

White Paper
**Advancing And Optimising
Acute Stroke Care In Malaysia**



White Paper

A Clot, A Life Interrupted

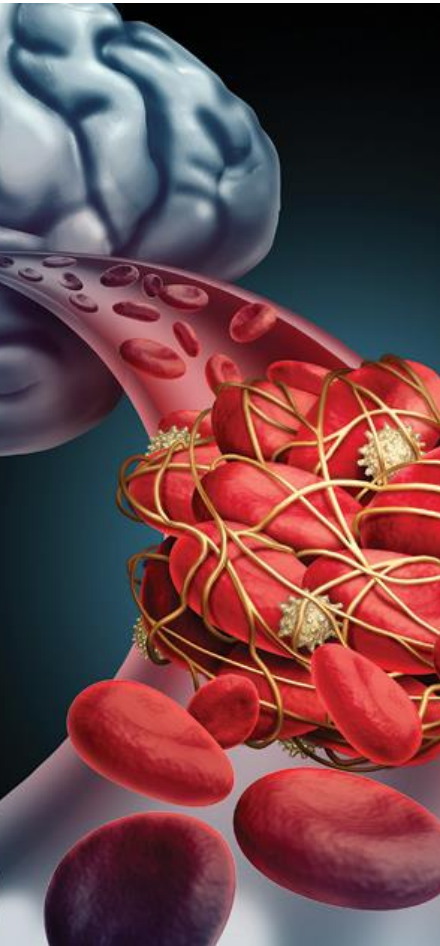
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Executive Summary

Stroke is the second leading cause of death worldwide. More than 40,000 strokes are estimated to occur annually in Malaysia resulting in almost 14,000 deaths. It is the second leading cause of death and disability in this country and the third most common cause of mortality.

Stroke is a medical condition that occurs when there is a blocked artery leading to reduced blood flow and oxygen supply to the brain (ischaemic stroke) or burst blood vessel (haemorrhagic stroke). It can often be life-threatening. Common symptoms include hemiparesis, vomiting, drowsiness, headaches, and loss of consciousness. These symptoms can often go unrecognized as a stroke.

Stroke is a disease of immense public health importance with serious economic and social consequences. It is the leading cause of adult disability in Malaysia. 60 percent of stroke patients were above the age of 60. The main risk factors for stroke include hypertension, diabetes, high cholesterol, and obesity.

Providing efficacious treatment within the **first 60 minutes** of an ischaemic stroke is a key objective in stroke care to minimise disability and severe, permanent deficits.

To be afflicted with this condition is a devastating and life changing event as many stroke patients end up with permanent disability.

Providing efficacious treatment within the first 60 minutes of an ischaemic stroke also known as the “golden hour” is a key objective in stroke care to minimise disability as well as severe and permanent deficits. Therapies such as thrombolysis are used to break-up blood clots up to 4.5 hours from the first onset of stroke symptoms, are available but may suffer from limited availability in the health system.

While stroke incidence has declined significantly in high-income countries due to improved access to appropriate health care and treatment, it has doubled in low-income and middle-income countries. People are found to be dying of stroke in these countries at a much younger age, compared to those living in high-income nations.

Significant improvements have been made to stroke care in Malaysia over the past decade through the provision of specialists, timely interventions and treatments that have helped save lives and reduced the impact of stroke for so many.

The public is also becoming better aware that stroke is a medical emergency and that it is necessary to seek help quickly.

The Ministry of Health Malaysia recently released its 3rd Edition of the Clinical Practice Guidelines for the management of ischaemic stroke. However, compliance with the exacting standards across the pathway for stroke care as laid out by the CPG can be extremely challenging.

7 key recommendations are proposed to support moving forward and close existing gaps in the stroke care pathway.

The number of Acute Stroke Units (ASU) equipped with skilled clinical personnel and updated treatments remains small. Most of the country do not have the benefit of these important 24 hour, 7 days a week services. Major hospitals in each state should have at least one ASU to ensure that such time-critical services are within reach of those who need it.

It is clear that major improvements and investments are going to be needed in the care pathways for stroke management. This includes increasing public education to improve identification of stroke; early accurate diagnosis and timely treatment during the acute phase; improving access and coverage of more efficacious therapeutic options; and increasing the availability and improving existing rehabilitation services.

A number of key recommendations are discussed in this paper as part of moving forward to close existing gaps in the stroke care pathway. These are:

- Increase the number of neurologists and related multi-disciplines managing stroke cases

- Need for more interventional radiologists and relevant facilities
- Increase availability of thrombolytic therapy
- Decentralise acute stroke care
- Creating stroke care teams in each hospital
- Redesign stroke care delivery in remote areas to overcome logistical challenges
- Provide adequate rehabilitation centres for post-stroke care

Additional recommendations for improving ischaemic stroke care should consider the following aspects: improved access to hyperacute care, quality of stroke management, existing resources, patient centred care with optimized health outcome, and value-based care.

Better survival outcomes for stroke patients are possible.

With the National Strategic Plan for Non-Communicable Diseases (2016-2025) currently at the mid-term stage of its implementation, there is an opportunity to bring increased attention and commitment to stroke, within the context of the NCD crisis in Malaysia, particularly to advance stroke prevention and care at all levels.

Gaining a deeper understanding of inequalities in access to stroke detection, care and management presents a significant opportunity to reduce the burden of stroke in Malaysia, especially with the backdrop of the COVID-19 crisis.

This White Paper is intended to be a call to action, highlighting areas where strengths and gaps exist, and the changes that are needed to be made to address them.



Looking at ischaemic stroke from the perspective of public health

Ten percent of the 55 million deaths that occur every year worldwide are due to stroke.¹ It is the sixth leading cause of serious long-term adult disability.

