

Medical Education Reform in China in the 21st Century: A Literature Review

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Abstract: Facing resource shortages and increasing gaps between regions and populations during the 20th century, around the 70s, the Chinese government authorized local governments to independently operate their own medical system, including medical education, to provide basic medical services and meet healthcare needs. These multiple independent but unparallel medical education systems throughout the nation inevitably created education quality disparities. Around the beginning of the 21st century, the Chinese government started a medical education standardization reform. This study aims to review and critically analyze these reform efforts toward standardization in medical schools and postgraduate and continuing education. All the background information, data, findings, government measures, etc. presented in this article were obtained through literature searches on PubMed, Baidu Scholar, and respective official online documents. Some of the key search criteria are, but not limited to, medical education reform in China and medical education history in China. These data were accessed in 2022. Standardization has been the core of reform in all three phases of medical education in China since the beginning of the 21st century. The three/five/eight principle, which refers to years of medical school, has been the backbone of medical school education in pursuing the “2030 healthy China” goal. The government streamlined postgraduate education further by establishing official licensing examination and launching a five+three+X model, which represents years required for medical school education, standardized residence, and specialty training, respectively. The standardization of continuing education is ongoing. Official and unified appraisal tests are in the pilot stage, whereas other areas have yet to change. Hopefully, this study will provide insight for future reform or research, or inform other countries.

Keywords: medical education, reform, China, postgraduate, continuing education

Background

There are various degrees conferred to medical school graduates in China en route to full doctor licensure. The standardized resident program was implemented in 2010 to gain uniformity in postgraduate training. The standardized specialty program and continuing education are required for continued practice. Furthermore, once the medical bachelor is conferred, the graduates enroll in the standardized resident program as a resident trainee. One year into the training, the trainees are eligible to write the medical licensing examination. Having passed, the trainee gains full licensure as a resident practitioner. Five years as the practitioners is required to apply for an attending doctor. Public hospitals in China are divided into three grades according to their complexity, equipment, level of specialization, education, and research, as well as other factors. Primary and community hospitals provide basic medical services at the community level. Secondary hospitals, also known as central hospitals, provide higher medical services for municipal prefectures. Tertiary hospitals are general or specialized hospitals at the highest level of medical care and serve at the regional or provincial level. During the 20th century, China experienced increasing nationwide inequality in educational and economic resources.¹ Facing a variety of problems with resource shortages and increasing gaps between regions and populations, around the 70s, the Chinese government authorized local governments to independently operate their own medical system, including medical education, to provide basic medical services and meet healthcare needs.²

Consequently, different medical systems were instituted across the vast area of China, leading to multiple ununified medical education systems throughout the nation. These multiple unparallel medical education systems are of disparate quality throughout the nation, leading to inequality in the provision of medical education. Consequently, training practitioners with uniform clinical capability was challenging. Around the beginning of the 21st century, the Chinese government started a reform to ensure uniformity in medical education. Thus, this study aims to review and analyze critically China's medical education reform efforts in the 21st century, toward a standard provision from medical schools and postgraduate and continuing medical education. All the background information, data, findings, government measures, etc, presented in this article were obtained through literature searches from PubMed, Baidu Scholar, and respective official online documents. Some of the key search criteria are, but not limited to, medical education reform in China and medical education history in China. These data were accessed in 2022.

Medical School Education

During the 20th century, the distribution of regional resources in China became increasingly uneven. Therefore, the government established a variety of medical college and university programs to meet the needs of various regions and social groups. Throughout the history of medical school education in China, three-, five-, six-, seven-, and eight-year and graduate programs have existed.³ Medical school entrants were recruited among high school graduates who passed the National College Entrance Examination (NCEE). Longer programs generally require higher scores. Although different program systems addressed the needs of different regions and groups, increasing inequality and efficiency losses in the healthcare sector were inevitable because of the emergence of heterogeneous doctor groups.⁴ Therefore, providing homogeneous medical care and equitable medical resource distribution across the nation was difficult. Furthermore, this created unnecessary complexity in postgraduate medical education.⁵ Making more effective use of multiple school programs is one of the goals of China's medical education reform.

In the 21st century, the Chinese government established a three/five/eight principle to address medical care needs at different areas and levels across the nation. Graduates from the three-year program are assigned to practice at rural areas where multiple aspects, including economy, education, and infrastructure etc., are underdeveloped compared with urban areas. The five-year program serves as the cornerstone of the primary medical care, while the establishment of the eight-year program implements the research needs in medical education. This training system provides basic medical education and training for specialized professionals, thus meeting international standards. This system is expected to provide sufficient medical staff for poor and remote rural areas as well as effective talent for higher medical education.⁶

Five-Year Program

The five-year clinical medicine program has the longest history and is the primary route of medical education in China. After years of reform, students now study basic medical knowledge for the first two years. In their third to fifth years, they enter teaching hospitals to study clinical courses, such as surgery, internal medicine, and pediatric care, and to participate in an observership, where they observe their supervisors applying clinical knowledge and skills on patients, followed by internship rotations. Bachelor's degrees in medicine and surgery are conferred on graduates who choose to practice medicine or obtain a higher-level degree (α in Figure 1).

