An overview of hyperacute stroke services and National Stroke Registry in Malaysia - Improving stroke care through evidence

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ABSTRACT

Introduction: Stroke is a leading cause of death and disability in Malaysia. This paper provides an overview of the stroke burden, hyperacute stroke services, importance, and challenges of stroke registries. It also details findings from the National Stroke Registry (NSR) Malaysia that have advanced knowledge on local patterns, inequalities and temporal trends in stroke presentation, care processes and outcomes.

Materials and Methods: A recent survey that involved all the government (Ministry of Health, MOH) and university hospitals in Malaysia was conducted by a group of neurologists and researchers to provide insights into the hyperacute stroke services in Malaysia from 2012 to 2023.

Results: The results from the survey found that out of 142 MOH hospitals, 29 (20%) hospitals offer only intravenous thrombolysis (IVT) service, and seven (5%) hospitals offer both IVT and mechanical thrombectomy (MT) services. The majority or two-thirds of MOH hospitals still offer office hour services for both IVT and MT. For university hospitals, four (67%) out of six university hospitals provide both IVT and MT services and one (16%) university hospital provides only IVT service. Most university hospitals offer 24-hour services for IVT and MT. The availability of IVT service across MOH hospitals has increased significantly from 2012 to 2023. Thus, there was a substantial increase in the number of IVT cases treated in MOH hospitals. The growth in MT service has been more gradual. Only 22% of the MOH hospitals that provide hyperacute stroke services are equipped with acute stroke unit (ASU). Whereas ASU is available in 80% of the university hospitals that offer hyperacute stroke services. The higher availability of ASU in university hospitals compared to MOH hospitals may be due to better resources, specialised expertise, and advanced facilities in the university hospitals. The National Stroke Registry (NSR) Malaysia was established in 2009 to monitor stroke management practices, patient outcomes and promote quality improvement initiatives.

Conclusion: Despite suboptimal adherence on several key performance indicators, the NSR reports recent improvements in thrombolysis rates, reduced mortality, and better functional outcomes. Key recommendations center on promoting greater participation, feedback systems, adequate funding, and governance structures to translate registry findings into national policies and targeted interventions for equitable access to quality stroke care.

KEYWORDS:
National Stroke Registry Malaysia, stroke burden, hyperacute stroke services, intravenous thrombolysis, mechanical thrombectomy

INTRODUCTION

Globally, stroke ranks among the top three causes of disability-adjusted life years (DALYs) lost. In Malaysia, age-standardized stroke mortality rates per 100,000 population have worsened from 74 in 2010 to 105 in 2016 based on NSR reports.[1] As stroke often causes long-term disability, improvements across the continuum of care from prevention to rehabilitation are vital. Clinical registries like National Stroke Registry (NSR) play an invaluable role in monitoring stroke care quality, identifying gaps and generating evidence to inform policy and quality initiatives. This paper provides an overview of NSR Malaysia in terms of rationale, scope, research output and limitations. Potential recommendations to optimize NSR's utility as a national platform for quality evaluation and improvement are also discussed.

Stroke Burden and Services in Malaysia

As per Institute for Health Metrics and Evaluation estimates, in 2019 stroke was the third leading cause of death in Malaysia after ischemic heart disease and lower respiratory infection.[2] Analysis of administrative data on hospital admissions showed increased stroke incidence from 2008 to 2016, especially among those below 65 years (50% increase for men aged 35-39 years and 53% for women).[3] While 28-day all-cause stroke mortality has declined, the ratio of one

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death for every five strokes in women and one death for six strokes in men underscores room for improving acute care and secondary prevention.[3]

Information on dedicated stroke units was lacking. According to the information available on the My Stroke Hospital webpage, there are 69 stroke-ready hospitals identified, but details on their capabilities to definitively manage acute strokes were unavailable.[4] Therefore, a recent survey with the title of "An Overview of The Hyperacute Stroke Services in Malaysia from Year 2012 to 2023" was conducted by a group of neurologists and researchers from Seberang Jaya Hospital in 2024. This survey included a total of 142 government [Ministry of Health (MOH)] hospitals and six university hospitals to provide insights into the trend of both intravenous thrombolysis (IVT) and mechanical thrombectomy (MT) services in Malaysia in terms of the total number of hospitals that provide IVT and MT services, the total number of hospitals that provide 24-hour IVT and MT services, the total number of hospitals equipped with acute stroke unit (ASU) and the total number of IVT and MT cases throughout the years from 2012 to 2023.

