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Medical education in China's leading medical schools

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SUMMARY *This article gives a general overview of the evolution and present state of the undergraduate medical education system, programs, evaluation methods and conferred degrees in contemporary China. The publication is based on the information collected from on-site visits to the eight (8) leading medical universities, medical education conferences, visits to Ministries of Health and Education and their staff, and the contribution of Chinese medical education experts. As the Ministry of Education of the People's Republic of China (PRC) approves all tracks and strives for uniformity of educational programs as a cornerstone of quality, this overview reflects the general content of all five- and seven-year medical education programs that have provided the great majority of physicians since the founding of the People's Republic of China.*

Introduction

The purpose of this article is to provide a general overview of medical education in contemporary China based on the information collected from on-site visits to the eight leading medical universities conducted in 2001–02. In addition, it reflects the views of one author (Tongfu Zhou) who has spent his professional life in medical education in the People's Republic of China (PRC). As the Ministry of Education of the PRC approves all tracks and strives for uniformity of educational programs as a cornerstone of quality, this overview reflects in broad strokes the content of all five- and seven-year programs of medical education in China. These two post-high school tracks have been providing the great majority of physicians since the founding of the 'New China' in 1951.

History of medical education in China

The cornerstone of Western science-based medical education in China has been largely based on the models laid down at the beginning of the twentieth century. Among the earliest attempts to create a Western science-based medical education program in China was Peking Union Medical College (PUMC) founded by the Rockefeller Foundation in 1917. From 1917 to 1928, PUMC was managed by the Rockefeller Foundation and the majority of the faculty were 'occidentals' or Caucasians, most of whom were American. In 1928, the medical education effort of the Rockefeller Foundation was split from the other interests of the Foundation, and set up as the China Medical Board (CMB). From 1928 to 1951, the sole activity of CMB was the operation of PUMC and its attached hospital (PUMCH).

In 1951, the new government of China confiscated PUMC's and PUMCH's building and dismissed the CMB. It was not until 1980, at the request of the post-Cultural Revolution government, that CMB returned to work in China. CMB now supports 13 medical education institutions in the People's Republic of China.

Since the establishment of the People's Republic of China in 1949, the evolution of medical education has been somewhat turbulent and uneven. In the beginning (1949–65), the effort of the Chinese government was focused on the establishment of an education system for health personnel conducive to the country's needs. To a very large extent, the system was based on the former Soviet Union's model of education in which the medical schools were set up as separate 'universities'. Some of these were directly supervised by the Ministry of Health, while others were under the authority of the Ministry of Education.

During the past five years, the education system in China has undergone profound changes that reflect the political and economic reforms which have made the system of medical education complicated. Broadly speaking, the system consists of two levels: the high-school level of vocational training and the university level of medical education of physicians.

Vocational medical training has been carried out in Secondary Medical Schools (SMSs). The main objective of these three-year programs (post-high school) has been to produce medical personnel for rural areas. However, owing to the increased number of graduates from university-level medical education tracks and the increasing societal demand for better-trained physicians, these programs have largely ceased to exist.

The medical education of physicians is carried out in the medical universities/medical colleges which enroll graduates of high schools and reflect one of two kinds of programs: a certificate-oriented three-year program, and degree-oriented five- and seven-year programs. In two schools, an eight-year program is offered.

In 1956, China also established five Traditional Chinese Medical Colleges (TCMCs). The number of TCMCs has increased over the years and their purpose is to train health-care personnel in traditional Chinese medicine (TCM). The length of study parallels that of their Western science-based counterparts, i.e. five to seven years.

During the Cultural Revolution (1966–76), all medical schools were closed and the faculties were in large part assigned to menial roles in the countryside. When the medical schools reopened in the mid-1970s, entrance examinations

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were abolished and the curriculum was reduced to three years for all medical universities. This resulted in widespread deterioration in the quality of education as compared with the quality in the pre-revolutionary period.

The Post-Cultural Revolution period has been characterized by efforts to rebuild the medical education system and to improve its quality. In 1977, national admission examinations were resumed and postgraduate education or residency training, continuing education and compensatory education or remedial education for poorly trained health workers were initiated. In addition, more than two million 'barefoot doctors' (now known as 'countryside doctors') were trained to 'practice medicine' in the rural areas where most of the 56 minority groups in China and 70% of the population are located.