A stroke is defined as an abrupt disruption of neurological or cerebral functions due to a vascular event, whose symptoms may last for more than 24 hours or longer, with the possibility of death.¹

Acute stroke, which is the focus of this paper, refers to the first 24 hours of a stroke event. Neurological deficits or disruptions which are less than that period, are known as transient ischaemic attacks, which usually last 5-20 minutes.² These may not involve hospitalisation.

Stroke is classified as either ischaemic or haemorrhagic.³ An ischaemic stroke is caused by the occlusion or blockage of a cerebral artery, leading to reduced blood flow and oxygen supply to the brain, while a haemorrhagic stroke results from a rupture of blood vessels caused by aneurysms or physical trauma.

The risk factors for stroke are similar to those for coronary heart disease and other vascular diseases: hypertension, elevated lipids and diabetes.⁴ Lifestyle factors include unhealthy diets, sedentary or low physical activity, obesity and smoking. Effective prevention strategies include targeting these key modifiable factors, which have been effective in reducing stroke mortality,

Individuals with atrial fibrillation, a heart condition that causes irregular and abnormal heart rates, are at 3 to 5 times greater risk for ischaemic stroke.⁵

8 to 12 percent of ischaemic strokes and 37 to 38 percent of haemorrhagic strokes result in death within 30 days.²

Acute care

In the first 48 hours after the start of stroke symptoms, people need urgent access to high quality acute care to help improve their outcomes.

The 3rd Edition of the Clinical Practice Guidelines for Management of Ischaemic Stroke provides guidance on pathways for stroke care.

Ischaemic stroke

An ischaemic stroke is caused by blockages or occlusion of the arteries as a result of plaque build-up along the inner lining of arteries.⁶ An ischaemic stroke is caused by blockages or occlusion of the arteries in the brain as a result of plaque build-up along the inner lining of arteries, or due to blood clots that form in the heart due to atrial fibrillation and travelled to the brain.

The blood supply to the brain stops, resulting in the death of two million neurons every minute.⁶

This type of stroke can happen in more than 80 percent of cases, often suddenly and without early signs or warning.⁷

The **B.E.F.A.S.T** formula is used to check for the most common symptoms of stroke:⁸

Balance: Sudden loss of balance or difficult to coordinate

Eyesight: Vision is impaired or changed

Face: Whether one side of the face droops, and if it is possible to smile

Arms: Both arms are raised, and whether one arm drop down instead

Speech: Check for slurred or strange speech.

Time: If the answer to any of these is yes, immediate medical attention is needed

The typical presentation of an ischaemic stroke is hemiparesis, when one side of the body suddenly experiences weakness or is unable to move.⁹

If it lasts seconds or a minute, complete recovery is likely.

Depending on its severity, cellular death or infarction will occur, causing permanent and irreversible damage. This is known as the “core” which is surrounded by tissue of affected or diminished functionality. This tissue may recover after restoration of blood flow to the affected areas. This is called the “ischaemic penumbra”.¹⁰

Most stroke patients will have an ischaemic penumbra which is responsive to treatment for up to 4.5 hours. This is known as the

Admission to an acute stroke unit

Early admission to a specialist acute stroke units ensures that people who have had a stroke are cared for by a specialised stroke team, and are more likely to receive the necessary assessments and treatments they need.¹¹

In an acute stroke unit, brain imaging can be performed, clot busting treatment can begin as quickly as possible if appropriate.

Brain imaging

How quickly patients receive a brain scan after arriving at hospital is a key part of acute care and helps with the diagnosis and to determine which treatment will be most effective.

Any person suspected of an acute stroke and a candidate for intravenous thrombolysis, should undergo a computed tomography (CT) scan immediately.¹²

The imaging assessment should be able to assess:

- whether the stroke has been caused by a blocked artery (ischaemic stroke) or burst blood vessel (haemorrhagic stroke)
- which part of the brain has been affected by the stroke event
- the severity of the stroke

‘therapeutic window’ which can be used for thrombolysis, a procedure used to break up blood clots allowing for blood flow to be restored.¹³

The treatments that work best are available only if the stroke is recognised and diagnosed within the first couple of hours of the onset of early symptoms. It is recommended that treatment is provided within the 4.5-hour window period.¹³

It is therefore critical to ensure proper and timely identification of treatable patients.

The best practice goal is to provide treatment within 60 minutes. This period is known as the “golden hour” of acute ischaemic stroke treatment. More efficacious treatments provided early in the chain of care will minimise disability and further suffering of the patient.¹⁴

Failure or delay in treatment will result in large areas of the brain becoming affected, brain cells being deprived of oxygen, and die. This could lead to death, a few days later. This happens in 80 percent of cases.²

50 to 70 percent of those who survived an ischaemic stroke will recover independent function within three months after it occurs.² However, 20 percent are likely to require care.

Haemorrhagic stroke

A haemorrhagic stroke is mainly caused by the rupture of cerebral blood vessels, aneurysms, or as a result of physical trauma.

There are two types of haemorrhagic stroke.¹⁵ Intracerebral haemorrhage is the most common and occurs when a cerebral artery ruptures; and the second are subarachnoid haemorrhages, caused by the rupture of an aneurysm. It is a less common type of haemorrhagic stroke.

Intracerebral haemorrhagic strokes usually develop within a 30–90 minutes timeframe.² Common symptoms include intense headaches, vomiting, and drowsiness. Haemorrhages may cause stupor, coma and even death.

For those who survive this type of stroke, more than half will experience significant disabilities.

A major public health concern

Worldwide, stroke is the sixth leading cause of disability. It is the second leading cause of death where 10 percent of 55 million lives lost each year is due to stroke.¹⁶ Strokes mainly affect individuals at the peak of their productive life.

