

The Future of Medical Education: The Second 100 Years

JEL Wong,¹MBBS, FRCP (Edin), FAMS

Abstract

This is a proud year for the medical profession in Singapore, as we celebrate 100 years of medical education. A centennial should force us to ponder whether we are producing a doctor that meets Singapore's future needs. A few of the issues that we face include how much time staff allocate to quality teaching; the continual loss of many of the best senior clinical staff in all the teaching hospitals; whether the medical profession should reconsider what, and how, it teaches given the pace of new knowledge; how we incorporate advances into standard practice; how we incorporate issues such as patient safety and effective communication into a curriculum already overcrowded with traditional topics; and how we subsidise the cost of medical education. We have undertaken a major revision of how we choose applicants, the content of the curriculum, how it is taught, the way it is assessed, and the means to recruit and retain role models in academic medicine.

Ann Acad Med Singapore 2005;34:166C-171C

Key words: Medical education, Singapore

Introduction

This is a proud year for the medical profession in Singapore, as we celebrate 100 years of medical education. As the oldest faculty in Singapore's first university, we are reminded that it was the Medical School which laid the foundation for tertiary education in Singapore. It is appropriate that we reflect on where we, as custodians of a noble heritage, should take the school.

This year, we honour the former graduates and staff, Heads of Departments, Deans, Provosts, and Vice-Chancellors who made Singapore's healthcare miracle possible. Without them, we would never have been able to offer the excellent level of medical care that all Singaporeans can avail themselves of, regardless of socioeconomic background.

Without them, we would not be able to offer living-related liver transplants, high-dose chemotherapy, early-stage clinical trials, drug-eluting coronary stents and intensity-modulated radiation therapy. We would never have dreamed of building a Biopolis with expertise in genomics, proteomics, stem cell therapy, tissue engineering, and molecular epidemiology.

A centennial should also force us to ponder whether we

are producing a doctor that meets Singapore's future needs. Are we prepared for the challenges facing us? Although science and technology have fuelled wondrous medical advances, have we produced a better doctor?

We are not alone in this self-examination. Calls for medical education reform have been commonplace since the 1910 Flexner Report in the United States, and it is sobering to note that there are striking similarities in nearly all the proposals to date.¹ Nearly all address the need to meet the public's interests, cope with burgeoning knowledge, foster generalism and decrease fragmentation, teach lifelong learning, use case methods or problem-based learning, decrease lectures, increase interdisciplinary teaching, ambulatory care, and social sciences (such as healthcare economics, ethics, behavioural science), stress preventive and community health, teach information handling techniques, and reward and improve teaching.

The most recent include the Association of American Medical Colleges (AAMC) position paper of July 2004 entitled "*Educating Doctors to Provide High Quality Medical Care: A Vision for Medical Education in the United States*"² and the General Medical Council of the United Kingdom's "*Tomorrow's Doctors: Recommen-*

¹ Dean, Faculty of Medicine

National University of Singapore, Singapore

Address for Correspondence: Professor John EL Wong, National University of Singapore, Faculty of Medicine, Blk MD11, 10 Medical Drive, Singapore 117597.

dations in Undergraduate Medical Education” of February 2003.³ I urge the entire medical profession, and all who are in any position of influence on the profession, to read and reflect on them.

Yet the Institute of Medicine’s report “*Crossing the Quality Chasm*” states that “*despite changes that have been made, the fundamental approach to medical education has not changed since 1910.*”⁴ This is sobering. How much have we, as a profession, applied ourselves to the issues at hand?

History

The history of the Medical School has been well chronicled, most recently in the book about to be published by the School in 2005 to commemorate the 100th anniversary of the School, and expanded earlier in this Journal.

Previous Deans include Drs GD Freer, Robert Donald Keith, GH MacAlister, GV Allen, Desmond William George Faris, and Professors Ernest Steven Monteiro, Thamboo John Danaraj, Kanagaratnam Shanmugaratnam, Lim Kok Ann, Wong Poi Kwong, Edward Tock Peng Chong, Lenny Tan Kheng Ann, Tan Chorh Chuan, and Lee Eng Hin. They were responsible for nurturing the generations of doctors that transformed Singapore’s healthcare standards from that of the Third World to the First World.