In principle, medical institutions appear to be governed according to the usual Western academic structure (Presidents, Deans, Department Chairs, etc.). However, in the PRC, there are party officials appointed at each level of the university (e.g. school, faculty, departments) and this faction holds more power for decision making than do the academic administrators. However, in the past two decades, it has been decided that in all higher educational institutions the administrative responsibility lies with the Presidents, who have to act under the leadership of the Communist Party Committees headed by the Party Secretaries. This makes for a rather complex decision-making mechanism, which in many instances may create significantly different opinions.

Until 1999, medical schools were free-standing medical universities or medical colleges (e.g. Beijing Medical University, Shanghai Medical University and Ningxia Medical College). Eleven of these institutions operated under the Ministry of Health. The remaining medical institutions reported directly to the Ministry of Education or indirectly to this Ministry via provincial or autonomous regions' education departments.

The cities of Beijing, Shanghai, Chongquing, and Tianjin are equivalent to provinces and autonomous regions and are under the direct jurisdiction of the Central Government in Beijing. The autonomous regions such as Tibet Autonomous Region or Inner Mongolia Autonomous Region are areas where minority nationalities often prevail and, hence, they enjoy more privileges in terms of administration and fiscal policies. All of these special 'units' have medical universities, a medical school or medical colleges.

In the 1960s, the State Council proposed to undertake a major program of educational reform, which began with the designation of fewer than 100 institutions as 'key universities'. Generally, these key universities had longer histories, stronger faculty and larger research programs than did non-key universities. Special central government support became available to these special institutions.

In the 1990s, the Ministry of Education established the 211 Project: '21' referred to the twenty-first century and '1' stood for the 100 universities that have been designated for special roles and special support from the Ministry of Education. In practice, the '211 Universities' became the 'key universities'.

In 1999, the reform process was accelerated by the introduction of dramatic structural changes to the universities. This involved merging medical universities with non-medical universities to create 'comprehensive universities'. The comprehensive universities are to create increased interdisciplinary research and educational programs, especially in those areas where scientific breakthroughs can be commercialized (e.g. informatics and life sciences). This has also helped to concentrate governmental investment in a few institutions with the hope of building 'world-class universities'. The current thinking is that in such world-class settings interdisciplinary education will flourish and the emergence of new ideas will be maximized. It is further hoped that the strengths of the different schools will complement each other and that the educational resources will be better utilized. All of this will result in continued growth of the country's economy through advances in science and technology. All of the newly merged universities, including 10 of the 11 institutions which previously reported to the Ministry of Health, now report directly to the Ministry of Education. The single exception is Peking Union Medical College (PUMC) which continues to report to the Ministry of Health.[1]

These mergers, especially those involving China's leading schools, have created universities that are increasingly similar to major universities of the West and especially those in the United States of America. As such, they replace the Russian model, which has been followed for 50 years.

'Mergers' however, have disadvantages. Among them are uneasiness among the staff and students in these newly merged universities, ineffective administrative structures, improper distribution of authority in view of the diversity of faculties, overstaffed faculties and administrations, improper reallocation of budgets, loss of name identity, loss of autonomy and inadequate understanding of the traditions of various disciplines. While adjustments to correct these problems will take time, there is a general belief among leaders of the universities that the gains from the mergers will exceed the deficiencies.

Challenges for reform of medical education

Not surprisingly, medical education in China has been deeply influenced by both Western medical education systems and by the former Soviet Union's system. Merging the experiences of these two systems and adding China's uniqueness, which is based on historical and cultural specifics, has made for an exciting model of education.

Although most medical schools continued the traditional 'teacher-centered' curriculum, in the past two decades a series of curriculum innovations have been carried out in some medical universities. Many Chinese educators believe the programs are overburdened with lecture sessions and an overemphasis on didactic teaching and examinations. This, they claim, has resulted in a passive approach to learning by students. In addition, they add that there is a lack of clearly stated educational objectives and poorly developed monitoring and assessment systems. Most innovative attempts to correct some of these problems have failed to be adopted on a broad basis.

The present challenge for both the government and the medical schools is to improve the quality of medical education and to train qualified people who can both adapt to a rapidly changing world and simultaneously meet the needs of the Chinese people. Therefore, some medical schools have recently modified their medical curriculum by incorporating integrated courses, small-group tutorials, courses

in humanities, ethics, society, the doctor–patient relationship, problem-solving skills, lifelong learning, and enhanced informatics including computer sciences and English language.