Thrombolysis

Thrombolysis is administered to patients who have had an ischaemic stroke to break down and disperse a clot that is preventing blood from reaching the brain.¹³

Breaking down a blood clot can restore blood flow to the brain, saving brain cells from damage and reducing disability after stroke.

Receiving thrombolysis, using intravenous alteplase, as quickly as possible, preferably within 4.5 hours, is crucial to improving outcomes after an ischaemic stroke.¹³

The stroke incidence in low-income and middle-income countries (LMICs) has more than doubled over the past four decades. 70 percent of strokes and 87 percent of both stroke-related deaths and disability-adjusted life-years occur in low-income and middle-income countries (LMICs).¹⁷ In these countries, people on average have been found to have haemorrhagic strokes and die of stroke at a younger age, 15 years earlier than those in high-income countries on average.¹⁸

However, during the same period, stroke incidence has declined by 42 percent in high-income countries. This has been mainly due to improved access to appropriate health care and treatment.

Outcomes have improved dramatically with specific treatments for acute stroke. For example, within the European Union, hospital discharges for stroke almost doubled during the last 15 years of the 20th century.²

The reduction in stroke mortality as seen in high-income countries has been recognized as one of the 10 great public health achievements in the past few decades.¹⁹

However, it is projected that the major increase in the global stroke burden will be coming from low- and middle-income countries.¹⁷

The burden of stroke is a growing crisis for many countries in Asia. Mortality for stroke in this region is higher than that of Europe or North America.²⁰

In locations where there has been risk factor control and stroke care improvement such as Japan, South Korea, Taiwan, stroke mortality has been declining.²¹ However, due to a growing aging population in this region, stroke incidence has not declined. There are more stroke survivors needing long-term care which can be costly.

For the earlier mentioned countries, survival rates have improved, and the national focus is now on how stroke can be prevented, treated quickly, and how people can be supported after a stroke.

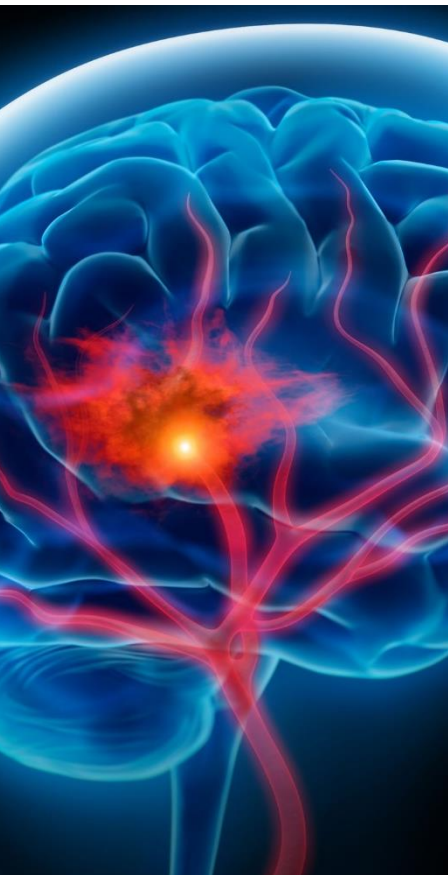
Risk factor control is possible. Approximately 80 percent of strokes can be prevented by addressing risk factors such as managing hypertension, smoking cessation, controlling diabetes, lowering cholesterol levels, eliminating excessive alcohol consumption and use of anticoagulation for atrial fibrillation.²²

However, in countries such as Indonesia and Malaysia as seen in Table 1, hypertension, diabetes, obesity, and cigarette smoking are of high prevalence, and poorly controlled.²³ Diagnostic tools, stroke specialists, and stroke care centres are insufficient and of low coverage. The result is often high stroke fatality.

However, neither hospital discharges nor the mortality rate accurately reflects the level of disability and suffering, which are mainly borne by patients and their families.

Table 1: Prevalence of stroke, risk factors, disability-adjusted life year (DALY) and mortality rate²⁴

Country	Stroke prevalence	Hypertension prevalence, %	Diabetes mellitus prevalence, %	Smoking, %	Obesity, %	DALY lost /100 000 people	Stroke mortality/100 000 person-years
Indonesia	10.9% (2018)	34.1 (2018)	10.9 (2018)	29.3 (2018)	21.8 (2018)	3481.0 (2017)	186.3 (2017)
Korea	1.71% (2014)	29.1 (2016)	14.4 (2019)	43.1(men) 5.7(women) (2019)	40.7 (2018)	703 (2013)	34.9 (2017)
Malaysia	11.3% (2017)	30.3 (2015)	17.5 (2015)	22.8 (2015)	17.7 (2015)	1686.1(2017)	71.5 (2017)
Philippines	6.6% (2013)	28.0 (2013)	5.8 (2016)	20.7 (2018)	31.1 (2013)	2596.8 (2017)	1340.7 (2017)
Singapore	3.7% (2006)	21.5 (2017)	8.6 (2017)	12.0 (2017)	8.7 (2017)	568.1 (2017)	14.1 (2017)
Taiwan	6.8% (2016)	25.4 (2016)	15.1(2016)	14.3 (2016)	52.1 (men) 37.4 (women) (2019)	872.3 (2017)	30.8 (2012)
Thailand	1.3% (2014)	24.7 (2014)	8.9 (2014)	19.5 (2014)	37.5 (2014)	1128.1 (2017)	62.5 (2017)
Vietnam	15.5% (2016)	28.7 (2017)	5.5 (2017)	13.8 (2017)	15.6 (2015)	2619.5 (2017)	115.4 (2017)



Burden of disease in Malaysia

Malaysia is currently witnessing an escalating incidence of stroke cases. It has been estimated that there are more than 40,000 strokes in Malaysia each year causing at least 11,680 lives lost or 10.7% of total deaths.²⁵ Estimates by the Institute for Health Metrics and Evaluation reported that stroke represents the third leading cause of mortality in Malaysia.²⁶

The Global Burden of Disease Report 2016 projected that stroke would become the second leading cause of mortality, with one in four Malaysians expected to suffer from it, by 2040.²⁷

Since 2009, Malaysia has been one of the few countries in the world to have and maintain a National Stroke Registry (NSR).