At the beginning of the 21st century, the students were trained to serve at all three levels of health institutions in China. If the graduates decided to practice, it was mandatory for them to participate in a postgraduate training rotation organized by the employed institution for one year before becoming eligible to take the medical licensing examination. The trainees could register to practice after completing the examination. If higher education was the choice for graduates, they had to take a national entrance examination to qualify for either a clinical or academic master's course to remain as students (β in Figure 1). Incorporating a referral scheme into the medical system was one of the more recent medical reforms in the new century. Since general practitioners serve as first line care providers in the scheme, in 2012, the training purpose for the five-year program changed to focus on serving community hospitals as China began training general practitioners, also known as community and family doctors.^{7,8}

For a long time, only students with the highest NCEE scores could enter the five-year program. Since the emergence of the seven-year program, which requires higher scores to enroll, the five-year program has been losing students. The

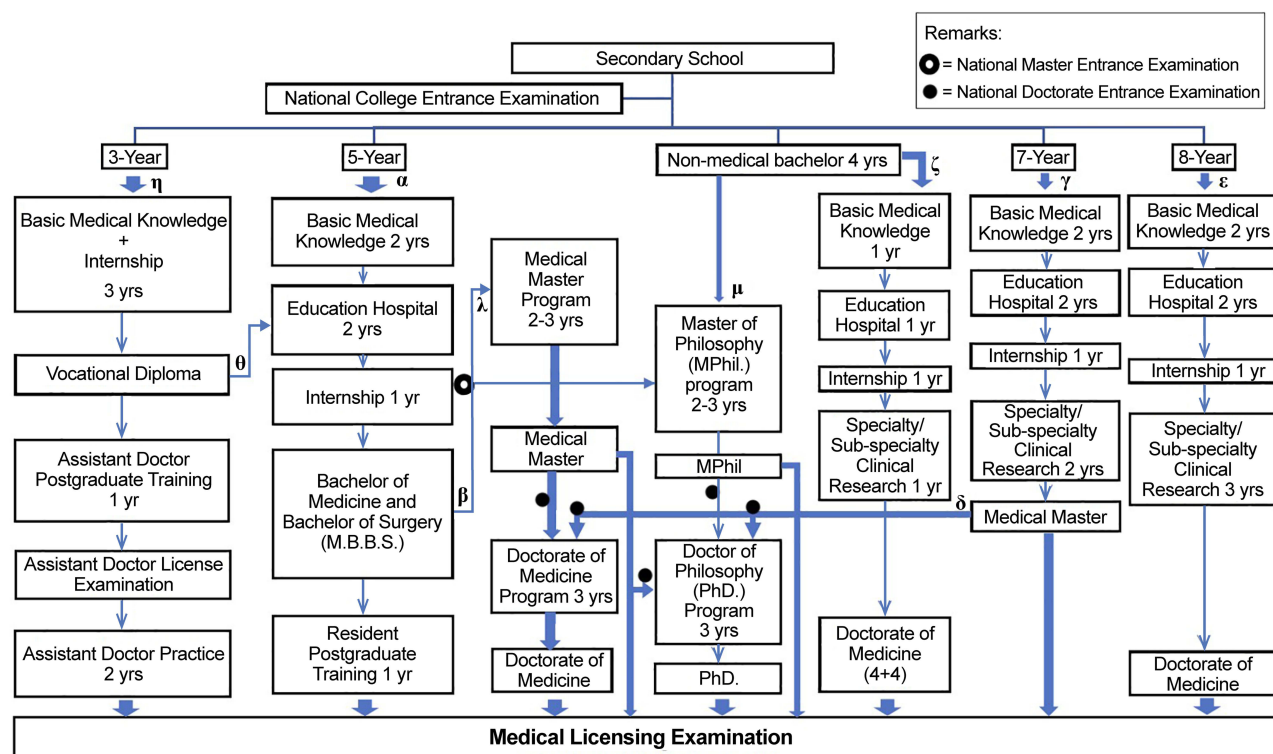


Figure 1 The flows of educational routes for doctors in China at the beginning of the 21st century: There were multiple medical education programs for secondary graduates to gain full licensure, which issued different degrees. However, these routes interconnected with each other for the participants to be able to gain higher education as they were en route to the medical licensing examination.

Notes: α, β, γ, μ, etc., represent the cross-reference for the subsections in the medical school education section. © represents the route required by national master's entrance exam. ● represents the route required by national doctoral entrance exam.

situation further deteriorated with the founding of the eight-year program, which requires higher entry scores than the seven-year program. This phenomenon remains to the present day and continues to undermine the student pool for the five-year program.

Seven-Year Program

The seven-year program was launched in 1988. The curriculum in the first five years is similar to that of the five-year program. Students must choose a tutor to supervise their clinical fellowship in their sixth and seventh years as fellows. During this time, the fellows enter resident training and fellowship rotations with clinical research requirements. Moreover, they become training residents in the same profession as their tutors (γ in Figure 1). For instance, if the tutor is a gastrointestinal surgeon, the rotation is designed to train the fellows to be gastrointestinal surgeons. In addition, students choose a thesis topic associated with the profession. A Master of Medicine (MM) degree is conferred upon graduation.

In contrast to the five-year program, clinical research capability is an additional training objective for the seven-year program. Graduates of the seven-year program can take a medical licensing examination during their year of graduation. They must also take a national entrance examination to attend a Doctorate of Medicine (MD) or PhD program if they choose to pursue higher medical education (δ in Figure 1). However, they are not trained in laboratory skills, and seven-year-program graduates demonstrate lower laboratory competence upon entering a PhD program than graduates with an academic master's degree.

