Despite the recognition that clinical teachers play a key role in the dissemination of EBM, training in how to confidently teach EBM in the workplace has not been widespread in continuing professional development. In New Zealand for example, 40% of the specialists and general practitioners teach EBM, but of these only 68% had formal training in the delivery of EBM teaching. We developed and evaluated a web-based course for training clinical teachers to deliver teaching of EBM alongside service delivery.

COURSE DEVELOPMENT AND EVALUATION

DESCRIPTION OF THE EBM TEACHING-THE-TEACHERS COURSE (http://ebm-unity.pc.unicatt.it/)

Funded by the European Union Leonardo da Vinci Vocational Training Action Programme (project grant number UK/05/B/F/PP-162_349), we developed a web-based course on how to impart clinically relevant EBM teaching in various clinical environments, with input from experienced EBM teachers, clinical epidemiologists, clinicians and educationalists from institutions in seven European countries. An independent steering committee provided input into the process.

The course targets clinical trainers who already possess basic EBM knowledge and skills. The e-learning format allows clinical teachers to undertake the course in the workplace during short breaks between clinical activities. The curriculum defines specific aims and objectives for learning how to teach EBM by exploiting educational opportunities.
in six different clinical settings. The course consists of six e-learning modules that cover EBM teaching on the acquisition, appraisal and application of findings from research in various clinical settings: ward rounds, journal club, audit, outpatient clinics, formal clinical meeting, formal clinical assessment of trainees and audit (Table 1). Audit in this learning context refers to a formal hospital meeting where current clinical practice is evaluated against predetermined standards of care.

In all modules, the key learning objectives are for the teachers to learn how to expose knowledge gaps in their trainees, to lead them to construct structured questions, to help them to track and appraise evidence, and to demonstrate how clinical judgment, patient preferences and research evidence are amalgamated for patient care. Each module lasts about 15 minutes, with the flexibility to stop and restart at the convenience of the participant. The e-learning modules have video clips that demonstrate practical and effective methods of EBM teaching in everyday clinical practice.

COURSE EVALUATION AND OUTCOME MEASURES (ASSESSMENTS)
We evaluated the course in Germany, Hungary, the Netherlands, Poland, Switzerland and the UK. The course was delivered to clinical teachers, from different specialties, in the participating countries. The participants were those clinicians who regularly taught EBM to their postgraduate trainees, within the context of practice. Teachers who only taught EBM in lectures or standalone courses were excluded, as were teachers who lacked basic EBM knowledge. Informed consent was obtained from the participants prior to the administration of the e-learning modules and the completion of the questionnaire instrument. The responses were anonymously analysed.

A before-and-after study design was used to examine the effect of the course on knowledge. The study was completed within a two-month frame. For outcome assessment, we developed and validated a questionnaire to assess the participants’ performance before and after completion of the course. The questionnaire, consisting of 26 multiple choice questions, was used to assess the knowledge of the participants in EBM teaching. The questions posed, reflected the contents of the course’s six e-modules. Their validation involved measurement of Cronbach’s $\alpha$, inter-item correlation and item discrimination. The questionnaire can be obtained from the authors (RKunz@uhbs.ch).
Participants completed the questionnaire before and after the e-learning sessions. The maximum possible score was 100 points. Pre- and post-course scores were compared, using the paired t-test. We computed the change in knowledge; a positive difference meant a gain in knowledge. The percentage of participants with gain in knowledge and the percentage of participants with loss in knowledge were compared using the McNemar test.

Table 1: An outline of the web-based educational course for clinical trainers to confidently teach evidence based medicine (EBM) on foot in everyday practice.

<table>
<thead>
<tr>
<th>Module</th>
<th>Ask</th>
<th>Acquire</th>
<th>Appraise</th>
<th>Assess</th>
<th>Apply</th>
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</thead>
<tbody>
<tr>
<td>Ward Rounds</td>
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<td>+</td>
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<td>+++</td>
<td>+</td>
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<tr>
<td>Journal Club</td>
<td>+</td>
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<td>+++</td>
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<td>+</td>
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<tr>
<td>Clinical assessment</td>
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<td>+</td>
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<td>+++</td>
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<tr>
<td>Outpatients Clinic</td>
<td>+++</td>
<td>+</td>
<td>++</td>
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<tr>
<td>Formal Clinical Meeting</td>
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<tr>
<td>Audit</td>
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</tbody>
</table>

Assessment: Knowledge questionnaire and reflection using a log of EBM teaching activities.

