



China's Medical Education and Interventional Neuroradiology Training

Xianli Lv, Hongwei He, Zhongxue Wu

Key words

- Interventional neuroradiology
- Medical education
- Training

Abbreviations and Acronyms

INR: Interventional neuroradiology

PBL: Problem-based learning

UEMS: Union Europeenne des Medecins Specialistes

WFITN: World federation of interventional and therapeutic neuroradiology

Beijing Neurosurgical Institute and Beijing Tiantan Hospital, Capital Medical University, Beijing, China

To whom correspondences should be addressed:

Hongwei He and Zhongxue Wu.

[E-mail: ttyzjb@sina.com; wuzhongxue6666@163.com]

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INTRODUCTION

Endovascular techniques and clinical experience have matured to the point that all or a significant part of the treatment of acute ischemic stroke, cerebral aneurysms, brachiocephalic occlusive disease, and arteriovenous fistulae or malformations is performed in angiography suites by neuroradiologists, vascular surgeons, peripheral interventionists, cardiologists, neurologists, and neurosurgeons worldwide (2). The incidence of stroke is approximately 2 million per year in China and is increasing at an annual rate of nearly 8.7% (8). Neurosurgeons currently provide only a small portion of the care of these patients. It is imperative that adequate training and quality assurance be in place to ensure that the use of interventional neuroradiology (INR) procedures impact favorably on the outcomes of these patients.

In 1999, Prof. Lasjaunias created, along with the Universities of Paris-Sud and Mahidol in Bangkok, a curriculum for INR training so that physicians of the Asian Pacific Rim have the opportunity to receive a unique education (10). The success of this

China's medical education system is complex and consists of degree programs lasting from 3 to 8 years, the inconsistency across previous educational backgrounds is a challenge when implementing residency training objectives and contents. Only in several advanced medical universities, education for interventional neuroradiology (INR) is a part of a rotation in the 2-year training for neurosurgery. Advanced INR techniques are confined to big cities such as Beijing, Shanghai and Guangzhou, where most of the Chinese INRs have their 6 to 12 months fellowship to major medical centers. With a tremendous economic growth in the region, we expect that INR practice will evolve at an equally rapid pace, and information presented in this chapter may soon become obsolete.

program was great, and soon it attracted doctors from around the world. To maintain and to improve the general quality level of its specialty, in 2012 discussions and multiple working seminars within the Union Europeenne des Medecins Specialistes (UEMS), a training charter to acquire such a particular qualification in INR was proposed and approved by the (UEMS 12). Both the World Federation of Interventional and Therapeutic Neuroradiology (WFITN) and UEMS recommendations recognize that there are a number of structural and operational differences in the health care systems, and training systems in the different countries (3, 11). In East Asia, there also are governmental or nongovernmental training charters for INR in Japan, Korea, and China. There are some differences, however, between these charters of 3 countries, and the courses of medical education also are different. Education and training for specialty (residency) or subspecialty (fellowship) are on the continuing education program even though the contents (15), format, or period are different in the 3 countries. I will attempt to describe the medical education and the evolution and current practice of INR in China.

UNDERGRADUATE AND POSTGRADUATE MEDICAL EDUCATION

China has 268 medical schools and very large production of graduates (144,000 per

year). China's medical education system is complex and consists of degree programs lasting from 3 to 8 years, with the longest duration usually associated with more competitive schools (5). The explanation for China's great production system is its very large class sizes, averaging 548 graduates per school. For the clinical doctors, 5 years undergraduate classroom work usually is followed by clinical practicum at affiliated hospitals. After graduation, a young doctor needs to complete 3–6 years of residency training; some doctors need extended training for their subspecialty. Internal medicine usually takes 3–4 years of residency training, but surgical specialties may take 5–8 years to complete. To control the medical education standard, the Chinese Ministry of Education set up a quality control regulation on medical education particularly for the English-medium undergraduate medical education (14). Upon graduation, the graduate must work as a resident physician for few years to be eligible to take a National Medical Licensing Examination for physician certification. This examination is conducted by the National Medical Examination Center. Without approval of registration by the Ministry of Health one cannot practice medicine in China as a physician or assistant physician. A medical graduate rotates through several departments and then assigned to a specialty department according to his or her strengths and the hospital's needs. Specialty physician usually are attendings

who specialized in a certain specialty during the training process in a specialty hospital or in a subspecialty at a general hospital. The classification of specialties at a Chinese hospital is similar to that at American hospitals.

The undergraduate curriculum for most common 5-year programs places heavy emphasis on basic biomedicine, medical technology, and clinical medicine (1). This focus also is prevalent in 3-year schools and in the more competitive 7- to 8-year degree programs. Reports across China consistently show the very little student exposure to the humanities, social sciences, communication skills, ethics, and population or public health. Early patient exposure is also uncommon. Class size and classrooms have limited application of problem-based learning (PBL), team-based learning, and case studies. There are limited faculty–student and student–student interactions for creativity and innovation. A big difficulty is that faculty numbers (and also quality) might not have kept pace with numeric expansion of students (12).

