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Evidence-based medicine training in a resource-poor country, the importance of leveraging personal and institutional relationships

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Abstract

Rationale, aims and objectives—Efforts to implement evidence-based medicine (EBM) training in developing countries are limited. We describe the results of an international effort to improve research capacity in a developing country; we conducted a course aimed at improving basic EBM attitudes and identified challenges.

Method—Between 2005 and 2009, we conducted an annual 3-day course in Perú consisting of interactive lectures and case-based workshops. We assessed self-reported competence and importance in EBM using a Likert scale (1 = low, 5 = high).

Results—Totally 220 clinicians participated. For phase I (2005–2007), self-reported EBM competence increased from a median of 2 to 3 ($P < 0.001$) and the perceived importance of EBM did not change (median = 5). For phase II (2008–2009), before the course, 8–72% graded their competence very low (score of 1–2). After the course, 67–92% of subjects graded their increase in

knowledge very high (score of 4–5). The challenges included limited availability of studies relevant to the local reality written in Spanish, participants' limited time and lack of long-term follow-up on practice change. Informal discussion and written evaluation from participants were universally in agreement that more training in EBM is needed.

Conclusions—In an EBM course in a resource-poor country, the baseline self-reported competence and experience on EBM were low, and the course had measurable improvements of self-reported competence, perceived utility and readiness to incorporate EBM into their practices. Similar to developed countries, translational research and building the research capacity in developing countries is critical for translating best available evidence into practice.

Keywords

developing countries; education; evidence-based medicine; evidence-based practice; international cooperation

Introduction

Evidence-based medicine (EBM) integrates clinical expertise with evidence to guide decisions about the care of individual patients [1]. During the last two decades, evidence-based public health and EBM instruction has become a priority for medical schools, residency programmes and practising clinicians in developed countries [2–9]. However, EBM training and education has lagged behind in resource-poor countries [10–14], where evidence-based practice has broader applications for public health programmes [15,16].

Given the technological and economical issues, teaching and adopting EBM principles in developing countries face additional difficulties. The desperate health situation tends to trivialize EBM as just another western innovation of little utility to developing countries [17]. Evaluating the efforts of EBM training in developing countries is fundamental, yet limited information is available [18–21]. For example, efforts to incorporate EBM teaching in a Latin American medical school resulted in an increase in critical appraisals skills, increase in the use of the *Cochrane Library*, improvement in the attitudes and possibly increase in knowledge [19]. Limited knowledge on EBM concepts in developing countries has also been identified [22].

To fill the gap of EBM and clinical research training in developing countries, an international collaboration developed a multi-approach programme for education and training, entitled the International Clinical, Operational and Health Services Research Training Award for AIDS and Tuberculosis programme (ICOHRTA-AIDS/TB) [23,24]. The programme provides training on clinical, operational and health services research. In addition, education and training on essential principles of decision analysis, cost-effectiveness and EBM were implemented.

We developed and conducted a course aimed at improving basic EBM knowledge, attitudes and skills in a resource-poor country. Our objective was to assess the perceived impact of the EBM course; importantly, we identified challenges and limitations as well as highlighted the importance of leveraging personal and institutional relationships.

Methods

Setting and participants

Between 2005 and 2009, we conducted five EBM courses in Lima, Perú. The course was initially sponsored by the participating institutions. Since 2008, the course was also

supported by ICOHRTA AIDS/TB. ICOHRTA supports research training to strengthen the capacity of institutions to conduct clinical research and implementation science, including operations and health services research focused on human immunodeficiency (HIV) infection and TB.

Participants were physicians in training, practising physicians and other allied health professionals from various organizations (university, private, public) and from locations throughout Perú. Since 2008, in collaboration with the leadership from the national programmes for AIDS and TB control, physicians working on various provinces in Perú also attended the course.

Evidence-based medicine course

Each year, the course consisted of three consecutive days of lectures and workshops about basic principles on EBM. Each day, two or three 45-minute interactive lectures were presented on various topics including: significance of EBM, study design (therapy, diagnosis, clinical prediction rules, case-control, cohort), basic statistical concepts (power, sample size, confidence intervals) and special topics (subgroup analysis, non-inferiority trials, effectiveness studies, cost-effectiveness). We used available EBM resources [25]. We did not include literature searches, as access to electronic resources was limited. Additional time before starting each day's lectures was available for participants to ask questions and solve any doubt left from the previous day.

