



Transformation of the education of health professionals in China: progress and challenges

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In this Review we examine the progress and challenges of China's ambitious 1998 reform of the world's largest health professional educational system. The reforms merged training institutions into universities and greatly expanded enrolment of health professionals. Positive achievements include an increase in the number of graduates to address human resources shortages, acceleration of production of diploma nurses to correct skill-mix imbalance, and priority for general practitioner training, especially of rural primary care workers. These developments have been accompanied by concerns: rapid expansion of the number of students without commensurate faculty strengthening, worries about dilution effect on quality, outdated curricular content, and ethical professionalism challenged by narrow technical training and growing admissions of students who did not express medicine as their first career choice. In this Review we underscore the importance of rebalance of the roles of health sciences institutions and government in educational policies and implementation. The imperative for reform is shown by a looming crisis of violence against health workers hypothesised as a result of many factors including deficient educational preparation and harmful profit-driven clinical practices.

Introduction

China, as the world's most populous country, has a vast and complex system of health professional education. Insufficiently recognised are Chinese reforms that might be the world's most ambitious, largest, and fastest transformation of health professional education in contemporary times. In 1998, the Chinese Government announced a national policy to merge many of the free-standing health professional institutions into universities.^{1,2} This policy resulted in the shift of technical schools into large university systems, following the pattern of health professional education in the USA and other developed countries.

This latest round of changes builds on a century of reforms. In 1912, the Republic of China started a national system that was dramatically expanded and transformed in 1949 by the People's Republic of China. The model of health professional education adopted that of the former Soviet Union's, characterised by autonomous medical institutions under the Ministry of Health and focused exclusively on the training of health workers. These training institutions were disrupted during the cultural revolution of 1966–76, with some schools closing and others shifting to the briefer training of farmers as barefoot doctors.^{3–6} The opening of China to the global economy in 1978 enabled health professional institutions to ramp up the training of more highly skilled professionals.⁷

The education of professionals might be credited with some Chinese health successes. The mobilisation of basic health workers at the start of the People's Republic in the 1950s is one of the key factors accompanying the rapid acceleration of China's average life expectancy. The barefoot doctor movement in the 1960s and 1970s revolutionised thinking about health workers, especially for disadvantaged rural communities.^{5,8} This round of

reform in 1998 comes at a time of robust economic growth as China attempts to reform education and health to balance social development with economic development.⁷

In this Review we focus on the latest round of educational reforms. What actually happened to the mergers, especially health sciences integration into universities? How did the mergers affect the institutional and instructional design of education? What have been the positive and negative results? What are the challenges?

In addressing these questions, our Review adopts the framework proposed by *The Lancet* Commission on Education of Health Professionals for the 21st century.⁹ Referring back to the Flexner report of 1910, the Commission proposes that health professional education be examined via what is learned (instructional design) and also where learning takes place (institutional design).¹⁰ These two approaches provide a framework to show the dynamics of health professional education reform.

Search strategy and selection criteria

The Initiative reviewed official documents issued by the Ministry of Education (MOE), Ministry of Health (MOH [now the National Health and Family Planning Commission]), and other relevant ministries, published reports, and news reports from both international and domestic sources (in both English and Chinese). Also searched were PubMed, Google Scholar, Science Direct (Elsevier) Journal, Springer Link, China National Knowledge Infrastructure, and Wan Fang Data for articles published since 1998. The search was restricted to works published in English or Chinese and used the search terms "medical education", "human resources for health", "medical education reform", "clinical medicine", "public health", "nursing", "institutional design", "instructional design", "medical education institution", "enrollment", "pedagogy", "merger", "doctor-patient relationship", and "professionalism", combined with the term "China". We also searched the websites of international development agencies and Chinese Government agencies for related documents and statistics. The date of the last search was April 10, 2014.

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See [Online](#) for appendix

Data sources and search strategy

In this Review, health professional education refers to many health professions such as clinical medicine, nursing, public health, pharmacy, and allied professions, and the term health sciences institutions refers to an organised cluster of health professional schools. Under this practice, the term medical education refers only to the training of clinical physicians.

