

Medical education in China for the 21st century

Tongqiang Gao,^{1,2} Kuminori Shiwaku,¹ Tetsuhito Fukushima,¹ Akio Isobe¹ & Yosuke Yamane¹

Drastic changes are occurring in medical education around the world. Medicine and medical technologies are developing rapidly and expanding beyond the multidisciplinary area. The needs of medical care and medical education are different even from those of several years ago. In order to cope with these increasing social needs, the innovation of medical education in China has become an urgent and important problem. This study is an attempt to answer the question of how to develop medical education in China for the 21st century, based on a historical review of the development of medical education. This development might be divided into three periods: (1) before the Cultural Revolution; (2) the Cultural Revolution (1966–76); and (3) post-Cultural Revolution (1977–present) in modern China, and based on problem analysis of the curriculum, teaching methods, education evaluation,

systems and policies and the balance between educational needs and supplies. We concentrate on the discussion of how to solve these problems, and have designed a new strategy for the further development of medical education in China. This discussion and newly developing strategy focuses on the main targets and priorities and adoption of suitable measures according to the conditions of the country. The purposes are to elevate the quality of medical education, to train qualified doctors to meet continuously increasing needs and to maintain the development of medical education for the 21st century in China.

Keywords China; curriculum; education medicine, *trends; health services, trends.

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Historical review of the development of medical education in modern china

The development of medical education in China has undergone a continuous process of reform, readjustment and the raising of standards over the past 48 years since the socialist revolution of the People's Republic of China.^{1,2} In general, there have been three developmental periods.³

Before the Cultural Revolution (1949–65)

This was a period of reorganization and development. During this stage, the government increased its efforts to control the medical schools and formulated a medical education system which consisted of a secondary-level training course carried out in the secondary medical schools (SMS) and an upper-level training course carried out in the medical universities (MU),

based upon the previous Soviet medical education model. The SMS enrolled graduates of secondary schools for a period of study of 3–4 years. The MU enrolled graduates of high schools for a period of study of 5–6 years. Meanwhile, five Traditional Chinese Medical Colleges (TCMC) were set up in 1956. For the purpose of producing physicians faster to meet the nation's needs, some reforms of medical education were carried out.

The Cultural Revolution (1966–76)

This was a devastating decade for medical education and for all social systems. All the medical schools ceased their routine instructive functions and admission of new students for 5 years (1966–70). When the medical schools reopened in 1970, entrance examinations were abolished, the curriculum was reduced to 3 years in all the MU and the quality of education had deteriorated seriously.

Post-Cultural Revolution (1977–present)

This was and remains a period of rehabilitation, readjustment and continuous development. Normal

¹Department of Environmental Medicine, Shimane Medical University, Japan, and ²Department of Medical Education, Health Bureau of Liaoning Province, China

Correspondence: Tongqiang Gao, Department of Environmental Medicine, Shimane Medical University, Enya-cho 89-1, Izumo 693, Japan

Table 1 Total enrolment and number of students admitted into medical and pharmaceutical schools in China, 1949–96

	1949	1957	1965	1975	1985	1990	1996
M(P)U	22	37	92	88	116	122	123
Admitted	0	9861	20 044	34 932	42 919	46 772	68 576
Total enrolment	15 234	49 107	82 861	86 336	157 388	201 789	262 665
TCMC	0	5	21	17	24	31	30
Total enrolment	0	1020	10 155	13 538	28 450	34 048	40 258
SM(P)S	0	182	298	480	515	563	550
Admitted	0	19 373	36 604	66 890	87 925	91 818	141 868
Total enrolment	15 387	81 079	88 972	139 113	220 963	306 405	432 216
Chinese population*	54 167	64 653	72 538	92 420	105 851	114 333	121 121

Source: Ministry of Public Health, China (1996). M(P)U: Medical and Pharmaceutical Universities including TCMC. TCMC: Traditional Chinese Medical Colleges. SM(P)S: Secondary Medical and Pharmaceutical Schools. Admitted: the number of admissions to the school every year. Total enrolment: total number of students in the school and the number of total enrolment of C(P)U, including that of TCMC total enrolment. *The unit is 10 000, and the number in 1996 the same as in 1995.

instruction and national admission examinations were resumed within the upper and secondary medical systems in 1977. Since then, postgraduate education, continuous education and compensatory education for undertrained health workers have been strengthened. Meanwhile, a multilevel, multichannel and multiform approach was adopted to develop medical education, and exchanges with medical education abroad is being extended continuously.

