



Neurocritical Care in China: Past, Present, and Future

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Key words

- China
- Intensive care
- Neurocritical care
- Neurosurgery
- Stroke
- Trauma

Abbreviations and Acronyms

NICU: Neurointensive care unit

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INTRODUCTION

Neurocritical care, especially in China, is a relatively new discipline dedicated to the care of critically ill neurologic patients and the advancement of these techniques. In the past several decades, neurocritical care has advanced tremendously as a subspecialty. According to the Chinese Ministry of Health, the number of hospital beds and number of inpatients has increased every year since 2003 and likely will continue to increase in the coming years.¹

Despite a lack of resources and materials, there is an increasing demand for acute neurologic care owing to the heavy burden of neurocritical illness in many developing countries.² A 2015 report from the Chinese Stroke Association listed stroke as the first cause of death in 1992–2012, resulting in 130,000 annual deaths and an annual prevalence of new cases of 270,000.³ The incidence of stroke has increased from 98 per 100,000 people in 1992 to 318 per 100,000.⁴ The most common conditions that Chinese neurointensivists manage are cerebral infarction, intracranial hemorrhage, intracranial infection, and neuromuscular

Despite the lack of resources and materials, there has been an increasing demand for acute neurologic care owing to the heavy burden of neurocritical illness in most developing countries, including China, where the morbidity and mortality of severe neurologic and neurosurgical disorders remains high. Neurointensive care units did not start appearing in China until the late 1980s. Although great progress has been made over the past 2 decades in the establishment of equipped neurocritical care centers, advancements in medical infrastructure, streamlining of resident training programs, and implementation of multidisciplinary care teams, there remain areas that warrant improvement to care for our growing patient population. Here we review and discuss the history, present state, and future of neurocritical care in the People's Republic of China.

diseases. Despite recent advances in infrastructure, the morbidity and mortality of severe neurologic illnesses and trauma remains high, with estimated rates of 23.64% for cerebral infarction and 27.97% for intracranial hemorrhage, and an overall mortality rate of 21.79%.⁵ In addition, chronic diseases cause approximately 80% of the deaths in China each year, one-third of which can be attributed to cerebrovascular accidents.⁶

History of Neurocritical Care in China

Beginning in the early 1950s, independent neurosurgical services began to appear in major Chinese cities. Medical personnel were dispatched to foreign countries, including the USA, the former USSR, and Japan for postgraduate training, and by the 1960s independent neurosurgical departments were in place in 1 or 2 large hospitals in each province. Since 1978, the Chinese economy has flourished, and the government has invested heavily in medical infrastructure. Neurosurgery in China has progressed swiftly since then, and hospitals have become well equipped. However, neurointensive care units (NICUs) did not start appearing in China until the late 1980s.⁷

During the late 1980s and early 1990s, NICUs began to develop with the expansion of neurosurgical practice, established mainly by existing neurosurgery departments to care for their growing population of traumatic brain injury

patients (Figure 1). The establishment of these units undoubtedly helped reducing the very high morbidity and mortality rates. With the significant increase in the incidence of stroke seen through the 1990s,⁴ these units became more prevalent and began to treat stroke patients, which led to the gradual expansion of the neurocritical care subspecialty to include neurologists and critical care physicians. Only in the last decade have dedicated neurocritical care physicians come into practice in China. The management of these units varies by institution and fall under the auspices of neurosurgery, neurology, subspecialty trained neurocritical care teams, or combined neuroscience services.⁷⁻⁹

Although these advancements have occurred in tertiary care hospitals for the most part, to this day persons in the most remote areas of China still do not have ready access to intensive care. Critically ill patients often need to travel great distances to receive adequate treatment.

Barriers to and Advancements in Healthcare Access

As of 1999, a total of 49% of the urban Chinese population had health insurance, in most cases provided by the state, but only 7% of the 900 million persons in rural China had any medical coverage.^{10,11} The government failed to fix this in 2003 despite the introduction of low-priced



Figure 1. (A–C) An older neurocritical care unit in China established during the early 1990s.

health insurance that covered some hospital expenses for rural residents, and in 2012 introduced government-subsidized comprehensive health insurance, which now covers 95% of the population.¹¹ In addition, significant efforts in the areas of preventative and primary care have been undertaken, including an extensive network of clinics nationwide.^{11,12}

The Chinese government has now launched the Healthy China 2020 Initiative, which aims to provide universal healthcare to the entire Chinese population and to foster chronic disease prevention through population-wide approaches.^{6,13}

Owing to the rapid rise of the Chinese economy in the past 30 years, the standard of living of the general Chinese population has increased. Today, there is a large middle-class population that seeks high-quality patient-centered healthcare. As a result of this demand, private hospitals also have increased in popularity in China,

especially in recent years.^{14,15} The private sector accounts for almost one-half of the total number of hospitals in China, and as of June 2014 there were 11,737 private hospitals in China, representing an annual growth rate of 16% from 2008 to 2013.¹⁵ The number of patients treated and discharged from these hospitals accounts for only approximately 10% of the country's total patient volume, which falls far short of the goal of 20% set by the State Council.¹⁵ However, private hospitals are often smaller in size, cater to primary and secondary elective care, and are less frequently visited by patients, increasing the demand on public tertiary care institutions. With the continuing expansion of healthcare and large investments from private investors, these hospitals are evolving with market forces and are making improvements in process management, human resources, and medical supplies and equipment,

and, importantly, are also expanding their scope and quality of service.^{14,15}

Increased Demand for Neurocritical Care in China

Because China's extremely large patient population is one of the unique features of neurocritical care in China, the high volume of cases often can result in significant wait times for surgery. In addition, owing to the heavy burden of cerebrovascular disease and brain tumors, neurosurgeons in China do not have enough time to perform simple surgeries, which are often referred to lesser-trained surgeons of other disciplines.⁸ To meet this demand, NICUs require a trained staff of physicians and nurses to effectively manage such critical patients (Figures 2–3).

Despite the very limited information available in the literature on neurocritical care in China, a nationwide survey conducted by Su and colleagues in 2013

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