The overwhelming bulk of the statistical data for China comes from two previously unreleased datasets provided by China's Ministry of Education (MOE): number of health professional graduates by major degree and schools and number of faculty of health sciences by professional title and schools (unpublished). Major refers to disciplines (eg, medicine, nursing, and public health) and there are more detailed majors for masters and doctoral students, such as gynaecology, epidemiology, and health statistics. Each higher education institution submits yearly statistical forms to local education authorities and to the MOE. Only aggregate results of these forms are accessible to the public, mainly through the MOE website and statistical yearbooks. For this Review, we obtained the complete datasets from the MOE, which consist of all health professional education institutions and their students. The total number of students and faculties in both the aggregate statistics available to the public and the complete datasets are the same, which underscores the completeness and accuracy of the MOE datasets.

These Chinese data were supplemented by data for other countries from the Organisation for Economic Co-operation and Development (OECD), and various countries' Ministry of Health (MOH), MOE, medical council, or medical school association.^{11–16}

Many of the analyses for this Review come from the China Medical Education Reform and Innovation Initiative that was launched in Beijing in May, 2011. The Initiative, a Chinese national follow-up to the global Commission in *The Lancet*, brought together an informal expert group of 23 professional leaders from universities and research institutions across the breadth of China. The expert group met regularly to review health professional education, analyse challenges and difficulties, and formulate recommendations for reform.

The Initiative also commissioned nine background papers including several questionnaire surveys of institutions, graduates, and faculty. These studies will be reported elsewhere in a Chinese book. Data from one commissioned study (unpublished), "Effect of university merger on admission of medical undergraduates" by Hou and colleagues, studied the merger of institutions by examination of yearly data provided by the MOE on health sciences faculty mergers. The investigators also reported on a sample survey stratified by province and type of institution of full-time medical undergraduate students in 2011, which was done to obtain information about the effects of different admission patterns in universities.

Questions were grouped into six categories: background information, study, professionalism, assessment of medical education, financial status, and career preferences. The appendix provides English and Chinese versions of the questionnaire used. The questionnaire was pre-tested among students in Peking University Health Sciences Center; of 4103 student questionnaires distributed to sampled students, 3132 surveys completed by students who had not predetermined their career choices were tabulated for this Review. 67 questionnaires were incomplete and thus were not included in the analysis. Every questionnaire was double-entered with EpiData to guarantee accuracy. Nevertheless, the dataset will probably suffer from selection bias because private medical schools did not participate in the survey although they were sampled. Because public medical schools are dominant in China's health professional education, the effect of selection bias is not expected to be large. The questionnaire survey was part of a situation analysis of China's health professional education approved by the MOE.

Health workforce

China is by far the world's largest producer of health professionals, albeit China shares with other countries the common difficulties of shortages, maldistribution, and imbalanced skill mix. Table 1 shows China's basic indicators with annual production of health professionals and its human resources for health stock in comparison with selected countries.^{11–16} Although India has more medical schools than China (381 vs 268), China has a very large production of graduates (144 000 per year) in comparison with India's 49 000. The USA has half the number of medical schools and produces only 22 000 graduates every year. China's health professional education system is complex and consists of degree programmes lasting from 3 to 8 years. The explanation for China's great production system is its very large class sizes, averaging 548 graduates per school.

The health workforce in China has 1.9 doctors per 1000 population, which is better than India's 0.6 per 1000, but lower than the UK's at 2.8 and the USA's at 2.4 per 1000. Chinese nurses at 1.9 per 1000 are greater than India's 1.0, but only a fifth the density of nurses in the UK and USA. The resulting nurse-to-doctor ratio in China is very low, less than 1.0. The overall workforce density of doctors plus nurses in China is 3.5 per 1000, about a quarter of that of the UK and USA.