Reviewing the development of medical education over nearly half a century, progress was uneven, leaving many lessons to be learned: in particular the turmoil induced by the political movement of the Cultural Revolution and the lack of scientific evaluation of innovations in medical education.⁴ However, as a result, a modern medical system was formed (Table 1)

and the total number of graduates increased rapidly from 1950 to 1995, as shown in Fig. 1. In addition, more than 2 million ‘barefoot doctors’ (now known as ‘countryside doctors’) were trained and about half of them have passed an examination comparable to that required of graduates in the secondary medical school. All the graduates and countryside doctors have contributed greatly to the medical and health care delivery system in China, and have elevated the average life expectancy at birth from 35 years of age in 1949 to 70 years of age in 1996.

Present problems and challenges

Rapid changes are taking place in medicine and related sciences around the world. These changes, such as the explosion of science, an ageing population, change of disease patterns, the expanding gap between urban and rural areas, continuously increasing needs for medical and health care and advanced scientific technology including medical imaging, genetic enquiry, micro-electronic technology and computer science, make for new problems, huge challenges and developing opportunities in China.⁵ Whether or not the doctors of the future will be able to cope with these challenges depends on how well they adapt to changing circumstances and how well they are prepared during their undergraduate courses in medical schools. Therefore, these changes raise the level of urgency for both the government and medical schools to improve the quality of medical education, to train qualified people and to maintain the persistent development of medical education in order to adapt to a rapidly changing world. Thus, both the government and medical schools must find solutions for the following problems.

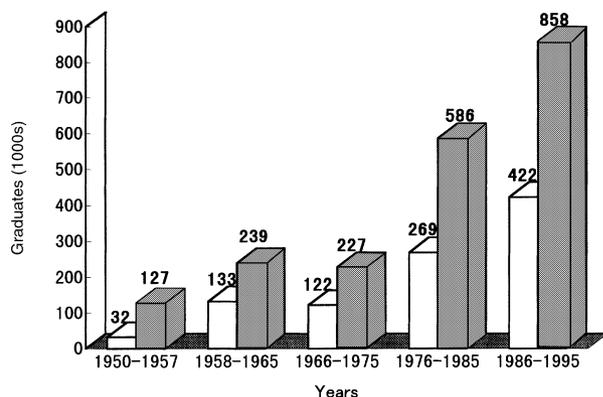


Figure 1 Number of graduates from 1950 to 1995 in the secondary medical schools (SMS) and medical universities (MU) of China. □, M(P)U; ■, SM(P)S.

Curriculum

The objective of the undergraduate curriculum was to train medical graduates who were well developed morally, intellectually and physically, possessing firm basic knowledge, strong working capabilities and good potential to advance further.⁶ To meet this objective, an urgent need for significant reforms of medical education, in particular the curriculum and instruction innovations such as community-orientated, problem-solving and student-centred education, were affirmed and acclaimed at the Tokyo Congress in 1986 by WHO (the Declaration of Tokyo 1986). Thereafter, a series of curriculum innovations were carried out globally.^{7,8} Such innovations were also carried out in some MU of China as pilot study projects but most medical schools, particularly the TCMC, were slower in coming to terms with this and still continued the traditional 'teacher-centred' curriculum, which is overcrowded and over-emphasizes didactic teaching methods and examinations, resulting in a passive approach by students and a lack of clear educational objectives and monitoring systems. The main reason for this reluctance is that such innovations had been conducted in China during previous political movements, and most of them were later abandoned.⁹ Thus, some leaders and researchers were not convinced of its value. Indeed, China had initiated integrated teaching and community-based education before and during the Cultural Revolution. That these reforms led to failure was due to political popularity and not based on careful scientific analysis. Thus, we should learn from the experiences of educational innovation models from overseas without initial rejection.

