MEDICAL EDUCATION

EVALUATION TECHNIQUES IN PUNJAB, PAKISTAN: EIGHT YEARS OF REFORMS IN HEALTH PROFESSIONAL EDUCATION

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Pakistan, the most populated country in the WHO Eastern Mediterranean region has a population of over 170 million, spread over five provinces and four federally administered areas. It has a growth rate of 1.9%. Punjab is the most populous and developed province with an estimated population in 2010 of 81 million. In 2008, Punjab's development index of 0.60 and a literacy rate of 80% were the highest in the country. In Pakistan, the number of doctors and nurses has risen from 48 to 71 per 100,000 and from 16 to 30 per 100,000, respectively between 1990 and 2003. The major challenge, still, is the imbalance of the population to health-care workers ratio. At the time of creation of Pakistan, King Edward Medical College was the only fully functioning medical college. Over the years, as a result of health reform initiatives, a number of government medical colleges were established in the country. University of Health Sciences, Lahore was established in 2002, having sole jurisdiction over all medical, dental and allied health institutes in the province with the aim of moving medical education towards an outcome-based patient and community-oriented competency-driven system. This paper attempts to clarify how initiatives and reforms in the evaluation process have helped the UHS realise its aims. Evaluation in all branches of higher education has long been taken as a means to an end. The focus of UHS on teacher-training, introduction of behavioural sciences as a compulsory subject and setting up an outcome-based evaluation process, has established a knowledge-acquisition medical education atmosphere. The challenges in the future relate to sustainability through capacity-building and staying abreast with the Best Evidence Medical Education practices worldwide, implementing them to fit our local needs and resources.

Keywords: Evaluation, Examination, Education, Punjab, OSCE, OSPE

INTRODUCTION

Pakistan is the most populated country in the WHO Eastern Mediterranean region with a population of over 170 million, spread over five provinces (Punjab, Sindh, Khyber Pakhtunkhawa, Baluchistan, and Gilgit and Baltistan) and 7 Agencies and 6 Regions of Federally Administered Tribal Areas, with a growth rate of 1.9%.[1]

The average literacy rate is 55%.[2] In 2009, Gross Domestic Product (GDP) per capita of Pakistan was US$ 841.[3] Socioeconomic development is low with high levels of poverty. Recently, government efforts to scale up development were hindered by an earthquake measuring 7.6 on the Richter scale which struck the north and north west of the country in October 2005[4], and countrywide floods in the summer of 2010. Both events resulted in around 30 million in dire need of health services.

Punjab is the most populous and developed province of Pakistan with an estimated population in 2010 of 81 million.[5,6] Punjab is bordered by Indian Kashmir to the north, India to the east, Pakistani provinces of Sindh to the south, Baluchistan to the south-west, Khyber Pakhtunkhawa to the west, and Islamabad capital territory to the north. Of all the provinces, its development index at 0.60 and the literacy rate at 80% were the highest, in 2008.[7,8]

Challenges in the Health-Care Delivery:

In Pakistan, the number of doctors and nurses has risen from 48 to 71 per 100,000 and from 16–30 per 100,000, respectively between 1990 and 2003.[3] The major challenge, still, is the imbalance of the population to health-care workers ratio.

In 2009, neonatal mortality rate of 42, infant mortality rate of 71, under-5 mortality rate of 87 and a maternal mortality ratio of 260 were amongst the highest in the world. Crude birth and death rates were reported in 2009 at 7 and 30 respectively.[9]

A list of health expenditure indicators are provided in Table-1, while the human and physical resources indicators rate (R) per 10,000 population is presented in Table-2.

Table-1: Health expenditure indicators[3]

Health indicators	Expenditure	Year
Total expenditure on health (per capita) Average US$ exchange rate	24	2008
Government expenditure on health (per capita) Average US$ exchange rate	7	2008
Total expenditure on health of % of GDP	2.9	2008
General government expenditure on health as % of total health expenditure	29.7	2008
Out-of-pocket expenditure as % of total health expenditure	57.9	2008

Table-2: Human and physical resources indicators Rate (R) per 10,000 population[3]

Resources	Rate/10,000	Year
Physicians	8.0	2009
Dentists	1.0	2009
Pharmacists	0.9	2009
Nursing and midwifery	6.0	2009
Hospital beds	6.0	2009
Infrastructure - primary health care units and centres	1.0	2009

At the time of creation of Pakistan, in August 1947, when the population was 72 million, King Edward Medical College was the only medical college in both west and east wings of the country. Colleges in Karachi and Dhaka opened in 1951. In the first decade, the country faced an acute shortage of registered medical practitioners from 500 to 1,000 due to mass migrations at the time of Independence.[10]

Facing the challenges:

As a result of health reform initiatives, a number of government medical colleges were established.

