



Investigation of Chinese Neurosurgeon Creativity - What can be drawn from the US Neurosurgeon Education System

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Abstract

The creativity of Chinese young neurosurgeon is a weakness comparing to that of the counterparts in US. The professional education system of Chinese young neurosurgeon is yet to be improved. This study compares the neurosurgery training system between China and US, especially the neurosurgeon residency training program, to draw experience from US neurosurgeon education system for enhancing the creativity of young neurosurgeon in China. The creativity improvement of young neurosurgeon requires mature professional training system, nice sense of humanism, high quality of personality, and powerful support of the nation.

Keywords: Neurosurgery; Chung-Cheng Wang; Surgery

Introduction

The neurosurgery in China experienced great development for the last few decades. The population neurosurgeon ratio (PNR) had already reached the similar level with that of the developed country in 2009, with one neurosurgeon per 100 thousands population and 13 thousands in all (data by Chinese Congress of Neurological Surgeons) [1] (Table 1). Generations of neurosurgeons in China had made impressive contributions to skull base tumor, brain stem tumor, and intramedullary tumor surgeries. At the mean time, young neurosurgeon in China weren't among the most outstanding on the international stage. The Young Neurosurgeon Awards was set up by World Federation of Neurosurgical Sciences (WFNS) in 1979. Since 1981 it started to offer five awards every four years for the best original unpublished papers whose first authors were neurosurgeons younger than 35 years old. The papers were evaluated according to the academic value and the creativity. Only three Chinese young neurosurgeons won the awards ever [2]. At a glance of those medical words named after a person most of the eponymous doctors were from western world or Japan, and they generally had already shown impressive creativity when they were still young neurosurgeon. Creativity development requires broad medical knowledge, profound culture, mature personality, and strong mind [3]. Creativity is essential to advancement and superior.

The young neurosurgeon development is not only a personal affair but reflecting the whole medical system and the medical education system of the country. Fully development of the professional training system is necessary and should be based on specific characteristics of the Nation while drawing experience from other advanced cultures.

The professional training system of young neurosurgeon

The residency training is a critical process for creativity development of young neurosurgeon. The Chinese neurosurgeon residency training program is still under revising. The latest policy, The Details of Chinese Neurosurgeon Training Program, was released by Chinese Congress of Neurological Surgeons in 2012. Medical students who choose surgery as their major enter the surgery residency training system after they received the medical doctoral degree. The first year is General Surgery training. The resident can take the medical license examination before or during this first year training. If passed the resident can go on entering the next stage of five years of neurosurgery training. During this stage, the resident will rotate in all groups of Neurosurgery department, Neurology Department, and Neuro-radiology/imaging department, and participate in research projects. The training methods include taking responsibilities in patient management, joining selective operations regularly, shifting on call and dealing with emergencies, attending classes and lectures, joining researching projects and publishing papers. The destination is to mentor a medical

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Received Date: 18 Jul 2018

Accepted Date: 23 Aug 2018

Published Date: 27 Aug 2018

Citation:

Ma J, Jia G, Jia W. Investigation of
Chinese Neurosurgeon Creativity
- What can be drawn from the US
Neurosurgeon Education System.
World J Surg Surgical Res. 2018; 1:
1047.

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Table 1: Population Neurosurgeon Ratio, PNR:

Country	Total population (million)	Neurosurgeon population	PNR
USA	300	2850	105000
UK	60	120	500000
France	66	270	244000
Germany	90	800	113000
Japan	130	7900	17000

*Statistics from The World Federation of Neurosurgical Sciences (WFNS) at the beginning of the 21st century, according to the numbers of registered neurosurgeon of WFNS, which may be less than the actual neurosurgeon population

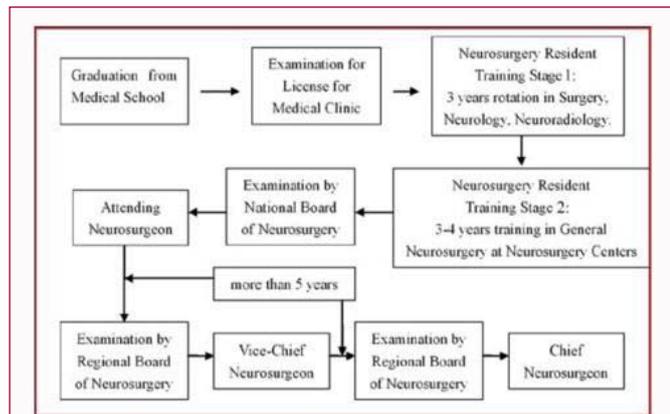


Figure 1: Schematic diagram for training of neurosurgeons in mainland China. Currently, training for neurosurgical residents lasts 6 to 7 years. After completing residency training, a neurosurgeon must complete continuing medical education training courses to be promoted to higher positions [15].

