

Pragmatic Solutions for Problems in the Undergraduate Medical Programmes in Pakistan

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Abstract

Reforms in the Pakistani undergraduate medical education have remained elusive for decades. An attempt is made to highlight the importance of research-oriented education and problem-based learning to Pakistani medical schools. Possible causes are analyzed and implementable solutions are suggested with appropriate references from literature search. An innovative “Research Ladder” approach to implementing a research-oriented curriculum that culminates in attainment of a combined MBBS-BRS degree is also proposed. In the end, techniques for making existing lecture-based learning more interactive are suggested (JPMA 52:331 ;2002).

Historical Perspective

The revolution from Dark Age medicine was heralded by the foundation of the first medical school at Salerno in Southern Italy around the 11th century¹. Helped by the translation of Arabic work, the Salernitan school influenced the development of the student-run universities of Bologna and Padua (1222 AD) in Italy and of Montpellier and Paris in France². The “Canon of medicine” of Ibn-Sina and Ibn-Ishaq’s summary of Galenic medicine formed the foundation of University medical courses in Europe from 1250 till 1600². Medieval university medicine was highly theoretical, often speculative and characterized by individual apprenticeships. The rise of the modern medical university began in the 12th century, when classical theories and metaphysical arguments on the causes of illness were overpowered by the direct observation of the human body³. Questioning of orthodox medicine subsequently opened the doors to scientific investigation and research. The nineteenth century was the true age of scientific experimentation. For the first time it became essential for doctors to acquire scientific training and medical education everywhere evolved to become more systematic and scientific. From the discovery of the stethoscope by Laennec (1816), of micro-organisms by Pasteur (1885), the birth of the modern clinical thermometer by Albutt and the X-ray by Rontgen, medical curriculum was fast being reshaped to keep pace with these new changes^{1,3}. This trend was carried to new heights in the 20th century and remains exponential to this day.

Pakistani universities since inception have largely followed a static system of undergraduate medical education with three years of basic sciences and two years of clinical courses. Apart from a dichotomy between the basic and the clinical sciences, this system depends on heavy use of lectures and other didactic sessions. Reforms in this traditional system have been painfully slow. An attempt is made in this article to highlight two of the most important aspects of Pakistani undergraduate medical education namely, non research-oriented education and lecture-based learning, two fields rusting from obsolescence and crying out for want of reform and update.

1. Research-oriented education. Nonexistent in Pakistan

Progress only dawned in medicine when the early emphasis on the authority of medieval printed books was shifted to the direct observation of the patient, cleverly described by French philosopher Michel

Faucalt as “le regard” (the gaze)³. Innovative scientific inventions like Xrays and CT scans have made the “gaze” more penetrating, enabling diagnosis to be more accurate and management more focused. Medicine has been transformed from being just an art to a science as well. Research formed and still forms the backbone of innovation and invention. Indeed these were the parameters that judged the progress of civilizations past and yet to come.

According to pundits, the number of scientists and researchers being trained globally may not be sufficient for the current rapid advances in biomedical research^{4,5}. Researchers have been termed a dying breed and an “endangered species”, and the situation a “crisis^{6,7}”. The mission of a modern university is not only to introduce students to research but also to seed in them a passion for discovery at all levels of learning⁸. A report from the Stanford University School of Medicine, where 90% of the students engage in voluntary research projects has indicated a tremendous impact of research on the students’ ability to critically review literature and to analyze and present data⁹. Even the research staff who worked with students found it extremely rewarding.

Majority of the medical undergraduates in Pakistan have no practical experience of basic research, laboratory techniques, methods of statistical analysis and their interpretation. Current status of research in Pakistan can be judged from the fact that in 1995 only 618 published scientific papers and 2,803 citations appeared from Pakistan¹⁰. Similar figures for United States of America were 249,386 scientific papers and 6,475,200 citations¹⁰. Undergraduate medicine programmes are an important source of researchers. However the current undergraduate programmes in Pakistan are not producing enough investigators for research purposes.

