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The evidence for practice in medical education. A review of modern learning approaches

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ABSTRACT
Many teaching and learning methods related to medical education practice have been described and promoted as modern ways to teach medical and health allied learners that could fit to the current concepts of education. However, evidence is still lacking on whether such modern methods are truly better than the traditional ones. More, many researchers pointed out contradictory and sometimes poor results when exploring the "hard" outcomes of such interventions. Recently, many medical educational scholars adopted the principles of evidence-based medicine on medical education research in an attempt to close the gap between current theories and medical practice. This review has the aim to describe the most common modern approaches and to compare them with conventional methods based on published evidence in relation to their efficacy, mainly to generate better future professionals.

INTRODUCTION

The need for evidence-based practice in medical education was highlighted years ago by many authors [1-4] following reports, from bodies such the World federation for Medical Education [5], the General Medical Council (GMC) in the UK [6], and the Association of American Medical Colleges (AAMC) in the US [7-9], raising concerns regarding the medical education status and the need for changes in teaching practices and medical curricula. Initially, many medical teachers and educational researchers inspired by the evidence-based practice (EBP) movement started to look for evidence in the field of medical education; since, and despite the acknowledged difficulty to conduct rigorous studies in the complex educational research area, a slow shift from opinion-based teaching to evidence-based teaching took place in a number of medical schools. However, challenges and limitations to the evidence-based approach in clinical practice

came to surface and several authors questioned the effectiveness, usefulness and generalizability, and pointed to the paradoxes and biases of such approach [10-13]. In fact, evidence was found to be only one among many essential elements which could improve patient care; the skills and background knowledge of the practitioners, the values and expectations of the patients or carers and the social context where practice is happening, were to be considered too. The same concerns were also applicable in educational practices such as the generalisability/context of published findings, and the higher level of difficulty in proving the efficacy/effectiveness of educational interventions due to the paucity of randomised studies in the literature. The purpose of this paper is to describe three common modern learning approaches-problem-based, integrative and outcome-based used mostly in medical schools of North America, Europe and Australia, and to

review the best available evidence in the literature that could support their use in medical education practice when compared to conventional methods such didactic lectures.

THE "EVIDENCE ISSUE" IN CURRENT MEDICAL EDUCATION LITERATURE

Clinicians and researchers exploring the application of the evidence-based approach to medical education practices draw lessons from the evidence-based medicine movement regarding its advantages and potential flaws. Similar to the model of the Cochrane Collaboration, teams and topic-focused groups such the Campbell Collaboration and the Best Evidence Medical Education Collaboration joined their efforts in order to critically appraise existing data, to design systematic reviews, to assess the effectiveness of existing and new interventions, and to assist people in making well-informed decisions.

Indeed, the development of evidence-based medical education should be an opportunity to inform, guide and sustain medical education research. As stated by Dauphinee and Wood-Dauphinee [14], there is a demand for increasing accountability, not only through assessment of structures and processes, but also by defining and measuring outcomes. But beyond this need, medical education research should have the ultimate goal to provide evidence to inform practices in medical education that eventually would benefit patient care. The gap between clinical practice and educational research should be overcome and efforts should be directed to establish a solid link between research and patient outcomes.

If it is agreed that a proper framework is essential to evaluate practice interventions, then many issues related to medical education research need to be tackled such as the lack of independent peer-review processes, the issues of instrument validation, sampling and randomization [14]. For instance, randomised trials in education are difficult to conduct essentially because true blindness is not possible and samples are often small. Additionally, students are active agents and will learn and study outside of the intervention especially if the stakes are high (e.g., grades in courses or passing / failing). An educational intervention trial, as per Cate's view, would tell probably more about students' inventiveness to construct their own learning program [15] than the intervention itself, and would often lead to non- significant results [16]. In opposition to the high number of randomised trials found in clinical research, the lack of randomisation due to ethical and practical constraints turned out to be a serious problem in medical educational research. Consequently, quasi-experimental designs, which are subject to bias and

constitute threats to the validity of the results, are used in educational research. As argued by Colliver and McGaghie [17], the problem is not restricted to some inevitable methodological flaws of the quasi-experimentation design, but also to the failure of researchers, reviewers, and editors to address and consider the impact of such research issues when drawing conclusions. Should these issues be addressed, the credibility of medical education research and its relevance to practice would be inevitably improved.