Major milestones in recent history include the moving of the School from the Sepoy Lines Campus (now the Singapore General Hospital) to the Kent Ridge Campus in 1980 following the Dainton Report. This recommended the consolidation of all Faculties into a single strong National University on the grounds of Kent Ridge. This move provoked significant angst from the medical community, as the Singapore General Hospital remains the largest teaching hospital in Singapore. However, this consolidation has allowed true multidisciplinary education and research to take root and flourish on a scale never seen before, which is essential if Singapore is to compete in a knowledge-based global economy.

Other milestones include the continuous revision of the medical curriculum, with the last major efforts starting in 1991, implemented in academic year AY1993/4, further revised in 1997, and implemented in AY1999/2000. It is perhaps indicative of the pace of change that we now consider another revision of the curriculum, from its content, and the way it is taught, to the way it is assessed.

The Ministry of Health has also formally contributed to medical education by paying hospitals substantially for every undergraduate and postgraduate they train. The significance of this contribution is that it speaks of the Government’s understanding that medical education is not the purview of the Ministry of Education alone, but also that of the Ministries of Health, and now Trade and

Industry, as the biomedical sector becomes an engine of the economy.

To place an even greater emphasis on producing the right type of graduate, a Medical Education Unit was mooted in 1997, and formally established in December 2001. This Unit is staffed with clinicians and scientists who have a special interest in this field. Several of them have undergone specialised training to equip them with the necessary credentials. The Unit advises the Dean’s Office in curriculum design, methods of instruction, and most importantly, reliable methods of assessment which have been validated.

Challenges and Issues in Medical Education

As we commence our second century of medical education in Singapore, let me reflect on some of the issues that we face.

1. The Importance of Teaching

This question may sound unusual to ask of a medical school, but given the competing demands of patient care and high-impact research, how much time can staff allocate to quality teaching? Teaching medicine well is time-consuming, involves small groups, and requires credible staff. It is difficult to overcome these problems given the demands on time and finite staff numbers.

Currently, the majority of the specialist staff in the National University Hospital (NUH) are academic staff from the University (in distinction to staff employed by the Hospital). They are expected to teach, do competitive research, as well as care for patients at a tertiary level. With a recent national survey conducted by the Ministry of Health concluding that the public sector is short of specialists, it is not hard to imagine how staff allocate priorities when juggling between patients, research, and teaching.

Practising doctors always put the patient first. This is something that must never change. As high-impact, highly cited publications are easy to quantify, promotion and tenure is currently heavily biased by these metrics. This often leaves teaching last in the three-way tug for time and resources. This situation is not unique to Singapore, but unless we come up with a solution, whole generations of future doctors and biomedical scientists are at risk of not being optimally taught.

2. The Need for Good Role Models

Good students need good mentors. This is especially so in medicine, which is acknowledged to be an art as much as a science. An art requires people with experience and wisdom to provide inspiration and perform as role models.

NUH has seen a continual loss of many of the best senior

clinical staff in all the teaching hospitals over the last decade. This shortage of senior staff in the clinical departments has become a critical issue in providing students with good role models.

3. *The Explosion of Knowledge*

Medical knowledge and advances continue at a breathless pace in shorter and shorter intervals. If one were to look at the number of new medical journals as an index of the amount of new information generated, the medical profession must reconsider what, and how, it teaches its members. How does one separate the gems from the chaff?

4. *The Failure of Effective Translation*

On the opposite side of the coin, how do we incorporate all these wonderful advances in medicine into standard practice? In the United States, McGlynn et al's⁵ landmark paper in 2003 showed that only half of Americans in major metropolitan areas receive appropriate healthcare. This is sobering in the country that leads the world in medical research and development. The same appears to be true in the United Kingdom, and almost certainly is the case in Singapore.

Despite clear evidence that pneumococcal and influenza vaccination is beneficial in people over the age 65, as well as patients with chronic illnesses, most eligible Singaporeans are unlikely to meet this recommendation. Despite clear evidence that glycosylated haemoglobin levels below 7.0% reduces the risk of complications in diabetics, most affected Singaporeans do not meet this recommendation. Despite clear evidence that smoking is a major cause of multiple cancers, as well as coronary artery disease, Singaporean smokers are seldom formally counselled to stop smoking during routine visits to their primary healthcare physician. Multiple reasons for this exist, but it is an issue that needs a coherent strategy as we pump even more funds into biomedical research.