Data inconsistencies, such as very large cohorts of graduates without commensurate increases of workforce density, suggest production inefficiencies of the Chinese system. There would seem to be many graduates who do not move on to professional practice, accepting employment in non-medical roles such as jobs in industry or shifting to other occupations. These data suggest that efforts to train large numbers of graduates might not translate into effective workforce strengthening. Anand and colleagues¹⁷ showed that

| | Population (million) | GDP/head (current US\$) | Life expectancy at birth (years) | Medical school production | | | Health workforce | | | |
|--------------------|----------------------|-------------------------|----------------------------------|---------------------------|------------------------|----------------------------|----------------------------------|---|-----------------------|---|
| | | | | Number medical schools | Graduates/year (1000s) | Number of graduates/school | Physicians (per 1000 population) | Nurses and midwives (per 1000 population) | Nurse/physician ratio | Nurses and physicians (per 1000 population) |
| China | 1351 | 6091 | 75.0 | 268 | 144 | 548 | 1.9 | 1.9 | 1.0 | 3.5 |
| Brazil | 199 | 11340 | 73.3 | 186 | 17 | 91 | 1.8 | 6.4 | 3.6 | 8.2 |
| Russian Federation | 144 | 14037 | 70.0 | 46 | 52* | .. | 4.3 | 8.5 | 2 | 12.8 |
| India | 1237 | 1489 | 66.0 | 381 | 49 | 129 | 0.6 | 1 | 1.7 | 1.6 |
| UK | 63 | 30094 | 80.8 | 36 | 7 | 194 | 2.8 | 9.5 | 3.4 | 12.3 |
| USA | 314 | 51749 | 78.6 | 159 | 22 | 138 | 2.4 | 9.8 | 4.1 | 12.2 |

GDP=gross domestic product. *A total of 52 000 students graduated from 46 state medical schools and an unknown number of private schools.

Table 1: Medical education and health workforce in China and selected countries, 2012 (or closest available year)

between 2000 and 2005, the total number of medical graduates from all health educational institutions greatly exceeded increases in the stock of practising doctors, suggesting that many graduates were not entering into professional practice after graduation.

China's workforce also displays disparities between urban and rural areas and high variability in educational attainment. Doctor density in urban areas, which contains 52% of China's population, was more than twice that in rural areas, with nurse density showing more than three-times difference. Whereas 43% of urban doctors had college or higher educational degree in 2005, the comparable proportion in rural areas was only 13%. In 2005, 3% of nurses in urban areas had a college or higher education degree, and less than 1% of the nurses in rural areas hold such a degree.¹⁷ In both urban and rural areas, a large number of nurses only had secondary school or high-school education or less. China also has 1.2 million village doctors, who are not classified as health professionals, since few village doctors have more than high-school training. Many are former barefoot doctors and vocationally trained workers. There have been continuing efforts to strengthen these village-based health workers through continuing medical education.

This picture of human resources for health comes from a half-century of an established professional education system that has categorised health professionals into standard categories: doctors, nurses, public health practitioners, dentists, pharmacists, and allied professionals. Professional education after high school varies enormously both across and within these professions. Medical doctor training has variably taken 3–8 years, with the longest duration usually associated with more competitive schools. Nursing education is customarily diploma level, with brief training periods after high school and very few bachelors or postgraduate degrees. Public health education is mostly undergraduate education or 5 years after high school, unlike the postgraduate public health degrees of the USA. For the clinical professions, undergraduate classroom work is usually followed by clinical practicum at affiliated hospitals.

