

The changing shape of teaching physiology in South Asia: Problems and prospects

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It is an established fact that the medical curriculum is not a static document and plays a central role in national health care programmes. Its pertinence to the health care needs is important for medical graduates to tackle the changing needs of the society. It is often a repeated criticism that medical colleges in the South Asian countries are producing graduates who are not well equipped to accept the fresh challenges. From time to time various sections of society emphasize the importance of teaching about primary health care, aging, cardiopulmonary resuscitation, alternative and complementary medicine. The challenging financial, political, consumers and technology trends are regarded as mounting hindrances to scholastic and community-oriented medicine in the south asian countries. A thorough understanding of the basic disciplines of biomedical sciences and provision of state of the art physical facilities are of primary importance.

Key role of physiology in the medical curriculum

There is no doubt that amongst the basic science disciplines of anatomy, physiology and biochemistry, knowledge of physiology as a core discipline is fundamental to health and disease. The subject is not less important for the students of biology, medicine, natural sciences, pharmacy and veterinary medicine. It is a pre-requisite for continuing education in paraclinical disciplines such as pharmacology, pathology and all the clinical branches of human and veterinary medicine. Even, the study of biochemistry, molecular biology and genetics is regarded complementary and enriched by knowledge of the physiological mechanisms by which single molecular and cellular mechanisms are integrated in a unified organism.

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As new drugs are introduced, novel diagnostic and interventional techniques are developed. This is complimented by better understanding of how the genome alters function. It thus becomes more and more critical for present-day medical students to understand the principles of physiology and pathophysiology so as to explore the new therapeutic approaches.

A vast majority of medical students in these countries struggle to analyze why they had difficulty in the first two term examinations in physiology, a subject they usually enjoy and consider well understood. It is realized much later that the approach to learning physiological concept was too simple and focused in contrast to the fact that almost every matter had many diverse inter-related aspects. Years later, from the viewpoint of a daily user of essential physiological knowledge in the practice of medicine and then in research one acquires another concept of which integration is a key feature. Further insight then emerges by participating in problem-based teaching, review of the curriculum and consideration of evaluation of students' knowledge and understanding of physiology.

No definite and reliable study regarding the problems of teaching physiology in medical institutions at the undergraduate or postgraduate levels has been conducted. However, many of these problems have often been spelled out in various fora. The contemporary fast-moving world of science and technology and rapid advancement in the field of medical science, basic as well as clinical at the cellular level, make the understanding of the discipline of physiology all the more demanding. Therefore, a thoughtful approach must be applied to the present problems of physiology teaching in order to find appropriate solutions to meet the present-day requirements.

Challenges to Teaching Physiology

Some of the problems commonly concerns to physiology teaching at undergraduate medical education are the following:

1. Lack of appropriate policies and plans for faculty and human resource development for health education;
2. Dilution of quality of training;
3. Brain drain;
4. Lack of input from physiologists;
5. Lack of team-work and predominance of discipline-based isolation;
6. Lack of regular review of the curriculum and teaching/learning strategies;
7. Disproportion between number of students and facilities offered;
8. Stereotyped teacher-oriented teaching.

Proposed strategies to address the challenges

Development of faculty for health care and medical education is based on policies and plans, their execution and management. Policy determines a directive of a general

nature for the implementation of the plan for human resources for health within a country. A plan is expected to define objectives, identify available resources and the proposed strategies to achieve it. In the current context it should clearly define categories, numbers and the quality of health personnel needed along with a certain time frame developed on the basis of a clear picture of the available resources. Execution involves training and education of health personnel. The faculty available has very little teacher training. Selections are made on the basis of subject specialization in (with no transparency in the process) and not on the basis of their innovative teaching skills. There is little concept of faculty development. Incentives and promotions criteria are needed to be coupled with substantial accomplishment in the teaching skills and peer-reviewed research accomplishments. Management requires placement of individuals to meet matching responsibilities and organizing for them enlightened mentors, career and opportunities for professional development.

While the increase in number of medical colleges coupled with increasing commercialization of medical profession is cited as a common cause for the dilution of quality, doubts have been raised regarding the quality of postgraduate training. Massive rate of brain drain has been further aggravating this aspect of human resource. Although in some cases individuals move from one developing country to another but this move is only short-lived because they eventually decide to move to a developed country, permanently. Overall effect of the whole process results in diminished quality of medical education and availability of less competent health care professionals, locally.