5. *The Integration of Issues, such as Patient Safety and Effective Communication, Into the Medical Curriculum*

There are several issues affecting all medical specialties. These include patient safety, medical error, the inability to translate medical advances into routine practice, and effective doctor-patient communication. Such complex issues are not the domain of any single department, and require not only multidisciplinary champions but the creation of effective amounts of time in a curriculum which is already overcrowded with traditional topics.

6. *The Cost of Medical Education*

Attempting to get the true cost of medical education in any country is complex and, in the terms of the AAMC, "opaque". In Singapore, medical education is provided by

staff and in facilities of both the Ministries of Education and Health. It would be difficult to come up with optimal means of managing costs if these cannot be better understood and resolved. As Singapore's economy matures, and single-digit GDP growth becomes the norm, how much are we going to subsidise medical education? And from whose budget?

7. *The Shift from Acute to Chronic Care*

Chronic disease has replaced acute disease as most of our leading causes of mortality, hospitalisation, and presentation to primary care physicians. In the United States in 2004, chronic diseases will consume 78% of the sum spent on healthcare.⁶

Yet undergraduate medical education is still very much centered on acute admissions to the hospitals. We still regard the 5 general hospitals, the Kangar Kerbau Women and Children's Hospital, and the Institute of Mental Health, as the site for most clinical undergraduate education. Again, this is not unique to Singapore. Stanford University medical students receive most of their medical postings in hospitals, where the length of stay is becoming shorter due to the pressures of diagnosis related group (DRG) reimbursement. Ambulatory care exposure is 2 to 4 weeks.⁶ One could almost substitute Stanford for Singapore in this respect.

Strategy for the Next 100 Years

What is our strategy to meet the demands of the next 100 years of medical education? These can be outlined under how we choose applicants, the content of the curriculum, how it is taught, the way it is assessed and the creation of the second Medical School. Lastly, we address means to recruit and retain role models in academic medicine.

1. *Admissions*

More than 3000 people competed for 230 places to read medicine at NUS in 2004. Six hundred and fifty people were shortlisted for consideration based largely on their A-level results, their Co-curricular Activities, and their SAT scores if it helped them. Given the high demand, it is not surprising that there were a significant number of applicants with straight As, as well as perfect, or near perfect scores, on the SAT. Medicine in Singapore has the enviable reputation of still attracting more than what it can accept of the brightest students from schools in Singapore and the region.

Yet it is increasingly apparent that scholastic achievements are but one of several qualities required of a good doctor. Equally important are humanistic qualities, the ability to communicate well, a commitment to lifelong learning, and the ability to work as part of a team. It is also apparent that A-level scores, while fairly predictive of whether students

are able to successfully complete the medical course, are not predictive of their competence as doctors, nor of the ability to pass specialty exams.^{7,8}

Although the graduate entry medical school will select an older candidate, the bulk of Singapore's doctors will still come from the current programme at Kent Ridge for the foreseeable future. The Medical School has piloted several new initiatives to try and select people with the best chances of becoming good doctors.

These include working with the schools and increasing the number of interviews with specifically selected interviewers who are briefed and given a template to score on. Interviewers will not only consist of full-time academic staff, but also members of the top quartile of the public sector, the private sector as chosen by the Academy of Medicine, the College of Family Physicians, the Singapore Medical Association, the Military Medical Corps, and the nursing profession. We have introduced the writing of a 45-minute essay on a topic which is only revealed when the candidates are assembled. This will demonstrate their clarity of thought, legibility, and uniqueness while under time constraints in a "high-stakes" condition. A psychometric test was also introduced in 2004 but will not form part of the selection process until it has been validated.

2. Content

It is clear that there are 3 stages of instruction in a doctor's career, namely, medical school, specialty training, and continuing medical education at the level of the fully trained professional.

It is unrealistic and foolhardy for medical schools to aim for a fully trained and competent specialist upon graduation. The current MBBS course lasts 5 years, and this period should serve as a gestational period. The product should be someone equipped with the skills to function as a good intern, and have enough core knowledge to then pursue further training in fields such as primary care, hospital-based specialties, biomedical sciences, or medical administration.

What should a modern curriculum contain? The Accreditation Council for Graduate Medical Education (ACGME) has outlined 6 core competencies of a practising doctor.⁹ He/she should possess:

- the ability to provide compassionate, effective, and appropriate patient care,
- medical knowledge on established and evolving clinical, biomedical, and cognate science, and the application of this knowledge to patient care,
- the ability to carry out practice-based learning and improvement,
- effective interpersonal and communication skills,
- professionalism,

- an understanding that medicine is part of a systems-based practice.

