Medical Education

SOME RECENT DEVELOPMENTS AND FUTURE CHALLENGES IN MEDICAL EDUCATION

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SUMMARY: Medical education is, for the last two decades, undergoing a steady process of restructuring to become more student-centered rather than tutor-centered system/computer aided learning. Such a move started in the 1970s, as a result of introducing problem-based learning (PBL) as a student-centered educational strategy. Considerable curricular changes were made by many medical institutes to implement PBL. This approach, however, necessitated the training of tutors and the creation of a learning environment, which is not adequately attained yet. The advancing information technology (IT) is anticipated to provide the necessary tools to achieve that objective. The students may be granted the opportunity to have more freedom in selecting their learning material and to enjoy a degree of distance-learning. The consequence of applying IT in medical institutes would, probably, enforce the trend towards moving to a student-centered learning environment, inducing hesitant tutors to become more compliant with the change. The future medical curriculum is anticipated to be more student-centered, more modular, more integrated, more PBL-oriented and more inter-institutionalized, with less memorizing and with more learning about learning. In addition, medical education as a whole at least in part, would be, performed at distance. The future medical tutor may have to be more PBL-oriented, more qualified in learning strategies, competent in small group (probably single-student) learning, more of a 'mentor' or a 'facilitator' than of a 'teacher', able to train students at higher cognitive levels rather than being an 'authority' in its field, fluent in IT, and interactive with learning via other learning-collaborating institutions.

Key Words: Medical education.

BACKGROUND

Traditionally and by necessity, medical education was 'teacher-centered'. The teacher had all the knowledge and only he knew the 'secrets of the profession'. He was the source of and, at the same time, the resource of the medical educational process. Thus, he was the one to decide 'what' and 'how' to learn. The objective of medical education was to make the student acquire an essential body of knowledge (in the form of facts, concepts and skills) and to train him on how to use that knowledge effectively in managing health problems (2).

With the ongoing fast vast expansion of medical

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knowledge, it is becoming increasingly evident that it is not possible to teach everything. Even if such a goal were to be attained, the rate of change in medical knowledge is so high that it would make taught knowledge out-of-date within a few years after graduation. This fact called for introducing new educational strategies in medical schools that can contend with the change in medical knowledge.

EVOLUTION OF NEW MEDICAL EDUCATION STRATEGIES

In the early seventies of this century, the wind of change blew on the traditional system of medical education. New-sprung educational strategies started to evolve. The central theme of which was to move towards more 'student-centered' medical education. Novel concepts such as problem-based learning (PBL) and integrated curriculum started to spread among various medical schools, and a new era in medical education started.

The new shift to student-centered medical education led to formulating curricula that limited pre-clinical knowledge which is only relevant to clinical practice. The curriculum was structured around meaningful entities such as organs/systems and in many institutions PBL was adopted on the understanding that it would promote students' intrinsic motivation and reasoning skills and to develop self-directed and independent learning aptitudes. PBL as a new educational strategy was envisioned as the 'tool' by which medical students learn material relevant to their future practice in a complemented/integrated manner and would better prepare them to continue acquiring advances in medicine after graduation (18).

To achieve the objective of introducing these new concepts, curricular changes as well as reform of the teaching environment were required. What was really required was a change in the learning experience of students. Such demanded changes in tutor expertise, resources as well as in teaching/learning modalities. Many schools managed to make the appropriate changes. In some cases, however, the new concepts were applied to curricula without fully appreciating the goals for which they were originally introduced. However, the required changes became, in many instances,

the aim of reform when they were intended to be the tools of change. As has been said by an authority in the field "When applied they all too frequently represent only a thin gold veneer to a curriculum package." (8).

FUTURE HARBINGERS

The schools of McMaster (Canada), Maastricht (Holland) and Newcastle (Australia) were the first medical schools to adopt PBL as an educational strategy. The principles used in these schools establish a good framework for shaping a new system of medical education. The cornerstone of the new educational philosophy was to offer relevant-to-practice learning material, which is delivered in an integrated way in a setting resembling that of real practice i.e. medical problems. Under this philosophical umbrella, the main educational objectives were to make students able to:

- be self-learners
- acquire basic knowledge through studying medical problems
- use learned knowledge to solve problems
- communicate effectively
- work in a cooperative manner
- practice evidence-based medicine

At present, there are more than 27 North American (15) and many medical schools in the UK (10) and in other developed and developing countries that have variants of PBL-based curricula with principles similar to the above. Such a trend indicates that PBL is envisioned as one of the ways forward in developing future medical education (7).

PRESENT PRESSURES

Sigerist (13) states that the characteristic features of the medical profession "are determined to a large extent by the attitude of society towards the human body and by the valuation of health and disease". Hence, medical education is not obliged primarily by the requirement of knowledge, but by the requirement of the medical profession (3). Therefore, Bloom concluded that, medical education is at the confluence of three forces: the medical sciences, the medical profession and the society.