The main cause of our dismal performance in the field of research and innovation has been a medieval curriculum that focuses on didactic learning instead of a scientific and an experimental approach. This lecture-based curriculum does not stimulate students’ interests in research during medical school and therefore they are less likely to seek a research experience or project during residency training.

Majority of the faculty lacks experience in research. Thus students are not exposed to dedicated role models and hence a vicious cycle of a non-experimental approach towards science is set up. Economic factors also need to be considered. Student’s who accumulate a large debt burden through medical school make career decisions within a framework that includes income potential. These factors combined with the uncertainty of research funding make a career in research less attractive economically. Additional factors include the lack of exposure to research through undergraduate laboratory courses, lack of time for meaningful research and inadequate faculty-student interaction. Counseling about research opportunities and research careers is non-existent at almost every medical school in Pakistan. Many of the above mentioned adverse factors are similar to the ones reported in several surveys of medical students in the West^{4,11}.

Several studies have pointed out the significant impact of a medical school research experience in determining the choice of a career in research¹²⁻¹⁶. According to one study, 37% of those who performed research in medical school were engaged in postgraduate research compared to 22% of those who were not exposed to research in medical school¹³. In another study graduates with research experience in medical school were three times more likely to become physician investigators¹⁹ Career achievement as measured by a higher academic rank, appointment at a research institution and number of citations, was independently associated with research experience¹⁷. Studies have also proven that practical exposure of students to research oriented activities enhances their scientific attitude, critical thinking, problem solving and communication skills^{18,19}. All this makes them better adapted to respond to the challenges of the rapidly evolving fields of health sciences. Indeed these are the “survivor instinct” of the 21st century.

To promote research at the undergraduate level and to make it the backbone of medical learning a “Research Ladder” approach is proposed (Figure 1).