Between its launch in the late 1980s and the beginning of the 21st century, the seven-year program provided higher medical education and was set to train students to serve in tertiary hospitals after graduation. Mutual interest existed between the seven-year program and tertiary hospitals. The hospitals wanted to recruit graduates from the program because they were the top talent, had the highest scores on the NCEE, possessed research capability, and held a higher

medical degree than the 5-year program. Graduates favored tertiary hospitals for being the most versatile medical institutions with the most comprehensive medical resources in China. In addition, graduates could choose to practice at any hospital in China. However, since 2010, holding an MD or PhD has gradually become an educational requirement for recruitment by tertiary hospitals. Furthermore, under the three/five/eight principle, five-year-program students are trained to serve community hospitals, whereas eight-year-program students are trained to serve tertiary hospitals. This has created an awkward situation for graduates of the seven-year program. Currently, hospitals offer limited options for practice after graduation. Furthermore, as tertiary hospitals favor MD and PhD degrees, the social value and impact of MM degrees issued by the seven-year program in China are fading. In addition, the program does not match international programs in terms of years of study and types of degrees issued. Therefore, from the beginning of the 21st century, an eight-year program was established gradually to replace the obsolete seven-year program. Consequently, most medical schools that once offered the seven-year program are switching to the eight-year program.

Eight-Year Run-Through Program

The eight-year program was based on the existing seven-year program: the first five years were similar, and the fellowship rotation was extended from two to three years. An MD degree is conferred upon graduation (ε in Figure 1). Graduates can undergo a medical licensing examination during their graduation year. The program prepares students for practice in tertiary hospitals after graduation.

One of the initial intentions in establishing the eight-year program was to provide longer and higher-level medical school education comparable with international systems, such as eight-year medical school education in the US and Canada. A bachelor's degree in any major is a prerequisite for medical schools in the US and Canada. This not only ensures that medical schools admit entrants with diverse academic backgrounds but also provides an opportunity for students to reconsider their commitment to a lifelong medical career after they enter the program. In China, passing the NCEE is the only route to enrolling in the eight-year program. Once students are admitted, continuing through the following eight years without a premedical option is the only way to graduate. Although students enrolled in the eight-year program have the highest NCEE scores among all programs, which reflects the top academic competence in their generation, the lack of premedical education means not only that medical classes are not composed of students with multidimensional academic backgrounds but also a lack of a second chance for students to be assured of their commitment to a medical career.

The Four+Four Program

As with the eight-year run-through program, the four+four program started at the beginning of the 21st century and takes eight years to complete. The curriculum is similar to its US and Canadian counterparts. Students are required to have a non-medical bachelor's degree, which requires four years of premedical education before they can apply for the four medical school years. An MD degree is conferred upon graduation. Graduates can undergo a medical licensing examination during their graduation year.

Unlike the US and Canada, where medical schools accept applicants with bachelor's degrees in any major, China admits only students with a specific major from a specific university. For instance, undergraduate students who graduated from Beijing Jiaotong University (BJTU) could be admitted to Shanghai Jiaotong University School of Medicine (SJTSU) in 2022 only if they majored in system science and engineering.⁹ Admission was not possible if the student had the same major from a different university or a different major from BJTU. Consequently, restrictions on which bachelor's majors are accepted for medical school admission limit the academic backgrounds of medical students. In addition, the last four years in the four+four program cover basic medical knowledge in the first year, clinical courses at a teaching hospital in the second year, internships in the third year, and clinical fellowships in the fourth year, followed by a thesis defense (ζ in Figure 1). This compresses the eight-year run-through program into the final four medical school years. As expected, students face a highly concentrated curriculum with insufficient time for both clinical courses and fellowship research.

Three-Year Program

Compared with urban areas, the economy and infrastructure in rural regions are underdeveloped, resulting in low living standards. Consequently, the young population in the countryside has been lost to cities. In addition, residents of rural areas are less willing to attend medical school, as it requires longer than a typical four-year university. Thus, medical personnel and resources are insufficient in rural areas.¹⁰ A three-year program was established to provide minimal medical services. Basic medical knowledge is covered in the first year, followed by clinical courses in the second year and clinical rotation in the third year. Students are trained and bound to practice in rural and remote areas. A vocational diploma, rather than a degree, is conferred upon graduation, after which graduates choose between practice and the higher education stream. If graduates choose the former, they must enter a one-year postgraduate training program as an assistant doctor trainee before taking the assistant doctor examination to become assistant doctors. After two years of work experience as an assistant doctor and passing a medical licensing examination, they can acquire full licensure (η in Figure 1). Graduates of the vocational diploma who opt to complete MBBS degrees enter the third year of the five-year program (θ in Figure 1). The three-year program was a product of disparities between urban and rural areas during the early days of reform. However, it cannot meet the need for high-level, diversified, and internalized medical education as China's overall system advances into the new century. Recently, the government passed a measure stating that only applicants with a bachelor's or higher medical degree may take the licensing examination. Therefore, medical personnel with only vocational diplomas will soon have to obtain a medical bachelor's degree to qualify for full licensure.