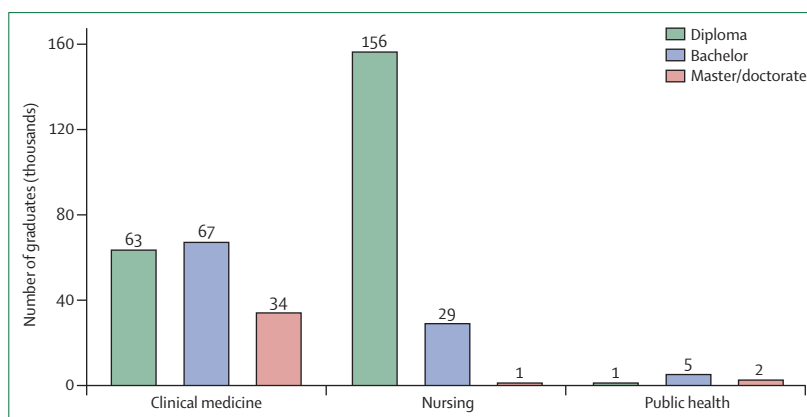


Figure 1: Number of graduates by degree programmes in 2012

Figure 1 shows the number of medical, nursing, and public health graduates by degree levels in 2012. China graduates 67 000 5-year bachelors medical students every year, which is the national standard that China seeks to achieve for all medical professionals. However, about an equal number of 63 000 graduates have only 3 years or less of medical training. About half of these graduates obtain additional higher masters or doctorate degrees. Although about 29 000 obtain nursing bachelor degrees, a robust 156 000 nursing graduates obtained diplomas mostly entailing brief training after high school. This substantial increase in nursing will help to correct low nurse-to-doctor ratios, but how these briefly educated graduates will translate into quality of care or improvement of health systems teamwork and delegation of functions is unknown. Public health has fewer graduates: only 5000 bachelor degrees in 2012. Many public health graduates secure jobs in Centers for Disease Control and Prevention (CDC) and governmental health inspection units.

Institutional design

Health professional training institutions in China are mostly government owned, with MOE policies guiding both institutional and instructional design. Government

| | Advantages | Disadvantages |
|---------------------|---|---|
| Centralised model | Enhanced potential for multidisciplinary research and education between health sciences and other disciplines Inculcate intellectual priority to professional training | Fragmenting coordination among education of different health professionals Reduces opportunity for interprofessional education Linkage of health science faculties to affiliated hospitals might affect coordination of undergraduate to clinical education |
| Decentralised model | Grouping of health science faculties enables development of interprofessional education Administrative and financial power of health science faculties improves coordination with affiliated hospitals | Limits opportunities for multidisciplinary research and education |

Table 2: Potential advantages of centralised and decentralised models

policies are comprehensive, ranging from degree-granting status to the specifics of curricular design. Although China's MOE has been committed to the design and supervision of the curriculum, there is an increase in movement towards decentralised autonomy for health professional schools to experiment with a new curriculum. Different levels of government (central, provincial, prefecture, and county) also have variable roles in ownership, operations, and financing. The political and bureaucratic context in China differs from private or public universities in many other countries, with China's system marked by strong government ownership and guidance.

The major reform of 1998 was aimed to increase the quality of all higher education in China, not only health professional education. To enhance academic quality and bring efficiency of scale, all health professional schools were encouraged to be integrated with universities. The integration might be viewed essentially as moving from the former Soviet model (independent medical training institutions with emphasis on empirical clinical training) to a developed country model (health professional education in universities and academic discipline based in the natural sciences). The early model that China adopted had medical training institutions providing technical training under the MOH. The developed country model that was introduced brought health professional education into comprehensive universities as one of the major faculties and under the MOE. The reforms were implemented mostly by administrative action with a powerful effect on institutional design and numerical expansion of graduates. Although there was interest in progressive educational improvement, the reforms did not revamp instructional design as much as the organisation of university management. Curricular reform has been a slow and steady continuing process, not sudden or dramatic like the administrative reform.

Starting from 1990, 98 health professional training institutions have been organisationally merged into 76 institutions.¹⁸ The university base for health professional school mergers has consisted of general universities, institutes or faculties of science and

technology, and other independent institutions. The number of mergers peaked at 20 in the year 2000.

Integration was greater among centrally controlled and funded health professional schools than in provincial or prefecture schools. Among clinical medical education programmes, the percentage of integrations into universities was estimated to be 72% for schools linked to the central government, 32% for schools linked to provincial governments, and 14% for schools linked to prefecture governments. Nearly all highly competitive national medical schools were merged into universities. Many provincial and low-level schools were not integrated. Many schools were left standing and some were consolidated by combination of several smaller schools.