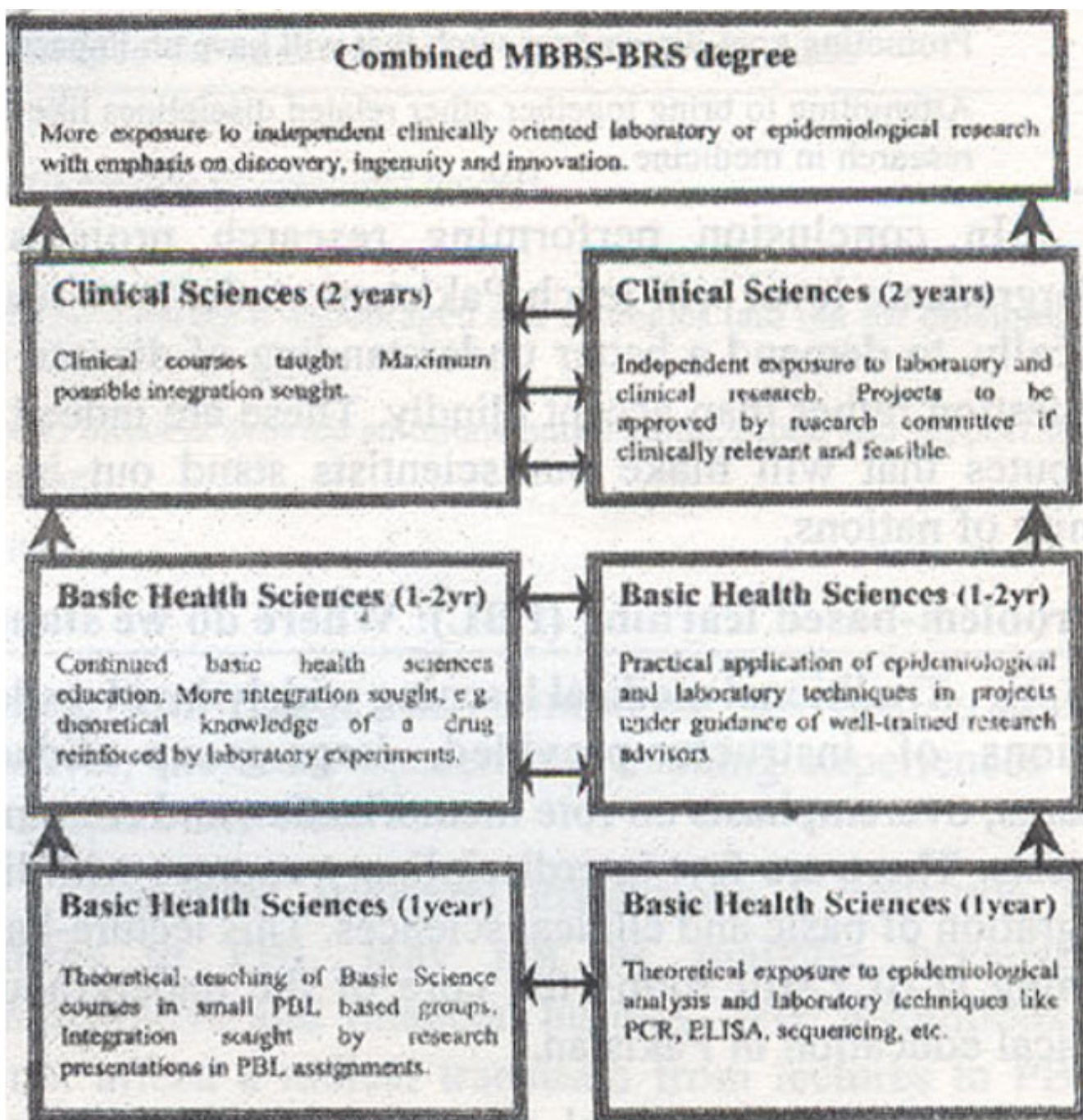


Figure 1: The Research Ladder

Years in brackets are suggested approximate duration of each year

↑ represents vertical advancement chronologically

↔ represents horizontal integration. Note the numbers increase as the years progress.

BRS= Bachelors in Research Science.

PBL= Problem-based learning

The research ladder starts off with basic training of laboratory techniques, biostatistics and epidemiology. Each higher rung proposes a more complex approach to research and emphasizes greater clinical integration, eventually culminating at the undertaking of an independent research project in the final year of undergraduate medicine. All aspects of laboratory and epidemiological research are assessed by a research committee to be clinically relevant to the health-care needs.

After this rigorous training, the students as an incentive are given a combined degree of MBBS-BRS

(Bachelors in Research Science).

Graduate students can be offered further opportunities to work with professionals on laboratory and epidemiological projects in their respective areas of interest. It is hoped that this combined MBBS-BRS degree will serve the same role as the combined MD-PhD programs that were started in the U.S. in 1964²⁰. Recent data has demonstrated that dual MD-PhD graduates in the U.S. are fast becoming the leaders of biomedical research in clinical departments^{21,22}. Analysis of combined MD-PhD graduates has confirmed that the majority become dedicated investigators, prolific authors and active participants in academic medicine^{23,24}.

Further solutions for integration of research in the undergraduate curriculum are highlighted in Table 1.

Table 1. Suggestions for promoting undergraduate medical research.

1. Encouraging research through admission process (favouring students with prior research experience or a research-oriented approach)
2. Promoting more curricular flexibility (allowing students to take research leave) to pursue an investigative project in depth and to gain experience.
3. Tuition remissions and scholarships for students pursuing research.
4. Dispensing academic credits, honors or Dean's awards on basis of research projects successfully completed.
5. Generating more funds for student research activities.
6. Training of full time student research advisors who will guide and help students gain the skills necessary to carry out their research.
7. Targeting research projects to the interests of individual students.
8. Integrating research activities and interests with clinical applications
9. Promoting goal-directed research that will have an impact on the diagnosis and the management of illnesses.
- 10 Attempting to bring together other related disciplines like chemistry, Zoology, Botany and even electronic engineering and integrating them with research in medicine.