Pakistan Medical and Dental Council was established in 1962 as the sole licensing and registration authority for doctors and dentists, and a regulating authority for the medical education in the country.[11] Through approval from PMDC, the first private medical college was established in 1995. Since then, the province of Punjab has seen a rapid growth of private medical education. A list of public and private medical, dental and allied health institutions in Punjab is shown in Table-3.[12,13]

Patchwork of Medical Education in Pakistan:

Medical education in Pakistan follows the British system.[10] This importing and grafting process of western curricula, teaching methods and assessment techniques in our own medical education system has continued since independence. The result was a patchwork of medical education. Since no real efforts were made for standardising medical education, the medical education system was based on outdated curricula and evaluation procedures. Basic medical, nursing and life health sciences were neglected.[14] Research culture was almost non-existent and there were no means of capacity building, professional development or audit of health professionals. The result was a deterioration of health-care delivery and Pakistani health-care professional qualifications were not recognized internationally.

A dedicated Public Sector Health Sciences University in Punjab:

It was against this backdrop that the need for a separate and dedicated medical university was felt, and University of Health Sciences (UHS), Lahore, came into existence on September 28th, 2002, the first of its kind in the province of Punjab.[15]

Table-3: Public and Private Medical, Dental, and Allied Health Institutes in Punjab

Name of Medical and Dental Colleges	Established
Government Medical and Dental Colleges in Punjab	
King Edward Medical College, Lahore	1860
de' Montmorency College of Dentistry, Lahore	1934
Fatima Jinnah Medical College for Women, Lahore	1948
Nishtar Medical College, Multan	1951
Quaid-e-Azam Medical College, Bahawalpur	1971
Punjab Medical College, Faisalabad	1973
Nishter Institute of Dentistry, Multan	1974
Rawalpindi Medical College, Rawalpindi	1974
Allama Iqbal Medical College, Lahore	1975
Army Medical College, Rawalpindi	1977
Sheikh Khalifa Bin Zayed Al Nayhan Medical College, Lahore	1986
Services Institute of Medical Sciences, Lahore	2003
Shaikh Zayed Medical College, R.Y. Khan	2003
Sargodha Medical College, Sargodha	2006
Nawaz Sharif Medical College, University of Gujrat	2008
Private Medical and Dental Colleges in Punjab	
Islamic International Medical College, Rawalpindi	1995
Lahore Medical & Dental College, Lahore.	1998
Margalla Institute of Heath Sciences, Rawalpindi	1997
University College of Medicine & Dentistry, Lahore	1999
Shifa College of Medicine, Islamabad	1999
FMH College of Medicine & Dentistry, Lahore	2000
Foundation University Medical College, Rawalpindi	2000
Islamabad Medical & Dental College, Islamabad	2000
Independent Medical College, Faisalabad	2000
Wah Medical College, Wah Cantt	2002
University Medical College, Faisalabad	2003
CMH Lahore Medical College, Lahore	2006
Sharif Medical & Dental College, Lahore	2007
Continental Medical College, Lahore	2007
Akhtar Saeed Medical & Dental College, Lahore	2008
Central Parks Medical College, Lahore	2008
Multan Medical & Dental College, Multan	2008
Shalamar Medical and Dental College, Lahore	2009
Yusra Medical & Dental College, Rawalpindi	2009
Rashid Latif Medical College, Lahore	2010
Avicenna Medical College, Lahore	2010
Amina Inayat Medical College, Sheikhupura	2010
Islam Medical College, Sialkot	2010
Public and Private Allied Health Institutes in Punjab	
Institute of Public Health, Lahore	1949
Armed Forces Postgraduate Medical Institute, Rawalpindi	1952
Armed Forces Institute of Pathology, Rawalpindi	1957
Postgraduate Medical Institute, Lahore	1974
College of Nursing, Shalamar Hospital, Lahore	1982
Pakistan Institute of ophthalmology, Al-Shifa Eye Trust Hospital, Rawalpindi	1985
Punjab Institute of Cardiology, Lahore	1988
School of Allied Health Sciences, The Children's Hospital & Institute of Child Health, Lahore	1990
Saida Waheed FMH College of Nursing, Lahore	1999
ACE Institute of Health Sciences, Lahore	1999
Sughhra Shafi Medical Complex, Narowal	2003
Gulab Devi Postgraduate Medical Institute, Lahore	2004
Faisalabad Institute of Research Sciences & Technology, Faisalabad	2005
Field Epidemiology & Laboratory Training Program, Pakistan	2006
Munawar Memorial Hospital, Chakwal (Institute of Optometry)	2009