In addition, the Ministry of Education has sought input from experts outside the country to help reach its goal of improving the quality of educational experiences and enhancing the academic and professional excellence of China's educational institutions. Changes in medical education are also promoted by a growing critique of the medical profession from a societal perspective. The recent development of national licensure regulations for physicians is one example of the desire to improve the standards of medical education.

Medical education system in China

Selection procedures

The education system in China is divided into Primary School (six years' duration, beginning at age six), Junior Middle School (three years) and Senior Middle School (three years). Senior middle school graduates are equivalent to Western high school graduates. Senior middle school graduates who wish to become doctors are required to complete an application in which the schools and specialties they favor are prioritized. Applicants come primarily from senior middle school graduates who have majored in science while in senior middle school.

In June of each year, a National College Entrance Examination (NCEE) is taken by nearly all applicants for university study. It covers five subjects including mathematics, physics, chemistry, the Chinese language (Mandarin) and literature (English). A standardized marking system with a maximum score of 150 per subject area or a total score of 750 is used to assess an applicant's performance. Students are allowed to repeat the exam in the following year(s) if their score is lower than they desire.

The selection process for admission to medical school is usually conducted in two steps. First, the Ministry of Education assigns a number of positions for each first class. The university then selects among the applicants who have listed the school as their top preference. This selection is largely based on NCEE scores. Second, if places still exist after the first step, the applicants who have chosen the school as their second or third preference are considered. The best or so-called 'key' universities have priority in the selection of students and admit candidates with higher scores than the scores of the non-key universities. After the key universities have completed their selections, the remaining colleges and universities make their selections.

The leading medical schools are open to candidates from all over China, being the so-called 'nationwide student recruit institutions'. Others admit candidates only from their regions (province and neighboring provinces) as determined by the Ministry of Education.

The applicants for the seven-year program must have a higher score than those applying for the five-year program and they have to meet certain additional criteria, e.g. Sichuan University requests that the English language scores must be higher for seven-year students than for five-year students. Applicants' written evaluations from their high schools are also carefully reviewed as they serve as 'letters of recommendation'. In some schools, faculty members conduct interviews with candidates during which they check, among other things, the applicant's linguistic and intellectual abilities. Finally, a school dean's office or the students' affairs office provides written notification to the successful applicant. This serves as the official statement of registration to medical school.

There are some exceptions regarding the process of student admissions described above. Each year, a university may receive from the Provincial Committee of Education as many as 20 'recommended candidates' who come from designated high schools. These individuals do not take the national admission test because their performance in high school has been so outstanding that they have emerged as the top students in both academic and behavioral performance. As such, these students bypass the usual admissions process and are admitted without further evaluation. Second, in an unusual instance, the educational institution may enter into a contract with large enterprises (e.g. a petroleum company) that have difficulties in getting and retaining physicians to care for their employees. Candidates to fill these positions can be accepted with lower NCEE scores than the rest of the class, provided they agree to work with the company after graduation.

Length of education programs

In China, the medical school training period normally lasts five or seven years. There are two exceptions. First, there are medical colleges that present three years of training resulting in a 'Certificate of Study'. Most graduates from these colleges are expected to practice in rural areas. Second, a small but growing number of universities are attempting to duplicate the eight-year curriculum following the model pioneered by Peking Union Medical College. This eight-year track is designed to produce future biomedical scientists for China.

After completing basic education, the majority of graduates are expected to go directly into medical practice. While residency or postgraduate programs exist, they are not yet well developed. However, a rapid change of attitudes towards the development of postgraduate residency programs is being urged by the Ministry of Health, especially in those medical schools who want to achieve international recognition.

As a result of the expectation placed on them, leading medical schools may present 10 main educational tracks for the health sciences professionals.

They are as follows:

(1) Eight-year training program in clinical medicine leading to a Doctor of Medicine degree;
(2) Seven-year training program in clinical medicine leading to a Master of Medicine degree;
(3) Five-year training program in clinical medicine leading to a Bachelor of Medicine degree;
(4) Five-year training program in preventive medicine leading to a Bachelor's degree;
(5) Five-year training program in medical nutrition leading to a Bachelor's degree;
(6) Five-year training program in Stomatology (Dentistry) leading to a Bachelor's degree;
(7) Five-year training program in Forensic Medicine leading to a Bachelor's degree;

(8) Five-year training program in Radiological Medicine leading to a Bachelor's degree;
(9) Five-year training program in Anesthesiology leading to a Bachelor's degree;
(10) Three-year training program leading to a Certificate of Study.