In conclusion performing research projects at undergraduate level will teach Pakistani students to reason critically, to demand a better understanding of disease and to question rather than accept blindly. These are indeed the attributes that will make our scientists stand out in the corny of nations.

2. Problem-based learning (PBL): Where do we stand?

Traditional medical learning widely involves long sessions of instructor-provided, large-group didactic lectures, overemphasis on rote memorization and cramming for tests. There are few interdisciplinary courses with little integration of basic and clinical sciences. This lecture-based learning (LBL) still forms the core of the undergraduate medical education in Pakistan.

Students undergoing PBL learning have reported it to be more relevant, flexible, stimulating and engaging²⁶⁻³². They have also reported more positive perceptions and an overall greater satisfaction about their learning process compared to their colleagues who underwent lecture based learning. And indeed a supportive medical school learning environment promotes student achievements. Moreover Table 1. Suggestions for promoting undergraduate medical research.

In the West, medical education is becoming more student-centered with an emphasis on active learning rather than the passive acquisition of knowledge. The assessment of clinical competence is becoming more important than the ability to recall unrelated facts. Problem-based learning (PBL) is fast becoming an integral component of this newer approach. PBL had its roots at McMaster university in the late 1960's,²⁵ and since has spread throughout North America and in other parts of the world^{26,27}. The theoretical basis of PBL is a student-centered approach in which the student is actively involved in identifying learning objectives, selecting personal learning resources and setting boundaries for individual study²⁸. The most fascinating aspect of PBL is an ability to make an association between an external stimulus or situation and the concepts stored in memory.

comparison of United States medical licensure examination (USMLE) scores has shown that PBL graduates perform at levels comparable to or higher than their conventional counterparts^{30,31,33}. PBL learning also allows students to explore special interests which can help to promote research and innovation^{19,28}.

Approaches to integrate Problem Based Learning in the Undergraduate medical education in Pakistan: In a Pakistani setting, any of the following three approaches may be employed to adopt problem-based learning in the undergraduate medical curriculum.

1. Initially an attempt to integrate some of the aspects of PBL into the existing lecture-based learning can be tried, for example, fewer lectures and increased emphasis on the study of patient problems. As the benefits of problem-based learning become more apparent in Pakistan, a complete adoption of PBL can be advocated.
2. The second approach can be to set up two separate groups of learning: one small problem-based curriculum group and another traditional lecture based curriculum group. Students can be randomly assigned or voluntarily asked to join either group with continuous assessment and evaluation.
3. A third approach can be to adopt PBL in some disciplines, for example, anatomy and maintaining an LBL approach in others, like physiology. Students' performance and perception can then be compared and a final consensus to fully adopt PBL can be taken.

There is no evidence to suggest that either approach is better than the other. In the Pakistani setting, investigation into the future implications of PBL should be conducted before a final decision to fully adopt it, is made. This will not only enable a scientific approach towards a radical change but will also ensure that no aspect of this reform is ignored. Continuous evaluation and assessment of PBL are therefore essential components of future reforms. Two instruments that can be used in the assessment process are the Cognitive Behavior survey and the Medical School Learning Environment survey^{34,35}. These surveys typically test teaching, administration, psychological aspects of student life and intellectual climate.

Further means of implementing PBL into the undergraduate curriculum in Pakistan are highlighted in Table 2.

Table 2. Recommendations for implementing Problem-based learning in the undergraduate medical curriculum.