At present, there are a number of factors that can be considered as subsidiaries to the above-mentioned

forces and are concurrently taking place on the medical educational arena. The most important are the expansion of medical knowledge and the new trends that are being witnessed in medical practice. Both would largely influence the pattern of future health care delivery (14). Other factors that may interplay to induce pressure on the traditional medical education system include: the increasing number of students whose educational awareness is rising progressively, the global interaction among institutes/students that is becoming a daily activity in many places, and the escalating cost of education.

The pressure of these factors has been already recognized by three international bodies responsible for the advancement of medical education worldwide. Namely, The World Federation of Medical Education (WFME), The General Medical Council in the UK (GMC) and The Association of American Medical Colleges (AAMC). It led these bodies to call for a change in the traditional medical education system (1,6,16); a change to a new system that would better prepare students for the future health care needs.

THE IMPACT OF INFORMATION TECHNOLOGY (IT) ON MEDICAL EDUCATION

Advances in computing and communication made a revolution in IT that subsequently led to the emergence of a new field in medical education viz. medical informatics (MI). MI is defined as "the rapidly developing scientific field that deals with resources, devices and formalized methods optimizing the storage, retrieval and management of biomedical information for problem solving and decision making" (12). The AAMC (1) states that the argument for MI being a central feature of medical curriculum rests in the following premise: "To support health care, life-long learning, education, research and management, medical students should be able, at the time of graduation, to utilize biomedical information for: formulating problems; arriving at strategies for solutions; collecting, critiquing and analyzing information; taking action based on findings; and communicating and documenting these processes and the results."

The impact of IT on medical education would not be limited to the above. IT is expected to remodel medical education in more than one aspect. Let us first speculate on the future impact of computing. Even with today's computer ability, virtual reality can imitate seeing, touching and smelling. In a few years computing would be very different from now, just as it is different now from a few years ago. Future computers will have a strong visual input, recognizing not only the user, but also many other things in the field of view. Users would communicate with the computer in the same way as they do with human beings, i.e. through words, body language and gestures, making it unnecessary to learn computer skills. Users would be, indeed, hardwired to the computer. Such advanced technology would, supposedly, allow the medical student to learn physical examination, surgical and other clinical skills, let alone acquiring facts and concepts, with less aid from the teacher or even the patient. Startlingly, the computer in the future would be a teacher of skills that were previously thought of as unimaginative to learn but from a 'master'.

The call for more 'student-centered' medical education would be, undoubtedly, much enforced with the inevitable use of MI through IT. Similarly, the learning objectives would be directed towards higher cognitive levels such as analyzing and applying information, problem-solving and making decisions rather than towards factual recall. Ultimately, the traditional role of the medical teacher as the 'source' and the 'resource' of information would largely recess, and a new role would be defined.

FEATURES OF FUTURE MEDICAL EDUCATION

Reigeluth (11) depicted a comparison between the present system of education and the future analogue. His vision, with some modification, is presented in Table 1.

The future system that is suggested by Reigeluth (11) explicitly indicates that future medical education would be exceedingly different from present system and in many aspects. If the impact of IT to be added onto Reigeluth's anticipation, then one can expect a 'wild' version of medical education. Naturally, the projecting picture of the future version would, amply, depend on the available computation facilities and the ease of communication between a particular site and

other parts of the world.

The effect of computing would, for the most, take place on the curriculum content, learning objectives, learning modalities, educational resources, as well as students and tutor roles. The earliest changes would, presumably, be seen on curriculum objectives and content and learning modalities.

The effect of advanced communication systems, on the other hand, would probably facilitate globalization of medical education. The routine and regular inter-institutional contact made easy by advanced technology would eventually lead to a worldwide similar curriculum content, similar student's 'learning experience' and a similar' process of assessment. A degree of variability between different schools is expected, which would, obviously, be dictated by a particular local environment.

FUTURE CHALLENGES

The main future challenges can be put in three main domains: curriculum development, tutor development and restructuring the learning environment.

Curriculum development

In general, developing the medical curriculum should take place in light of future role of doctors, the student styles of learning and the available resources including IT.

The AAMC (1) identified five major roles for the future doctor as to be life-long learner, clinician, educator/communicator, researcher and manager. If these roles are accepted, then the curriculum should be steered in this direction. Accordingly, present curriculum content should be rigorously revised. The GMC (6) suggests that there should be less emphasis on the basic sciences and more on ethics, communication skills, and social sciences, with the earlier exposure to patients and their families. An example to urge such a move is what was mentioned by Weatherall (17) when he made a comment on teaching anatomy for two years to medical students. He stated that "few people would disagree that two years spent in the company of a corpse is not the most imaginative introduction to a profession, that more than any other, needs to develop the skills of talking to distressed people." Training future

doctors should be directed towards meeting the multi-faceted need of the patient not only medical sciences.

The future role of doctors may be radically redefined in such a way that may even supersede the expectations of the GMC and the AAMC. Recently, Lipman (9) suggested that general practitioners might not have a clinical role altogether in the future. The general practitioners of the future, he stated, may be "...highly skilled medical generalists and information specialists..." The general practitioner, he believed, will play "a key role in helping patients make complex decisions about diagnosis and management.." Everything else, he stated, "..will be done by nurses, technicians and robots." Indeed, in some European countries, pharmacists, at present, are granted the responsibility of managing chronic disease by national health authorities (4).