Three-Year Medical Master's and Doctorate Programs

After passing the national entry examination following graduation with an MBBS degree, applicants can enroll in a three-year postgraduate program. An MM degree is conferred upon graduation. They can then take an examination to participate in a further three-year program that confers a MD/PhD degree (λ in Figure 1).¹¹ Those who are not in their bachelor's graduation year must acquire full licensure to qualify for an application. The master of medicine program aims to train students to bear the responsibility of a resident, whereas the MD program trains students to be attending doctors. Graduates from both programs usually require clinical research achievements. Trainees can take a licensing examination during their graduation year. The provision of both programs has reduced after the emergence of standardized resident training (SRT) and standardized specialty training (SST) in the 2010s, as the SRT and SST programs overlapped with the MM and MD curricula, respectively.¹²

MPhil/PhD

In contrast to the MM and MD programs, applicants with a bachelor's degree in any major can take the national examination to enroll in the MPhil or PhD programs offered by medical schools. Completing the program requires 3–6 years. Students can receive an MPhil in three years, followed by another three years to earn a PhD. Alternatively, they can participate in a joint MPhil–PhD program to receive a PhD in five years (μ in Figure 1). The program is designed to train students to develop research skills and professional laboratory techniques, and the publication of a scientific paper in a prestigious peer-reviewed journal is usually mandatory for graduation. Therefore, the clinical component is minimal within the programs. Until the 2010s, MPhil and PhD graduates from medical universities and colleges were eligible to take the licensing examination during their graduation year, regardless of the nature of their bachelor's major.

Medical Graduate School: Clinical vs Academic

After the cultural revolution, the Chinese government established a three-level medical education system: medically-focused bachelor, master, and doctorate degrees.¹³ In the mid-1990s, the first seven-year program graduates received an MM degree, which highlighted training in clinical research and dissertations rather than laboratory skills. In 1997, the government divided medical graduate school education into two streams:¹⁴ clinical (also known as professional or medical) and academic (also known as basic or laboratory research). Undergraduate education of the two streams bears minimal differences. For graduates, the MPhil and MM programs share one Chinese label, “shuo shi”, and are recognized as having the same educational values and levels for PhD and MD, which are both called “bo shi”. The initial intention of

the government was to allocate educational resources efficiently, as students in the two streams were trained in two different professional fields. However, the government and the public did not distinguish between them and perceived both streams as the same entity with identical medical competencies and capabilities. This inevitably confused the medical degree system.¹⁵ At the beginning of the 21st century, graduates from both streams gained full licensure by taking an examination. Doctors who graduated academically were found to underachieve in clinical settings, especially in terms of clinical skills.^{16,17} This revealed that most MPhil/PhD graduates lacked the one-year internship included in a five-year medical bachelor's program, which plays an essential role in doctors' career development. After the mid-2010s, new measures were implemented to exclude candidates without a one-year clinical internship from the licensing examination.

One of the top official grants from the National Natural Science Foundation of China (NSFC) is reserved for applicants with doctorate-level (bo shi) degrees. The grant is mostly related to basic scientific research rather than clinical studies. In most highly competitive tertiary hospitals that recruit only doctors with a doctoral-level (bo shi) degree, obtaining this grant is required for promotion. Unlike PhD holders, who train extensively in laboratory skills, MD holders' training is clinically focused, so it is challenging to ensure that they are able to compete fairly for the NSFC. While the government officially distinguished between the two postgraduate streams, inequity in access to official research grants continues today for the clinical professional stream.

Postgraduate Education

For decades, China's health sector has only aimed to overcome a serious shortage of health resources to meet the basic medical and health needs of citizens due to low economic development and multiple social issues. Allowing medical graduates to practice shortly after graduation was one of the many reasons why China did not implement systematic and standardized medical licensing examination or standardized postgraduate training until the beginning of the 21st century.

Medical Licensing Examination

According to the Provisional Regulations on Physicians promulgated in 1951, the medical licensing examination was not mandatory for graduates of public or private medical schools with curricula longer than four years. On June 26, 1998, the third meeting of the standing committee of the Ninth National People's Congress passed the Law on Practicing Doctors, which came into effect on May 1, 1999.¹⁸ The medical licensing examination has been mandatory since. The law legalized and standardized multiple facets of medical practice, including the medical licensing examination, practitioner registration and training, and legal liabilities. This law not only regulates the practice of doctors but also provides legal protection to patients. Before the law was enacted, the quality of medical education relied on each medical university or educational institution's background and competencies, which were unevenly distributed. This led to unbalanced training. After enforcement, the Act ensured that each educational institution had the same standardized training goal, irrespective of its academic achievements, reputation, and educational background, to provide a unified and balanced nationwide training system.¹⁹

Postgraduate Training

Until the first decade of the 21st century, medical school graduates in China received immediate postgraduate clinical training, organized by their employing hospital. The quality of postgraduate training, which comprised resident and specialty training, could be determined only by the nature of the employers' institutions. This resulted in a training quality that was neither consistent nor comparable. Higher-level institutions trained more competent doctors, whereas lower-level remote institutions were likely to develop underachieving doctors. Consequently, rural areas had fewer opportunities to obtain high-quality doctors than urban areas.²⁰ In some developed countries, such as Australia, Canada and the UK, medical graduates have to undergo postgraduate training at government-certified teaching hospitals before writing the medical licensing examination.²¹ After 2010, China launched a similar postgraduate standardized training program composed of two parts, standardized resident training, SRT and standard specialty training, SST.²² The training institution must be approved and accredited by the National Health Commission (NHC) and the Ministry of Education of the People's Republic of China to standardize and homogenize the quality of postgraduate training. In 2015, the two

ministries created a five+three+X education model, including a five-year bachelor's degree in medical school, followed by three-year resident training and X-year specialty training, depending on the program specialty.²³ The length of the training varies with the trainees' educational background, type of degree held, and selected practice area.