Combined with analysis from the “Monitoring Stroke Burden in Malaysia” project, the latest edition of the registry (2009-2016) found that on average, 92 stroke admissions occurred daily across healthcare facilities nationwide.²⁸

Men were predominantly affected (56 percent). 40% of stroke patients were below the age of 60 years.²⁸ Almost 32 people died due to stroke daily. In one case, 23 percent of hospitalisation cases were patients with a history of recurrent stroke.²⁹

Ischaemic stroke incidence in Malaysia has increased annually by 29.5% and haemorrhagic stroke by 18.7%.³⁰ The number of stroke incidences continues to increase as can be observed by a three-fold increment trend from the year 2010 to 2014.³⁰ With increasing numbers of

stroke patients, especially those needing hospitalised care, the cost of stroke management is most likely to rise.

Of particular concern was the fact that young stroke, defined as stroke that afflicts those between 19 and 50 years of age, constituted 16 percent of hospitalised patients.³⁰

Hypertension remained the major risk factor at 70 percent, followed by diabetes (41 percent) and hyperlipidemia (24 percent), which is similar to what has been observed in Singapore, Thailand, Indonesia and India.

Patients with atrial fibrillation were found to suffer from severe stroke, increased complications, poor functional outcomes and higher mortality.

Post-stroke survivors were often burdened with multiple morbidities. The National Stroke Registry provided evidence that 35% of patients regain full independence post-stroke treatment whilst 55% of patients require partial or complete dependence on a caregiver.³⁰

Cost of stroke care

Stroke has been the top 5 principal cause of hospitalization from the 2012 to 2019.²⁵

The estimated lifetime treatment cost for each ischemic and hemorrhagic stroke patient was RM36,400 (USD\$8,607) and RM37,757 (USD\$8,928), respectively.³¹ Based on current data with an expected 40,000 stroke admissions per year, the cost of stroke management is estimated to be around RM 213 million annually.²⁵

In 2016, the projected lifetime economic burden for stroke patients diagnosed was USD\$1,359,953,353.³¹

Much of existing cost data for stroke care in Malaysia refer specifically to the direct medical expenditure involved. However, a study, considered one of the first in Malaysia to look at the financial burden of stroke, was able to examine the costs incurred by stroke survivors and their families upon discharge from hospital.³²

The study was able to highlight the fact that stroke severity also influences the cost of outpatient care following a stroke.

Stroke's economic impact

The impact of stroke care goes beyond the costs of advanced acute care, costly secondary prevention and its prolonged high dependence on institutional chronic care as well as costs related to rehabilitation.

Patients who experienced more severe strokes required more medical support and nursing assistance, attended outpatient therapy more frequently, and were more likely to seek alternative therapies. They spent approximately 60 percent of their total expenses on attendant care and medical equipment purchases.³² Only 14 percent of the total cost was for medical expenses including consultation, medication, and rehabilitation.

This is largely due to medical services in Malaysia being heavily subsidised (up to 98%) in public hospitals.³³

As a result, patients and their families tend to bear most of the costs related to disability and long-term care (including rehabilitation and nursing care), logistics (e.g. mileage, parking), meals and health aids and equipment. In one case, travelling to the hospital for therapy and consultations was found to form the bulk of crippling costs borne by the individual and their family.

Stroke and COVID-19

The Malaysia Stroke Council expressed concern that the COVID-19 public health emergency would result in stroke services being severely disrupted due to the redeployment of healthcare personnel, causing much of the gains and progress made in stroke care to be lost.³⁴

Surveys last year showed reduction in stroke admission and challenges in managing stroke services in view of the current pandemic.

While stroke is debilitating and affects activities of daily living; stroke patients often struggle to adhere to scheduled clinic appointments in addition to physical barriers. The COVID-19 crisis exacerbated that struggle forcing healthcare systems to change and adapt.

It is not yet known to what extent has the COVID-19 crisis and the measures imposed to manage the public health emergency, have impacted on stroke care in Malaysia.



Trajectory of stroke care

There has been significant progress made in the past decade on the availability of treatment options for stroke, making it possible to secure better health outcomes for post-stroke survivors.

Continuous progress has been achieved in stroke care services offered across both government and private hospitals in Malaysia.

Clinical practice in stroke prevention and management

In 2006, the Ministry of Health published its first clinical practice guidelines (CPG) on the diagnosis and initial management of ischaemic stroke. The CPG now currently in its 3rd edition (2020), provides clear and concise approach to all clinicians on the current concepts in the management of ischaemic stroke patients and the best available therapy.³⁵ It incorporates many of the new developments in the management of ischaemic stroke.