student into a junior clinical surgeon, being able to applying medical knowledge into real clinical world, dealing with common diseases of neurosurgery, finishing selected operations, and to communicating with patients under every circumstance. At the end of the whole training there will be a written test and in interview for Certification of Chinese Neurosurgeon.

In US the present neurosurgeon residency training program was the program released by Accreditation Council of Graduate Medical Education (ACGME) in 2013. The medical students usually take the first two steps of medical license examination before the graduation and apply for residency training program through national medical matching system afterwards. The matching is national-wide, two-way match, and double blind. The whole residency training program is seven years. The first year is rotation in General Surgery, Emergency Department, Multi-Trauma, Neurology, and Anesthesia Department. The next 1.5 years will be rotating in neurosurgery-related departments like Neurology, Neuropathology, Neuro-ICU, Neuro-imaging, etc. Then starts the rotation in Neurosurgery Department for the rest years. Around year five there will be a quite flexible choice time of one to two years of pursuing research or further neurosurgery subspecialty training. The last one to two years are the chief residency training. Evaluation will be given after every stage by multi-departments and documented through ACGME registry. The results will be fed back to the resident every half year, reviewed by the program director together. At the end of seven years training there will be a systemic summary based on professional standards on clinical work, as well as on education work and personality [4-7] (Table 2).

Table 2: The neurosurgery resident training program of the Massachusetts General Hospital (MGH) of USA.

Year	Training	Period
1 st year	General surgery	6 months
	Neurology	3 months
	Neurosurgery	6 weeks
	NICU	6 weeks
2 nd year	Vascular surgery	4 months
	Radiosurgery	4 months
	Associate junior attendant, North Department	4 months
3 rd year	Associate senior attendant, East Department	4 months
	Pediatric neurosurgery	4 months
	Spine	4 months
4 th year	Research	1 year
	Emergency (night)	1-2 times per week
5 th year	Research	1 year
	Responsible for the neurosurgery blackboard (literary)	1 year
6 th year	Pediatric neurosurgery and Spine	4 months
	Chief resident, East Department	4 months
	Chief resident, West Department	4 months
7 th year	Chief resident, South Department	4 months
	Attendant, North Department	8 months

There are essential differences between the two training systems. The US system possesses national-wide double-way matching admittance criteria, counteracting the limitation of region or institute. This promises more reasonable distribution. The individual will result in the most interested and suitable position, which are important internal motivation for one’s long-term development. The training covers all aspects from the most basic to the most advanced abilities as a neurosurgeon, while being carried out step by step. During the process a young neurosurgeon will first cultivate strong bases of neuroscience, and then engaged into neurosurgery, further investigate their own orientation of professional development during the individualized research or subspecialty training, and lastly practice all they’ve learnt during the chief residency training. Furthermore there’re fully developed evaluation systems from ACGME focusing not only on resident but also on teachers and the training system as well [8-10]. In China the medical graduates will searching the residency training program in person due to lack of a national-wide matching system. The bias of resident distribution does exist and will be influenced by where the candidates come from or from which medical school they graduate. Some regions have their own training system which may not follow exactly the same standard. The training stages are more interweaving. The residents rotate in all related departments including research work without detailed stages. The evaluation system also has bias which focuses more on residents while lacks sufficient feedbacks of the training system itself. The present training system requires further revising and a national-wide standard is necessary.

The role of humanism and personality

Modern medicine is more humanistic rather than scientific. Humanism is the center point and any science will be hollow and banal without this. Western medicine emphasizes the basic elements,

investigating into the molecular level, revealing the most innate mechanisms and then following the subsequences. Chinese culture is more macroscopic, tending to view a organic body as a whole, emphasizing the interactions of all systems, and trying to recuperate on the basis of harmony both internally and externally. The harmony theory is the essence of Chinese medicine. The two cultures are viewing from two sides but into the same center point. Embracing US experience into Chinese training system with combination of the two cultures maybe expected to cultivate even more promising results, and can be drawn for young neurosurgeon training. More wide spread culture background is as important as professional knowledge and skills for improving personality with superior integrated abilities of understanding, admiring, expressing, and creativity. Creativity is a synchronized ability based on encyclopedic professional knowledge as well as profound cultures. With high level of creativity the individual is able to pursue life-long study, cultivate sensitivity to new information, investigate in new arena with the capability, and to discover and invent. A young neurosurgeon full of these abilities will thus be able to contribute on a world-wide stage [11,12].