We agree with Harden et al. [18] that in adopting the evidence-based approach, teachers will be encouraged to question their practices, to look for the best evidence available for their issues, and to relate the evidence to their own situation. This approach, as Hart suggested [19], would force educators to critically appraise the existing literature while increasing their ability in assigning levels of evidence. On the other hand, we should also be aware that the hierarchy of evidence needs not be rigid or dogmatic. There should be room for subjugated knowledge and common sense in searching for the "truth". Currently, EBP enjoys a privileged status in health sciences, and many academics are building their career mainly on their capacity to produce "evidence-based" publications. Research in medical education seems to take the same path but with a slight difference; when randomized studies are promoted as the best if not the only method of knowledge and when other type of studies are deemed imperfect, medical education research might be gradually reduced to an "evidence-based product" of knowledge. After all, PBL and other modern ways of teaching are widely adopted applications of innovative theories ideas and not the product of scientific knowledge.

Furthermore, and as argued by Regher [20], there is a practical issue in research; medical education field is too broad and it might lack coherence. In his paper, he stated that the synthesis of all its topics is necessary and that the uncoordinated accrual of information was due to the lack of "sense of community of researchers" and to the fact that "individual studies did not seem to inform each other" rather than the absence of a guiding theoretical framework. He pointed out to the fact that when research is not related to practical applications, it is considered with less priority. In our opinion, the actual status is due probably too to the fact that many program coordinators and educational administrators do not have research expertise.

PROBLEM-BASED APPROACH

Problem-base learning (PBL) is a student centered approach to active learning where students in groups are presented with a well-structured problem or case

which they study collaboratively over a week or longer in contrast to systematically building knowledge in individual subjects. The goals of PBL are to help the students develop flexible knowledge, effective problem solving skills, self-directed learning, effective collaboration skills and intrinsic motivation [21]. Over the years the role of tutor was subject to gradual change from a passive facilitator to an active discussion leader [22].

The theoretical basis of PBL is grounded in a constructivist perspective in learning as the role of the instructor is to guide and challenge the learning process rather than strictly providing knowledge [23,24]. Feedback and reflection on the learning process and group dynamics are essential components of PBL which is considered as an aid to guide the student from theory to practice through solving problems [25].

Nevertheless, one of the main critics to this approach is that, early in the learning process, learners may find it difficult to process a large amount of information in a short amount of time due to their working memory limitations. In 1998, Sweller proposed the "cognitive load theory" [26] to explain how novices react to problem solving during the early stages of learning and described the guidance-fading effect. To counter this effect he suggested a worked example to be used first, and then a gradual introduction of problems to be solved [27].

As demonstrated by Taylor and Miflin [28], PBL has an enormous variability at different medical schools and even within the same medical school. Such variability constitutes a real difficulty when comparing "PBLs" together or to other types of learning. Though more than eighty percent of medical schools in the United States have some form of problem-based learning in their programs [29], the debate is still ongoing on the weaknesses and strengths of the PBL curriculum compared with traditional methods. Koh et al.'s [30] found positive effects on physician competence (mainly on social and cognitive competencies) with PBL. Oja [31] reported a positive relationship between problem-based learning and improved critical thinking in nursing students, Shin and Kim [32] found that PBL has positive effects on the outcome domains of satisfaction with training, clinical education, and skill course. On the other hand, other systematic reviews failed to show robust evidence that PBL improves problem-solving ability. The review conducted by Williams and Beattie [33] including undergraduate nursing students revealed a paucity of evidence supporting or confirming the application of PBL in the clinical setting. Polizois et al. [34] reported no clear difference between PBL and conventional teaching such as lectures, and Hartling et al. [35] demonstrated no significant differences in knowledge acquisition and concluded that research is needed to determine appropriate outcome measures in order to

capture and quantify the effects of PBL. As stated by Neville, while various outcomes of PBL can be measured, including knowledge acquisition and clinical competence, very few published studies considered all the variables that can affect PBL [36].

In addition, the implementation of PBL could be challenging. In fact, the literature is scarce on the process and the evidence of a good implementation; multiple factors might be incriminated such as the extent of incorporation of PBL into the school curriculum, the motivation of the learners, the dynamics of the group and the experience of the teachers [20].

INTEGRATED LEARNING APPROACH

In the past years, North American and European medical educational systems witnessed a decline of the traditional pre-clinical/clinical model towards more integrated and descriptive models [37]. Horizontal integration aimed to gaining skills and knowledge via a system-based approach, and vertical integration restructured the pre-clinical and clinical courses, leading to an early gain in clinical experience while keeping "scientific" throughout the clinical years.

