WHAT ARE THE REQUIREMENTS OF MEDICAL EDUCATION IN THE 21st CENTURY?

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ABSTRACT

Doctors in the 21st century will have to move beyond the century old Flexnerian system of medical education and practice. This entails dealing with an increased quantum of knowledge and incorporating genomic medicine and systems biology into clinical practice. This is particularly important in Pakistan and university education rather than disguised technical colleges is required to produce a doctor capable of dealing with the increased pressures of the new century rather than simple technical competence. This ability to unlearn and relearn is essential for both teachers and students.

Key words: Genomic Medicine, Systems Biology

INTRODUCTION:

The Higher Education Commission, as the highest educational authority in Pakistan has been charged with improving the standard of university education. It is germane, therefore, to consider what is required of medical graduates in the 21st century in Pakistan.

The need for change in medical education in the new century is widely recognized in academic and professional circles and is a worldwide problem as the existing paradigm of Flexnerian medicine, based on the curative medical approach of diagnosis, pathological confirmation and treatment of individual patients is clearly only a limited part of medicine in these days of increasing globalization, communication and knowledge. This is particularly of importance in emerging nations such as Pakistan where the new century demands provide skills rather than the mere competence of a technician, which is acquired at a technical college. Once a curriculum of lectures and prescribed books are specified, a technical course, not a university education, is being followed, particularly with an emphasis on multiple choice examinations and the examination industry as the outcome measures. It is clear that very few universities meet these requirements and that competency is best measured by technical standard bodies such as the college of medicine and a minimum standard specified by registration bodies. University educationalists need to have a career structure, which must be sufficient to exclude the need for a separate private practice which is destructive to the whole concept of university education.

Universities are under threat worldwide, including the developed world. This has to do with whether medicine is a job with a good living or whether it is a profession and a calling. The first factor is the general public in developing countries as it is essential to have better doctors than elsewhere because of a higher disease load and fewer resources and facilities. Unfortunately, in such countries as Pakistan, governments allow private enterprises, with its entrepreneurial, profit oriented, curative approach to dominate medical practice. In Pakistan, 74.6% of medical spending is in the private sector, and this Flexnerian approach is clearly retrogressive, expensive not in the interest of the Pakistani people and will lead to an intellectual second class of medical practitioners.

Multiple factors lead to this situation in countries such as Pakistan and these need to be considered if a better direction in medical education is to be achieved.

The first factor is the role of a university in medical education. A university teaches a person how to think and produces the prepared mind of Louis Pasteur, as the doctor of the new century must be capable of dealing with the changes inherent in individual members of the medical profession. The generation gap has dictated a less altruistic approach, leading inevitably to a downgrading of the traditional trust in the medical profession, much as has occurred in the teaching profession.

These public attitudes are reflected by governments. In Europe and the U.K., medicine is being downgraded to a job with shift work, limited working hours in line with other employment and medicine itself is being considered as no different to other Social Services. “Tomorrows Doctor” has a repetitive requirements, of which only 6 can only be done by doctors and it is only on the 19th requirement that health

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is first mentioned. An alternative interpretation is that this document reflects the broadening scope of medicine. In the USA, financial considerations dominate medical practice. This has led to the USA, despite spending over 1.3 trillion dollars on health care, with over 40 million people having no health insurance safety net, a large number of personal insolvencies. being due to medical expenses and a runaway litigious environment. It comes as no surprise therefore, that despite technical excellence in some centres, the USA is only 37th in health care provision on the WHO’s controversial rating.

It is clear that these ways of dealing with complexity will be disastrous for Pakistan and need to be carefully considered by the responsible authorities. What is needed in countries such as Pakistan is an emphasis on professionalism and ethics rather than the widespread attitude in developing countries that life is a struggle for survival which justifies any corruption including the medical profession. The universities have a major role in the process and must move away from simply being technical colleges.

TECHNICAL ASPECTS. A widely known adage is that prior to about 1985, students became good doctors because of their training. With increased complexity, knowledge and the internet, after this, students become good doctors despite their training. This situation will certainly escalate and these factors are critical in revitalizing medical practice in Pakistan. Again, worldwide initiatives such as ICRAE, do not address the issue of what doctors should do but rather the environment in which they practice. The major factor requiring consideration are actually the knowledge explosion, the genomic revolution, systems biology and inappropriate and incorrect statistical bias in medical practice.

1. THE KNOWLEDGE EXPLOSION. High Quality information is doubling every 3 years. According to David Sackett, the founding father of evidence based medicine, this requires the reading of 33 clinical articles daily simply to keep up with this knowledge explosion. The usual medical response is to follow guidelines despite their obvious inadequacies. Another approach is to surf the internet, only 4% of which is valid because of lack of editorial rigor. A better approach is critical analysis of topics (C.A.T.) It is incumbent on university teachers to have a higher quantum of knowledge in order to set the higher standard necessary in Pakistan.

