

Stroke and Stroke Care in China Huge Burden, Significant Workload, and a National Priority

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Abstract—At the same time as the world recognizes the rapid economic development in China, Chinese healthcare system has also had significant improvement. However, this nation of 1.4 billion faces tough challenges in treating stroke, the leading cause of death in China. The recently completed Chinese National Stroke Registry has provided new information on the status of stroke epidemiology, diagnosis, management, and prevention strategies in China. In this article, we summarized these new findings, described the effort of providing and improving stroke care, and illustrated the challenges in risk factor modification and secondary stroke prevention. Well-designed epidemiological surveys and clinical trials for stroke prevention and management are still urgently needed in China. (*Stroke*. 2011;42:3651-3654.)

Key Words: cerebrovascular disease ■ economics ■ risk factors ■ stroke care

See related articles, pages 3336, 3338, 3341, and 3655.

Globally, stroke is the second leading cause of death in those >60 years and the fifth leading cause of death in people aged 15 to 59 years old.¹ In China, with 1.4 billion populations, the annual stroke mortality rate is approximately 1.6 million, approximately 157 per 100 000, which has exceeded heart disease to become the leading cause of death and adult disability. Stroke causes approximately 116 deaths in population of 100 000 in cities and 111 deaths in rural areas. In addition, China has 2.5 million new stroke cases each year and 7.5 million stroke survivors.^{1,2}

There are >50 ethnic minorities in China. Although studies of stroke epidemiology in these groups are difficult to conduct, the annual incidence of stroke in Tibetans is approximately 88.7 per 100 000 with a mortality rate of 25.9 per 100 000.³

There is also a geographical difference of stroke incidence in China. Northeast China has the highest incidence (486 per 100 000), whereas in southern China, the incidence is significantly lower (136 per 100 000). Stroke is more prevalent in older Chinese (>75 years) and the ratio of stroke in Chinese men to women is 1.3 to 1.5:1.

Stroke has had a significant impact on healthcare expenditures and the Chinese economy. In 2004, the average fee for stroke admission was 6356 RMB (\$1000.94), which was 2 times the annual income of rural residents. The cost for stroke care by the government-funded hospitals was 1.17 billion RMB in 2003 and 8.19 billion in 2009 (117% increase annually). Now the annual cost of stroke care in China is

approximately 40 billion RMB, 10 times higher than the care of cardiovascular diseases.^{4,5}

Like in other countries, ischemic stroke is the most common type of stroke in China. It is accountable for 43% to 79% of all strokes. Intracerebral hemorrhage has a higher percentage (18%–47%) than that in Western countries. Intracerebral hemorrhage is the highest (55.4% of all strokes) in Changsha, a city located in south-central China. The China Acute Cerebrovascular Events Registers (CACER-I) reported that ischemic stroke cases were increasing, whereas intracerebral hemorrhage was decreasing.⁶ Rising incidences and impact of stroke have created a serious public health problem in China.⁷

The Risk Factors

The lifestyle of China has changed rapidly along with the economic growth in the past 20 years. As the economy improves, major stroke risk factors increased substantially, including obesity and hypercholesterolemia. For example, total fat intake increased from 88.1 g/day in 1983 to 97.4 g/day in 2002. The average blood cholesterol levels increased by 24% from 1984 to 1999. From 1994 to 2002, there was a 97% increase in diabetes prevalence, and obesity in China increased by 13% in urban areas and 85% in rural regions.⁸

China now faces similar cardiovascular and stroke risk factors as in the Western nations: hypertension, diabetes mellitus, hypercholesterolemia, smoking, coronary artery disease, arterial fibrillation, physical inactivity, and obesity. Among them, hypertension remains the most important risk

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factor for all types of strokes with the highest population-attributable risk at 34.6%. A cohort study of 11 provinces in China, including 26 787 people with ages from 35 to 64 years, showed that there were 750 cases of hypertension with hypercholesterolemia but 250 cases of hypertension alone in a population of 100 000 population.^{9,10} With the exception of Mongolia, smoking rates are higher in Chinese men than in any other country. The prevalence of diabetes is now approaching that of the United States (7%).