The survey [NMRR ID-24-00730-TKM (IIR)] has granted ethical approval from the Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia. The required data from each hospital was collected through an online questionnaire. A Google link that contained the questionnaire was shared with the neurologist or the main person in charge of stroke care in each hospital through email. The questionnaire consists of four different sections. Section one is about the respondent's details (name, designation, participating hospital). Section two and three consist of several questions pertaining to the IVT and MT services provided by each hospital respectively. While section four assesses the availability of ASU facility in the hospital. This survey has potential limitations. All the data captured was based on the feedback provided by the respondent of each hospital which was unverifiable. Ideally, the source of data should be from the national database which is the NSR Malaysia. Unfortunately, the number of hospitals that contribute data to the NSR is limited.

Intravenous Thrombolysis and Mechanical Thrombectomy Services Availability

As of March 2024, there are 142 government (MOH) and six university hospitals in Malaysia. Figure 1 shows the total number and percentage of MOH and university hospitals with IVT and MT services. Based on the information available from 142 government hospitals in Malaysia, 29 (20%) hospitals offer only IVT service and seven (5%) hospitals offer both IVT and MT services. Among six university hospitals, one (16%) hospital offers only IVT service, and four (67%) hospitals offer both IVT and MT services.

Figure 2 presents data on the total number of MOH hospitals that provide IVT and MT services from 2012 to 2023. The availability of both IVT and MT services across MOH hospitals has increased over the past decade. There was a significant increase in the number of hospitals providing IVT services between 2018 (6 hospitals) and 2023 (37 hospitals), indicating a substantial expansion of IVT service during that period. While the growth in MT service has been more gradual, there was a noticeable increase from one hospital in 2020 to seven hospitals in 2022, suggesting a recent focus on expanding MT services as well.

24-hour Service Availability

Table I shows the total number and percentage of MOH and university hospitals that offer 24-hour MT and/or IVT services. The majority or two-thirds of the MOH hospitals still offer office hour services for both IVT and MT. Most university hospitals offer 24-hour services for IVT and MT.

Acute Stroke Unit (ASU) Availability

Table II shows the total number and percentage of MOH and university hospitals that provide hyperacute stroke services equipped with ASU. The higher availability of ASU in university hospitals compared to MOH hospitals may be due to better resources, specialised expertise, and advanced facilities in university hospitals.

Service Utilization Trends

Figure 3 shows the total number of IVT and MT cases in MOH hospitals from year 2012 to 2023. The number of IVT cases treated in MOH hospitals has increased over the years, with a significant rise from 2018 onwards, reaching 916 cases in 2023. Similarly, MT cases in MOH hospitals have risen from 0 cases before 2016 to 72 cases in 2023.

Figure 4 shows the total number of IVT and MT cases in university hospitals from year 2012 to 2023. University hospitals have also seen a steady increase in IVT cases, from 16 in 2012 to 181 in 2023, and MT cases from zero before 2018 to 73 in 2023.

Overall, the findings indicate a positive trend in the expansion of the hyperacute ischemic stroke treatment services in Malaysia, with more hospitals adopting IVT and MT capabilities over the years. However, there are still significant gaps in service availability, particularly in terms of 24-hour service coverage and the presence of dedicated ASUs. The data also reveals regional disparities, suggesting the need for more equitable distribution of these critical services across the country.

Role of Stroke Registries

Clinical registries collect observational data on demographics, processes of care and outcomes to evaluate real-world practice against guidelines. They inform quality improvement initiatives, research and policies aimed at reducing evidence-practice gaps and unwanted variations in care quality. Stroke registries specifically enable monitoring of case volumes, treatment rates and adherence to certain key performance metrics. They benchmark hospital performance, while shedding light on inequalities in outcomes and longitudinal trends at regional and national levels.

For instance, the Clinical Research Collaboration for Stroke in Korea (CRCS-K) registry has been very helpful and beneficial for improving stroke care in Korea.[5] It has enabled the monitoring of secular trends in stroke epidemiology, quality indicators, and outcomes over time. This was associated with improved outcomes like reduced stroke recurrence, mortality,

Table I: The total number and percentage of MOH and university hospitals that provide 24-hour MT and/or IVT services

Type of hospital	Total number of hospitals that provide MT or IVT service n (%)	Total number of hospitals that provide MT or IVT service during office hours n (%)	Total number of hospitals that provide 24-hour MT or IVT service n (%)
MOH hospitals			
IVT service	36 (100.0)	23 (64.0)	13 (36.0)
MT service	7 (100.0)	5 (71.0)	2 (29.0)
University hospitals			
IVT service	5 (100.0)	1 (20.0)	4 (80.0)
MT service	4 (100.0)	1 (25.0)	3 (75.0)

Table II : The total number and percentage of MOH and university hospitals that provide hyperacute stroke services equipped with ASU