One of the aims for mergers was to consolidate academic universities to become strong academic institutions. For example, several secondary schools might have been merged to form a medical college, or colleges were merged to form a university. After the merger to create a higher education institution, the schools can admit undergraduate and diploma students that they were not allowed to before. Thus, a faculty who taught diploma students in the past begins to teach undergraduate students. Whether or not they have the competency is of obvious concern. Furthermore, there might be insufficient expansion of educational resources for the revamped institutions to train more advanced students.

The integration of medical schools into universities changed their institutional design, which includes financing, affiliation, and management structure. No administrative model defining the relation between medical schools and the university has yet fully emerged; two basic models have predominated but there are many variants in between. The fully centralised model integrates all the different health science faculties into the university, with deans of medicine, nursing, public health, etc, individually reporting directly to the university president. The decentralised model brings the health sciences faculty under unified management, usually the medical school, within the university. An intermediate level of integration organises administration and financing somewhere in between the two extremes. There are also pseudo decentralised models in which the organisations might appear decentralised on paper but operationally are still centralised.

These administrative models might have had a substantial effect on the autonomy of medical schools in terms of student admission, staffing, teaching, scientific research, financing, and international cooperation (table 2). Universities that created health sciences centres keeping all health science faculties together, retain substantial administrative power. Education of the health professionals, including interprofessional education, can be pursued more effectively because of administrative cohesion of the several professional schools. By contrast, the centralised organisations might have more potential for multidisciplinary research and education between the

health sciences and other disciplines in the rest of the university. But the direct report of individual health science deans to the university presidents can fragment and disrupt coordination among interprofessional education of health professionals.

Equally important is the continuum of education from undergraduate studies to clinical training in affiliated hospitals. In many cases, university affiliated hospitals work smoothly with medical schools and graduates. In other cases, especially where a university hospital has been shifted to report to a non-medical university president, there might not be a smooth relationship between medical dean and hospital director, consequently affecting educational transition from classroom to clinical education.

Salient to these issues are the direction and volume of financial flows. The fiscal relationships vary enormously and have yet to settle into established patterns. Medical schools in universities depend overwhelmingly on public funding and only modest revenues from tuition. Service charges from hospitals represent a substantial source of income. Yet, health sciences schools usually reimburse hospitals for clinical teaching. The reimbursement might be as high as 75% of tuition revenues in some schools, although most teaching reimbursements are negotiated on a case-to-case basis.

Paralleling the organisational merger has been the numerical expansion of institutions (appendix). Between 1998 and 2012, the number of health sciences institutions has doubled. Traditional Chinese medicine institutions have had similar expansion. The expansion was particularly marked in the years immediately after the 1998 reforms, slowing down somewhat in the past few years. The expansion has been across the board of all educational programmes, although brief diploma training programmes might have had disproportionate expansion.

The differential expansion in the appendix shows the number of graduates for the three major professions. The expansion of training in modern medicine has witnessed a parallel expansion in traditional Chinese medical practice. All practices had growth, but nursing was most marked whereas public health was nearly stagnant. The overwhelming share of the nursing expansion was among diploma graduates, especially in the early years of the reform. The bachelors and master or doctorate nursing programmes have also shown substantial growth.

Figure 2 shows the consequent trends of students, faculty members, and faculty–student ratios from 1998 to 2012. In 2012, China had half a million health professional graduates from 590 institutions, with large cohorts of graduates coming from expansion. The professions show differential growth by years of training: increases in nursing (36%), clinical medicine (32%), pharmacy (18%), public health (2%), and allied professions (12%). A big difficulty is that faculty numbers (and also quality) might not have kept pace with numeric expansion of