In addition to these 10 tracks, schools of medicine may offer 'adult education tracks'. These tracks are of variable length and are designed to upgrade the knowledge and skills of existing providers who were educated at an earlier time. Often, these programs enroll large numbers of 'students', as achieving higher education levels can result in increased job options and higher income.

Outline of the medical education program

The national objective for medical education is to produce medical professionals with the appropriate understanding of basic and clinical medicine. They are also expected to be competent in disease prevention and medical practice, as well as also being able to undertake some degree of medical research.

A typical seven-year medical curriculum has five sections as follows:

- *Part I—General Education:* This phase contains 1135 hours of instruction, constitutes 26.7% of total teaching hours and contains courses in mathematics, chemistry (inorganic and organic), social and political sciences, biology, computer application, physical and military training and English.
- *Part II—Basic Medical Education:* This phase contains 1383 hours of instruction, constitutes 31.2% of total teaching hours and contains courses in anatomy, histology and embryology, physiology, biochemistry, medical genetics, cell biology, immunology, medical microbiology and parasitology, pathophysiology, pharmacology, pathology, preventive medicine, medical psychology, health law, sanitary law and introduction to clinical medicine.
- *Part III—Clinical Medical Education:* This phase contains 1537 hours of instruction, constitutes 36.2% of total teaching hours and contains courses in physical diagnostics, experimental diagnostics, imaging diagnostics, general concepts of surgery, internal medicine, surgery, gynecology & obstetrics, pediatrics, Traditional Chinese Medicine (TCM), psychiatry, neurology, ophthalmology, otolaryngology, dermatology, clinical pharmacology, stomatology, rehabilitation and medical ethics.
- *Part IV—Elective Courses:* This phase contains 252 hours of instruction which constitutes 5.9% of total teaching hours. It is divided into elective courses in basic sciences (189 hours) and electives in clinical education (63 hours). Included are the following:
  - *Early Elective Courses* include four groups consisting of 44 individual courses. A student must select at least one course from each group so as to obtain five credits during the first three years. Examples of these courses are Applied Document Writing, History of Medicine, Classical Literature Appreciation, Medical Thesis Writing, Political Economy and World International Relations, Social Psychology, Behavioral Sciences, Health Economics, Basics of Health Management, the Science of Public Relations and Basic Music Appreciation.
  - *Later Stage Elective Courses* contain courses such as gerontology, modern oncology, rehabilitation medicine, emergency medicine, clinical pharmacology and clinical acupuncture. To obtain Later Stage Elective credits, a student must attend a four-week clerkship in preventive medicine and healthcare in a rural hospital, an eight-week clerkship at a university hospital and three elective courses.
- *Part V—Internship Training (Clerkship):* This phase is 52 weeks in length and constitutes 20% of total teaching hours; 36 weeks are devoted to four specialties (12 weeks each for internal medicine and surgery and six weeks each for pediatrics and obstetrics and gynecology and 16 weeks for selective clinical training).

The five-year program

The five-year program is designed to produce future practicing doctors who are not only expected to have a knowledge and understanding of the basic medical sciences and possess certain clinical skills, but are also expected to have knowledge of preventive medicine.