Each lecture was followed by a 45-minute interactive workshop. Each workshop consisted of three parts: (1) the discussion of a case scenario with a specific clinical question [26]; (2) the critical appraisal of a pre-selected published study using available guides [25]; and (3) a guided discussion. Attendees had sufficient time to read the articles in advance. All articles were in English and attendees with limited English proficiency were encouraged to work in groups. The articles selected for workshop discussion included topics related to common problems in general internal medicine (2005–2007) and HIV/TB (2008–2009). The broad content and organization of each workshop remained the same with small variations between the individual workshops. The format of the lectures and workshops had many of the characteristics of an effective continuing medical education intervention utilizing adult learning principles [27].

Course faculty

Faculty included three clinician-educators from a single academic medical centre, two of whom attended medical school at the hosting institution (Lima, Perú). Individual faculty conducting each lecture or workshop varied; however, all lectures and workshops were structured similarly. Two faculty members presented the material in Spanish and one in English (with immediate translation by the other two). Faculty had extensive experience teaching EBM to medical students, residents, fellows and practising clinicians; had advanced training in clinical epidemiology, medical education and research design; had designed and conducted research in clinical epidemiology, clinical prediction rules, meta-analysis, cost-effectiveness analysis, clinical trials and other research designs; and routinely review submissions for peer-review journals. In 2009, Peruvian faculty participated in leading the interactive workshops.

Programme evaluation

At the start of each course, we obtained demographic characteristics and baseline information on prior experience with EBM. The programme evaluation was conducted in two phases. In phase I, 2005–2007, an initial evaluation was composed of a limited number of questions addressing self-reported perceived competence and utility. Following principles

of curriculum development, where changes are implemented based on cycles of feedback, we implemented a more detailed evaluation in phase II, 2008–2009. The change in the evaluation process was facilitated by external funding becoming available and by additional Peruvian faculty support. We chose to assess EBM self-reported knowledge, rather than actual skills, for several reasons: (1) a validated questionnaire in Spanish was not available at the time [28]; (2) funding was not available to develop and validate a questionnaire; (3) preliminary reports from local faculty indicated limited skills and training; and (4) although self-assessment of competence has limitations [29,30], we felt it was a necessary first step to engage adults with the hope to promote self-directed learning [31,32].

In phase I, self-reported competence on EBM was assessed with a single item (1 = low, 3 = medium, 5 = high); participants also rated their level of agreement with a statement 'EBM is important for my practice' (1 = disagree, 3 = neutral, 5 = agree); both questions were asked before and after the course. At the end of the course, participants graded their overall learning experience ('During the course I learned ...'; 1 = little, 3 = some, 5 = much).

In phase II, self-reported baseline competence on EBM was assessed with a 14-item questionnaire (1 = low, 3 = medium, 5 = high). Perceived utility of the course was measured at the end of the course with: (1) a 14-item questionnaire addressing self-reported increase in knowledge on the interactive class lectures and workshops (1 = a little, 3 = some, 5 = a lot); and (2) rating the utility of eight peer-reviewed publications used during the workshops ('Review of the following article was helpful in understanding Evidence-Based Medicine'; 1 = disagree, 3 = unsure, 5 = agree).

The questionnaires took approximately 5 minutes to complete. The inclusion of contact information was optional; a list of all people who attended each session was not available. We attempted to collect data on EBM practices at 6 and 12 months and were not successful.

Statistical analysis

We used descriptive statistics and compared before and after training ratings with the Wilcoxon signed-rank test (phase I, 2005–2007). For the 14-item baseline competence on EBM questionnaire (phase II, 2008–2009), we explored main domains included in the questionnaire with factor analysis, and calculated the Cronbach's alpha. Cronbach's alpha is a statistic that measures the internal consistency or reliability between items of a questionnaire, survey or assessment; values above 0.70 are considered acceptable, that is, the items measure the same concept or construct. We finally calculated an overall score for the 14 items. We present percentage of participants rating <3 for self-reported competence or >3 for increase in knowledge and utility of peer-reviewed publications (we chose a cut-off of 3 as it is the midpoint between low and high scores). We used a level of significance of $P < 0.05$.

