

## Stroke Physician Training in China

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Rapid advances in stroke diagnostics and management, and gains in our knowledge of stroke pathogenesis, pathophysiology, and prevention, make it essential for physicians to develop specialized skills in all aspects of stroke care. It is no longer feasible for general physicians or even internists to address issues that can affect patient outcome, such as reperfusion assessment and decision making in acute ischemic stroke, optimal blood pressure management, selection of patients for anticoagulation or cardiac intervention, genetic aspects of stroke, interpretation of advanced neuroimaging findings, or the diagnosis and management of the not-so-uncommon causes of stroke, such as cerebral artery dissection, vasculitis, and Moyamoya disease. Expansion of stroke-related knowledge and therapeutics has led to the establishment of Vascular Neurology as a subspecialty within Neurology in United States.<sup>1</sup> With the advent of new interventions, such as endovascular thrombectomy, stroke physicians are and will continue to be at the forefront of stroke care worldwide.

The number of patients with stroke and stroke survivors in China has been growing rapidly. Stroke care has become a national priority in China. During the past few years, a dedicated stroke medical association (China Stroke Association), regional and national stroke meetings (such as Tiantan International Stroke Conference), and focused journals (*Stroke* and *Vascular Neurology*) have emerged. Chinese patients, general physicians, and even neurologists are now seeking the advice of physicians with specific training and expertise in stroke. Specialized training and certification of stroke physicians are clearly warranted. This article presents information about the current demand from stroke burden in China and its organizational care, details of stroke-related medical education, and the future direction of stroke physician training in China.

### Increasing Burden of Stroke in China

In 2013, there were ≈2.4 million new patients with stroke and 11.1 million stroke survivors.<sup>2</sup> Given the rapidly aging population for the next 2 decades, the incidence of stroke is expected to double or even triple increase. In addition, the average length of hospital stay in China is 2 weeks, much longer than that in United States, and contributes to the substantial workload of those engaged in stroke care. Approximately 60% of

patients admitted to neurological wards in tertiary hospitals experience stroke. This percentage can be as high as 90% in county-level hospitals. It is common for a neurologist or stroke specialist to see ≈80 patients with stroke daily in outpatient clinics. The number of neurologists in China was increased from 51 000 in 2006 to ≈100 000 neurologists in 2015. More stroke physicians need to be trained to meet the demand of the huge burden of stroke in China.

### Stroke Care Organization in China: Current and Future Directions

The first stroke unit in China was established in 2001 under the leadership of Professor Yongjung Wang at Beijing Tiantan Hospital. Stroke care organization has evolved to include stroke units, primary stroke centers, and comprehensive stroke centers. China still lacks an officially recognized stroke care organization. To improve stroke care system, the Chinese Stroke Center Alliance was initiated by the Chinese Stroke Association to guide stroke center construction in 2015.<sup>3</sup> A guideline for construction of stroke centers, incorporating a vision for primary stroke centers and comprehensive stroke centers, has been issued by Chinese Stroke Association. This guideline emphasized that a specialized care team, each with a director and team members demonstrating stroke expertise, be an essential element in the creation and operation of stroke centers. Stroke physicians need to be trained for leadership positions within stroke care organizations.

### Medical Training in China

Faced with many challenges in delivery of healthcare, including most importantly stroke care, China has changed its medical education strategy and now offers medical degrees of varying durations to foster the training of physicians. Medical training includes basic medical education, graduate medical education, and continuing medical education.

### Basic Medical Education

Unlike medical students in the United States who require a university Bachelor's degree before medical school admission, in China, high school graduates can be admitted directly into medical school based on results on the National College Entrance Examination (GAOKAO). Medical students can graduate in

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either 5 to 6 years (Doctor of Medicine degree, which is similar to the Bachelor of Medicine degree in other countries) or 7 years (Master of Medicine degree) or 8 years (combined Bachelor of Medicine–Doctor of Philosophy degree). Medical students with a Bachelor degree can separately obtain a Master or a Doctor of Philosophy degree by completing 3- or 6-year degree courses.<sup>4</sup> These degrees are intended to cultivate specialists, clinical researchers, and academic leaders in various fields, such as stroke. The stroke subspecialty of a neurology Doctor of Philosophy program is a 3-year curriculum that offers additional or adjunct training of neurologists, focusing on either stroke clinical or research skills.

### Graduate Medical Education

In 2013, the clinical training system in China was reformed to embrace 5 years of undergraduate medical study (Doctor of Medicine degree) combined with 3 years of hospital-based residency (5+3 program).<sup>5</sup> This 3-year postgraduate medical education is called standardized residency training and will become mandatory for all practicing physicians by 2020. After this 3-year mandatory standardized residency training, there will be X years of specialty training, which is called 5+3+X. This is similar to the US residency training program. The length of the US residency training varies from 3 to 7 years according to the specialty. If medical students earn a Master of Medicine or a combined Bachelor of Medicine–Doctor of Philosophy degree in China, then they only need 1 to 2 years residency training to gain access to specialty training. In general, medical students after graduation need to spend 5 years in residency training to become a general neurologist (Figure).

### Continuing Medical Education

In China, there are several models of continuing medical education for stroke physicians. First, the most common way to obtain continuing medical education is to take part in annual regional, national, and international conferences or webinars. The Chinese Stroke Association, a national academic non-profit social organization, provides a variety of continuous education programs, including training, webinars, and other online educational courses to further the physicians’ professional development. In total >30 000 professionals attended educational meetings in 2016. The Tiantan International Stroke Conference, launched by Chinese Stroke Association, is the largest national stroke meeting in China. Over 10 000 stroke-related physicians and healthcare providers take part in this academic forum that provides a vital platform for continuing medical education in stroke, introducing the latest basic

and clinical developments in stroke prevention and treatment, and presenting information on controversial clinical issues.