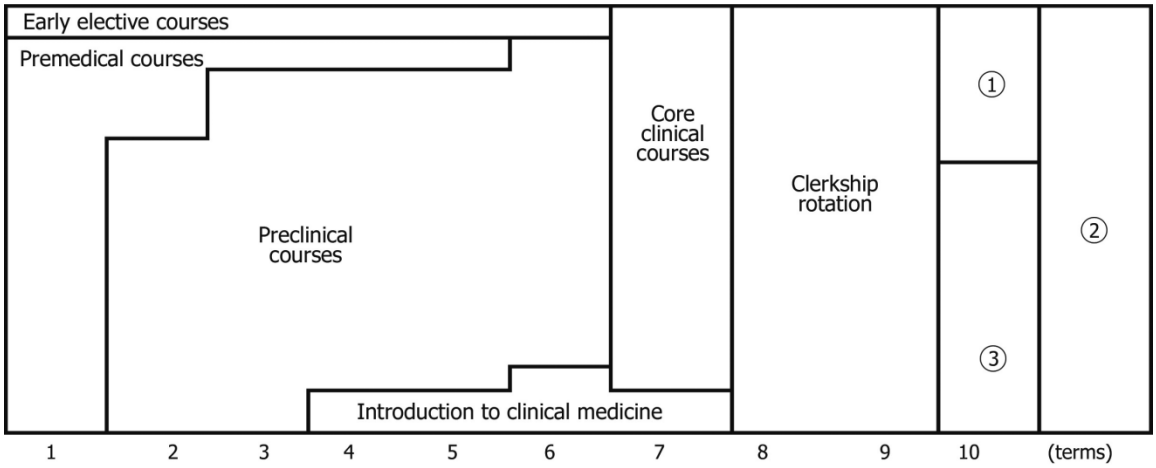
The five-year curriculum consists of 10 terms versus 14 terms in the seven-year program. Each term in both tracks lasts an average of 20 weeks and usually includes two weeks for end-of-term examinations. The terms are separated by a summer vacation (usually seven weeks) and winter vacation (usually three to four weeks). When students enter their clinical rotations, they have no vacations (See Figure 1).

The seven-year program

In the seven-year program, studies in medical basic sciences and clinical practice are closely linked. The courses are spread over seven years and when successfully completed lead to both a Bachelor's and a Master's degree. The curriculum has four parts:

- *Year 1:* natural and social sciences usually are taught in the university (e.g. Peking University);
- *Years 2–3: b*asic medical courses;
- *Years 4–6:* clinical courses and general clinical practice;
- *Year 7:* sub-internship in specialized fields; in this year, the required dissertation should be completed and defended (see Figure 2).

The fourth-year clinical training includes courses in neurology, psychiatry, infectious diseases, oncology, otolaryngology, ophthalmology and dermatology. During this year, students take clerkships of varying weeks' duration as follows: internal medicine and surgery (six weeks each), pediatrics and gynecology and obstetrics (three weeks each), neurology and psychiatry (one week each) and infectious diseases, oncology, otolaryngology, ophthalmology and dermatology (two weeks each). These clerkships are conducted in teaching hospitals operated by the medical schools.



Teaching hour: 3398 hour (classroom). 26.5~31 hour per week

Number of required courses: 46

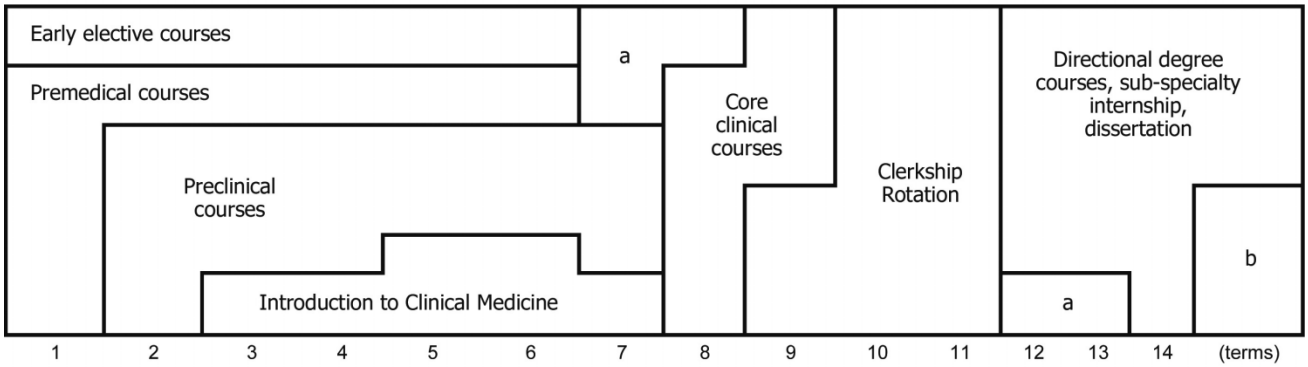
Credits: 170

Note: ① Four weeks for Preventive Medicine Practice and clerkship at the rural hospital and clinics, also signified as Late Elective Courses I

② Late Elective Courses III

③ Eight weeks of make-up clerkship, also signified as Late Elective Courses II

Figure 1. Example of organization of five-year curriculum.



