

Declining Stroke Mortality in Singapore and The Challenges Ahead

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Stroke mortality has declined considerably in Singapore. The age-adjusted mortality rate of stroke had reduced from 20.8 to 14.1 per 100,000 patients from 2011 to 2017 (Fig. 1A).^{1,2} Although stroke contributed to 9.0% of all deaths as recently as 2011, mortality rates have steadily reduced to an all-time low in 2017, contributing to 6.3% of total deaths in 2017 (Fig. 1B).³ Data from the Ministry of Health, Singapore, have indicated that stroke is now the fourth leading cause of death after cancer, ischaemic heart disease and pneumonia.^{2,3}

Importantly, stroke is also the disease with the highest improvement in survival.^{2,3} The decline in stroke mortality is an important milestone in our healthcare history since this took place in the face of a rising incidence of stroke in our ageing population. The crude incidence rate of stroke has increased from 187.9 to 229.6 per 100,000 population from 2008 to 2017 (Fig. 2). The incidence of stroke is also highest in those aged ≥ 60 years old.²

A stroke occurs when blood supply to a part of the brain is interrupted or reduced, depriving brain tissues of oxygen and nutrients from either blockage of blood vessels (ischaemic

stroke) or rupture of brain vessels and aneurysms (cerebral haemorrhage). Ischaemic stroke is responsible for close to 80% of strokes in Singapore and from around the world.^{1,2}

World Stroke Day, which falls on 29 October every year, invites a reflection on the significant progress that has been made in combating this debilitating disease in Singapore and an opportunity to define the future challenges that lie ahead.

In Singapore, stroke patients are mostly treated in organised stroke units where access to a specialised multidisciplinary team (comprising physicians, nurses, physiotherapists, occupational therapists, speech and swallowing therapists and coordinators) allows for treatment, prompt recognition of complications and early rehabilitation aimed at addressing stroke-specific impairments.^{4,5} The provision of centralised stroke care in a dedicated area translates into efficient coordination of care by a multidisciplinary team whose goal is to maximise return of function and reduce fatal complications.⁶

A careful interrogation of the cardiac rhythm and cardio-cerebral vasculature undertaken within days or weeks after a stroke is important for the elucidation of stroke

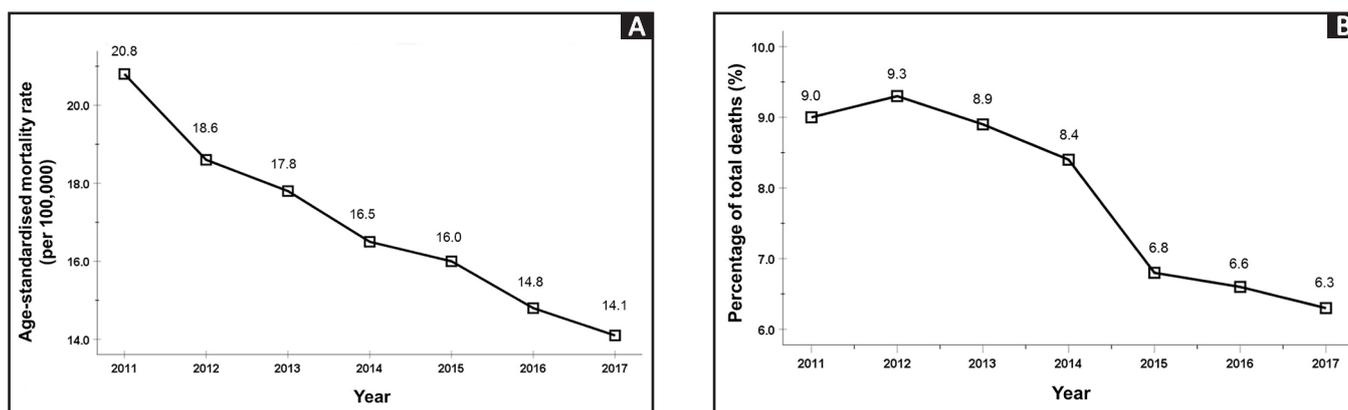


Fig. 1. Decline in stroke mortality in Singapore. A: Age-standardised mortality rate (per 100,000 population) has steadily declined from 20.8 to 14.1 per 100,000 patients from 2011 to 2017. B: The contribution of stroke as a leading cause of death has fallen from 9.0% in 2011 to 6.3% in 2017.

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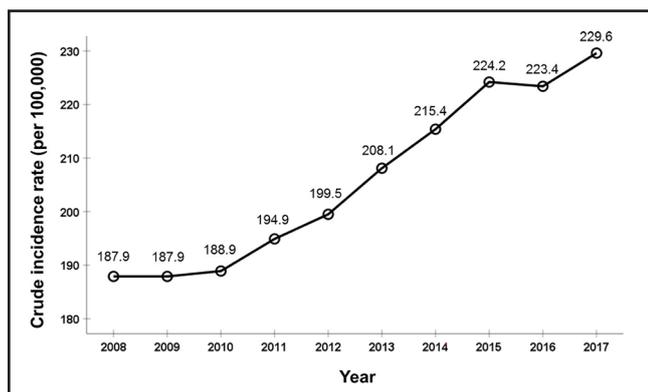


Fig. 2. Increase in stroke incidence in Singapore. The crude incidence rate of stroke has increased from 187.9 to 229.6 per 100,000 population from 2008 to 2017.

aetiology since this can have implications on the choice of antithrombotic treatment in stroke prevention. For example, patients with cardioembolism would benefit from anticoagulation while those with large artery disease and lacunar aetiology would derive more value from antiplatelet treatment.^{7,8} Conversely, incomplete investigations could result in suboptimal data that could hinder accurate diagnosis of stroke aetiology. This observation has been cited as a reason why the cause of stroke was undetermined in close to a fifth of stroke patients.^{7,9}

In stroke units, patients are monitored closely to assess their risk for early stroke complications and they are screened for occult risk factors such as paroxysmal atrial fibrillation.¹⁰ Patients are counselled on stroke and its long-term consequences, urgency to tackle cerebrovascular risk factors and importance of medication compliance. When there is a need, patients are referred to agencies such as Stroke Support Station and the Singapore National Stroke Association for financial assistance and community-based support services.