Type of hospital	Total number of hospitals that provide hyperacute stroke services n (%)	Total number of hospitals with no ASU available n (%)	Total number of hospitals with ASU available n (%)
MOH hospitals	36 (100.0)	28 (78.0)	8 (22.0)
University hospitals	5 (100.0)	1 (20.0)	4 (80.0)

Table III: Availability of hyperacute stroke treatment services in different states throughout Malaysia

State	Total number of MOH and university hospitals n	Total number of hospitals that offer only IVT service n	Total number of hospitals that offer both IVT and MT n
Perlis	1	0	0
Kedah	10	2	1
Pulau Pinang	6	2	0
Perak	14	4	0
Selangor	16	3	2
Wilayah Persekutuan Kuala Lumpur	3	0	3
Wilayah Persekutuan Putrajaya	1	0	0
Negeri Sembilan	7	2	0
Melaka	3	1	0
Johor	12	0	1
Pahang	12	2	0
Kelantan	10	3	1
Terengganu	6	1	0
Sabah	23	3	2
Wilayah Persekutuan Labuan	1	0	0
Sarawak	23	7	1
Total	148	30	11

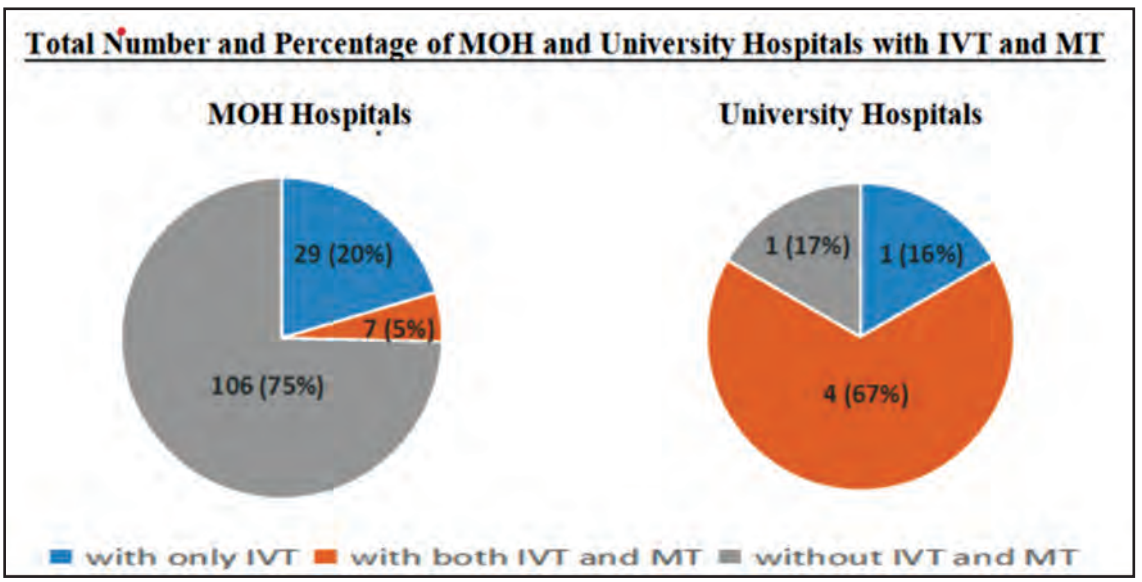

Fig. 1: The total number and percentage of MOH and university hospitals with IVT and MT services

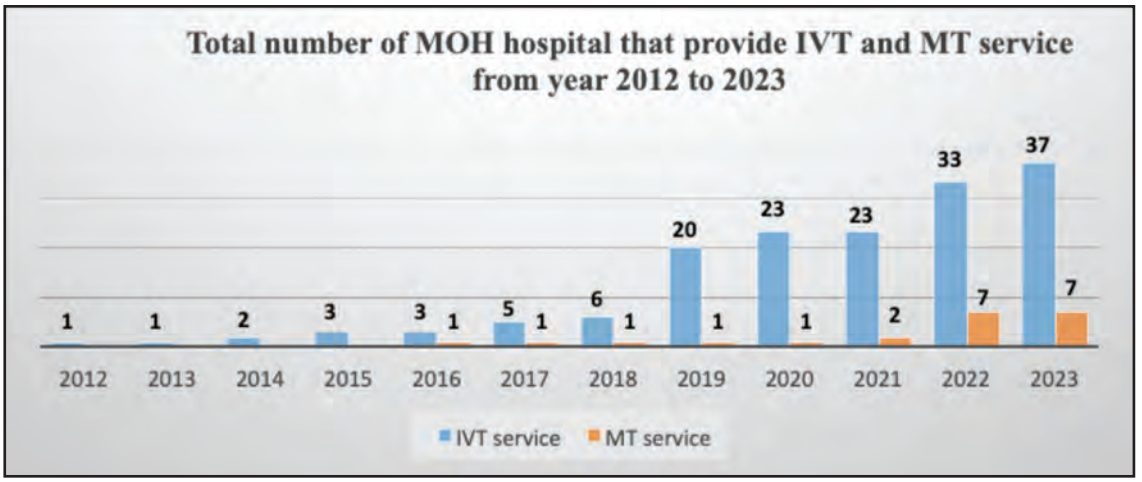

Fig. 2: The total number of MOH hospitals providing IVT and MT services from year 2012 to 2023.