Stroke treatment and care services

At present, with the exception of Kedah and Perlis, all major hospitals located in state capitals have at least one neurologist. There are approximately 123 registered neurologists across the country. However, only 31 are practicing in Ministry of Health hospitals, while the remaining are attached to university hospitals and private healthcare facilities.³⁶

Based on a 2018 pilot study carried out by Sarawak General Hospital, it was concluded that the establishment of an acute stroke unit with the availability of reperfusion therapy would not only significantly

It remains crucial that doctors treat stroke patients as early as possible

reduce stroke morbidity and mortality, it would also reduce the hospital's expenditure on treating the condition.³⁷ RM57.6 million was estimated to have been saved in the Sarawak study.²⁵

The establishment of Acute Stroke Units (ASU) also known as Stroke Care Units (SCU), with trained clinical personnel and updated treatment such as endovascular treatment (EVT)/ intravenous thrombolysis (IVT), and reperfusion therapy have improved the clinical outcome of stroke patients over the past few years.³⁸

In 2012, thrombolytic therapy was first approved for use in public hospitals. However, despite that only ten public hospitals currently provide full access to this treatment on a 24-hour, 7 days' a week basis, including Hospital Seberang Jaya, Hospital Queen Elizabeth, Hospital Sultanah Nur Zahirah and Sarawak General Hospital.³⁷ Other facilities may have varying levels of access.

Data from the National Stroke Registry showed that only 0.65% of stroke patients were treated with thrombolysis.³⁰

It is necessary to examine and highlight the effectiveness of this therapy in clinical practice to ensure that there is enough justification and evidence to support increased investments in this area. Such substantiation is necessary to ensure expansion of patient access and treatment coverage to thrombolytic therapies.

Recent advances in thrombolysis and thrombectomy have shown a strong impact on such treatments restoring function and saving the lives of severely disabled acute stroke patients.

There are 71 hospitals nationwide (37 and 34 in the public and private sectors respectively) currently providing thrombolysis service. Nonetheless with the benefits of having a specialised stroke unit known for more than 30 years, and thrombolysis as an effective treatment for stroke accepted for almost two decades, the current state of stroke management is still considered suboptimal.³⁹

Malaysia has the potential and capacity to improve and enhance existing services.

Only 21 percent of stroke patients were able to be treated at a medical facility within 3 hours of the onset of symptoms. The median time was at 7 hours or more. Delays were caused by lack of awareness and recognition of stroke symptoms.

Stroke referral systems and post-stroke care are not uniform across healthcare settings in Malaysia.³⁹ There are gaps between the public and private sector which creates disparities in the availability and provision of stroke treatments provided.

This can lead to increased cost of treatment and care. It also has the potential to increase the mortality rates of stroke patients.

The Ministry of Health has embarked on a stroke care delivery model comprising two phases to address some of the gaps in existing services.³⁷

Phase 1 (2019-2020) involved the setting up of primary stroke centres at all state-level major hospitals and identification of regional comprehensive stroke centres.

Phase 2 (2021-2024) focuses on building from the earlier progress and to set up more comprehensive stroke centres. Additional primary stroke centres will be formed in all specialist hospitals with neuroimaging facilities.

Successful implementation of the plan is vital to ensure a standardized treatment approach to acute stroke care for all stroke centres. Under this plan, a 3 percent thrombolysis target rate has been set.

Only 21 percent of stroke patients were able to be treated at a medical facility within 3 hours of the onset of symptoms. The median time was at 7 hours or more.

Training of healthcare providers

The provision of stroke care in a Ministry of Health healthcare facility will often mean that the medical team led by a neurologist will take a

prominent role, handling most of cases.³⁷ Haemorrhagic strokes, are managed by neurosurgeons, and may require surgical interventions. In Malaysia, some stroke patients are also managed by non-neurologists.

However, the number of neurologists, especially in public service, are limited. It is therefore a priority for more such specialists to be trained and recruited to cater to the country's increasing ageing population.

There is also a role for primary care doctors, especially in post-stroke care. They should be able to help prevent recurrent stroke, avert late complications, maximise individual functionality, and help optimise quality of life through patient-centred care.

Echo trainings for thrombolysis assessment and administration as well as endovascular and intervention neurology, have been proposed as part of required training plans under Phase I of the current stroke care delivery model.³⁷

ANGELs Initiative

Introduced in Malaysia in 2017, the ANGELs Initiative (Acute Network strivinG for ExceLLence in Stroke), involves 34 hospitals with the aim to improve the quality of stroke care through continuous training and consultations.⁴⁰

To qualify for the World Stroke Organisation (WSO) Angels Award, hospitals submitted records of their stroke cases including the procedures and therapies administered, which is then recorded in the Registry of Stroke Care Quality (RES-Q).

An evaluation is later made to compare to existing standards of stroke care which include treating stroke patients in a dedicated stroke unit or Intensive Care Unit (ICU), and able to treat at least 50 percent of patients with recanalisation therapies within 45 minutes upon arrival at the hospital and 75 percent within 60 minutes.⁴¹

As of 2021, 11 Malaysian hospitals, in public and private sectors, have been successful in being recognised and awarded with a World Stroke Organization Angels Award (2 Gold, 5 Platinum and 4 Diamond).



The way forward: Closing the gaps

Major improvements are needed in the care pathways for stroke management. This includes increasing patient education to improve identification of stroke by relatives and family members; early accurate diagnosis and timely treatment after prompt referral to an appropriate medical facility; improving access to expanded and more efficacious therapeutic options; and increasing the availability of and improving existing rehabilitation services.

Increase the number of neurologists and related multi-disciplines managing stroke cases: the number of neurologists and multidisciplinary healthcare professionals who can treat stroke and administer thrombolysis needs to be increased to fill the expertise gap.

Need for more interventional radiologists and relevant facilities: Stroke services in Malaysia currently suffer from both a limited number of interventional radiologists as well as related radiology facilities, which poses significant barriers to being able to offer thrombectomies as the treatment of first choice, particularly in government hospitals. Neuro-interventionalist training programmes should be conducted to increase the number of specialists readily available for care of hyperacute patients.

Better survival outcomes are possible with existing treatment options which are more efficacious.