Note: a. selective courses; b. selective courses at late period

Teaching hour: 4127 (in classroom), 25~30 hours per week

Number of required courses: 49

Credits: 208

Figure 2. Example of organization of seven-year curriculum.

The fifth year consists of a clerkship lasting 48 weeks that includes experiences in internal medicine and surgery (twelve weeks each), pediatrics, gynecology and obstetrics (six weeks each), neurology, infectious diseases and public health (two weeks each) and six weeks of free choice of experiences. These choice experiences may be in any of the sub-disciplines of medicine including cardiology, endocrinology, orthopedic surgery and otolaryngology, etc.

Table 1. Difference between seven- and five-year program.

	Five-year program	Seven-year program
Degree	Bachelor of Medicine	Master of Medicine
Training	Five years' study including clinical skills training; no research study and paper	After 5 years study, 2 years of clinical skills training; conduct and defend a clinical research study
Compulsory courses	46	49
Teaching	Student able to give lecture in Mandarin	Student able to give at least part of lecture in English

Besides the required courses, students must pass the elective courses they enroll in. For example, Sichuan University/West China Medical Science requires every student to pass two elective courses each semester. These two courses are chosen from among 74 available courses.

Table 1 depicts the difference between five- and seven-year tracks. In general, besides more intensive education during premedical coursework and a longer period of preclinical training, the major difference between the five- and seven-year tracks is that in the seven-year program students have additional clinical training (clerkship or internship) in subspecialties. They also are involved in basic or clinical research and must prepare and defend a master's thesis (see Table 1).

All curricula in Chinese medical schools contain three areas of emphasis that are worth noting. These include English-language training that usually has over 300 hours of instruction, computer sciences and political philosophy. Interestingly, the English course has the largest number of hours of instruction (300) in the curriculum. Computer studies are second and political philosophy is third. China places great importance on all three courses but especially on computers skills and English. In the latter two areas, the competence or pass bar is also continually being raised.

Student advancement—five-, seven-year tracks

To be promoted to the next year of study, a student has to complete all required courses and have passed all course examinations of the previous year, as well as having attended the requisite elective courses and obtained corresponding credits. A student who fails an examination will be given opportunities to re-sit exams or retake a year of study and then retake the exam. Those who fail three make-up exams or two of the major course exams in a year must repeat the academic year. The students who fail three key courses or four courses altogether can stay in the same class on 'probation' and take the make-up exams at year-end. Those who fail make-up exams in three major courses or more than four courses altogether, and unsuccessfully repeat an academic year twice, have their enrollment cancelled. Enrollment cancellation also happens when behavioral defects appear such as cheating on an examination.

The eight-year program

The eight-year program in clinical medicine leading to the degree of Doctor of Medicine (MD) has existed in Peking Union Medical College (PUMC) since 1917 when the school was founded by the Rockefeller Foundation. It is actually the only medical school which is under the jurisdiction of the Ministry of Public Health. The purpose of the eight-year program is to train medical scientists and medical educators for China. The medical curriculum consists of four parts:

(1) *Premedical Course* of two and a half years' duration. These were provided by the School of Life Sciences of Peking University and are offered presently by Tsinghua University.

(2) *Basic Medical Sciences Course* of one and a half year's duration. This is provided by the Basic Medicine College of PUMC.

(3) *Clinical Medicine Course* of three years and four months' duration; during this course, all students have to complete an obligatory clerkship in the departments of internal medicine, surgery and obstetrics/pediatrics of PUMC Teaching Hospitals of four months' duration in each of these disciplines.

(4) *Research Training* of eight months' duration. This takes place in the research laboratories of the Basic Medical Sciences and Clinical Medicine Colleges of PUMC and concludes with the preparation and public defense of a dissertation.

After completion of all required courses and receiving positive evaluation of academic records, graduates are awarded a Master of Medicine degree. Those with excellent marks also receive the Doctor of Medicine degree.

In 1995, PUMC set up an MD transfer program for students from the seven-year programs at 10 'key' national medical schools who want to complete eight years of training. In this program, students are transferred to the PUMC eight-year program after completing six years in their parent school. They must also pass special examinations in the English language and in basic and clinical sciences. After completing all required courses and other requirements for the degree, they are awarded with an MD degree as if they had been in the eight-year track from the time they entered medical school.