In addition to the future role of doctors, there are two other determinants of curriculum development, namely student learning styles and available resources. For a curriculum development to be realistic, it has to balance between its inspiration and the feasibility of its delivery. Defining students learning styles and competencies is an essential component for selecting the educational modality, which would be used to deliver the content. Similarly, tailoring these to the available resources should also be intersected. Otherwise, for example, it is not cost-effective to assume using advanced MI material when the available computing ability is not able to run such material.

Three main features would tinge the future medical curriculum. It would be integrated (basic-to-basic, basic-to-clinical sciences and clinical-to-clinical both vertically and horizontally) and delivered in units (modules) with PBL being utilized. The rationale behind this assumption is that, integration reduces fragmentation of the curriculum, motivates students, improves effectiveness of teaching, attains higher level learning objectives, promotes staff collaboration and rationalizes resources (8). That is how integration appears to be a must for the future. An integrated curriculum prerequisites 'modular' approach; hence the curriculum has to be delivered in 'modules'. The PBL-based delivery would be needed to make student 'learning experience' relevant to real clinical practice.

Table 1: A comparison between some of the features of the present system of education and the future analogue as modified from Reigeluth (11).

	Present System	Future System
Relationship	Adversarial learning	Cooperative learning
Delivery	Group-based content delivery	Personal learning plans
Environment	Classroom	Learning centres
Objective	Memorization of facts	Thinking, application, problem-solving skills
Rating	Grade levels	Continuous progress
Contents	Covering the content	Outcome-based learning
Assessment	Norm-refrenced testing	Individualized/Performance-based assessment
Tutor	A dispenser of knowledge	A coach or facilitator
Skills	Reading, writing skills	Communication skills
Tools	Books as tools	Advanced technologies as tools

The assessment process can only evaluate curriculum development. A new education system requires a new method of assessment. The traditional educational system is not designed for 'learning'; rather it is designed for 'selection'. To emphasize learning, the future system must no longer hold time constant and allow achievement to vary (11). 'Ranking' by normative assessment cannot be considered as the best evaluation tool of the lifetime-learner. Instead, 'achievement' measured in the form of 'attainment' of a particular number of 'competencies' would, probably, be the future assessment tool. 'Higher level of attainment' rather than 'higher score' would formulate the basis of selection allowing time for learning to vary from one student to another. This, in turn, would lead to more 'individualized' learning.

Tutor development

The tutor was, is and will be the backbone of the educational process. Despite the many available educational strategies and their variability, all, with no exception, are tutor-dependent. However, a matter of great concern that, probably, takes a lot of debate when novel educational approaches such as PBL are being implemented, is to define the tutor role.

In the traditional educational systems, there is usually, a form of 'resistance' among teachers who use didactic teaching modalities to move towards a student-centered system. In the future analogue, it would be imperative for the teachers to accept the fact that their role as 'teachers' is not needed as much as their role as 'facilitators' and 'mentors'. The future challenge that tutors would face is how to make the student as a self-reliant 'learner' more than how the tutor prove to be an authority dispensing information to students; and how to enhance students aptitudes towards higher cognitive levels more than training them on factual recall.

Development of tutors should be based experiential learning, small group work, and training on PBL (10). This requires them to learn more about educational strategies and small group/individual learning so that they become confident and component in delivering the curriculum. Besides, they should become fluent in using advanced MI products and active in collaborating with other institutions. Tutor development should be a continuous process not limited to the start. In brief, for the tutor to successfully coach his students to become lifetime-learners, he himself should become one.

Restructuring of the educational environment

To meet the new curriculum objectives and to encourage students to mature as a self-learner and the teacher to become a facilitator, it is crucial to prepare the educational environment for these goals. Students and teachers, rather 'learners and facilitators', should have a 'comfortable' access to various MI products, classrooms may be replaced by learning centres, and collaborative programmes with other institutions may become the norm.

Learning would not be restricted to a particular site or institution. Distance-learning and collaborative inter-institutionalized curriculum delivery may be adopted as the most cost-effective means of curriculum delivery. As a result, the 'learners', the 'facilitators' and their institute would be exposed to the World at large not only in curricular delivery but also in assessment. This exposure would lead to worldwide raising of educational standards the product (doctors) more similar and better qualified.

CONCLUSION

Knowledge is either a mountain of facts or an ever-changing stream of theories and new concepts. The present educational system is failing to balance between these two approaches. "Unless we begin to confront this imbalance soon, our future physicians researchers will not be adequately trained for the emerging health care environment" (5). The present educational system as a learning-experience or in its objective is not ready to meet the future needs of medical education. The new IT has not only made a new educational system necessary but has also made it possible (11).

The question to be asked is how much involvement do we wish to have? The consequences with regard to planning, training, cost etc. are all to be answered, hopefully, not too late.

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