Like other basic science disciplines physiologists in the south asian countries also are not well organized professionally. Working as individuals in isolation with departments offering extremely limited opportunities for faculty development and collaboration they are generally handicapped as compared to their peers in more developed countries. Physiological societies and health care professional bodies must be organized on progressive lines so as to play effective role in curriculum development and professional development of their fellow physiologists and other basic medical scientists.

Lack of teamwork in the academic institutions is another common phenomenon in South Asian countries. Eventually, faculty suffers from predominance of 'discipline-based isolation'. There is a tendency to work in isolation without interacting with other disciplines. This emphasizes a need towards interdisciplinary effort for regular curriculum review exercises so that effort is made for curriculum integration and professional development resulting in availability of free time facilitating possibility of enhanced collaboration. Such an enabling environment would make the curriculum creative and integrative. More meaningful results could be obtained by involving students in the whole process of the course administration and decision-making, as they are the actual customers. Students involvement will give them ownership and the desired support. This will help future academic mentors with good management qualities.

Not only physiology teaching but medical education as a whole in the south asian countries frequently forces teachers to cope single-handedly with large-groups leading to disproportion between number of students and facilities offered. This situation strains the available physical facilities (lecture halls, laboratories and learning resource centres) and

equipments. Often, the only teaching approach used in these situations is for the teacher to provide factual information to the students with inadequate explanation. As a result students tend to opt for rote learning. Even best teachers in these circumstances would be reluctant to incorporate more imaginative approaches and content on simplistic and conventional approaches. To overcome this, it is suggested that the physical facilities and provision of trained laboratory staff and equipment be dealt on priority basis. Special attention therefore is needed to be paid towards updating audio-visual and library facilities and learning resource centres. Teaching and learning in this way should see a shift from teachers-oriented to integrated and students-centered approach.

In order to enhance and harmonize the teaching of physiology in the South Asian countries, a mechanism should be put in place so as to ensure a systematic gathering of information on how physiology is taught in different faculties (biology, medicine, veterinary medicine, pharmacy, etc.). The aim is to identify the core information that must be imparted in all courses of physiology, while leaving ample direction for individual choices of additional topics available. It may be difficult to achieve uniform teaching of physiology; nevertheless the success of such an effort would encourage integrated learning with a contextual approach. This is expected to open new horizon and enhances reliance on innovative teaching strategies (such as PBL and distance learning). This would encourage medical schools and universities in the region to adopt policies to improve interaction and collaboration. An easy and conducive environment would thus allow students to transfer their credits in physiology from one institution to another. Collaboration between research scientists will be enhanced by increased mobility of students and teachers leading to promotion of much-needed research culture and strengthening of the discipline of physiology.

How much physiology should be taught in 2006?

It may seem odd to raise this issue, but it should be recognized that present day medical student cannot be expected to learn as much physiology as was the case 25 years ago. The reason is simply that so much essential new material has entered the pre-clinical medical curriculum that something has to give; of course, it cannot be suggested that all the reduction should be in physiology. Rather it should be shared among all the pre-clinical courses. Naturally, reducing the content of a core course is always difficult. In fact, there is continual pressure from some courses to increase the amount of material and expand their courses because this can bolster their case for more resources.

The problems highlighted can only be curtailed by investing more in health and education leading to creating of new opportunities and incentives.

Increasing pressure on health care infra-structure and increasing commercialization of medical education thus indicate that, times are needed to be changed both for the medical profession and the medical curriculum. Academic medicine has to do better to survive as a leading player in the healthcare infrastructure.

Remarks to Professor Arif Siddiqui's essay*Teaching physiology: A comparative view based on the article of Arif Siddiqui*

It was a great pleasure to read the exciting thoughts of Professor Arif Siddiqui on teaching physiology in developing countries. Going through the text I realized that to some extent we share common problems teaching physiology in Hungary. The rapid increase of new results and numerous new discoveries of essential physiological mechanisms, the expansion of physiology to the molecular field, thus the expansion of curriculum and the new arrangement of the whole medical teaching system (including compulsory and optional courses in the "Bologna system"), these are the new challenges for the teachers and faculty.