The rationale for the integrated approach took roots in cognitive psychology literature; it is easier to retrieve and use information when it is combined in meaningful schemata [38]. It refers to the concept of "context specificity" where the ability to retrieve an item from memory depends on the similarity between the condition or the context in which it was originally learned and the context in which it is retrieved.

Using the integrative approach, the learning context has an equal importance and have to be integrated too; an example could be the concept of *community-based medical education* where students in general practice, family medicine and primary care would be provided opportunities to more clinical experience from a patient-centered approach in rural and remote clinical settings such as ambulatory, community health centers and district general hospitals rather than a disease-oriented one in large teaching hospitals. Though most of the claims made for the advocacy of integrating learning remain largely untested, longitudinal programs such as the Parallel Rural Community Curriculum, a program/context matching first initiated at Flinders University in Australia in 1997 showed evidence of success as demonstrated by Worley et al. [39]; students enrolled in the program performed better in their examinations than their teaching hospital-based peers.

Community-based education could be a relevant way of encouraging medical students to become general practitioners in rural and remote areas in order to

respond to changing demographics. Many programs are now incorporating the "symbiotic curriculum", enhancing partnerships between medical schools and communities constituting a part of a new set of criteria for a modern, diverse, and flexible medical curriculasuch as the PRISM model [40]. Hays [41] raised some concerns with regard to the practicability of such program stating that while smaller hospitals and rural practices can provide interesting clinical learning opportunities, such opportunities are becoming more crowded and not necessarily well resourced. More, a qualitative systematic review by Hunt et al [42]-the only systematic review exploring aspects of integrative learning that could be found, exploring the goals of service learning and community-based medical education found little emphasis on the reciprocal nature of partnerships between communities and medical schools

OUTCOME-BASED APPROACH

Measuring outcomes, be with the use of quantitative or qualitative methods, has emerged as an inevitable step in assessing educational interventions. Measurements, while giving sense of responsibility, can strengthen accountability to the benefit of all stakeholders.

Beside the issues related to the various assessment tools found in the literature today of same or different outcomes, the most important goal of medical education is and should be, to produce excellent physicians; though it is difficult to define, it should be the ultimate outcome to be achieved by medical schools. In 2002, the UK GMC report *Tomorrow's Doctors* [43] pointed out that, to some extent, the quality of medical education students receive would determine the quality of care the public receives. In its newest iteration [44], the 2009 report placed huge emphasis on doctors' professionalism which included learning outcomes related to professional behaviors, ethics and law; all medical schools in the UK should be appraised against GMC's quality assurance recommendations for the UGME. Good physicians are not defined by their high-level of clinical competence only and as expressed by Donnon, we need to know "how we educate and train our next generations of health care practitioners to be altruistic, dutiful and competent physicians in their advocacy for quality patient health care" [45].

When comparing different modern curricula, the GMC's commission conclusions in 2008 on the "preparedness" for practice of graduates in three medical schools in the UK using different curricula found little difference between the preparedness of

graduates between schools [46]. Indeed, basic medical education is prescribed under statutory frameworks securing and assuring academic standards; in the UK for example all pre-registration medical programs are required to adhere to subject benchmark statements published by the Quality Assurance Agency for Higher Education [47]. Still, we share the belief of other authors that there is an opportunity and a duty to create a set of performance-based assessment tools that would reflect on and define what would be the evidence for achievement and how to demonstrate and measure it, therefore yielding information to all stakeholders about the value denoted by the award [48]. It is worthy to note that no systematic reviews were found dealing with this specific learning approach.

IN CONCLUSION

We described three modern medical educational approaches-PBL, integrative learning and outcome-based approach and reviewed the available evidence supporting their use in the literature compared to traditional methods such didactic lectures. The major limitation faced while conducting this review was the lack of published evidence regarding outcome comparisons between the three concerned modern approaches and conventional learning approaches. We could find no conclusive evidence supporting the superiority of one modern learning method over others or whether modern approaches were better than the traditional ones in terms of the ultimate outcome- the quality of health care provision. We believe that medical education researchers and professionals should combine their mutual efforts in building evidence related to the effectiveness of the different teaching approaches used in medical curricula and to address this difficult but nonetheless most essential question: in adopting this specific approach or that combination of approaches, will graduates perform better in their practice? Evidence-based medical education research should place this question high on its agenda and should contribute in the process and implementation of its future findings.

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