Standardized Resident Training

In 2010, Shanghai became the first pilot city to introduce the SRT program, which expanded to the entire nation the following year.²⁴ Subsequently, instead of being trained as hospital residents in-house, all graduates had to complete the SRT in an accredited tertiary hospital before employment in a public hospital.²⁵ The public sector possessed more than 80% of the beds in the nation in 2018.²⁶ Participation in the first two parts of the five+three+X model is strongly encouraged by the government, and trainees graduating from the five-year program can take the licensing examination one year into the three-year SRT. The trainees receive an SRT certificate after completing the program. In addition, trainees with a bachelor's degree can also receive an MM degree if they successfully pass all the necessary courses and defend their thesis. The number of SRT years required for trainees holding other degrees depends on the nature of their degree. Graduates from the four+four and MPhil/PhD programs must participate in the three-year SRT. Their seven- and eight-year-program graduate counterparts, who have acquired clinical experience prior to graduation, can reduce their SRT to two years if they pass the qualifying examination offered by the training authorities. All trainees with degrees higher than a bachelor's degree can take the licensing examination in the graduation year as well as in the SRT-entry year (Figure 2). The one-year SRT is reserved for those with extensive clinical experience.

Modification of the SRT has been an ongoing process since its launch. In the initial stage, graduates from the three-year MM/MD had to complete the 2- to 3-year SRT before employment, even if they already had years of clinical experience in school programs. Subsequently, the SRT and MM programs were found to share similar facets. First, applicants must earn at least a bachelor's degree in either program. Second, both aimed to develop the participants into resident practitioners. Finally, an MM degree is conferred upon completion of either program. Consequently, years later, the SRT and three-year MM were merged into a new “doubletrack” three-year program (Figure 3).²⁷ The participants in the program must undergo not only the required curricula and thesis defense of the MM program but also the clinical training of the SRT. The participants receive “four-certificates-in-one” upon completion of the program: certification for the MM, SRT, practitioner eligibility, and registered practitioner. Instead of spending 5–6 years to complete both the MM and SRT in the original system, graduates of the five-year program need only three years in the new “doubletrack” system to accomplish both (Table 1).

The three-year SRT can effectively develop clinical competency for trainees from the five-year, four+four, and MPhil/PhD programs with minimal or no clinical capabilities and experience at the time of graduation. However, the effectiveness of the SRT for seven- and eight-year program graduates remains controversial. Students in the seven- and eight-year programs need to choose a subspecialty as a research area for the final two or three years of the program, respectively. During these years, students are trained to develop abilities in both clinical competency as residents and in

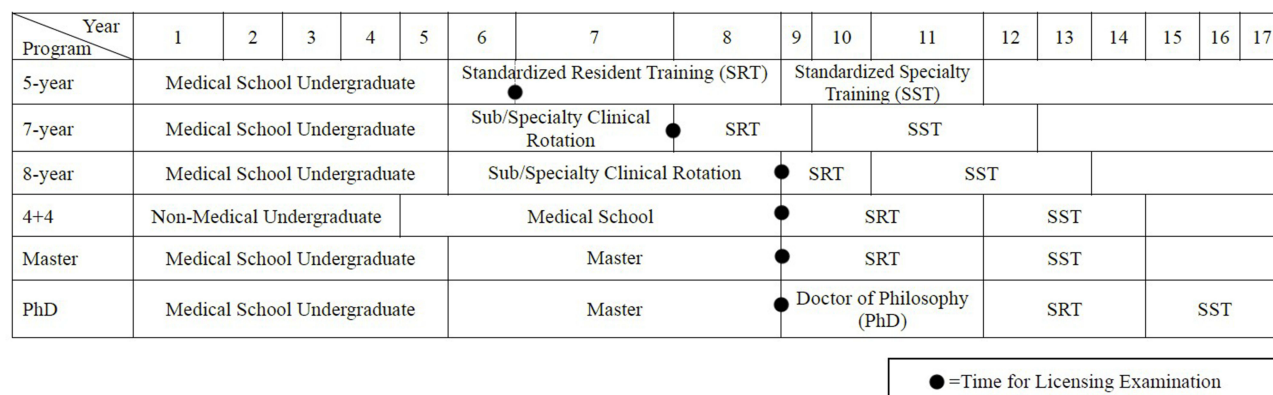


Figure 2 Comparison of postgraduate training years based on the various medical school programs under the existing system.

Note: ● represents the earliest time (year) for the participants to be eligible for the medical licensing examination according to their medical school programs.