Thrombolysis and thrombectomy services should be made available nationwide

Based on National Stroke Registry data, an estimated 30,000 people are afflicted with stroke annually. Half will likely suffer from severe stroke. Around 5,000 people or a third, will be able to return to independent function when treated properly with thrombectomy or thrombolysis, a significant impact.⁴²

There needs to be serious effort to ensure that thrombolysis and thrombectomy services are made available nationwide.

Increase availability of thrombolytic therapy: There are only ten public hospitals which currently have 24-7 access to this type of treatment. As “time is brain”, this availability must be extended to other health facilities to ensure that efficacious treatments provided early in the chain of care are able to minimise disability and avoid future suffering as well as reducing the economic costs in societies with higher ageing populations. It is also preferable that such services are provided through 24-hour, 7 days’ a week stroke care service. New initiatives such as the RESQ (Regional Emergency Stroke Quick Response Unit) further strengthen the availability of such services but remain limited in geographical coverage.³⁷

Decentralise acute stroke care: The greatest improvements have been seen when hyper-acute stroke care has been decentralised to a number of better-equipped and staffed hospitals placing care closer to the community, rather than depending on a small number of regional health facilities. There should be more “stroke ready” hospitals at least one per state, providing 24-hour, 7 days’ a week service through an ASU. District hospitals are frequently unutilized and could be used to deliver appropriate stroke care during the early critical period.

Creating stroke care teams in each hospital: This would allow for better triaging of acute stroke patients at emergency medicine departments, allowing for more effective early intervention in acute ischaemic stroke cases, as well as timely decisions of appropriate options where possible.

The Sarawak General Hospital’s piloting of its acute stroke unit demonstrated the benefits of having such a facility with clear, measurable and improved outcomes as can be seen in Figure 1.

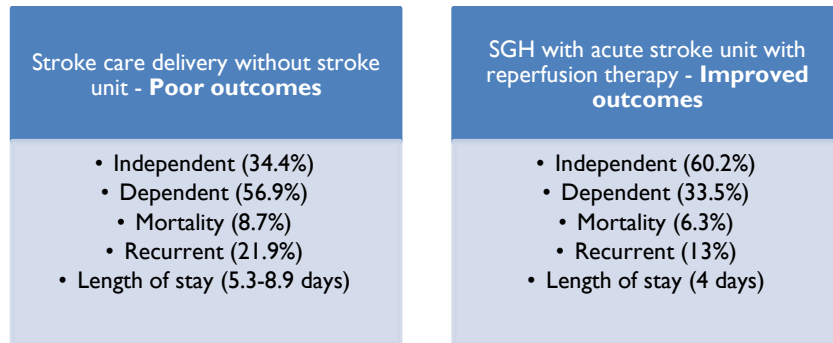
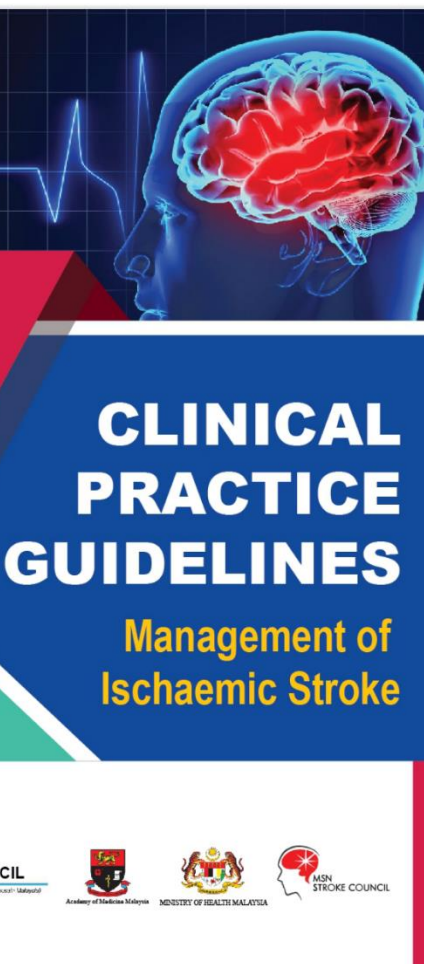


Figure 1: Comparison between stroke care delivery outcomes, without stroke unit and the SGH stroke unit³⁷

Redesign stroke care delivery in remote areas to overcome logistical challenges: The latter would include lack of designated stroke beds, and the absence of stroke care units to provide IV thrombolysis and thrombectomy.

Provide adequate rehabilitation centres for post-stroke care: The abovementioned care must be followed by rehabilitation. As more people survive stroke, there is a greater focus on this part of the care pathway, as part of strategies to improve quality of life, and reduce ill health. People should be able to return to their homes and even work if they wish to do so.

Besides emphasising a patient-centric approach to stroke care which includes prevention, management and rehabilitation, it is crucial for recommended treatment standards such as those contained in the Clinical Practice Guidelines (CPG) are adhered to.



Conclusion

It is timely to ensure that Malaysia's stroke care delivery system is fit for purpose and is able take on the challenge of meeting the standards as laid out in the 3rd edition of the Clinical Practice Guidelines for the management of ischaemic stroke.

The aim is to reduce the burden of stroke through enhanced preventive strategies, better access to hyperacute care, improved treatment coverage and modalities, and commitment to long term care.

As shared in this document, acute stroke care has seen some much-needed improvements and developments in recent years. However, the challenge remains in being able to provide high quality and effective treatment utilising existing resources via a patient-centred approach.

Malaysia has within its means and the opportunity to transform people's outcomes and experiences of stroke.

Better survival outcomes for stroke patients are possible.

Addressing the gap in the provision of acute stroke services, particularly ensuring that efficacious treatment is available and provided during the critical first 4.5 hours, will save lives, improve outcomes, and reduce the overall cost of stroke, both to society and to the economy.