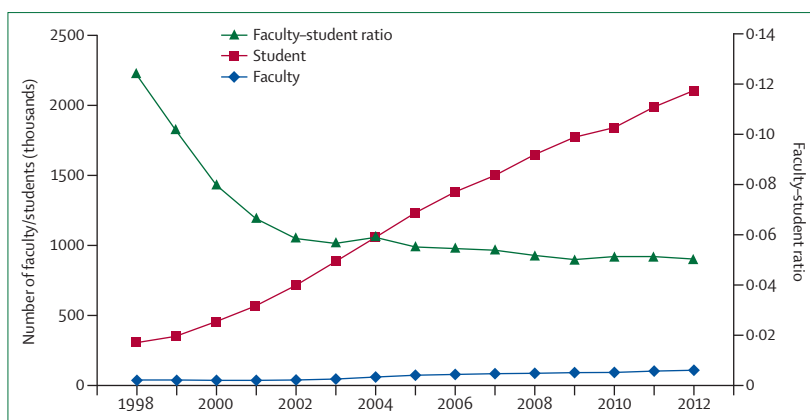


Figure 2: Number of student, faculty members, and faculty–student ratios, 1998–2012

students. Figure 2 shows that the collapse of the faculty–student ratio is very marked. Thus, along with qualitative organisational mergers came quantitative expansion in the 1998 reforms. The reform goal might have been to modernise education along the developed country model, but the infrastructure, public funding, and especially the faculty might not have kept up with the expansion of student enrolment.

Instructional design

The medical education reforms have affected instructional design, some directly and others through change of institutional structures. Three key questions are: who achieves admission to become a health professional? What are the pedagogic methods and curricular content of instruction? And what are some of China's priorities for reform of instructional content?

The reform has opened two different pathways for admission into health sciences professions in universities dependent on the admissions code. One perhaps unintended result of the reforms is that some medical students did not select medicine as their first career choice. Rather, test scores for entrance into universities might result in students being assigned to medicine who do not select being a doctor as their top choice.

Like many other countries, admissions into medical school are mostly based on national college entrance examination (CEE). An estimated 90% of students are admitted on the basis of CEE scores, and the more competitive Chinese universities admit students with the highest CEE scores. About 10% of admitted students have special attributes like minority quotas (eg, Xinjiang and Tibet). Medical student admission into universities can follow one of two pathways. A school might have a separate admission code to which students apply to join the health professions. A school might also have a university-wide admission code in which all faculties in a comprehensive university have the same code. The first group of medical schools with a separate code for admission is able to accept students who express first preference for entering the

medical profession. Medical students applying under uniform university code, however, might express preferences for five or six different subject majors. Many, if not most, do not achieve enrolment in their first preference. Rather, the university might assign students to various degree programmes on the basis of their CEE scores. In universities with a uniform code, 17% of medical students were assigned to medicine where clinical medicine was not ranked as their first choice of career. The survey of undergraduate medical students supports the hypothesis that medical students who rank medicine first in preference are more likely to express increased motivation towards health service careers, plan to stay in the profession, and do best in clinical work. Graduates of health professions who enter via uniform-code admission in comprehensive universities might not be similarly oriented, motivated, or do well in human services.¹⁸ Patients presumably would rather be cared for by a professional who has expressed preference for a health service career rather than a professional who expressed preferences for other occupations but were involuntarily assigned to health services.

Although the organisation of medical schools has been substantially revamped, and student enrolment has expanded, the pedagogic methods and curricular content seem to have changed very little. Faculty size has not kept pace with student numbers. Health faculties mostly exercise autonomy in education content design, but more encouragement and incentives could be provided for innovative reform of the curricula. For instance, curricular reform is not taken into account in assessment of executive performance. Education in the biomedical sciences moving to clinical practice overwhelmingly dominates the curriculum.

The curricular plan for most common 5-year programmes places heavy emphasis on basic biomedicine, medical technology, and clinical medicine.^{18,19} This focus is also prevalent in 3-year schools and in the more competitive 7–8-year degree programmes. Reports across China consistently show the very little student exposure to the humanities, social sciences, communication skills, ethics, and population or public health. Early patient exposure is also uncommon. The undergraduate curriculum provides a minuscule share of classroom hours to humanities, social sciences, ethics, public health, psychology, communication skills, and professionalism. The clinical education allots very little exposure time to social medicine. Moreover, almost all clinical training is done in hospitals, not based in community clinics or home-based care.