Evaluation

Quality evaluation, as a means of elevating the quality of medical education, was developed and popularized overseas. Although a series of reforms in medical education were made before the end of 1977 in China, most of them were discontinued due to the shortage of scientific evaluation. After the end of the Cultural Revolution, the first medical education research unit was established in China's Shanghai First Medical University in October, 1978. Following that, more research units were established in other medical schools, while at the same time a series of activities were developed to evaluate and promote the quality of medical education. Indeed, these activities had a positive influence on the quality of education. However, most of these activities lacked the support of leaders of the medical schools. Unlike knowledge evaluation, as-

essment of students' clinic techniques and attitudes lack criteria and methods. Apart from assessment of students and the curriculum, evaluation of the teachers and the conditions within the schools were imperfect. In addition, a national examination system for doctors or nurses has not been set in China.

Structure

In terms of undergraduate training, currently more than 30 specialities are available in the MU (including TCMC) in China. This is too sophisticated to meet the needs of graduates in adapting to changing circumstances, and too-early specialization would not benefit students in extending their knowledge field. Also, too many specialities available in one MU have not improved the conditions and qualities of the MU. The graduates from some specialities in the MU, such as Radiology, Nutrition and Mental Health Medicine, have been faced with difficulties in their attempts to find employment in recent years (this has also been the tendency in the TCMC). Regarding the tier-structure, the training of doctors was the main objective of the SMS and played a complementary role in medical and health care in the rural areas before 1980.¹⁰ However, coupled with the growth of the need for health and high-level doctors, those doctors who graduated from the SMS have encountered difficulty in meeting the demand and in gaining employment. Therefore, it is necessary to adjust the structures of the speciality and tier system in medical schools.

Distribution

The distribution of health manpower in China was unreasonable. The ratio of health professionals to population was 3.61:1000 in 1996, more in the urban areas (5.30:1000) and less in the rural areas (2.33:1000). The ratio of doctors was 1.23:1000 and, of them, 0.71:1000 were in rural areas, 1.93:1000 in urban areas. The ratio of nurses was 0.97:1000 and, of them, 0.50:1000 in rural areas, 1.60:1000 in urban areas.¹¹ The ratio of doctors and nurses in the urban areas was almost three times more than in the rural areas. Coupled with uneven development and an expanding gap between the city and countryside, most graduates of MU did not want to go to the rural areas to work and some medical professionals, especially the senior doctors who graduated from MU and had already worked in the countryside, returned to the cities. A lack of senior doctors has occurred, and some young people who were not systematically trained in medical schools have joined medical or health teams in the rural areas.

Developing strategies for facing the 21st century

Developing medical education in China must focus on the main targets and priorities and adopt suitable measures according to conditions in the country. The population of China is more than 1.2 billion; about 70% live in the rural areas. The GDP of China is less than \$600, much lower than those of developed countries.¹² These factors show that developing strategies of medical education in China may differ from those of other countries. We have proposed a new developing strategy of medical education in China for the 21st century, as shown in Fig. 2, which focuses the main targets on improving the education quality, solving the maldistribution of doctors and maintaining the continuous development of medical education. To achieve these goals, we must devise a system which is constantly updated in both the medical schools and administrative departments.

The priorities for the medical schools should be to elevate the quality of medical education. This main task should be emphasized not only among the leadership in policy-making but also among the teachers and staff in all medical schools and, along with the reforms of the curriculum and instruction, evaluation and management systems should be instigated more quickly and universally. There is no doubt that our schools will no longer be able to equip students with all the information they will need for a lifetime of practice. Rather, the

emphasis will shift to encouraging students to learn how to study in order to keep abreast of changing environments. This is the global trend in medical education.^{13,14} Therefore, the leadership and teachers of medical schools should raise the awareness of medical education reform and develop an active, community-orientated, student-centred and problem-based learning curriculum which is able to strengthen their self-learning ability according to the various characteristics of each school. Apart from ensuring that medical students obtain the necessary medical knowledge and skills, they should also learn other subjects such as analytical methods, management and ethics.¹⁵ Meanwhile, a special curriculum on training general practitioners for the rural areas should be considered in some MU,¹⁶ and the curriculum design of TCMC should be reformed to promote the competence of graduates, apart from keeping their character. In addition, information exchange with those abroad and the research abilities of teachers should be strengthened.