The medical profession has reacted to this explosion of knowledge by increasing the number of super specialties. This leads to compartmentalization and a lower quantum of general medical knowledge, particularly in Part I examinations.

Medical education has reacted to this knowledge explosion by introducing teaching strategies such as problem based learning and examination processes such as OSCE. The proper perspective of these is that problem based learning is largely a vertically integrated teaching strategy which has the advantage of maximizing student involvement but has been very difficult to prove outcome improvement. Learning is left to the student and once a reference text book is requested there is reversion to technical knowledge and note learning. The solution is to use a brain function based system of learning rather than the longstanding psychologically based learning philosophy that does not differentiate between rote and deep learning at cognitive stage I with disastrous long term consequences.

The minimum required in Pakistan is a drastic overhaul of Basic Science requirements and Part I examinations as this will make understanding of inevitable advances feasible.

GENOMIC REVOLUTION. The genomic revolution has produced a major change in medical practice which has escaped most clinicians. The central change is that every disease has a genetic predisposition which is expressed by interaction with the environment, mainly lifestyle in this modern world. Food is therefore the most powerful drug in the world and clinical nutrition a dominant part of clinical practice. This is poorly managed by the medical profession and its interaction with the global food industry is lamentable.

With over 7 million single nuclear polymorphisms, clinical medicine has to practice individualized medicine instead of dealing with the average. This entails the extra clinical step of how should I treat this particular patient differently to standard treatment. A more extensive family history is required and special tests are interpreted as appropriate or not, unlike the present paradigm of normal or abnormal. This already applies to blood glucose, insulin, lipids and white cell count. In the future, microarrays will clearly become cheaper and more widely used.

Perhaps the most important implication of the genomic revolution to clinical practice is that prevention becomes a major goal, particularly in this world of globalization where degenerative diseases are already the commonest cause of death in an ageing world. Upstream prevention, largely by life-style and immunization leads to a 50-60% decrease in
degenerative diseases and their consequences.

This process starts long before incident pregnancy. Midstream early detection of conditions such as impaired glucose tolerance, dyslipidaemia, coronary artery disease or hypertension leads, in general, to 20 - 30% improvement in outcome whereas downstream treatment of established disease such as coronary thrombosis by CABG and renal failure by transplantation leads to a 6 to 12% improvement, is very expensive and is inefficient in ensuring population health. This downstream management is the focus of the Flexner system of medical education and practice and this perspective of the Royal College of Physicians is the most powerful argument for changing medical education and practice towards a population based community dependent health care system.

SYSTEMS BIOLOGY. The clinical application of systems biology produces integration based on fragmentation of multiple super specialities and has been called the beginning of real biology. It is based on engineering and mathematical principles of input (via a dominant brain in the human) process and output with feedback.

It is the first new faculty founded at Harvard for over 20 years. A fuller discussion is beyond the scope of this article except to point out that it is virtually unknown to clinicians and without it, an intellectual underclass is predicted for the twenty first century. For instance, it is essential as an introduction to the vertical integration of problem based learning as well as making such specialities as obstetrics, gynaecology and endocrinology very incomplete perceptions of the patient.

BIAS TOWARDS STATISTICS TO THE DETRIMENT OF BIOLOGY:

Students at all levels are taught statistical criticism instead of critical analysis. Although good statistics are necessary, the presumption of the Cochran Collaboration, as an example, that the only satisfactory evidence is statistically stringent has no validity because most studies are simply poor biology. As a ludicrous example, the original penicillin publication would never have been accepted by a modern editor.

Apart from downgrading biology, Bayesian statistics are far more appropriate to the clinician than are the flawed frequentist methods of statisticians. Finally, the tractable mathematics of chaos and network are more appropriate for the study of biology.

In summary, an outline of what will be necessary (and is already underway) for adequate medical practice in the 21st century is presented. It requires very careful consideration by all stakeholders of the real interests of Pakistan and does not require very expensive facilities or equipment but does mandate the prepared mind of Louis Pasteur. Universities are required to function as true universities and to update the quantum of knowledge as are certifying bodies, particularly in basic science and approach to clinical medicine and teaching. As was pointed out in the Presidential Address at the Indian Paediatric Association Meeting in 2005 - the key characteristic required for the new century is the ability to unlearn what has been learned in the past and relearn.

The ultimate objective is to produce a capable doctor for the twenty first century's increasing complexities rather than a competent doctors by inadequate requirements and examinations.

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