Stroke remains one of the greatest health challenges. However, Malaysia has within its means and the opportunity to transform people's outcomes and experiences of stroke. With the right support, courage and determination, people can survive, recover, and heal.

References

1. Donnan GA, Fisher M, Macleod M, Davis SM. Stroke. *Lancet*. 2008 May 10;371(9624):1612-23. doi: 10.1016/S0140-6736(08)60694-7. PMID: 18468545.
2. Wittenauer, R and Smith, L. Update on 2004 Background Paper: Background Paper 6.6 Ischaemic and Haemorrhagic Stroke. Priority Medicines for Europe and the World. "A Public Health Approach to Innovation". World Health Organisation. December 2012. Available from: https://www.who.int/medicines/areas/priority_medicines/BP6_6Stroke.pdf
3. Ibid
4. Amelia K. Boehme, Charles Esenwa, and Mitchell S.V. Elkind. Stroke Risk Factors, Genetics, and Prevention. *Circulation Research*. Volume 120, Issue 3, 3 February 2017; Pages 472-495. <https://doi.org/10.1161/CIRCRESAHA.116.308398>
5. Heart and Stroke Foundation of Canada. *Atrial fibrillation*. Available from: <https://www.heartandstroke.ca/heart-disease/conditions/atrial-fibrillation>
6. Moini, J, Piran, P. Chapter 5 - Blood supply of the CNS. Editor(s): Jahangir Moini, Pirouz Piran, *Functional and Clinical Neuroanatomy*, Academic Press, 2020, Pages 131-176, ISBN 9780128174241, <https://doi.org/10.1016/B978-0-12-817424-1.00005-7>.
7. Donkor ES. Stroke in the 21st Century: A Snapshot of the Burden, Epidemiology, and Quality of Life. *Stroke Res Treat*. 2018;2018:3238165. Published 2018 Nov 27. doi:10.1155/2018/3238165
8. Chen X, Zhao X, Xu F, Guo M, Yang Y, Zhong L, Weng X, Liu X. A Systematic Review and Meta-Analysis Comparing FAST and BEFAST in Acute Stroke Patients. *Front Neurol*. 2022 Jan 28;12:765069. doi: 10.3389/fneur.2021.765069. PMID: 35153975; PMCID: PMC8837419
9. Edward C Jauch. Ischemic Stroke Clinical Presentation. Medscape. Updated: 27 May 2020. Available from: <https://emedicine.medscape.com/article/1916852-clinical>
10. Baron, JC. Protecting the ischaemic penumbra as an adjunct to thrombectomy for acute stroke. *Nat Rev Neurol* 14, 325–337 (2018). <https://doi.org/10.1038/s41582-018-0002-2>
11. Phillips SJ, Eskes GA, Gubitz GJ; Queen Elizabeth II Health Sciences Centre Acute Stroke Team. Description and evaluation of an acute stroke unit. *CMAJ*. 2002;167(6):655-660.
12. Baudains, B. Stroke care pathway from the emergency department to CT and the improvement of patient time from CT scan to thrombolysis. Shared learning database. National Institute for Health and Care Excellence. January 2018. Available from: <https://www.nice.org.uk/sharedlearning/stroke-care-pathway-from-the-emergency-department-to-ct-and-the-improvement-of-patient-time-from-ct-scan-to-thrombolysis>
13. Alper BS, Foster G, Thabane L, Rae-Grant A, Malone-Moses M, Manheimer E. Thrombolysis with alteplase 3-4.5 hours after acute ischaemic stroke: trial reanalysis adjusted for baseline imbalances. *BMJ Evid Based Med*. 2020 Oct;25(5):168-171. doi: 10.1136/bmjebm-2020-111386. Epub 2020 May 19. PMID: 32430395; PMCID: PMC7548536.
14. Advani R, Naess H, Kurz MW. The golden hour of acute ischemic stroke. *Scand J Trauma Resusc Emerg Med*. 2017;25(1):54. Published 2017 May 22. doi:10.1186/s13049-017-0398-5