The mission of the University is to promote the delivery of a bio-psycho-social model of health-care. It aims to establish preventive, therapeutic and rehabilitative domains of health-care delivery. The University has the charter of affiliating all public and private medical, dental and Allied Health Sciences institutions within the Province of Punjab (Table-3). It was ideally suited to bring about a revolution through evolution in the medical education environment of the province.

The University has been pivotal in introducing an outcome-based[16], student and patient-centered[17,18], community-oriented and problem-based curricula and evaluation techniques[19,20], rooted in local needs and demands.

Evaluation drives education:

The examination system evaluates the students and, through a process of analysis of result and audit, examines the curriculum, the teaching methodology, and the techniques and strategies used to assess and evaluate the knowledge[21,22,23] and competency of the students[24,25] (Figure-1*).*

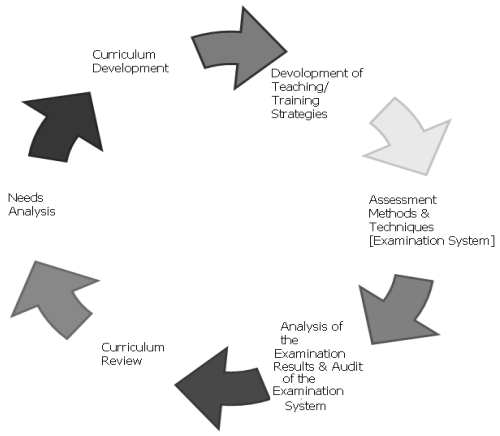

Figure-1: The Education Cycle

Medical education is largely outcome-cantered and the examining system should focus on evaluating the 'higher mental function' and 'reasoning skills', preferably in the settings they are most likely to be used.[26] The results reflect on the teachers and the teaching methods as much as it does on the students and their competency.

The evaluation system plays a role of regulating the education cycle, since it determines the product of the system and manages and informs of changes in the curricular content and teaching methodology. It is required to have sufficient breadth and depth to be able to engage the student in evaluating their competency and knowledge of the curricular content. It is, therefore, usual for higher education programmes to base their training and teaching methods on the outcomes, contrary to the didactic method of basing the outcomes on curricular content.

Without a fair, just and outcome-based examination system[27], the validity and authenticity of an educational programme will remain questionable. In today's global environment, it is the examination system that provides worldwide standardisation to the products of medical schools.

Reforms in Evaluation in Medical Education:

The changes in the assessment techniques have been increasingly task and problem oriented. This applies to outcome-based assessment using Structured Answer Questions (SAQs), Multiple Choice Questions (MCQs) and Objective Structured Clinical Examination (OSCE), that test the higher order and reasoning skills of students.[28,29] This has directed students to problem and task-based learning strategies.

The University realised that a change in the medical education environment would only be lasting and effective if brought about through changing the examination system. UHS has restructured the system, from essay type examinations, subjective marking and other intensive tests, into objective type questions (MCQs & SAQs), an assessment key for marking, and concept-intensive examination. Excerpts from the visitors book are reproduced below:

"……very impressive system with excellent transparency arrangements. Congratulations."
(Prof. Stuart Montgomery, Imperial College, School of Medicine, London. December 09, 2003).

"……very impressed with the concept of setting state-of-the-art standards in medical education and evaluation. Outstanding evidence of an intelligent approach. Best wishes for your future, development and success."
(Prof. Charles Sorbie, Past President of International Society of Orthopedic Surgery and Traumatolgoy & Professor of Surgery, Queen's University, Kingshire, Canada. January 20, 2004).

"……we hope your dream has come true, as we see today on our visit such an impressive setup, a dire need for quality assurance in medical education."
(Dr. Meena Nathan Cherian, Medical Officer, WHO, Geneva, Switzerland. January 20, 2004).

"……very impressive and unique system which I wish to see in other countries of the Islamic World. Congratulations."
(Prof. Gamal I. Serour, Al-Azhar University, Cairo, Egypt. December 17, 2003).