The reforms have yet to be translated into overhaul of the curriculum. Although there are some efforts to reform pedagogic methods, they are still rigid, static, and lag behind the innovations in many institutions. The curriculum is teacher-controlled and consists usually of didactic lectures requiring rote-memorisation. With student expansion, there have been efforts to retain

standard class sizes through expansion of the number of class groups. But restricted faculty numbers has meant that this effort to retain small class sizes has not been achievable in many cases. The sheer class size means that many innovative pedagogic methods are not possible. Class size and classrooms have limited application of problem-based learning (PBL), team-based learning, and case studies. There are limited faculty–student and student–student interactions for creativity and innovation.

The combination of admission of students who do not select clinical medicine as their top career choice and the narrow biomedical-clinical curriculum insufficiently enriched with broad education for development of ethical professionalism might be a cause or exacerbation of the growing difficulties in doctor–patient relations.

China has launched curricular and organisation strategy for rural coverage through new policies in both the education and health sectors. The China strategy deploys well recognised actions to produce primary service providers in rural areas. In the health sector this strategy includes more incentives and improved working conditions such as increased compensation, incentives for rural retention, positive family environment and children's schooling, and prospects for career development. In the education sector, rural coverage can be enhanced by rural school location, rural student recruitment, scholarship or bonding and compulsory rural service, and social recognition for rural service. An important element of educational reform is systematic and relevant exposure to rural health practice, both in the classrooms and in clinical practice.

The new Chinese policies aim to cultivate general practitioners (GPs), including the so-called “excellent doctor” programme. China has set a national target of 300 000 GPs by 2020. The primary goal is to train GPs with 5 years of medical education and a bachelors degree followed by 3 years of residency training. A lower educated variant of GPs is assistant GPs, with 3 years of medical education (diploma) followed by 2 years of residency training.^{20–23}

In 2010, China launched a rural doctors programme to staff township health centres. Upon admission into medical school, a student signs a contract to serve 6 years at the local township health centres. In return, the student obtains a scholarship with free tuition, room and board, plus living expenses.^{24,25} The student pledge is signed with three parties in agreement: student, medical school, and township to be served. Schools that have accepted these scholarships have begun to bring more rural clinical and community practice into their curricular offerings.

Progress and challenges

China's 1998 reform aims to revamp the largest health professional education system in the world. Some initial achievements have been positive: expansion of graduates to address shortages, special acceleration in production of nurses to correct skill-mix imbalances, and the priority

accorded to general practitioner training especially of primary care providers for rural China. Whether the reforms have improved the efficiency of graduates entering into professional health practice rather than other occupations is uncertain, and the mixed educational background of practising professionals might be assumed to be improving, albeit slowly. These developments have been accompanied by some concerns: rapid student expansion without commensurate faculty growth, worries about dilution effect on quality, outdated curricular content still narrowly focused on biomedicine and clinical practice, and a rise in entry of students who do not express medicine as their first career choice (table 3).

China's educational reform in 1998 preceded by a decade China's 2009 national health reform.²⁶ How well are the educational reforms serving the five pillars of health-care reform (insurance coverage, primary health care, prevention, essential drugs, and public hospitals)? Some educational reforms seem to be on the mark (ie, more nurses, GPs, and rural doctors); other needed reforms have yet to begin such as public health for non-communicable diseases, geriatrics and ageing, and management of disabilities. The tracking of institutional and instructional design will be important, especially the horizontal flow between science-based undergraduate education to clinical postgraduate education and the vertical integration between training for tertiary, secondary, and primary service provision.

The reforms are also rebalancing the roles of health sciences faculties and government. In this rebalancing, medical institutions would improve with more autonomy to navigate reforms. Institutional design is profoundly affected by institutional autonomy and agility in comprehensive universities for faculty strengthening, infrastructure development, and innovative financing.

Instructional reforms are urgently needed. Since 1998, there has been insufficient curriculum change and only marginal adjustments. Long-recognised deficiencies of curricular exposure to the humanities, social sciences,

medical ethics, communication skills, and population public health have not been addressed. Horizontal integration across the basic sciences to clinical medicine has struggled to adjust to the changing relation between health professional undergraduate education and clinical training, sometimes in affiliated hospitals that are no longer well coordinated. Insufficient attention has been paid to faculty development. Reforms need expertise in health professional education. Many universities around the world now offer masters programmes or advanced training in health professions education to support instructional reform. To ease instructional reform at institutional level, the government should provide health professional educational institutions with effective incentives instead of relying on their self-motivated good will.