All 6 areas are equally important.

To quote the Institute of Medicine's report: "Clinical education has not kept pace with or been responsive enough to shifting patient demographics and desires, changing health system expectations, evolving practice requirements and staffing arrangements, new information, a focus on improving quality, or new technologies."¹⁰

How we should go about restructuring our under- and postgraduate medical education in all 6 competencies is something we as healthcare leaders must tackle before they are forced upon us by external parties.¹¹

3. Process

How we teach students is critical. Problem-based learning was introduced in 1999, but much more needs to be done. The basic sciences are still largely taught in the first 2 years, and the clinical sciences, in the last 3 years. Students still struggle with the relevance of what they learn. Clinical teaching is still largely done in the inpatient setting, when the bulk of clinical practice as a doctor is in the ambulatory setting.

To tackle these issues, the Faculty is looking at teaching medicine based largely, but not exclusively, on themes. These will include the leading causes of mortality, hospitalisation, and conditions presenting to primary care physicians in Singapore. Each will be taught by a multidisciplinary team of scientists and doctors working together to ensure continuity of process and relevance.

For example, cancer and vascular diseases are very common problems in Singapore. Students will be taught at a defined level the molecular biology, pathophysiology, diagnosis, evaluation and management of these conditions in both the hospital and the ambulatory setting over the entire undergraduate period. Effective communication techniques involved in dealing with these conditions, as well as public health and societal issues, will be emphasised. Significantly increased exposure to longitudinal care is critical for students to understand how to manage chronic disease. We will look at assigning first-year students to patients with these conditions, and have the students provide follow-up all the way to graduation. Formal exposure to the hospices in Singapore is under consideration to enable students to gain a better understanding of end-of-life issues.

We are looking at further reducing the number of formal lectures. Lectures have been shown to correlate poorly with the ability to deliver quality care. Learning is best done when interactive and involving practice, reinforced at the bedside or in the clinic, and easily accessible. For this to be done well, we need many more experienced, dedicated, and committed staff.

4. Assessment

Attempts at educational reform will only be successful if we ensure that the assessment system reinforces what we aim to achieve. The system must be validated. At every level of medical school, and most importantly at graduation, the candidates must demonstrate that they have the 6 core competencies outlined by the ACGME.

Currently assessment is too heavily biased towards medical knowledge. There is not enough emphasis on being able to deliver appropriate patient care as defined by the ability to communicate effectively with patients; make informed, evidenced based decisions on diagnostic and therapeutic interventions; develop and carry out management plans, educate patients and their families; be able to competently perform all medical and invasive procedures required of a house officer; and use medical information technology to assist in the management and education of the patient and their families.

There are even fewer attempts at assessing professionalism, how graduates interact with the rest of the medical system, interpersonal skills, and being able to develop practice-based learning for lifelong improvement.

We have begun to address these issues.

Plans are well underway for the implementation of a compulsory Student Internship Programme in Internal Medicine, whereby 2 final-year students will be assigned the tasks of a house officer for 4 weeks. During this time, they will be full-time members of the team, with the expectations of clerking, formulating diagnoses, making investigations and management plans, performing procedures, as well as interacting with the patient's family, all under the close supervision of the entire ward team. Their assessment will be done by the ward Consultant, Registrar, Resident, and Nursing Officer. This programme will evaluate whether the student has acquired the necessary skills to be a competent house officer after passing the final MBBS examination.

We are also planning to test specific skills in the final year, such as how to break bad news, provide advanced cardiac life support, insert urinary catheters and intravenous cannulas, and perform venesection.

5. Recruitment and Retention of Staff

For all this to happen, we must recruit and retain sufficient motivated and trained clinical staff in the University and teaching hospitals. No amount of educational reform can get past the starting blocks without the right staff to implement, refine, and adapt the changes to best suit Singapore's needs. Although we have managed to stabilise and grow our basic science faculty, we have lost more senior clinical staff than we have been able to recruit over the last 15 years.

How do we plan to address this fundamental issue?