Humanity and personality are also important as all doctors are serving human beings [13,14]. A wonderful doctor should be a philosopher of life, with all qualities of decency, selflessness, modesty. A noble soul will guide a young person following the pure route of pursuing ideal, leading to the real scientific creativity. On the other hand the neurosurgery career requires extreme energy as well as full intelligence. ACGME has already considered rational rest into professional plan of a neurosurgeon. There are standards on working hours, frequencies of on call, and reporting program. A nice personality will promise a good health status of the young neurosurgeon, both physically and mentally.

The characteristics respecting young neurosurgeon training in China

China is a large country. The levels of development are quite various for different regions, so is for medicine or medical education system. Neurosurgery as a subspecialty in surgery has significant imbalance in development [15] (Figure 1). All advanced neurosurgery sources gather around first line cities like Beijing, Shanghai, etc. Beijing Tiantan Hospital is one of the largest neurosurgery centers in China, with annual operations around 8,000 to 9,000. 75% of the patients are from all around China other than Beijing. Each neurosurgeon is in charging of approximately one 2.4 inpatient beds, taking care of 903 clinics admission, 67 inpatients, and 61 operations per year [7]. The main sources of neurosurgeon residents are new graduates from medical school without much professional experience. So that the difference in levels of medical school of different regions will also influence the residents embraced into the residency training system.

The neurosurgeon training system in China has been greatly improved by Dr. Chung-Cheng Wang. He is one of the most excellent pioneers in Chinese neurosurgery and is also the first neurosurgeon awarded by Academic Divisions of the Chinese Academy of Sciences in China, the highest academic awards in China. He set up Beijing Neurosurgical Institute relying on the support of Beijing Tiantan Hospital in 2004, dedicating to neurosurgeon training [16,17]. The Institute is open to those being certified with medical license from all public medical schools and hospitals in China. The Institute adopts a five-year training system, emphasizing on both clinical ability and academic researching ability. The participants will take rotation in Neurosurgery, Neurology, Neuro-radiology/imaging,

Neuro-pathology, and Neuro-physiology departments, and are qualified to apply for chief resident position, participating in large amounts of operations. The staged evaluation was taken by Beijing Tiantan Hospital Expert Committee. The first 20 students graduated in 2009. Most of them returned to their original regions and became the main force of local neurosurgery. Beijing Tiantan Hospital also has a lot of further study programs of different terms, accepting neurosurgeon of all levels. Dr. Chung-Cheng Wang also built a wide-range of collaboration between Beijing Tiantan Hospital and Other hospitals from those regions of less advanced neurosurgery, while offering training opportunities for young neurosurgeon of these institutes as well. The limitation of these training systems is lacking of official supports from the government. During the five years of training in Beijing Neurosurgical Institute, the participants have no opportunities of specialty certification or promotion, nor additional salary or imbursement. During collaboration with other hospitals, imbalanced development of different hospitals will appear according to the subspecialties of the experts that supporting the institute. This will be a special limitation for the training of young neurosurgeon, who needs balanced development of all aspects. There are a lot of public and private institutes in US offering financial and political supports for residency training. The comprehensive national strength and policy will always be a major determining factor for young neurosurgeon development.

The present world is an everyday-changing world. As a representative of the most interdisciplinary science medicine is experiencing faster and faster development, combining the most advanced science and technique to serving life. Only the highly talented and fully trained person can be qualified to master this honorable profession. Neurosurgery is among the peaks. Young neurosurgeon is the future. Let's hold the respects for neurosurgery, cherish the young talents, and fulfill the ultimate summit what has been pursued by every Chinese neurosurgery pioneer. That is to advance neurosurgery in China, and to advance neurosurgery in the world.

Financial Support

Jun Ma is supported by the Funding Project for Development Program for Beijing Superior Talent. Granting organization: Organization Department of Beijing Municipal Committee. Program No. 2015000021469G223.

Wang Jia is supported by National Natural Science Funding. Granting organization: National Natural Science Foundation of China. Program No. 81471229.

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