Results

Study population

Over the 5-year period, we obtained evaluations from 220 subjects; 76% included a legible name to match their pre- and post-surveys. Participants' characteristics and prior experience with EBM are shown in Table 1. Almost half of participants were practising clinicians or other health professionals (47%) and had previously attended a lecture, course or seminar on EBM (48%).

Phase I, 2005–2007

The self-reported competence increased from a median of 2 (25th, 75th percentile; Q1, Q3: 1, 3) to 3 (Q1, Q3: 3, 4) ($P < 0.001$); the self-reported median importance of EBM for practice at baseline was 5 (Q1, Q3: 5, 5), and it did not change after the course (median 5; Q1, Q3: 5, 5; $P = 0.59$). Of the participants, 79.5% (95% confidence interval 71.9–87.1%) graded their overall learning experience very high, score 4 or 5, in the 5-point Likert scale.

Phase II, 2008–2009

Baseline competence and importance to practice—Baseline reporting on competence was available in 67% participants (64/96; some of whom did not complete the end of the course assessment). Factor analysis of the 14-item questionnaire baseline competence on EBM suggested that a two-factor solution explained 85% of the variability, with Eigenvalues of 6.47 and 1.45, respectively. We conceptualized the two factors as: (1) ability to understand and explain EBM concepts; and (2) applicability to patient care. This analysis appears in Table 2. Two items did not load well into the two factors. The overall internal consistency, Cronbach's alpha, was 0.91; the Cronbach's alpha remained unchanged, 0.91, when the two factors that did not load well were excluded.

Before the course, 8–72% of participants graded their baseline competence on the 14-item questionnaire as very low, score 1 or 2, in the 5-point Likert scale; the overall median for the 14-items was 2.9 (Q1, Q3: 2.4, 3.2; Table 2). The self-reported importance of EBM for practice was high; in the 5-point Likert scale, the median was 5 (Q1, Q3: 4, 5).

Course utility

Course utility reporting was also available in 67% participants (64/96; some of whom did not complete the baseline assessment). After the course, 67–92% of participants graded their increase in knowledge very high, score 4 or 5, in the 5-point Likert scale; the overall score for the eight items assessing the interactive class lecture and for the five items assessing the workshops was the same, median 4 (Q1, Q3: 3.8, 4.4; Table 3).

Of the participants, 67–93% rated the utility of eight peer-reviewed publications used during the workshops high, score 4 or 5, in the 5-point Likert scale; the median ranged from 4 to 4.5 (data not shown). Of the participants, 97% felt the course contributed to understanding EBM concept, 95% felt better prepared to incorporate EBM in their practices, and 95% felt it would benefit their patients (score of 4 or 5 in the 5-point Likert scale).

Discussion

In this study, we found that the self-reported competence and experience on EBM at baseline were low and that the highly interactive course had measurable improvements of self-reported competence, perceived utility and readiness to incorporate EBM into their practices. Participants reported that they believed it would benefit their patients. The self-reported importance of EBM for practice was high, and it did not change after the course. Informal discussion and written evaluation from participants were universally in agreement that more training in EBM is needed.

Challenges and lessons learned

The challenges we noted in developing this programme illustrate the barriers and limitations in programme development in resource-poor countries. First, the language barrier was significant and similar to other programmes [33]. While English is the main language for many medical schools across the globe, this is not the case in Perú or other Latin American countries. We attempted to address this barrier by having native course faculty and

immediate translation. However, all of the articles discussed during the workshops were in English. On the most recent iteration of the course (not included in this study), the abstracts and one of the articles were translated into Spanish; however, this was time-intensive and of uncertain sustainability. Our attempts to identify relevant high quality articles written in Spanish were not fruitful. Over the last few years, searchable databases in languages other than English are becoming more available [34–39].

Second, participants had difficulties attending the course. Most participants required official release from their government responsibilities or were at financial risk when taking time away from their practices (many from remote areas in the country). Similar to other professional development activities in this area, the local organizers charged \$40–80 to attend the course and some participants received scholarships.