There are more intracranial atherosclerotic disease in the Chinese population than in Western countries. In the recent multicenter study of the prevalence and outcomes of intracranial large artery atherosclerosis among patients with stroke and transient ischemic attack in China (the Chinese IntraCranial AtheroSclerosis Study, CICAS), the prevalence of intracranial stenosis was 46.6% (1335 patients, including 261 patients with coexisting extracranial carotid stenosis). Patients with intracranial stenosis had more severe stroke at admission and stayed longer in hospitals than those without intracranial stenosis (median National Institutes of Health Stroke Scale score 3 versus 5; median length of stay 14 versus 16 days, respectively). After 12 months, recurrent stroke occurred in 3.24% of patients with no stenosis, 3.82% for 50% to 69% stenosis, 5.16% for 70% to 99% stenosis, and 7.40% for 100% occlusion (unpublished data).

Stroke Treatment and Prevention

Through the Chinese National Stroke Registry, the status of acute stroke treatment is now available. The Chinese National Stroke Registry, sponsored by the Ministry of Health of China, is an ongoing national registry of patients presenting to hospitals with acute cerebrovascular events.¹¹ Initiated in 2007, the Chinese National Stroke Registry included 1% of the total 13 372 general hospitals in China. Among the 132 hospitals selected, 75.8% were tertiary care hospitals with the size of the neurology ward ranging from 30 to 176 beds. Approximately 52.4% had stroke units and 63.8% had neurology coverage in the emergency departments. CT scanning was available 24/7 in 99.2% of the hospitals. Although the Chinese National Stroke Registry cannot reflect the stroke care in rural areas, it offers updated information on the infrastructures of stroke care in large hospitals in China. From this registry, 21.5% of patients with acute strokes presented to the emergency department within 3 hours, 12.6% were eligible for thrombolytic treatment, and 1.6% received intravenous tissue-type plasminogen activator. The median onset-to-needle time was 180 minutes; the median door-to-needle time was 116 minutes; the median imaging-to-needle time was 90 minutes. Patients who were younger, presented to the emergency department more quickly, with higher National Institutes of Health Stroke Scale scores, having higher income, and better education had a better chance of receiving intravenous recombinant tissue-type plasminogen activator.¹²

Primary Stroke Prevention

Not much data are available in primary stroke prevention in China. Healthcare organizations and community-based health

education groups have conducted varied educational activities on stroke prevention, including treating hypertension, stop smoking, healthy eating habits, and so on.

One major accomplishment is the carotid disease screen and intervention project sponsored and started in 2009 by the Ministry of Health. This project organized 140 tertiary, provincial, and regional hospitals throughout China and conducted several carotid disease screening sessions. The project reported that in 2009, approximately 176 114 people had the screening and 6012 patients >60 years were found to have $\geq 70\%$ carotid stenosis. They were treated with carotid endarterectomy (227 cases) and carotid angioplasty and stenting (CAS; 916 cases). Another screen of 78 825 people in 2010 found 4095 patients with $\geq 70\%$ carotid stenosis.

They were treated with carotid endarterectomy (122 cases), CAS (948 cases), and medically (40 932 cases). These data have shown that carotid screening is effective and CAS is the predominant interventional treatment of carotid disease in China.

Secondary Stroke Prevention

The recurrence rate of stroke remains high in the Chinese population (11.2%). Studies on the detection and control of potential risk factors and medication therapy for stroke prevention remain insufficient. Adherence to strategies to prevent secondary ischemic stroke was evaluated. It was found that having medical insurance or free medical care increased medical compliance in patients with stroke. It is surprising that the administration of nonaspirin antithrombotic agents or disability (Barthel Index) had significant negative effects on medication compliance in patients with stroke. These results suggest that adherence to stroke prevention strategies is dependent on the economic status, income level, the category of antithrombotic agent used, and personal capabilities.

In general, details on secondary stroke prevention strategies are scarce in China. More studies are needed to examine the effectiveness of all secondary stroke prevention efforts at the national level.

The Challenges of Stroke Prevention and Treatment in China

According to the Ministry of Health, PRC, China faces these major challenges in stroke care: lack of a national policy in stroke prevention and control, lack of a systematic approach, no work plan in place, and lack of skilled and trained personnel treating strokes. One example is that China does not have family physicians and primary care clinics. Although physicians in community hospitals may assume some roles as primary care physicians, their roles are different from the obligations of family physicians in Western countries such as emphasizing disease prevention, risk factor controls, and maintenance of health. These community physicians mostly treat uncomplicated conditions and have no long-term relationship or follow-up with any patient.

There may not be an access problem for the Chinese patient to see a physician, but there is not a physician who behaves like the in-charge physician for a patient or family.