At the same time, priorities for the administrative departments of government should be to strengthen the management and evaluation of medical education. Government has to increase its investment in improving the conditions of schools, particularly in the libraries and laboratories, and change management methods from strict micro-management to macro-management. Their main responsibilities are to evaluate, supervise and control the quality of medical education and the

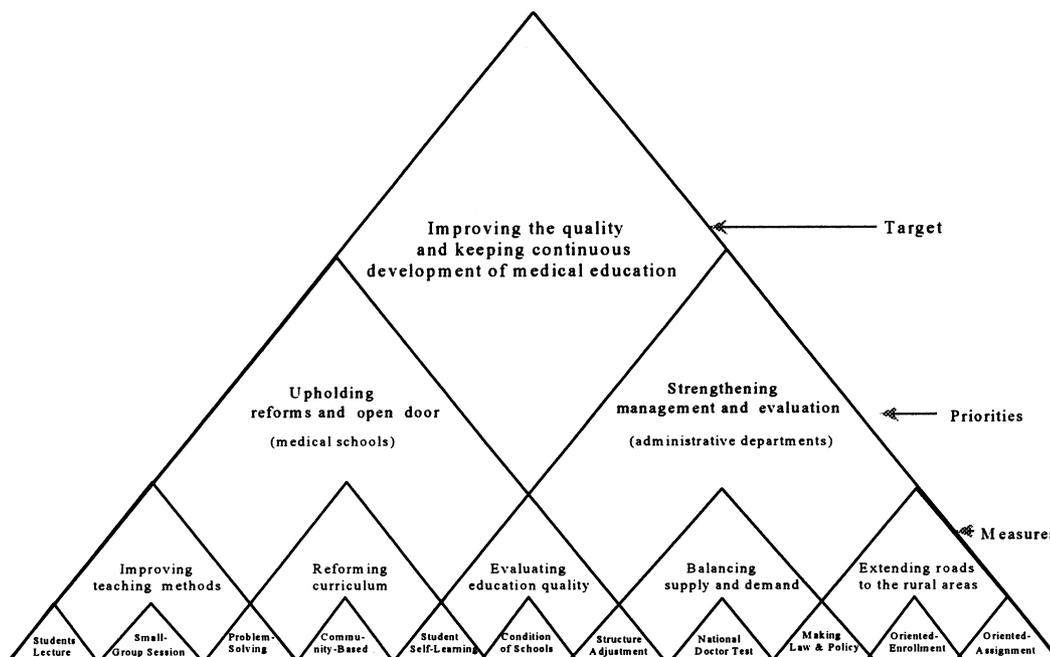


Figure 2 Developing strategies of medical education in China for the 21st century.

conditions in schools, balance supply and demand and make laws and policies to maintain the continuous development of medical education.

Both local governments and medical schools should strengthen co-operation in setting up scientific assessment criteria and methods for controlling the quality of medical education, and emphasize the following measures.

Balance of supply and demand

Accompanying the development of medical education, the total number of health personnel has increased to 5419 002 in 1996 (Fig. 3). This number does not include countryside doctors, whose total number was 1649 882. The ratio of doctors to population has risen to 1.62:1000. If the expected number of doctors graduate from the SMS the ratio will be 1.23:1000, which will exceed the ratio of 1:1000, the strategic development target by 2000 made by the Ministry of Health in China at the end of the 1980s.² Nevertheless, the distribution of medical manpower is unbalanced, being greater in the urban areas and less in the rural areas, as mentioned above. If we do not adopt adequate measures there will be both an excessive number of doctors in the city and a lack of doctors in the countryside in the next century. Thus, it is necessary to devise a plan for developing medical education which should balance supply and demand and co-ordinate the development of medical education with the development of economic and health services.¹⁷ Therefore, adjustments should be considered to reduce and combine some specialities such as Otorhinolaryngology, Environ-