Third, the study design we used has limitations. We used a quasi-experimental design (before–after), assessed self-reported perceptions, did not use validated methods of assessing EBM knowledge [40,41], and did not have long-term follow-up. At the time the course started, a validated questionnaire in Spanish was not available [28]; however, the baseline self-reported competence performed well on factor analysis and had excellent internal consistency (Cronbach's $\alpha = 0.91$). We attempted to collect follow-up data at 6 and 12 months on EBM utilization and were not successful; participants had either returned to their disperse practice locations in the country or had sought other professional opportunities. However, the realist approach [42] described in our report was necessary, given the multiple complexities of implementing a programme like this in a resource-poor country where financial support was limited to travel expenses for faculty teaching the course. The magnitude of the effect size in this report was similar to a study done in Iran; in two half-day workshops conducted in the same year, the self-reported EBM skills increased from 3.1 to 4.4 (using a 5-point Likert scale) and the attitudes towards EBM were unchanged [43]. The results of an ongoing cluster-randomized clinical trial on an integrated reproductive-health electronic learning EBM programme are not yet available [12]. Developing real-life and sustainable approaches for EBM training, evaluation and dissemination, without funding support is problematic.

Fourth, the support for global health training was critical. Individual faculty or isolated institutional commitment is a necessary, yet insufficient component. In our case, the course faculty professional and family relationships with Perú cannot be underestimated. The ICHORTA programme grew from leveraging a long-standing history of collaboration between the participating institutions. During this experience we had a successful transition of process, teaching methods and knowledge; some of the original participants in the course – who had prior training on EBM methods and teaching – became faculty for the later courses. In the most recent version of the course (2010), Peruvian faculty assumed full responsibility for all aspects of the course.

EBM barriers for global training

The objective of EBM training is to develop a model where the evidence is generated, findings are made available, and eventually clinical decisions are influenced. However, the practice of EBM in developing countries faces many barriers and challenges.

For example, limited resources, time for training, availability of role models and limited capacity for continuing medical education are some challenges facing clinicians in many part of the world [17,44,45]. Also, access to databases, publication bias (studies from developing countries less likely to be published), literature relevant to local realities, library facilities and infrastructure, and evidence generated in resource-poor countries are also scarce [17,33,44,46–49]. Another challenge is defining strategies to engage the health care

team and making it part of the routine of clinical practice [19]. In summary, practices that are well established in developing countries are not necessarily available, relevant, or transportable to resource-poor countries [48,50,51]. In our experience during the past 10 years teaching this course in Perú, we have encountered the same barriers.

Translating evidence into practice in resource-poor countries

Similar to developed countries [2,52,53], translational research and building the research capacity in developing countries are critical for translating best available evidence into practice. Key elements for sustainable efforts include leadership development, facilitation of career paths, developing a critical mass, infrastructure development, access to information, research training and translational research among others [54–56]. All such elements are being addressed in the Peruvian ICOHRTA-AIDS/TB programme; working with leadership from the national programmes for AIDS and TB control was also important to build capacity, strengthen relationships across national programmes, and leadership development. In another example, a weeklong course – Bioinformatics and Medical Informatics International Course in Perú – focused on public health and bioinformatics, Web-based systems for patient management, computational biology and other areas [20]. In the pre- and post-evaluation, the 43 participants' knowledge increased, and they perceived the course as very helpful.

International collaborative efforts have been developed to build capacity in resource-poor countries. For example, the Data for Decision-Making (DDM) project, developed by the US Centers for Disease Control, was tested in Bolivia, Cameroon, Mexico and the Philippines. The outcomes were measured in a three-step approach, which include process outcomes (training activities), outcomes achieved (skills acquired) and impact of the programme (decisions made by participants). The DDM project improved several metrics of evidence-based public health [57].

Other proposed solutions include the clinical integration of EBM teaching into practice [58], and the translation and dissemination of evidence by EBM centres, such as the Cochrane collaboration [33]. Additional proposed solutions, although not tested, include: (1) translating evidence into context-specific usable formats; (2) creating simplified management algorithms; (3) implementing continuous quality improvement initiatives [21,44]; and (4) developing interventions designed to address local educational needs and organizational barriers [15,47].

Conclusions

In an EBM course in a resource-poor country, the baseline self-reported competence and experience were low and the course had measurable improvements of self-reported competence, perceived utility and readiness to incorporate EBM into their practices. The challenges and limitations included limited availability of studies relevant to the local reality written in languages other than English, participants' limited time because of competing professional demands, and lack of long-term follow-up on practice change.