Anyone can go to a hospital, select a specialty that may be related to his or her problem, register for that specialist, and then wait to see the doctor. The specialist sees this patient and may direct him or her away for another specialist when needed. Such a system may offer every patient a chance to be seen at any given time, but it has put tremendous pressure on the physicians conducting clinics. They often see >60 patients in a half day. There is simply no time to explain to patients about the significance of stroke risk reduction and medication compliance. The patient also carries his or her own medical record, which makes it difficult to conduct epidemiology studies.

Stroke is an emergency. Decisions on delivering therapies such as thrombolytics to patients with acute ischemic stroke may need to be made quickly. However, 2 cultural conditions in China presented specific challenges to Chinese physicians treating strokes. One of them is the rather tense physician–patient relationship, which has many causes, including social, economical, healthcare policies, media reports, physician and patients rights, and so on. According to a report from the Chinese Physicians Association, two thirds of physicians in China feel that their rights are not being protected, and nearly every hospital has had events such as healthcare providers being physically attacked and injured by patients or their family members. Such poor rapport often causes mistrust between physicians and patients and therefore has an adverse effect on the decision-making process by the physicians. Physicians would not recommend or prescribe treatment although it may be evidence-based but carries a small risk. This is why the intravenous tissue-type plasminogen activator rate is low in China and better educated patients may have a better chance of receiving intravenous tissue-type plasminogen activator.

The other cultural phenomenon is that Chinese people believe in the natural way of healing more than Western medicine. This belief presents challenges to physicians to practice evidence-based medicine such as prescribing statins or antihypertensives. Furthermore, compliance by patients is even a bigger problem. This belief may also contribute to the rapid development of CAS therapy throughout China. As described, a patient with carotid disease is >5 to 10 times likely of receiving CAS than carotid endarterectomy. There are only approximately 1000 cases of carotid endarterectomy performed annually in China.

Plans for Lessening the Burden of Stroke in China

The Chinese government has been taking several important steps addressing the challenges of stroke care and prevention. In 2009, the Ministry of Health began the Stroke Screening, Prevention and Treatment Project. The project has printed series of educational materials on stroke. The Project has established 140 Stroke Intervention Base Hospitals. These hospitals were required to fulfill the following criteria: hospital administration supportive, collaboration among departments, conducting training and public stroke education, establishing standardized therapies and protocols, emphasizing stroke prevention and follow-up of patients, building research project, and networking with community hospitals.

In 2011, the National Center for Stroke Care Quality Control was established under the charter of Ministry of Health. The purpose of this center is to further standardize evidence-based stroke care throughout China. In addition, it will explore the need for establishing an electronic national stroke registry. The center will use the data to define priorities and design effective interventions.

China is also actively involved in conducting stroke trials. In addition to its participation in several well-known pivotal trials such as the International Stroke Trial (IST), Factor Seven for Acute Hemorrhagic Stroke (FAST), Prevention Regimen for Effectively Avoiding Second Strokes (PROFESS), and so on, other large stroke trials are in progress such as the Clopidogrel in High-Risk Patients With Acute Nondisabling Cerebrovascular Events (CHANCE) trial,¹³ a collaboration between the United States and China, a prospective, multicenter, placebo-controlled ongoing one to evaluate the efficacy and safety of dural antiplatelet treatment to those with minor stroke or transient ischemic attack at the acute stage. Several ongoing trials from Beijing Tiantan Hospital have been designed as multicenter cohort studies, including Thrombolysis Register for Acute Ischemic Stroke in China (TRAIS-China), Imaging-based Thrombolysis trial in Acute Ischemic Stroke (ITAIS), Abnormal glucose regulation in patients with acute stroke across China—a national multicenter prospective study (ACROSS-CHINA), and a prospective cohort study on the incidence and outcome of patients with poststroke depression in China (PRIOD-China).¹⁴

Despite the challenges and the amount of work the Chinese people are facing in providing better stroke care, the Chinese people have developed a comprehensive plan to address this leading cause of death and improve stroke care. The Ministry of Health has just established the Chinese National Center for Stroke Care Quality Control and Management. A national stroke data bank is being built based on the blueprint of the Chinese National Stroke Registry. Extensive physician training and community education on evidence-based stroke care have been written into the 12th 5-year plan. As the world has witnessed the impressive economic growth in China in the past 2 decades, China will also make substantial improvement in stroke care soon.

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Disclosures

None.

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