I absolutely agree on that amongst the basic disciplines in the medical and pharmaceutical schools, physiology is the most important subject. Understanding pathophysiology, pathology, pharmacology and the clinical sciences are based on the knowledge of physiology. Physiology is the subject teaching us how the healthy organs work, how these organs work in concert, and that how the whole organism exists and survives when responding to different challenges. Thus, physiology is an integrative subject. Students should integrate their knowledge considering different aspects of different chapters of physiology focusing on the whole organism when studying clinical sciences. The best way to control this process is the form of oral examination. Due to the increasing number of students in the Hungarian, English and German language courses it seems, however, that we should apply the multiple-choice tests instead of oral form, even for the final exam. I know that this corresponds to the international trends, but we lose the possibility conditioning the students for integrative type of thinking. Therefore, we should stress teachers to focus on much more to the problem-based teaching in both the lecture hall and the exercise room.

The other problem of teaching physiology in Hungary is the recruitment of young physiologists. In the past, teachers of physiology were medical doctors exclusively and they were usually our best students, the members of the Scientific Student Association. These graduates joined us for four years having part time teaching and research duties. Because the "Specialization in Physiology" degree does not exist anymore in Hungary, and because physiologists can not take specialist examination (Specialist in Clinical Laboratory Sciences), the original value of MD diploma of the young medical doctor physiologists is practically lost. If someone would like to shift from physiology to clinical sciences after having been a teacher of physiology for several years, he/she may realize that it is too late. Namely, to have a clinical specialization needs at least 6 years clinical practice. Due to these problems there are an increasing number of physiologists with MA degree in Biology. They are excellent in research but they need time to conduct special studies in medical/pharmaceutical physiology and clinical sciences as well. The brain-drain is also a serious problem in Hungary. Young physiologists spending several years abroad, in excellent research laboratories, take permanent residence in the US because of better working conditions (and for better salaries).

Teaching physiology involves different experimental demonstrations and exercises. High quality teaching depends on modern instruments and good back-ground teaching facilities. In order to keep the international standards in teaching we should show the most modern equipments to the students. Under the present financial situation of the Hungarian universities we are far from that goal. These problems can be solved only by investing much more in health and education. Otherwise the quality of teaching will decrease and the traditionally well recognized Hungarian medical education will lose its position.

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Professor Siddiqui reviews the situation of physiological teaching in South Asian countries, elucidates its shortcomings and phrases out the possibilities for improvement. The lack of proper education policies and shortage of human resources are identified as the major source of problems. The problems outlined by Professor Siddiqui provide important lessons for other countries, as well. Although the fundamental role of physiology teaching in the curriculum of human and veterinary medicine is generally accepted, in our opinion, emphasis should be given to optimize the proportions of students and teaching stuff. The professor should be provided with sufficient time both to do outstanding teaching and carry on research at an internationally recognized level. The current situation demonstrates that, if this is not provided, the best people will start exploring other possibilities, the work load of the remaining stuff will further increase, and the level of teaching will start deteriorating. The only way to stop this vicious cycle is to attract talented young people by offering appropriate teaching and research opportunities, and living standards.

Professor Siddiqui lists a number of problems for teaching physiology. However, when we emphasis the importance of integration, we should also realize that the heart of physiology teaching, when it is properly taught, is integration itself. Whereas the lectures and textbooks should provide a systematic overview of physiology, the practices and consultations of the physiology course should provide ample time to discuss integrative and problem-based situations to teach students how to use this information. Although the core physiology course requires systematic studies, which can only be achieved with classical teaching methods, complementary problem-based courses can also be very useful additions to the program. However, this requires even more time and teaching staff. We disagree with the view that “present day medical students cannot be expected to learn as much physiology as was the case 25 years ago”. We believe that a well-designed physiology course has a key role to teach students how to approach medical problems, and should not be reduced. Physiology textbooks 25, 50, 100 or even 200 years ago were similarly large, and will be probably similarly large throughout the 21st century. However, the content of these textbooks is obviously changing dramatically, and it is mandatory to remove outdated information from the

curriculum, to give room for the rapidly growing number of new concepts. Although we agree that these concepts should be carefully selected and limited to the ones essential for medical education. As clinical disciplines are becoming more and more specialized and fragmented the physiology curriculum has an important role to provide an integrated overview of pre-clinical medicine. The enthusiasm and motivation of students is the proof that the demand for physiology as a core discipline is high.