15. Donkor ES. Stroke in the 21st Century: A Snapshot of the Burden, Epidemiology, and Quality of Life. *Stroke Res Treat*. 2018;2018:3238165. Published 2018 Nov 27. doi:10.1155/2018/3238165
16. World Health Organisation. Factsheet: The top 10 causes of death. World Health Organisation. 9 December 2020. Available from: <https://www.who.int/news-room/factsheets/detail/the-top-10-causes-of-death>
17. Johnson W, Onuma O, Owolabi M, & Sachdeva S. Stroke: a global response is needed. *Bulletin of the World Health Organisation* 2016;94:634–634A. Available from: <https://www.who.int/bulletin/volumes/94/9/16-181636.pdf>
18. Owolabi MO, Akarolo-Anthony S, Akinyemi R, Arnett D, Gebregziabher M, Jenkins C, et al.; Members of the H3Africa Consortium. The burden of stroke in Africa: a glance at the present and a glimpse into the future. *Cardiovasc J Afr*. 2015 Mar-Apr;26(2) Suppl 1:S27–38. doi: <http://dx.doi.org/10.5830/CVJA-2015-038> PMID: 25962945
19. George MG, Fischer L, Koroshetz W, Bushnell C, Frankel M, Foltz J, Thorpe PG. CDC Grand Rounds: Public Health Strategies to Prevent and Treat Strokes. *MMWR Morb Mortal Wkly Rep*. 2017 May 12;66(18):479–481. doi: 10.15585/mmwr.mm6618a5. PMID: 28493856; PMCID: PMC5657990.
20. Quek, David & Goto, Shinya & Hankey, Graeme & M, True & D, Hu & Hu, Han Hwa & GYH, Lip & Loban, Trudie & KH, Sim & N, Tanahashi & HF, Tse & BW, Yoon & Zhang, Shuiyun. (2011). Can We Avoid a Stroke Crisis in the Asia-Pacific Region? *Working Group Report: Stroke Prevention in Patients with Atrial Fibrillation*.
21. Venketasubramanian N, Yoon BW, Pandian J, Navarro JC. Stroke Epidemiology in South, East, and South-East Asia: A Review [published correction appears in *J Stroke*. 2018 Jan;20(1):142]. *J Stroke*. 2017;19(3):286–294. doi:10.5853/jos.2017.00234
22. National Institute of Neurological Disorders and Stroke. *Brain Basics: Preventing Stroke*. NIH Publication No. 11-3440b. 14 April 2020. Available from: <https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Preventing-Stroke>
23. Adisasmito, W., Amir, V., Atin, A. et al. Geographic and socioeconomic disparity in cardiovascular risk factors in Indonesia: analysis of the Basic Health Research 2018. *BMC Public Health* 20, 1004 (2020). <https://doi.org/10.1186/s12889-020-09099-1>
24. Turana, Y, Tengkawan, J, Chia, YC, et al; the HOPE Asia Network. Hypertension and stroke in Asia: A comprehensive review from HOPE Asia. *J Clin Hypertens*. 2021; 23: 513– 521. <https://doi.org/10.1111/jch.14099>
25. Galen Centre for Health & Social Policy. Event Report - Expert Meeting: Strengthening Ischaemic Stroke Care and Outcome in Malaysia. 17 September 2021
26. Institute for Health Metrics and Evaluation. Malaysia. Available from: <http://www.healthdata.org/malaysia>
27. Bernama. Dr Noor Hisham: One in four Malaysians estimated to suffer from stroke by 2040. *New Straits Times*. 29 October 2021. Available from: <https://www.nst.com.my/news/nation/2021/10/741067/dr-noor-hisham-one-four-malaysians-estimated-suffer-stroke-2040>
28. Nik Ramli NN, Asokan A, Mayakrishnan D, Annamalai H. Exploring Stroke Rehabilitation in Malaysia: Are Robots Better than Humans for Stroke Recuperation?. *Malays J Med Sci*. 2021;28(4):14–23. doi:10.21315/mjms2021.28.4.3

29. Cheah WK, Hor CP, Zariah AA, Looi I. A Review of Stroke Research in Malaysia from 2000 - 2014. *Med J Malaysia*. 2016 Jun;71(Suppl 1):58-69. PMID: 27801388.
30. Aziz ZA, Lee YY, Ngah BA, Sidek NN, Looi I, Hanip MR, Basri HB. Acute Stroke Registry Malaysia, 2010-2014: Results from the National Neurology Registry. *J Stroke Cerebrovasc Dis*. 2015 Dec;24(12):2701-9. doi: 10.1016/j.jstrokecerebrovasdis.2015.07.025. Epub 2015 Aug 31. PMID: 26338106.
31. Lee, Yin Leng Yvonne & Shafie, Asrul & Sidek, Norsima & Aziz, Zariah. (2017). Economic burden of stroke in malaysia: results from national neurology registry. *Journal of the Neurological Sciences*. 381. 167-168. 10.1016/j.jns.2017.08.488.
32. Akhavan Hejazi SM, Mazlan M, Abdullah SJ, Engkasan JP. Cost of post-stroke outpatient care in Malaysia. *Singapore Med J*. 2015;56(2):116-119. doi:10.11622/smedj.2015025
33. Economic Planning Unit. Malaysia - Voluntary National Review (VNR) 2021. Prime Minister's Department. Government of Malaysia. June 2021.
34. Yusof Khan, Abdul Hanif Khan & Hoo, Fan & Bin Basri, Hamidon & Wan Zaidi, Wan Asyraf & Chung, Law & Looi, Irene & lip, ang & choon, wong & Wan Yahya, Nafisah & yong, tan. (2020). MJM Malaysia Stroke Council Guide on Acute Stroke Care During Covid 19 Pandemic. *The Medical Journal of Malaysia*. 75. 311.
35. Malaysian Society of Neurosciences. Clinical Practice Guidelines – Management of Ischaemic Stroke. 3rd Edition. Malaysian Society of Neurosciences (MSN), the Academy of Medicine Malaysia, and Ministry of Health.
36. Malaysian Medical Council. National Specialist Register. Accessed on 5 November 2021. Available from: <https://www.nsr.org.my/Home.html>
37. Law WC. Transforming Stroke Care: the Sarawak's Experience. *Discover! Malaysia's Stroke Care Revolution – Special Edition*. 2019.
38. Phillips SJ, Eskes GA, Gubitz GJ; Queen Elizabeth II Health Sciences Centre Acute Stroke Team. Description and evaluation of an acute stroke unit. *CMAJ*. 2002;167(6):655-660.
39. Chia PK, Mohamad NA, et al. Regional Emergency Stroke Quick-Response (RESQ) Network: A Proposed Paradigm of Malaysia Stroke Care Services. *Malaysian Journal of Medicine and Health Sciences* (eISSN 2636-9346)
40. Malaysiakini. World Stroke Organization rewards 5 Malaysian hospitals for outstanding stroke care. *Malaysiakini.com*. 17 August 2020. Available from: <https://www.malaysiakini.com/announcement/538934>
41. Caso V, Zakaria MF, et al. Improving stroke care across the world: the ANGELS Initiative. *CNS* 2018; 4:(2). December 2018. Available from: <https://www.oruen.com/wp-content/uploads/2018/12/Review-article-4.pdf>
42. Ministry of Health. Annual report of the Malaysian Stroke Registry 2009-2016. *National Neurology Registry*. 2017. Available from: <https://www.neuro.org.my/assets/guideline/Stroke%20registry%20report%202009-2016.pdf>

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