The national resident standardization training has not been implemented nationwide in Chinese hospitals, although almost all hospitals require their physicians to be trained as resident for few years before promotion to attending. The resident standardization training was launched in some University-affiliated hospitals. These students will complete their MD study and have to pass the National Medical Licensing Examination during the residency (14).

The national resident standardization training will start in 2015, and all medical graduates are required to receive mandatory training from 2020. The primary model is a 5-year course in a medical school plus 3 years of residency training; however, it still faces significant challenges. China has a large and diverse group of 144,000 graduates. Sixty-seven thousand are 5-year medical students, 34,000 are master or doctoral-level graduates, and 63,000 graduates have only 3 years of medical education (5). The inconsistency across previous educational backgrounds is a challenge when implementing residency training objectives and contents. The resident standardization training contents issued by National Health and Family Planning

Commission (5) are heavily focused on medical technology, with little content about humanities, ethics, communication skills, and public health. Many medical graduates have lost their enthusiasm in pursuing their career because of insufficient salaries, heavy workloads, and patient–doctor tensions (14). An additional 3 years of residency training with inadequate income may prevent more talented graduates from going into this field. Efforts should focus on several aspects: a more detailed framework for differently educated individuals, a more humanistic and pragmatic training content, and acceptable salaries that will attract greater enrollment (1).

CURRENT STATUS OF INR AND INR TRAINING IN CHINA

Recent advances in devices and materials and therapeutic technical improvements in INR practice make it possible to use this therapeutic method for the treatment of neurovascular disease. INR has progressively become a true subspecialty at the crossroad of neuroradiology, neurosurgery, neurology, and neurosciences (12). The participation of the Far East in INR was 39.7% in 2013 (Marco Leonardi, 2013, personal communication).

INR was introduced to China during the 1980s in conjunction with China's Open and Reform Policy. Currently, there are approximately 1405 full-time and part-time INRs in China, including 833 neurosurgeons, 361 neurologists, and 211 radiologists (Feng Ling, Shanghai, 2012). In the past 10 years, INR procedures dramatically have increased in China. Advanced INR techniques are confined to big cities such as Beijing, Shanghai, and Guangzhou, where most of the Chinese INRs have their 6- to 12-month fellowship at major medical centers. Zhongxue Wu was a professor of INR of Capital Medical University and Beijing Tiantan Hospital and a pioneer of INR in China. He trained the first generation of full-time INRs in China in the 1980s and founded the first INR ward in 1992, which is the only one in China. I was trained by him since 2006 and I have been deeply influenced by his great enthusiasm and professional spirit for INR (16).

INR in China is a relatively young subspecialty. It has become the largest one in the world in terms of the number of INRs.

The inpatient INR ward is very important to win the turf battle with other specialties. At the INR ward of Beijing Tiantan Hospital at Capital Medical University in Beijing, more than 2500 INR procedures are performed annually by full-time INRs.

The training requirement for INR in China is contained in the “Management Standard for Diagnosis and Treatment of Interventional Neuroradiology in China,” which was an official charter published by Chinese Ministry of Health in 2012. In this charter, the full training to become an INR specialist is defined as two and half years of full-time training. One of these years is to be spent in core INR and 9 months is to be spent in neurosurgery, neurology, and neuroradiology, respectively. However, there is not yet any official or national INR training in China. Only in several advanced medical universities is education for INR a part of a rotation in the 2-year training for neurosurgery. This training is designed to provide students time to become proficient with catheter-based techniques used in cerebral angiography (with a requirement of at least 100 angiograms) in addition to providing a fundamental foundation in radiation sciences (including knowledge in radiation physics and in interpretation of neuroradiological studies).

The Chinese INR Coordinating Committee of the Chinese Doctor Association was founded at the beginning of 2014 and included 9 members. Every year, 3 major internal symposiums are hosted regularly each year in Beijing and Shanghai. An example is the Beijing Tiantan Neurointervention Symposium, for which the number of participants has increased to approximately 1000. Many world renowned professors, including Fernando Viñuela, Lasjaunias, Karel terBrugge, Luc Picard, Alex Berenstein, Anton Valavanis, Marco Leonardi, and Michel Mawad, have come to China to deliver lectures. All of these meetings and symposia offer good platforms for neurosurgeons to exchange ideas and broaden their views. The Chinese Doctor Association also plays an important role in continuing medical education for resident training in each specialty. Annually, many hours of courses for continuing medical education credit are available in large cities such as Beijing, Shanghai, and Guangzhou. Today's Chinese neurosurgeons actively participate in

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