We have tabled 2 proposals for consideration to the leadership of the National University of Singapore (NUS) and the National University Hospital (NUH). Both of these proposals are standard practice in US medical schools [Personal communications – Nachman RLN (Weil College of Medicine of Cornell University); Holmes EW (School of Medicine, University of California, San Diego); Brennan TA (Brigham and Women's Physician Organization)].¹²

Currently, all clinical staff in NUS are expected to see patients, teach, and do competitive research. Given the complexities of medicine now, it is clear that it has become increasingly difficult to do all 3 well.

We are thus proposing a formal Track System, whereby clinical staff, in consultation with their Heads of Department, choose either to be on the clinician-scholar or clinician-scientist track. Both are required to see patients, teach, and do research, but the proportions involved are different.

Clinician Scholars spend the bulk of their time seeing patients and teaching students. They will be nationally and, in the case of Professors, internationally renowned for their clinical abilities. They will be required to do research, but this research will be of a more clinical nature, and often they act as collaborators.

On the other hand, Clinician Scientists see only a limited number of patients, usually those who are directly related to their line of research. The bulk of their time is spent as Principal Investigators who are expected to win competitive peer-reviewed grants. They are still required to teach, usually on key translational topics, to demonstrate the relevance of basic science to clinical care.

Clear metrics of quality will be implemented for both tracks to ensure equivalency for promotion, tenure, and compensation.

The second proposal is to allow clinical staff to participate in a physician-led academic practice plan. Details of this are still being worked out, but it will be largely similar to models used at both state universities, such as the University of California at San Diego, as well as private universities, such as the Massachusetts General Hospital and the Brigham and Women's Hospital of Harvard University. The purpose of this plan is to develop new streams of revenue required for the recruitment and retention of staff, to provide staff with incentives that drive quality and productivity, and to give staff a sense of ownership of their destiny.

6. The Second Medical School

As we enter the second century of medical education in Singapore, plans are well underway for the opening of the country's second medical school on the grounds of the Singapore General Hospital. Many of us in the profession have argued for a graduate entry school, based on the North

American model, as it preselects a more mature student. The second medical school will have its own Dean and administrative structure, and be autonomous from the current school at Kent Ridge. Both will be under the umbrella of the National University of Singapore, but as part of a multi-campus university. The final relationship between the 2 schools is still being discussed. Many of us hope that both will complement each other and lead to synergies, rather than competition. Medical education is far too expensive and important to have the 2 publicly funded schools compete for the limited human and financial resources in such a small country.

Conclusion

These are challenging times, but not more than what our predecessors faced in 1905 when starting the Medical School. Recognition of the issues allows a diagnosis and management plan to be formulated and implemented. This affirmation of how we should train ourselves is a hallmark of why we are a profession, and a most noble one at that. Our colleagues would be proud of us.

REFERENCES

1. Christakis NA. The similarities and frequency of proposals to reform US medical education. *JAMA* 1995;274:706-11.
2. Association of American Medical Colleges. *Educating Doctors to Provide High Quality Medical Care: A Vision for Medical Education in the United States*. Washington, DC: Association of American Medical Colleges, 2004.
3. General Medical Council. *Tomorrow's Doctors: Recommendations in Undergraduate Medical Education*. London: General Medical Council, 2003.
4. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academic Press, 2001.
5. McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, et al. The quality of health care delivered to adults in the United States. *N Engl J Med* 2003;348:2635-45.
6. Holman H. Chronic disease – the need for a new clinical education. *JAMA* 2004;292:1057-9.
7. Ferguson E, James D, Madeley L. Factors associated with success in medical school: systemic review of the literature. *BMJ* 2002;324:952-7.
8. Salvatori P. Reliability and validity of admissions tools used to select students for the health professions. *Health Sci Educ Theory Pract* 2001;6:159-75.
9. Available at <http://www.acgme.org/outcome/comp/compFull.aso>. (Accessed March 30, 2005).
10. Institute of Medicine. *Health Professions Education: A Bridge to Quality*. Washington, DC: National Academic Press, 2003.
11. Kligler B, Maizes V, Schachter S, Park CM, Gaudet T, Benn R, et al. Core competencies in integrative medicine for medical school curricula: A proposal. *Acad Med* 2004;79:521-31.
12. Longnecker DE, Henson DE, Wilczek K, Wray JL, Miller ED. Future directions for academic practice plans: thoughts on organization and management from Johns Hopkins University and the University of Pennsylvania. *Acad Med* 2003;78:1130-43.