A Brief Overview of the UHS Evaluation Process:

- The University of Health Sciences conducts 292 Undergraduate and Postgraduate Examinations per year for 19, 200 candidates.
- Undergraduate & Postgraduate examinations calendar approved by the respective Board of Studies is notified a year in advance.
- From the approved list, subject specialists are invited up to 6 months before the commencement of examinations to develop a bank of Multiple Choice Questions, Structured Answer Questions and Static

and interactive stations of Objective Structured Performance Evaluation (OSPE), and to review existing ones.

- The Question Bank together with a reference key (to be used for assessment when required) is developed centrally at UHS by senior subject specialists.
- The final paper is set using the UHS Question Bank and the International Database for Enhanced Assessment and Learning[30] in accordance with the syllabus and Tables of Specifications following Bloom's Taxonomy[31].
- Strict criteria, including attendance & continuous assessment results, are applied to eligibility to sit in all examinations.
- The final paper set has at least 90% problem-based, patient-oriented questions. For assessment of psychometric and affective domains, students' have a viva voce and clinical, competency-based, patient-oriented OSCE conducted by a team of senior subject specialists. In the case of MCQs, multiple coded copies of the same paper are produced, shuffling the sequence of questions and responses within to discourage the use of unfair means.
- All question papers are bar-coded and the students are required to enter their names, bar-code No. and shuffling code of the question paper for record keeping at the time of examinations.
- All examination-related material is sent to specially designed, secure, triplicate key lockers at over 20 centres throughout Punjab under secure transport, packed in specially designed waterproof and confidential envelopes.
- The question paper envelopes are opened only after the students have identified themselves using the UHS issued photo-identity cards, and have been seated in centres throughout Punjab.
- Specially trained supervisory staff at all centres add to the efficiency of the examination and prevent any use of unfair means.
- Used and unused examinations material, from throughout Punjab, is returned on the same day under secure transport to the Examinations Department of UHS in sealed bundles.
- All returned examination material is tallied with the list of bar-codes and ledger numbers of the material sent to examination centres to prevent use of unfair means and leakage from the Questions Bank.
- In each examination, a list of fictitious roll numbers is generated against the original roll numbers of candidates and the fictitious roll numbers are applied to all examination-related material of candidates. This confidential fictitious list is deposited in a secure locker of the Vice Chancellor of UHS, Lahore. Thus, the result of candidates is prepared under fictitious cover.
- Centralised assessment is undertaken using the standardised reference key for assessment.
- One assessor marks only one question of all candidates.
- A separate team of Subject Specialists randomly reviews the scripts assessed to ensure quality control and any discrepancies are rectified at this point.
- Multiple Choice Questions are assessed using an Optical Mark Reader (OMR).
- Questions in which 90% of the candidates have failed are culled from assessment.
- 10% of all MCQ response forms are checked manually for quality control.
- For any unfair means case registered, the decision of an Independent Disciplinary Committee is final.
- A comprehensive result is prepared entering the awards of all components and subcomponents of assessment including all SAQs, MCQs, all OSPE stations, *viva voce*, all clinical and practical stations and internal assessment in a custom-made software using fictitious students' numbers.
- The scripts of students failing by up to 3 marks are reviewed by a team of subject specialists for quality control prior to declaration of result.
- Duplicate result is prepared under fictitious cover at both Secrecy and Tabulation Sections and tallied (master checked) to ensure that there are no mistakes.
- The key of fictitious cover is retrieved from the locker of the Vice Chancellor and result declared within half an hour.
- Candidates may apply for rechecking of totalling of awards within 10 days after the date of result. (However, mistakes are extremely rare ~1:100,000)

CONCLUSIONS

Evaluation in all branches of higher education has long been taken as a means to an end. Success in higher education, especially medical education in Pakistan, is a ticket to a better future, nationally or abroad. However, many students study to get through the end-of-year examinations and not for the acquisition of knowledge and competency. Innovations in curricula and teaching methodologies introduced by the UHS in Punjab have reformed the medical education environment. Its focus on teacher-training, introduction of behavioural sciences as a compulsory subject and setting up an outcome-based evaluation process, has established a knowledge-acquisition medical education atmosphere.

The challenges in the future relate to sustainability through capacity-building and staying abreast with the Best Evidence Medical Education (BEME) practices worldwide, implementing them to fit our local needs and resources.

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