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It is generally accepted that physiology as a subject (and the physiology curriculum) has a very important role in medical education. It derives from the fact that this is the subject which should explain how the body works and what mechanisms are responsible for controlling the basic functions; thus the knowledge provided is absolutely indispensable from the point of view of the clinical subjects. Many tutors (and perhaps even more importantly, lots of students) share the opinion that physiology is one of the most important subjects throughout the 5-6-year-long medical education. The importance of physiology does not only lie in the aforementioned points, but one must realise that it is impossible to understand the mechanism of the action of the various drugs without being aware of the exact functions they act upon. As the number of newly developed drugs and potentially important molecules affecting a broad range of body functions increases on a daily basis, firm and critical physiology knowledge of the practitioners seems to be an essential prerequisite for accommodating new methods and drugs in the everyday medical practice.

It must be understood, and regretfully students quite often realise this late, that physiology is Janus-faced, as it comes in two important forms. While it provides a logical explanation for most of the body functions, a substantial factual knowledge is also required for the proper command and utilisation of physiology, which students often fail to appreciate. As Prof. Arif Siddiqui has indicated in his comment, students often consider physiology well understood, and they may realise later (often while they sit for the physiology final exam) that this is not the case. They either did not understand it as perfectly as they thought, or if they did, the factual knowledge they acquired was not enough to give them an adequate overall command of physiology. It must also be emphasised that it is the principal task of the physiology professors to test both levels (understandable part and factual information) of the physiology knowledge. The test questions which are commonly used for the mid-term self-controls to assess the current knowledge of the students seem to be more suitable for testing the factual knowledge, and although they can also provide some information about the current level of understanding, they are not absolutely suited for this purpose. It is essential, therefore, to utilise the vial examinations at least for the final exams, to assure that the students finishing their physiology education thoroughly understood the subject, and it may serve as a strong

foundation for their further medical education, and they will be able to tackle the challenges thrown onto them by the clinical aspects of the medical education.

It must also be realised that the physiology curriculum should always reflect our current understanding of body functions. The constant restructuring of the curriculum is thus a must today. All physiology tutors would agree that we deliver a much more comprehensive and detailed explanation about the molecular mechanisms of numerous phenomena than we did a couple of years ago. It is a good idea, as suggested by Prof. Siddiqui, to have regular meetings (these may be organised as part of the annual meetings of the national physiological societies) where the guidelines are declared and the most prominent tutors and professors can agree on a core subject which is regarded to be essential for the education of the would be doctors.

There is, however, one point we strongly disagree with Prof. Arif Siddiqui's opinion, namely, "*...it should be recognised that present day medical student cannot be expected to learn as much physiology as was the case 25 years ago. The reason is simply that so much essential new material has entered the pre-clinical medical curriculum that something has to give...*". We are strongly convinced that the amount of physiology taught in medical universities cannot be reduced, as it would jeopardise the medical students' abilities to fully understand the body functions, and to appreciate the complexity and interdependence of the various physiological phenomena. The amount of physiology taught, therefore, should not be reduced, but it should be continuously reorganised and restructured to accommodate new knowledge. There are two particular reasons supporting this view. On the one hand, some basic reflexes and phenomena never change and never become unimportant or obsolete (think about the basic cardiovascular reflexes for example), thus these should be introduced to the medical students no matter what new discoveries are made in other preclinical disciplines. On the other hand, physiology itself is in a continuous change, as new pieces of information are discovered and these are also integral parts of physiology. While a couple of years ago much less was known about the molecular action of the hormones, today it would be unimaginable to discuss their effects without explaining their receptors, the signalling pathways and intracellular changes they initiate. However, in the mean time, one should not ignore the effects at the level of the entire body, either. If we are to provide modern and adequate physiology education for the medical students, we ought to incorporate these new lines of information into the medical curriculum. Evidently, the continuous revision of the material delivered to the students is not an easy task, but it has to be done if we wish to maintain the present high quality physiology education in the future.

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