In 2002, an eight-year program was initiated at Peking University Health Science Center (PUHSC) and a few other leading schools are planning to follow in the same footsteps.

Teaching methods

The most common teaching method used in China is the lecture. In addition, traditional classroom methods such as audiovisual aids (blackboard, slides, overhead projectors and multimedia) are employed in teaching settings. On average,

75% of the basic science (theory) classes are taught by associate professors or professors. Administrators responsible for instruction are required to observe some of the classes. After class, students complete questionnaires designed to provide feedback to the class instructors. In spite of efforts to reduce classroom hours, especially in clinical disciplines, lectures constitute 50–60% of the teaching hours, while laboratory exercises occupy 40–50% of instructional time.

One of the outstanding features in teaching is the emphasis placed on conducting experiments. Sufficient laboratory hours are allowed to guarantee that students have adequate time to conduct these studies. The scores that students achieve on their experimental tests account for a significant part of each student's final grades. Also, the contents of experiments are reviewed by faculty and the student modifies the experiments to reduce those purely designed for verification or demonstration purposes from those that are truly research in their purpose and orientation. The goal is to enhance the proportion of interdisciplinary experiments being conducted by the students.

Efforts have been undertaken widely to promote the transition from 'teacher-centered' to 'student-centered' education. However, problem-based learning (PBL) has not been widely adopted. Although 'case-based group discussion' has been exercised for a few years in some schools (e.g. Sichuan University), it cannot be called 'PBL' because of large-group participation and the 'teacher guidance' components of this teaching method. The slow progress in the introduction of PBL is related to a relative shortage of teaching resources including space, library facilities and trained teachers. The large groups of students are also too large to implement PBL effectively. Modern teaching technology such as the use of computers and computer simulations has been widely adopted and is generally integrated with traditional teaching aids.

Besides bedside teaching in the clinical years, seminars or small-group discussions are used. However, according to many Chinese educators, the interplay between students and teachers remains less than optimal. The clinical clerkship (five years) takes place both in teaching hospitals and in affiliated hospitals. The 'Hospital Dean' has the overall responsibility for the quality of teaching and full-time clinical tutors or supervisors are empowered to guide the interns. 'Inspection groups' from the Dean's Office are also regularly sent to the teaching hospitals to monitor the quality of clinical teaching. Evaluations of clinical teaching are conducted twice a year.

To motivate students to learn after class, interest groups, book clubs and, in some instances, scientific research groups are organized for the students. These approaches have proven to be highly effective in improving students' motivation and learning, as well as serving as an outlet for their creativity.

To improve the competence of the academic staff, especially in the teaching hospitals, in-service teacher training (faculty development) classes are conducted. Course contents are constantly adjusted and the latest advances, i.e. evidence-based medicine or clinical epidemiology, are added. Although the official language of instruction is Mandarin, the use of English in scientific courses is strongly encouraged. Recently, the former Minister of Education suggested that China should set a goal of teaching 50% of its courses in English.

Assessment system

The basic method used to assess student achievement is the *written examination*. This usually takes the form of a paper-and-pen evaluation. These tests are used in most courses for the end-of-term and/or end-of-academic-year examinations. The examination items usually take the forms of multiple-choice questions (MCQs), or short-answer questions, fill-in-the-blank and essay questions. The marks are usually recorded as a percentile. For example, 100 is the full mark and 60 is the pass mark. In some courses, students are asked to write short articles to summarize what they have learned. This is in addition to the regular paper-and-pen examinations.

In disciplines such as histology, anatomy and pathology, tissue slides are widely used and video displays of anatomical specimens to be identified are employed extensively.

The objective structured clinical examinations (OSCEs) are used on a regular basis only in a few schools. The same is true for the use of standardized patients. The assessment of students' performance and professional attitudes during the clerkship are done by faculty and at the end of the clerkship assessment is done through traditional written exams.

Graduation test

A comprehensive pre-graduation clinical examination is administered annually to final-year students. Typically, this exam includes 200 MCQs and a national English proficiency test called the College English Test. Seven-year track students are expected to perform at a higher level on the English exam than are five-year students. In some provinces, there is also a provincial computer competence test called the Computer Competence Grading Test (CCGT). In these provinces, all students in the five- and seven-year programs are expected to pass the CCGT exam.