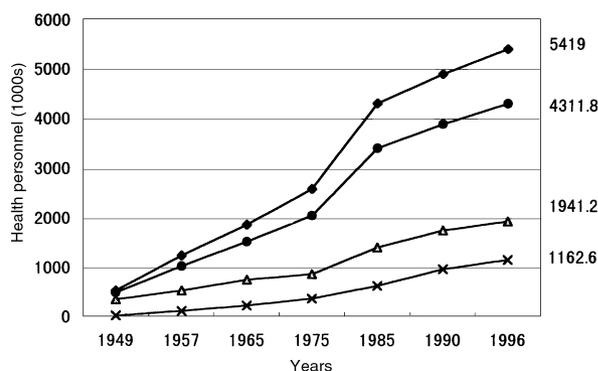


Figure 3 Development of health personnel from 1949 to 1996 in China. ◆, THP: total health personnel including health administrative personnel, logistic personnel and other technicians (some engineers and technicians work in the health and medical institutions) besides health professionals. ●, HP: health professionals including pharmacists, clinical laboratory technicians and midwives, etc. besides doctors and nurses. △ doctors; ×, nurses.

mental Medicine, Nutrition and Mental Health Medicine, etc. Training doctors in the SMS should cease by 2000, and the training should move from SMS to enrolled high school graduates in MU. In addition, students should be trained for 3 or 4 years as general practitioners to engage in medical work in the rural areas after graduation. The main task for SMS should be to move towards the training of nurses, midwives and medical technicians. The development of TCMC will move from quantity to quality, and focus on strengthening the competence of its graduates. Meanwhile, extending the road to the rural areas for graduates and medical workers and avoiding placing untrained young people into medical or health teams should be emphasized.

Extending the road to the rural areas

Currently, nearly 70% of China's population lives in the rural areas. Therefore, the distribution of medical manpower is unbalanced. The number of doctors in the rural areas is much lower than those in the urban areas, and the medical backbone in the rural areas comes almost entirely from SMS. Because of the existing gap between the urban and rural areas few graduates of MU went to the rural areas, and some students who have already worked in the countryside returned to the city after working for a number of years in the rural areas. Thus, the method of orientated enrolment, orientated training and orientated assignment should be continued and developed further in the MU. The training emphasis for doctors who work in the rural areas should be placed on training general practitioners in the MU, and strengthening community-orientated training to meet the needs of primary health care. Also, the part-time countryside doctors should be trained and helped to attain the level of graduates from SMS. In addition, it is important to stabilize medical workers who have been working in the countryside and to encourage graduates and medical workers to go to the countryside to work.

Strengthening legislation

To control the quality of medical education and train qualified people are the main responsibilities and tasks for both the government and medical schools. Many countries have established laws and regulations for qualifying as doctors, nurses or specialists and have developed national examination systems for graduates of MU. It is beneficial to guarantee the level of doctors and nurses and to raise the quality of medical education, but these laws have not yet been established in China. It is necessary to set up the laws and the national

examination system for doctors, nurses or specialists based on China's concrete situation. Meanwhile, we should establish laws or policies to encourage graduate students and medical workers to go to the rural areas, and stabilize those medical workers who have been working in the countryside. Also, strict laws or rules to avoid placing untrained young people into medical or health teams, and to control the conditions of schools and the opening of new medical schools, should be established.¹⁸

Strengthening co-operation

Co-ordination and co-operation between the various departments (such as Education, Health, Finance and Labour as well as the Medical Schools, Communities and Associations) will be important for improving the quality of education and the conditions of the schools. To strengthen co-operation between various departments, the establishment of an information network is critically important. Information exchange on medical education should be emphasized; meanwhile, the open-door policy must be upheld, and co-operation and exchange of information, technology and system engineering with those abroad should be extended.¹⁹ These would be beneficial for China's medical schools to evaluate the quality of education, improve instructional methods and promote the development of medical education.²⁰

Conclusion

A modern medical education system has been established in China over the past half-century in spite of the fact that its development was uneven. The lessons of political impact, turmoil and lack of scientific evaluation in medical education should be learned and avoided in the future. For the development of China's medical education in the 21st century the emphasis should be on strengthening and elevating the quality of medical education, as well as balancing supply and demand. Therefore, it is necessary to carry out further reforms to the curriculum, instructional methods, structure, extend the road to the rural areas for graduates and medical workers and co-ordinate the development of medical education with the development of economic and health services in order to maintain the continuous development of medical education in China.

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