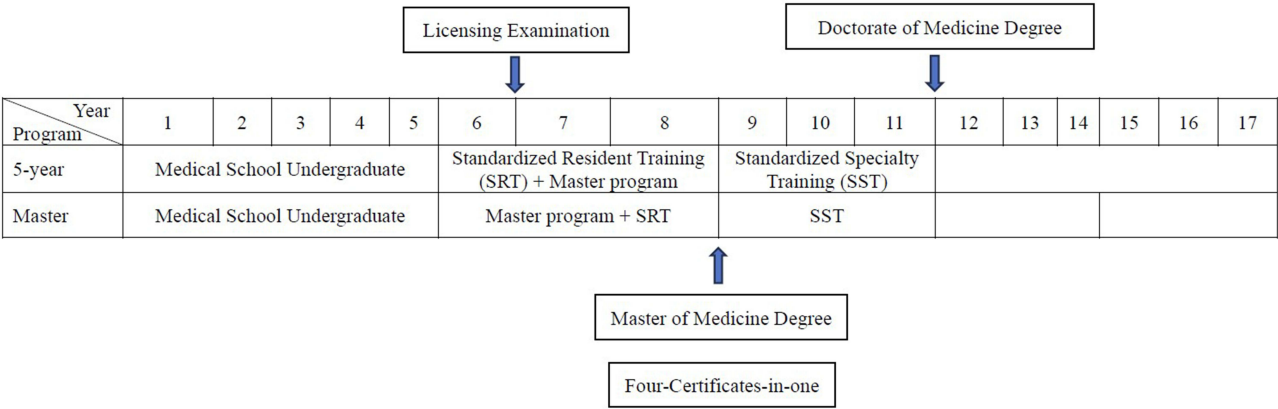


Figure 3 Doubletrack system: Instead of spending 5–6 years to complete both the MM and SRT in the original system, graduates of the five-year program need only three years in the new “doubletrack” system to accomplish both.
Notes: “Four-certificates-in-one” is a newly established phrase reflecting that participants in the modern SRT would receive four certificates upon completion of the program: certification for the MM, SRT, practitioner eligibility, and registered practitioner.

clinical research. In general, they possess greater clinical abilities than students who graduate from other programs before entering the SRT. Some seven- and eight-year program graduates might have even developed the clinical competency required for the completion of the SRT. This raises questions about whether the SRT can provide more than repetitive training for students in run-through programs. Compared with graduates of other programs, graduates of seven- and eight-year programs develop specialties or subspecialties earlier in their careers.²⁸ After the SRT, seven- and eight-year-program graduates are likely to choose a career specialty in the same profession as their research area during their final school years. This further undermines the efficiency of the SRT. For instance, a graduate with 2–3 years of clinical rotation and research experience in breast surgery can choose only an SRT as a breast surgeon. As breast surgery is a subspecialty of general surgery, according to the rotation plan, only one month is allocated to breast surgery in a two-year SRT in surgery. However, the trainee must complete another 20 months or more in other professions to obtain an SRT certificate (Table 2).

Standardized Specialty Training

As part of standardized postgraduate training, SST serves as X in the five+three+X model and follows the SRT. Shanghai was the first pilot city to launch the SST in 2013. The program gradually expanded across China in subsequent years. Trainees who complete the SRT may continue further subspecialty training by entering the SST. The SST requires 2–4 years of training, depending on the subspecialty of interest, most of which requires three years. Similar to an MM for the SRT, trainees in the SST may receive an MD if all conditions are met.²⁹ However, the differences between the SRT and SST pose

Table 1 Comparison of the Postgraduate Training System for Graduates from Various Medical Schools in China Between the Existing and the Revised Education Systems

Program	Beginning of the 21 st century	Current system
5-year	Resident training program*	Standardized resident training, (SRT)
7-year	Resident training program*	SRT
8-year	Resident training program*	SRT
4+4	Resident training program*	SRT
MM/MD	Resident training program*	Merged with SRT/SST
MPhil/PhD	Resident training program*	Not allowed to participate SRT without MBBS degree

Note: • Resident training program was held by health institutes where the participants were employed.

Table 2 A 2-Year SRT Rotation in Renji Hospital Affiliated with Shanghai Jiaotong University School of Medicine

Department	Rotation time/month	Department	Rotation time/month
Pathology	1	Neurology	1
Radiology	1	Liver Surgery	2
Cardiac Surgery	1	Vascular Surgery	1
Thoracic Surgery	1	Head & Neck Surgery	1
Orthopedics	4	Breast Surgery	1
SICU	1	Gastrointestinal Surgery	3
Anesthesiology	2	Biliary-pancreatic Surgery	2
Urology	1	Surgery ER	1

challenges to their expansion. Compared with accredited SRT hospitals, fewer SST hospitals are available to provide qualified specialty training, particularly training in uncommon specialties. Participants in the SRT are paid by the Health Commission of the city where the training takes place or in which the trainee's residential household is registered. Participants in the SST must be employees of an institution that is liable for salary and training expenses. The institution can be the same hospital where the SST takes place. Institutions without the SRT must send their employees to train at an institution that offers the program. Consequently, doctors in lower-tier hospitals often cannot obtain permission and payment from their employers for training at another hospital. Even SRT hospitals, which are tertiary hospitals, reluctantly send their employees to train at other hospitals for programs not operated by their employer hospital. The SST is not compulsory and does not pose a barrier to future promotion. This reduces the incentive for doctors to join the program. Doctors who graduate from the eight-year, four+four, and PhD programs cannot improve their educational level by obtaining the MD conferred by the SST. This program can elevate the educational level of graduates of the seven-year or MM programs. However, doctors with academic degrees lower than MD or PhD often cannot meet hospital recruitment requirements. As family medicine has not been established in the SST, doctors who complete the SRT in family medicine cannot obtain further specialty training and are unable to earn an MD through the SST. Solutions are needed to address this contradiction in the principles of the five +three+X model and higher education encouraged by the government.³⁰

Continuing Medical Education

Continuing medical education in China mainly takes the form of appraisal tests, research accomplishments, in-service training, and an educational credit system. The completion of this process is associated with doctors' promotion.³¹ In contrast to medical school and postgraduate medical education, continuing medical education has undergone only minor reforms in the 21st century.