In some medical schools, a student is required to take a '*middle-stage test*' when he/she has completed half of his/her clerkship. This exam focuses on bedside skills and serves to detect areas needing improvement. Although the test assesses the student, it also helps to evaluate the teaching abilities of the tutors who have been responsible for the first half of a medical school's clinical experience.

Switches between five- and seven-year programs

At specific points in a five-year medical school program (in the instance of Sichuan University, at the end of the first year), the top students in academic studies and behavior can apply to switch to the seven-year track. Reciprocally, the poorest performers from seven-year programs may be demoted to a five-year track. In Sichuan University, this switch is determined by a 'diversion examination' covering computers, maths, English language and chemistry. The same test is used for students in both the five-year and seven-year programs. As a result of the examination, the five-year students whose scores are above the mean plus at least one standard deviation, and the seven-year students whose scores are under the mean by at least one standard deviation will be switched to the opposite track of study.

The demotion of a student in a seven-year to a five-year program can also happen at any time as a result of the

following developments: failure to pass the end-of-term and subsequent make-up test of a required course, failure to pass the CET at a proper level by the end of the third year, or any confirmed fraud or cheating.

Requirements for diploma and degree

Students who have completed all courses, passed all required examinations (or compensatory exams within the required time) and fulfilled the Criteria of College Student Physical Fitness (PE) will receive a graduate diploma. Additional requirements must be met (e.g. passage of the CET at the proper level before they are granted the Bachelor's degree). Only a small proportion of graduates fail to complete all requirements. Most of these cases involve violations of codes of proper behavior in addition to low academic performance.

Students who are not eligible to receive the diploma and degree but have completed all the courses within the years required are granted the *Certificate of Study*. Using this certificate, they may work in the Chinese healthcare system but not as a 'doctor'. Hence, the effort in training them is not completely lost.

In addition to these requirements for the five-year track, students in the seven-year program have to complete and defend a research thesis and pass the CET at a much higher level than expected in the five-year track. If they have not fulfilled the requirement for a Master's degree, they receive a Bachelor in Medicine degree similar to that of the five-year track graduates.

The future

It should be clear that tumultuous changes are sweeping across China. Many of these will change medical education. The mergers of universities that have the goal of becoming world-class institutions are already having a profound impact on medical centers and the educational experiences provided there.

Another initiative that will change Chinese medical education is the Institute for International Medical Education's (IIME) 'Global Minimum Essential Requirements' (GMER). These outcome measurements of the competences possessed by graduates will face the use of OSCEs, standardized patients and structured logbooks for observing medical student performance. Whatever the leading schools do, in this regard, the rest of the Chinese medical education establishment will follow suit.

Finally, the development of online education and virtual medical schools will make it possible to hold more and more students accountable to the same standards. This would have been unthinkable before the informatics revolution and the establishment of the World Wide Web.

Based on these and other reforms or developments that are occurring in China, it is reasonable to predict that major changes will be made in Chinese medical education in the next few years. Hence, a motivated 'student' of the medical education enterprise in China will, of necessity, be required to make periodic 'visits' to medical education in the PRC since what is described in this paper will not persist indefinitely.

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Notes

1. Recently, PUMC signed a 'merger' agreement with Tsinghua University. The exact details of this union are not available at this time. Hence, it is not possible to judge whether this is a 'merger' or an 'affiliation'.

References

Deng, Y.Z. (1999) Development of medical education in China, *Academic Medicine,* 65, pp. 512–514.

Huang, J.S. (1992) Medical education and medical education research and development activities in modern China, *Medical Education,* 26, pp. 333–339.

John, A.D. & Lin, Y.G. (1987) Medical education in the People's Republic of China, *Journal of Medical Education,* 62, pp. 287–292.

Scott, C.S., Shiping, Z., Brock, D.M., Ma, X., Mei, R., Qui, X. & Tan, X. (1992) Chinese medical school exit objectives: a multi-institutional survey of teacher opinion, *Medical Education,* 26, pp. 128–137.

Tongqiang, G., Kuninori, S., Tetsuhito, F., Akio, I. & Yosuke, Y. (1999) Medical education in China for the 21st century, *Medical Education,* 33, pp. 768–773.

Sun, B.Z. (2003) Curricula of medical colleges in China and America: a comparative study, *Medical Teacher* (in press).

Schwarz, M.R., Wojtczak, A. (2002) Global minimum essential requirements: a road toward competence-oriented medical education, *Medical Teacher,* 24, pp. 125–129.