Second, local and national Ministries of Health also have launched several stroke training programs to increase the number of physicians with knowledge and skills necessary for stroke management, as well as to educate physicians on stroke services, and to assist them in keeping up-to-date with relevant research findings. For example, the Chinese Stroke Center Training Program has been sponsored by the Ministry of Health for >10 years and is dedicated to developing stroke units.

Third, a 3- to 12-month stroke training program has been designed for neurologists from county-level or small–medium city-level hospitals. These neurologists dedicated to stroke care are enrolled by tertiary or academic hospitals to receive stroke training. They learn how to establish a stroke team, which includes a stroke physician, nurses, rehabilitators, and other staff members, and how to operate a stroke unit. They also learn the standard operation procedure of recommendation-based stroke managements.

### Future Vision for Accredited Stroke Training in China

In comparison with the continuum of stroke physician training in the United States (Figure), there is a remarkable gap and a lack of a standardized subspecialty training for stroke physicians (vascular neurology fellowships training) in China. In 2015, 9 ministries of the Chinese government, including the National Health and Family Planning Commission (previously called the Ministry of Health), jointly issued national guidelines for a pilot project that would standardize the training for a specialist. Thus, establishment of a system of standardized stroke physician training and accreditation in China is moving forward. We studied the training program of vascular neurology fellowships approved by the Accreditation Council for Graduate Medical Education in the United States. But, taking into consideration the current healthcare situation in China, we put forth some of our own proposals for future stroke physician training.

First, under the guidance of the National Health and Family Planning Commission, a national board of vascular neurology should be founded by an authorized body, such as the Chinese Medical Doctor Association, the Chinese Medical Association, or the Chinese Stroke Association. This national board would be responsible for formulating the framework for a vascular neurology training program: certification criteria for training institutes, fellow eligibility requirements, content outline for the examination, stroke training medical education and clinical rotations, fellow evaluation, and so on. The training program in stroke would be at least 12 months in length

Stage 1	Stage 2			Stage 3
Medical school	Graduate medical education			Continuing medical education
MD programme (entry after bachelors)	Residency training 1 (1-year internal medicine training)	Residency training 2 (3-year neurological training)	Vascular neurology fellowship training (1 year)	Career-long
Bachelor (5 years)	Standardized residency training (3 years)	Standardized neurologist training (2-3 years)		Career-long
Master (7-8 years) or doctorate (8-11 years)	Residency training (2-3 years)			

Figure. Three stages of medical education. MD indicates Doctor of Medicine.

and include 9 months of clinical rotations, typically, 6 months on the inpatient stroke service and 3 months in outpatient stroke clinics or in neurocritical care, and 3 months of elective/research time. Optional stroke-related rotation units also could include vascular neurology emergency, interventional neuroradiology, neurovascular surgery, neuroradiology, neurosonology, or neurorehabilitation. Fellows should master the following: basic science aspects of stroke; epidemiology, risk factors, and prevention; causes of stroke; evaluation and treatment of stroke patient; genetics; and rehabilitation. Successful candidates will receive time-limited certificates. In addition, with the available evidence from the landmark trials in 2015, there also exists a remarkable shortage of neurointerventionists in China. We also need pay great attention to training neurointerventional specialists. To allow the trainee to have a well-developed research experience, a research component should be integrated into the primarily clinically based training program. This component should be flexible and include training of physicians in research methodology, clinical trial design, and statistics.

Second, a system of guaranteed support for stroke physician training should also be established and include appropriate remuneration for physicians in stroke training, degrees and credentials, clinical practice, support for training institutes, and a platform of certification examinations. In addition, we would choose select regions in which to conduct pilot projects and to optimize the components of this training program.

### Conclusions

In the past few decades, knowledge in the stroke field has expanded rapidly. Because of an ever-increasing stroke burden, and the development of stroke care organization, more specialized stroke physicians are needed in China. Although China has launched key steps toward a national standardized

residency training system for general physicians and specialists, standardized stroke physician training is still relatively lacking. Following international practices, a standardized stroke fellowship program needs to be developed to bridge this gap in stroke medical education so that the changing demands in China are met.

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### Disclosures

None.

### References

1. Adams HP Jr, Biller J. Future of subspecialty training in vascular neurology. *Stroke*. 2014;45:3730–3733. doi: 10.1161/STROKEAHA.114.006318.
2. Wang W, Jiang B, Sun H, Ru X, Sun D, Wang L, et al; NESS-China Investigators. Prevalence, incidence, and mortality of stroke in China: results from a nationwide population-based survey of 480687 adults. *Circulation*. 2017;135:759–771. doi: 10.1161/CIRCULATIONAHA.116.025250.
3. Wang Y, Li Z, Zhao X, Wang D, Li H, Xian Y, et al. Stroke care quality in China: substantial improvement, and a huge challenge and opportunity. *Int J Stroke*. 2017;12:229–235. doi: 10.1177/1747493017694392.
4. Xu D, Sun B, Wan X, Ke Y. Reformation of medical education in China. *Lancet*. 2010;375:1502–1504. doi: 10.1016/S0140-6736(10)60241-3.
5. Zhu J, Li W, Chen L. Doctors in China: improving quality through modernisation of residency education. *Lancet*. 2016;388:1922–1929. doi: 10.1016/S0140-6736(16)00582-1.

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