The appraisal test system has been reformed with the aim of uniformity in the new century. To ensure that practitioners are up-to-date in their professions, they are required to take regular appraisal tests. Originally, employers' hospitals decided and organized tests, but maintaining uniformity across the nation for multiple aspects of tests was challenging. To make the test more reliable, homogeneous, and effective, the Health Commission of Shanghai was the first in China to conduct an official and unified appraisal test for all doctors in 2014. This test was designed to be taken every 2–3 years. However, it was disrupted for several years by the COVID-19 pandemic. Therefore, many facets of the test, such as creating appropriate questions for doctors with different seniority levels; updating the test using state-of-the-art technologies and guidelines, including appropriate humane medicine principles; and imposing penalties for failing the test, remain in the pilot research stage.³²

Research areas are determined by the doctors' interests and abilities. The requirements for research differ accordingly.³³ Since the beginning of the 21st century, research has gained increasing importance in deciding on the promotion of doctors. However, competition has increased annually, moving from publication in a domestic journal to publication in a prestigious

international journal with a high impact factor to completing a national grant. Consequently, this has driven doctors planning career promotions to trade their clinical time for a laboratory research commitment that may be irrelevant to the practice area.³⁴ Consequently, research is the most active and independent form of continuing education.³⁴ Recently, the government has modified promotion requirements by weighing clinical research more heavily than laboratory research.

In the three-level hospital system in China, doctors must fulfill the continuing educational requirements of in-service training in superior hospitals. Doctors in the highest-grade hospitals must provide in-service assistance to lower-tier hospitals or study abroad as visiting doctors. Furthermore, doctors must participate in academic and clinical conferences held by the government, medical doctor associations, or teaching hospitals to gain educational credits and update their medical knowledge to meet the annual continuing education requirements. The annual number of credits required depends on the doctors' practice location, seniority, and many other factors.³⁵ Doctors can attend conferences for practice professionals according to their needs and desires. As conference content can only match the professional field shared by a group of doctors, holding conferences to match individual needs is impractical.³⁶ Consequently, most doctors participate in conferences only marginally associated with their profession to complete the required credits. Currently, these in-service training and credit systems remain in place.

Conclusions

During the 20th century, resource scarcity created inequalities across China's population and regions. Multiple medical school programs have been established to provide medical services that meet the needs of each population and region. In addition, the government played a minor role in postgraduate and continuing education, which hospitals mostly provided. Around the beginning of the 21st century, reform of all three phases of medical education focused on uniformity of provision as the government played more roles. Although the three/five/eight principle has been the backbone of medical school education in pursuing the goal of 2030 healthy China, the loss of talent pools from the five-year to eight-year program is inevitable. The government streamlined postgraduate education further by establishing official licensing examination and launching a five +three+X model for standardized resident and specialty training. However, the repetitive clinical rotations between the longer programs and the SRT remained unresolved. The standardization of continuing education is ongoing. Official and unified appraisal tests are in the pilot stage, whereas other areas have yet to change. Inevitably, reforms in the 21st century have generated new problems in all three medical education phases, and some problems are yet to be addressed. However, medical reform should ultimately address not only these problems but also new obstacles that will arise in the future.

Abbreviations

BJTU, Beijing Jiaotong University; MD, Doctorate of Medicine; MM, Master of Medicine; MPhil, Master of Philosophy; NCEE, National College Entrance Examination; NHC, National Health Commission; NSFC, National Natural Science Foundation of China; PhD, Doctor of Philosophy;

SJTSM, Shanghai Jiaotong University School of Medicine; SRT, Standardized resident training;

SST, Standardized specialty training.

Data Sharing Statement

All the background information, data, findings, government measures, etc., presented in this article were obtained through literature searches from PubMed, Baidu Scholar, and respective official online documents. Some of the key search criteria are, but not limited to, medical education reform in China and medical education history in China. These data were accessed in 2022.

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Disclosure

The authors report there are no competing interests to declare.