Although stroke units are credited with lowering stroke mortality,^{4,5} reperfusion treatment (intravenous thrombolysis and/or endovascular thrombectomy) remains the only treatment that can improve and reverse neurological deficits after an ischaemic stroke. Following arterial occlusion, brain tissues are deprived of blood supply and when this supply is not restored, a cascade of ischaemic events is triggered, ultimately leading to irreversible cell death and cerebral infarction.¹¹ Despite compelling trial data that supported its efficacy, utilisation of thrombolytic treatment for ischaemic stroke remained low in Singapore in the 2000s (between 0.5% and 2.9% from 2005 and 2010). This was due partly to late presentation of patients beyond the treatment window.^{12,13} Subsequently, efforts to encourage reperfusion treatment had led to the reorganisation of prehospital and hospital services that facilitated expeditious screening and

selection of patients who were deemed suitable for this treatment. Currently, computed tomography angiograms are routinely performed to evaluate patients for large vessel occlusion. Also, selective cerebral perfusion studies are carried out to identify patients with salvageable brain tissues (cerebral penumbra).

With the aid of social media and the mass media, educational initiatives were rolled out to inform the public on how to recognise stroke symptoms through the use of “F.A.S.T.” (Face droop on one side, Arm weakness, Speech difficulty and Time to call for immediate emergency assistance) and an emphasis on the need to seek prompt medical attention in order to arrest and reverse early stroke deficits.¹⁴ Paramedics were also trained to recognise stroke symptoms with the use of appropriate stroke screening tools and were authorised to activate hospital-based stroke response teams through the use of a prehospital notification system that facilitates fast-track stroke evaluation. Furthermore, hospital processes were reorganised to remove barriers in work flow and time-based quality parameters were implemented to improve door-to-needle time and patient outcomes.¹⁵

Currently, there are increasing data to support the use of endovascular thrombectomy as an adjunctive stroke treatment to improve recanalisation rates in excess of 80%.^{16–20} With a more developed and organised stroke management system in place, endovascular thrombectomy was adopted with greater ease in Singapore. There is a roster of interventional stroke radiologists who provide endovascular expertise around the clock and they also hold regular discussions on complex clinical cases. By 2015, the reperfusion rate in the city-state had increased substantially to 6.5%.^{21–3} Compared to cities such as London and Helsinki which have a reperfusion rate of 10.3%²³ and 13.0%,²² respectively, the rate in Singapore is considerably lower. By tapping on requisite resources that support fast-track evaluation and treatment of stroke patients, endovascular thrombectomy should be further encouraged to harness the benefits conferred by early reperfusion treatment.

The decline in stroke mortality has translated into a growing community of stroke survivors whose long-term care poses an increasing challenge. Epidemiology data indicate that stroke occurs at a relatively young age in Singapore (mean, 68 years) compared to other developed countries.¹ Since the mean life expectancy of stroke patients had increased to 78 years,¹ it was conceivable that the population of Singapore has one of the highest prevalence of stroke in Asia.²⁴ Data from the Department of Statistics, Singapore, also indicated that stroke is a leading contributor to the burden of disease in Singapore.²⁵

Stroke survivors are prone to suffer from permanent physical impairment (such as immobility, incontinence

and spasticity), emotional disturbances (like anxiety and depression) and cognitive issues (that range from mild cognitive impairment to severe dementia). To tackle the multifaceted needs of stroke survivors and their caregivers, a holistic approach is needed to reintegrate stroke survivors back into the community.²⁶ Stroke rehabilitation involves a multidisciplinary team of experts that comprise occupational therapists, physiotherapists, psychologists, rehabilitative physicians and speech therapists.²⁷ The demand for rehabilitative services is projected to grow and can be met through innovative solutions that minimise repeated visits to medical facilities and leverage on smart technologies and telemedicine that encourage rehabilitation to take place in one's home or in nearby facilities.²⁸

After overcoming their financial, physical and psychological setbacks, stroke survivors are then confronted with the prospect of developing a cardiovascular recurrence. Findings have shown that 1 in 2 stroke survivors have a risk of developing another stroke episode.²⁹ Patients ought to be empowered and incentivised to adopt positive lifestyle behaviours (such as alcohol avoidance, balanced diet, physical activity and smoking cessation), medication compliance and active surveillance of risk factors (such as atrial fibrillation, diabetes mellitus and hypertension) to lower their risk of developing another stroke or myocardial infarction. With the recent availability of safer and more efficacious anticoagulants (such as apixaban, dabigatran and rivaroxaban), anticoagulation use should also be encouraged in select patients.^{30,31}

Instead of using data extrapolated from overseas studies, it is vital to emphasise local stroke research since the findings from a racially diverse population such as Singapore could inform heterogeneity in stroke biology and have important treatment implications that resonate beyond her shores. The successful reduction in stroke mortality in Singapore is evidence of how we can steer the natural course of chronic diseases, even in one that is as multifactorial as stroke. It is important that a concerted effort is mounted to help stroke survivors cope with their disabilities and to guard them from having another stroke episode so they can be successfully reintegrated back into their own home and community.

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