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| 1. Emphasizing patient-based clinical experience using actual patients, simulated patients or computer models. |
| 2. Forming small groups with 5-6 students in a group. |
| 3. Arranging three 1-2 hour sessions weekly to discuss patient cases where critical thinking is encouraged and strategies laid out for obtaining information from external sources. |
| 4. Training faculty members to the various aspects of PBL. Faculty's role is not to direct or provide solutions but to guide, probe and support student initiatives. One basic scientist and one clinician should mentor each small group. |
| 5. Supplementing case learning with occasional scheduled lectures on core topics. |
| 6. Emphasizing self-learning and integration of basic and clinical sciences. |

The positive attitude towards learning imparted a problem-based curriculum will definitely carry over with the medical students into their practice year and affect their desire and attitudes towards future learning. All this will set the foundation of a progressive health care system, the hallmarks of which will be critical thinking and research.

How can lectures be made more interactive?

Lectures remain the most widely employed technique for teaching medicine all over the world. When done interactively, lectures can allow students to learn new material, explain different concepts and promote problem solving and challenge attitudes³⁶. However, the role of lectures in effectively transmitting knowledge has been criticized widely. They are considered by many to be a relatively poor means of sharpening skills and formation of life-long learning attitudes^{37,38}.

Interactive lecturing means active participation of the students, ensuring that they are no longer passive in the learning process³⁶. The main reasons that prevent faculty from delivering interactive sessions are fear of losing control over the students and the teaching material or fear of not covering all the

contents³⁶. Additional fears include anxiety about not knowing the answer to a question posed, concern that a “dominant” group will take over and fear that no one will respond to questions asked. Time constraint is also a frequently cited reason for not delivering interactive sessions. Many faculty members believe that interactive lectures are not suitable for undergraduates because of their limited knowledge as compared to post-graduates. However, literature conceing teaching experinces dose not support this view³⁶.

For most Pakistani institutions a transition from lectures to PBL may not be realistic because of administrative and financial hurdles. For institutions that cannot afford a radical transition from lectures to PBL, a more steady nad systematic approach should be tried. Existing lectures can be made more programmed and interactive and every effort made to enhance student participation.

Table 3. Techniques for making lectures more interactive.

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| 1. Breaking the class into smaller groups (often called the 'buzz groups' because of the noise produced). |
| 2. Questioning the audience by using straightforward questions, rhetorical questions, brainstorming, audience surveys, quizzes or short answers. |
| 3. Engaging the audience in active participation by using live cases, simulations, role-plays, organizing debates and panel discussions and using audience responses. |
| 4. Using audiovisual aids, films and videotapes to promote interaction. |
| 5. Using written materials, for example handouts as summaries, diagrams and figures. |
| 6. Using effective presentation skills, by speaking at suitable volume and pace, demonstrating enthusiasm for the topic, maintaining eye contact and using non-verbal gestures appropriately. |

Table 3 lists some of the most commonly employed techniques for making lectures more interactive. Small group teaching, questioning the audience and the use of live cases promote comprehension, stimulate interest and arouse attention and motivation³⁹. Studies have demonstrated that increased attention and motivation in turn enhance memory and retention of knowledge^{36,40}. These techniques also provide valuable and instant feedback to the teacher and the student alike. Audiovisual aids are used as a trigger to promote meaningful discussion or to stimulate student thinking³⁶. They are also useful for examining student attitudes and skills. Written materials like handouts assist in organization of key concepts and promote retention of information⁴¹. They also remove pressure on the teacher to cover everything and on the students to write everything down. Students also achieve higher test-scores from lectures with handouts and the design of the handout can influence note-taking practices³⁶. Similarly, effective presentation skills on part of the presenter like maintaining eye contact can facilitate or hinder interaction.

In short interactive lecturing can be an effective tool to impart knowledge that can stimulate interest of students and be retained longer.

Conclusion

Research-oriented curriculum and problem-based learning are two of the most urgent requirements of Pakistani undergraduate medical education. Together with these reforms, improving upon the existing lecture-based learning will definitely seed a new breed of physicians, better equipped to cope with the challenges of our health care system in the 21st century.

Acknowledgement

I am greatly indebted to the Faculty at the Aga Khan University for their indispensable guidance and

stimulation, without which this endeavor would not have materialized.

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