References

1. Tang S, Meng Q, Chen L, Bekedam H, Evans T, Whitehead M. Tackling the challenges to health equity in China. *Lancet*. 2008;372(9648):1493–1501. doi:10.1016/S0140-6736(08)61364-1
2. Li D, Xu H, Wang Y, Wei M. The development of Chinese medical education. *J Craniofac Surg*. 2020;31(2):453–455. doi:10.1097/SCS.0000000000000633
3. Xu D, Sun B, Wan X, Ke Y. Reformation of medical education in China. *Lancet*. 2010;375(9725):1502–1504. doi:10.1016/S0140-6736(10)60241-3
4. Hsieh CR, Tang C. The multi-tiered medical education system and its influence on the health care market—China's Flexner Report. *Hum Resour Health*. 2019;17(1):50. doi:10.1186/s12960-019-0382-4
5. Huang Z-J, Li Y-P. Historical review and enlightenment of higher medical educational system in China. *Northwest Med Educ*. 2007;15:973–978.
6. Yang L-Y, Yang M-H. An analysis of the curricular program changes of the higher medical education system in China. *Med Educ*. 2010;9:292–294.
7. Guo TT, Zheng JZ, Wen X, Jin Y. A historical review of general medicine. *Zhonghua Yi Shi Za Zhi*. 2020;50(2):95–100. doi:10.3760/cma.j.cn112155-20190507-00043
8. Li H, Liu K, Gu J, Zhang Y, Qiao Y, Sun X. The development and impact of primary health care in China from 1949 to 2015: a focused review. *Int J Health Plann Manage*. 2017;32(3):339–350. doi:10.1002/hpm.2435
9. Shanghai Jiaotong University School of Medicine. *Second Round List for 'Double-Premier' Constructive Universities and Faculties* 2022. Shanghai: Jiaotong University School of Medicine. Available From: <http://www.moe.gov.cn/srcsite/A22/s7065/202202/W020220214318455516037.pdf>. Accessed April 10, 2022.
10. Anand S, Fan VY, Zhang J, et al. China's human resources for health: quantity, quality, and distribution. *Lancet*. 2008;372(9651):1774–1781. doi:10.1016/S0140-6736(08)61363-X
11. Ren X, Yin J, Wang B, Roy Schwarz M. A descriptive analysis of medical education in China. *Med Teach*. 2008;30(7):667–672. doi:10.1080/01421590802155100
12. Liu H, Hu Y, Shao J. Research about connection between postgraduate education and standardized residency training. *Chin High Edu*. 2013;3:127–129.
13. Ministry of Education of the People's Republic of China. Regulations of the People's Republic of China on academic degrees [in Chinese]; 1980. Ministry of Education of the People's Republic of China. http://www.moe.gov.cn/jyb_sjzl/sjzl_zcfg/zcfg_jyfl/202204/t20220421_620264.html. Accessed May 17, 2022.
14. Ministry of Education of the People's Republic of China. Opinions on the modification on types of medical degree and establishment of professional medical degree; 1998. Available From: http://www.moe.gov.cn/srcsite/A22/s7065/199802/t19980204_163521.html. Accessed April 8, 2022.
15. Wu L, Wang Y, Peng X, et al. Development of a medical academic degree system in China. *Med Educ Online*. 2014;19:23141. doi:10.3402/meo.v19.23141
16. Wang Y, Kang H, Fan J. Results of surgical skill assessment in general practitioners in Beijing. *Chin J Gen Pract*. 2010;9:264–266.
17. Yin J, Zha X, Li N. Contrastive analysis of resident trainees: relationship of education background and learning performance. *Chin J Med Educ*. 2021;41:243–246.
18. The Central People's Government of the People's Republic of China. Law of the People's Republic of China on practicing doctors [in Chinese]; 1998. Available From: https://www.gov.cn/banshi/2005-08/01/content_18970.htm. Accessed May 8, 2022.
19. Zhang M, Wen J. Establishment and perfection of the examination system for the licensing of doctors in China. *J Hospadm*. 2001;17:453–455.
20. Li X, Lu J, Hu S, et al. The primary health-care system in China. *Lancet*. 2017;390(10112):2584–2594. doi:10.1016/S0140-6736(17)33109-4
21. Weggemans MM, van Dijk B, van Doijeweert B, Veenendaal AG, Ten Cate O. The postgraduate medical education pathway: an international comparison. *GMS J Med Educ*. 2017;34(5):Doc63. doi:10.3205/zma001140
22. Zhu J, Li W, Chen L. Doctors in China: improving quality through modernisation of residency education. *Lancet*. 2016;388(10054):1922–1929. doi:10.1016/S0140-6736(16)00582-1
23. Han L. Challenges to the standardized specialist training in “5+3+X” mode of China. *Contin Med Educ*. 2016;30:19–21.
24. Zheng JC, Zhang H, Wu B, et al. Medical education reform in China: the Shanghai medical training model. *J Grad Med Educ*. 2020;12(6):655–660. doi:10.4300/JGME-D-20-00069.1
25. Li H, Zhou X. Medical education reform in China. *Postgrad Med J*. 2018;94(1118):673–674. doi:10.1136/postgradmedj-2018-136145
26. Deng C, Li X, Pan J. Private hospital expansion in China: a global perspective. *Glob Health J*. 2018;2(2):33–46. doi:10.1016/S2414-6447(19)30138-1
27. Gao J-M, Wu H-M, Lai Y-N. Preliminary study on combination of standardized training of residents and training of postgraduates professional degree in clinical medicine. *Chin J Med Educ*. 2012;32:125–128.
28. Gao T, Shiwaku K, Fukushima T, Isobe A, Yamane Y. Medical education in China for the 21st century. *Med Educ*. 1999;33(10):768–773. doi:10.1046/j.1365-2923.1999.00313.x
29. Ministry of Education of the People's Republic of China. Opinion on medical reform for extensive clinical personnel training by collaboration between medicine and education; 2014. Available From: http://www.moe.gov.cn/srcsite/A22/s7065/201407/t20140714_178832.html. Accessed April 24, 2022.
30. Chen L-H, Tian H, Shan J. The status quo, problems and countermeasures of standardized training for specialists in Shanghai. *Chin J Gen Pract*. 2019;17:1582–1585.
31. Cai H-Y, Liu Y, Zhang X-YZ, Ma H -J-J. Study on the effect factors of health professional title evaluation. *Chin Hosp Manag*. 2012;32:51–53.
32. Chen Q, Tan M, Lu T-L. Practice and appraisal on medical doctor regular evaluation in Shanghai. *Hosp Admin J Chin PLA*. 2015;22:1078–1079.
33. Zhang Z, Winston GP, Zhao HT, et al. Focus on China: should clinicians engage in research? and lessons from other countries. *Quant Imaging Med Surg*. 2014;4(5):413–425. doi:10.3978/j.issn.2223-4292.2014.10.07
34. Yuan HF, Xu WD, Hu HY. Young Chinese doctors and the pressure of publication. *Lancet*. 2013;381(9864):e4. doi:10.1016/S0140-6736(13)60174-9
35. Wang K-Y, Yang B, Tan Y. The status quo and trend of domestic and international continuing medical education. *J Mil Surg Southwest China*. 2009;11:951–952.
36. Wu X. The problems and countermeasure analysis on continuing education at hospital. *China Health Ind*. 2015;18:60–61.

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