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Fast-tracking acute stroke care in China: Shenzhen Stroke Emergency Map

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ABSTRACT

China has the largest stroke population and at-risk population in the world. However, it has a lower thrombolytic therapy rate and longer onset-to-needle time/door-to-needle time for patients who had an acute stroke compared with developed countries, which might be due to redundant procedures or inefficient systems. Things are changing due to some new initiatives. Two years ago, a new emergency system in China, Stroke Emergency Map, was first launched as a regional emergency system in Shenzhen, the bustling metropolis just north of Hong Kong. As a result of the Stroke Emergency Map in Shenzhen, the number of thrombolytic cases increased in the last 2 years, from 568 to 809 annually. The Stroke Emergency Map, first pioneered in Shenzhen and now spreading to the rest of China, is a comprehensive and interdisciplinary system. The benefits are not just the immediate improvements in the acute stroke care because the continuous data collection and audit allows for improvements in logistics and future strategies.

Early reperfusion is the key principle in stroke treatment. Regional emergency systems have been found to enable rapid access to thrombolysis and so they are now part of the standard operating procedure (SOP) in London, Los Angles, Toronto and other big cities.[1–3] Centralising a hyperacute stroke service in London and Manchester in the UK was shown to reduce mortality and length of hospital stay.[1] These regional stroke emergency systems aim to provide rapid identification and transport service to patients who suffered an acute stroke by combining pre-hospital presentation and in-hospital treatment into a seamless operation. SOP protocols precisely determine golden hour, onset-to-needle time (ONT), door-to-needle time (DNT) and image-to-needle time to standardise and audit the procedures.

China, with a total population of 1.3 billion, has the largest stroke population and at-risk population in the world. The annual age-standardised stroke incidence is 246.8/100 000 person-years.[4] However, it has a lower thrombolytic therapy rate and longer ONT/DNT for patients who had an acute stroke compared with developed countries, which might be due to redundant procedures or inefficient systems. Fortunately, things are changing due to some new initiatives. Two years ago, a new emergency system in China, Stroke Emergency Map, was first launched as a regional emergency system in Shenzhen, the bustling metropolis just north of Hong Kong. This initiative came from the local Health and Family Planning Commission and leading stroke centres. The Stroke Emergency Map standardises a complete acute stroke activation protocol, including emergency transport system, specialised screening tools, regional stroke centres/hospitals and fast decision-making process. It unites all local hospitals that provide a thrombolysis service (with or without endovascular treatment) and works with local emergency services during the first aid stage for patients who had a stroke. The coordination between local hospitals and emergency services makes for an effective emergency service to transport patients who suffered a stroke to the nearest qualified centre. Information technology is used extensively, for instance, to process pre-hospital assessment, automatically select hospital and transmit the related information to hospital in advance. On arrival, the in-hospital Stroke Green Channel shortens the ONT significantly. Besides, apps for the public help them to recognise stroke symptoms, call 120 (the emergency number in China) and find the nearest stroke centre. All of these innovations are aimed at shortening ONT. The Stroke Emergency Map also provides frequent training to its subcentres and reviews their qualification regularly, which helps to optimise the system for the future.

As a result of the Stroke Emergency Map in Shenzhen, the number of thrombolytic cases increased in the last 2 years, from 568 to 809 annually. The early and rapid success of the Shenzhen Stroke Emergency Map has inspired other cities in China to take up the model. By now, over 40 cities involving over 1100 hospitals in China have launched their own local Stroke Emergency Maps to attain a faster, smarter and safer stroke emergency system. Although things can be done very quickly in China, it remains a daunting challenge to extend this to smaller cities and rural areas. A mature stroke emergency system needs high public awareness, early diagnosis and treatment, qualified stroke subcentres/hospitals and rehabilitation centres. In a country with a population of 1.3 billion, this is a huge task. Moreover, most of the population live in big cities either near the coast or along the major rivers, so it is not easy to cater for the rural areas. Fortunately, China has a healthy GDP and a good stroke service is a justifiable healthcare expenditure when stroke morbidity and mortality can be reduced.

The crux of stroke emergency management is the motto: time is brain. The Stroke Emergency Map, first pioneered in Shenzhen and now spreading to the rest of China, is a comprehensive and interdisciplinary system. The first beneficiaries of the Stroke Emergency Map are the patients who suffered a stroke, who are taken to qualified hospitals more efficiently and rapidly than in the past. Besides, the Stroke Emergency Map helps the ambulance services in 120 emergency systems in China to transport patients who had a stroke more efficiently and quickly. The benefits are not just the immediate improvements in the acute stroke care because the continuous data collection and audit allows for improvements in logistics and future strategies.

Main messages

- Early reperfusion is the key principle in stroke treatment.
- Regional emergency systems have been found to enable rapid access to thrombolysis.
- A new regional emergency system, Stroke Emergency Map, launched two years ago in Shenzhen, resulted in an increase in the number of thrombolytic cases.
- This comprehensive and interdisciplinary programme is now adopted in other cities in China.

Current research question

- The continuous data collection in the Stroke Emergency Map programme facilitates research and auditing.
- This helps to improve logistics and future strategic planning.

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Contributors LR and WL planned the project. CL, YZ, SY, ZCL, HF, QL, JC and SH conducted the project. LR, CL, WL, YZ, SY, ZCL, HF, ZHL, JC, SH, YS, QL and BMYC reported the work.

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REFERENCES

1 Morris S, Hunter RM, Ramsay AI, *et al*. Impact of centralising acute stroke services in English metropolitan areas on mortality and length of hospital stay: difference-in-differences analysis. *BMJ* 2014;349:g4757.
2 Kidwell CS, Starkman S, Eckstein M, *et al*. Identifying stroke in the field. prospective validation of the Los Angeles prehospital stroke screen (LAPSS). *Stroke* 2000;31:71–6.
3 Gladstone DJ, Rodan LH, Sahlas DJ, *et al*. A citywide prehospital protocol increases access to stroke thrombolysis in Toronto. *Stroke* 2009;40:3841–4.
4 Wang W, Jiang B, Sun H, *et al*. Prevalence, incidence, and mortality of stroke in China: results from a nationwide population-based survey of 480 687 adults. *Circulation* 2017;135:759–71.