Adapted from Thangaratinam et al.\textsuperscript{11}

Cohen’s d were also computed. Cohen’s d is a measure of the effect size computed as the mean difference of the two interventions over the common standard deviation in order to describe the relative effect in relation to its precision. Cohen refers to a value of 0.2 to small, 0.5 to medium and 0.8 to large effect sizes.\textsuperscript{12}
RESULTS

There were 80 participants, from different specialties, who enrolled in the course. Of these, 70 participants completed the pre-course questionnaire and 56 completed both the pre- and post-course questionnaire. There were two main reasons given for non-completion; time pressure and reported difficulties on accessing the web-based material, in some countries. Participants who completed both questionnaires came from Hungary (14), the United Kingdom (12), Switzerland (11), the Netherlands (9), Germany (7) and Poland (3). Among these 56 teachers, the median age was 45 years, 39% were female and 89% were affiliated to a teaching hospital. We found the mean score for the pre-course assessment to be 69.2 (SD=10.4), while the mean score post-course to be 77.3 (SD=11.7). This improvement (8.1 points) corresponded to a 26% of the maximal possible improvement. Figure 1 shows the distribution of the pre- and post-course scores achieved by the participants. Overall, 47 participants (84%) improved their score between the precourse and postcourse assessment. The paired comparison, between preassessment and postassessment, renders a statistically significant difference (8.1 points; t-test p<0.0001). The magnitude of the effect size, Cohen’s d was 0.73. A trend towards knowledge gain was apparent across different countries and settings, although due to small sample size subgroup analyses did not show statistical significance.

Figure 1: Pre- and post-course scores in a knowledge test among clinical trainers taking the web-based educational course for learning how to teach EBM principles in everyday practice.
COMMENTS

We have developed an on-line EBM teaching-the-teachers course which improves teachers’ knowledge relating to the teaching of EBM in various clinical settings, including ward rounds, audit meetings, journal clubs and outpatient clinics. We have also demonstrated that web-based courses for teaching EBM teachers can be harmonised for delivery across different countries.

One limitation of our evaluation is the relatively small number of participants. The before-and-after design allowed us to initially efficiently pilot the effect of educational materials. It reassures that web-based learning is a feasible method for continuing education in this area. We have previously shown that e-EBM is feasible in postgraduate education in different languages, educational settings, medical disciplines and countries. The absence of a control group in our current evaluation can be seen as a limitation of this study. The assessments before the course served as a baseline control for each individual. Cook et al. have shown that effects are consistent across designs in research on internet-based interventions. Because the before-and-after evaluations were conducted over a short period, the effect of external influences is likely to be negligible and knowledge gains can reasonably be attributed to the effect of exposure to the e-learning course. All participants were already teaching EBM, so their baseline score was high, which makes an increase in the score more difficult to achieve. However, the mean increase was moderate and statistically significant. Although 9 participants showed a drop in scores post-course, 47 (84%) showed knowledge gain. The Cohen’s d of 0.73 suggests a moderate effect size, when compared to other educational interventions.

Evaluation in other settings and with different study designs, particularly with larger numbers, may be undertaken in the future for which the course is made available freely on the Evidence-based Medicine resources page (http://ebm.bmj.com/site/resources/index.xhtml or from http://ebm-unity.pc.unicatt.it/).

In conclusion, a web-based educational intervention on how to teach EBM within the clinical context can be implemented across different countries and in various settings. Empowering EBM clinical teachers this way can pave the way for incorporating EBM into practice through teaching on foot during clinical working hours, rather than standalone teaching off-site.
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Further members of the EBM Unity Project are: Susanne Weinbrenner, Andrea R Horvath, Rita Onody, Gianni Zanrei, Regina Kunz, Katja Suter, Jacek Walczak, Bernard Burnand, Chantal Arditi, Javier Zamora, Ben WJ Mol, Gemma Barnfield, Harry Gee, Anna Kaleta. Contact addresses for the further members of the EBM Unity Project can be found as an additional data file under http://ebm.bmj.com. Address for obtaining the questionnaire from authors: RKunz@uhbs.ch

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