Finally, the Fogarty International Center, which partially funded the last 2 years of this course, supports activities addressing individual, institutional and organizational development [54]. The partnerships developed during this project have resulted in broader training plans including formal collaboration agreements between the participating schools. The multi-institutional training programme in Perú will strengthen the development of Peruvian and Latin American scientists and will catalyse the application of experience in research in Latin America towards treatments, patient care and better and more cost-

effective prevention services for HIV/AIDS and TB. The ultimate goal is to create the capacity for evidence-based practice.

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Table 1Evidence-based medicine. Course participants' characteristics ($n = 220$)

Characteristic	Total n/N (%)	Phase I (2005–2007, $n = 124$) (%)	Phase II (2008–2009, $n = 96$) (%)
Trainee status			
Student	18/163 (11)	6	20
Resident/fellow	40/163 (25)	25	23
Faculty	29/163 (18)	24	8
Practising clinician/other	76/163 (47)	45	49
Professional affiliation			
Community-based	33/165 (20)	18	24
University-based	60/165 (36)	40	30
Government/public health	48/165 (29)	25	35
Other	24/165 (15)	17	11
Prior experience with evidence-based medicine			
Attended a lecture, course or seminar	79/165 (48)	49	47
Taught a lecture, course or seminar	24/159 (15)	19	10

Table 2Baseline perceived competence on evidence-based medicine* (Phase II, 2008–2009, $n = 64$)

Domain/variable	Median (Q1, Q3)	% answering 1 or 2
Understand and explain evidence-based medicine		
Explain the concept of a diagnostic test's sensitivity and specificity to a colleague	4 (3, 4)	19
Explain the concept of a predictive value to a colleague	3 (3, 4)	23
Explain the concept of a likelihood ratio to a colleague	3 (2, 3)	47
Read and understand the medical literature	3 (3, 4)	8
Judge the validity of the research design selected for a medical study	3 (2, 3)	35
Describe the difference between an effectiveness study and an efficacy study to a colleague	2 (2, 3)	52
Determine if the findings reported in a journal article may be attributed to other factors such as chance or biases	3 (2, 3)	38
Interpret statistical data presented in tables	3 (2, 3)	33
Applicability to patient care		
Use published data to more accurately predict the probability a patient has a disease before undergoing a diagnostic test	3 (2, 3)	38
Use published data to more accurately determine that a patient has a disease, given the result of a diagnostic test	3 (2, 3)	34
Judge whether the results reported in the medical literature are clinically relevant to patients	3 (2, 3)	25
Determine whether the information read in the medical literature would be useful in own patient care	3 (3, 3)	25
Other		
Comprehend the data presented in a receiver operating curve	2 (1, 3)	72
Employ decision analysis to determine the right medical decision for a patient	3 (2, 3)	35
Total	2.9 (2.4, 3.2)	–

* Self-reported, 5-point Likert scale (1 = low, 3 = medium, 5 = high).

Table 3Self-reported knowledge increase of evidence-based medicine (EBM) * (Phase II, 2008–2009, $n = 64$)

Learning venue/thematic content	Median (Q1, Q3)	% answering 4 or 5
Interactive class lecture		
How to read the medical literature, EBM resources	4 (4, 5)	88
Randomized trials: overview, sample size, blinding and randomization	4 (4, 4)	84
Randomized trials: interpreting results (relative, absolute risk reduction, number needed to treat)	4 (4, 5)	86
Cohort studies: overview, incidence, prevalence	4 (4, 4)	84
Diagnostic tests: overview, sensitivity, specificity, predictive values, likelihood ratios, receiver operating curves	4 (4, 5)	92
Clinical prediction rules: integrating prior probability to medical decision making	4 (3, 4)	73
Meta-analyses: literature review, heterogeneity, random and fixed effects models	4 (4, 4)	76
Advanced topics in randomized controlled trials: external validity, effectiveness vs. efficacy, subgroup analyses, non-inferiority designs	4 (4, 4)	77
Overall, interactive class lecture	4 (3.9, 4.4)	–
Workshop		
Randomized trials (I)	4 (4, 5)	89
Randomized trials (II)	4 (4, 5)	84
Cohort studies	4 (4, 5)	67
Diagnostic tests	4 (4, 5)	84
Meta-analyses	4 (3, 4)	72
Overall, workshop	4 (3.8, 4.4)	–

* Self-reported, 5-point Likert scale (1 = a little, 3 = some, 5 = a lot).