The government should rely more on setting of standards, undertaking of accreditation, institution of assessment, and increase of public financing. Professional associations could play a great part in certification. The national policies announced in 2014 for postgraduate training of specialists are a step in the right direction. This policy needs the concurrence of seven relevant ministries. Finally, enhanced public financing is a key role of government. Augmentation of funding has gone to the more competitive schools often aimed at biomedical research, not basic or clinical education. Underfinanced schools have consequently driven up enrolment in search for tuition income, which has even resulted in proactive recruitment of foreign medical students, and might show revenue-seeking behaviour.

A worrisome sign of the urgency of deep reforms is the emerging crisis of violence against medical workers.²⁷ Data suggest a growing problem, but investigations into causes and solutions are still needed. In 2008, 48% of hospitals reported violent attacks against health-care workers.²⁸ In 2013, 70 000 medical disputes, many causing violence, were reported.²⁹ Medical disputes have increased by about 23% every year since 2002, and

| | Achievements | Problems | Suggested reforms |
|----------------------|---|---|---|
| Institutional design | Consolidation and integration of available academic resources Expansion of professional institutions and graduates to address national shortages Improve skill-mix imbalance through accelerated production of diploma nurses | Weakened autonomy of health sciences faculty affecting admission, financing, staffing, teaching, and research Insufficient faculty growth and strengthening diluting education quality Persisting mismatches in skill-mix produced by the educational system and health system needs | Greater academic autonomy for health education institutions to improve faculty and promote curricular reform Enhanced and more equitable public financing |
| Instructional design | Standardisation and improved quality of curriculum Establishment of general practitioners for primary care and scholarship and bonding for rural health services | Rote-memory driven pedagogy that is instructor-textbook centric Weak integration of humanities, social sciences, ethics, communication skills Narrow focus on biomedical knowledge and medical technology Admission of students who do not express medicine as first preference Crisis of violence against medical workers because of break down of physician-patient trust | Curricular reform to train full range of competencies of service provider Government should set standards, undertake accreditations, institute evaluation, and increase public financing |

Table 3: Achievements, problems, and suggested reforms of China's health professional education system

medical violence tripled in 8 years, from around 5000 incidents in 2002, to 17 243 in 2010.^{30–33} Concerns are so great that the ministries of health and public security have issued a joint declaration in 2012 to control medical disturbances, including recommendation of one security guard per 20 patient-beds.³⁴

Medical violence might be presumed to expose the breakdown of trust, a fault line between patient expectations and what doctors and the health-care system delivers. Hypotheses of health-care system conditions fuelling attacks are high costs of treatment paid out of pocket; absence of patient trust in profit-driven doctor ordering of tests and prescriptions of drugs; underpaid and overworked doctors with only brief time available for patients; poor communications between doctors and patients; and weak legal systems to process malpractice claims. Insufficiently integrated into the educational curriculum is an understanding of the complex social determinants of health and the inherent limitation of modern technology alone to tackle complex chronic non-communicable diseases that now account for 80% of the total burden of disease in China.³⁵

Hypotheses of weaknesses in the education of health professionals are also germane. The admission of students who did not select medicine as their first career choice is worrisome. China's curriculum is heavily focused on medical technology and hospitals, with little curricular content that would enhance humanistic care that is essential for establishment of rapport between doctors and their patients (eg, humanities, social sciences, communication skills, ethics, and population health). There might also be an absence of faculty mentors, clinical role models, or positive aspects of the so-called hidden curriculum.

Ultimately, no matter how well health professionals are educated technically, the system will not function unless health professionals develop ethical professionalism essential for gaining the trust of their patients and the public.

Contributors

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Declaration of interests

The authors declare no competing interests. H Lin serves as Assistant Minister of Education.

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