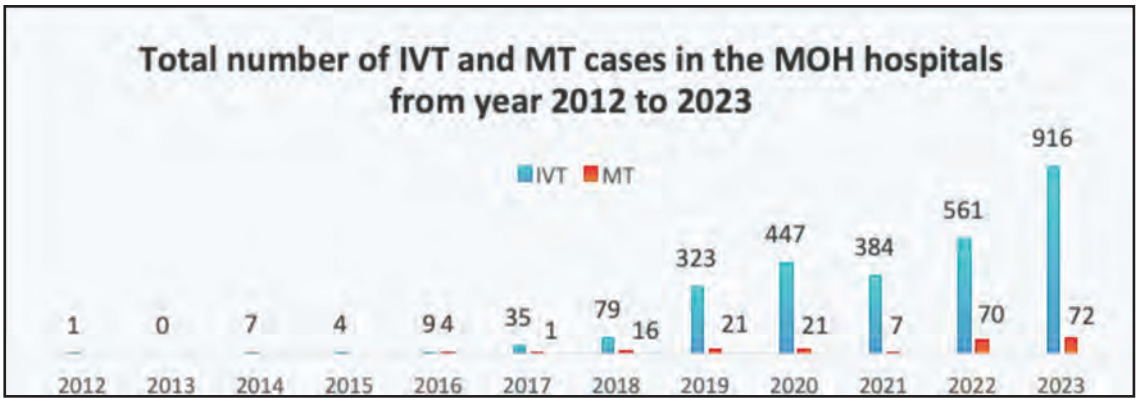

Fig. 3: Total number of IVT and MT cases in MOH hospitals from year 2012 to 2023

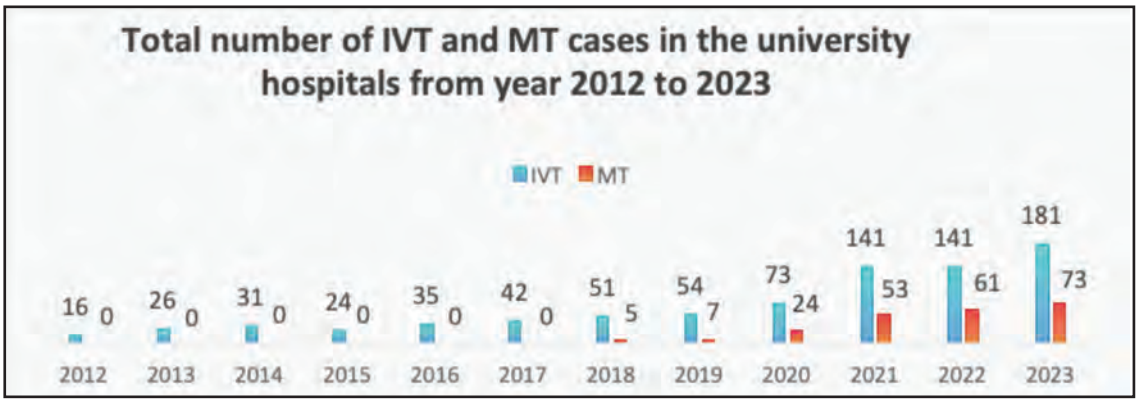

Fig. 4: Total number of IVT and MT cases in university hospitals from year 2012 to 2023

and better functional status. The large, high-quality dataset of about 100,000 registered stroke cases across 17 centres has enabled comparative effectiveness research studies comparing different treatment strategies that are difficult to study in randomised trials. Linkage of the registry data with other data sources has opened new research opportunities. International collaborations comparing the Korean dataset with other large stroke databases globally have enabled understanding of differences in stroke risk factors, aetiology, and outcomes across populations. Overall, the multicentre, prospective CRCS-K stroke registry has served as an invaluable resource for stroke epidemiology, comparative effectiveness research, clinical trials, and ultimately improving the quality of stroke care and outcomes in Korea over the past 15 years.

Over 1994-2013, 28 countries established population-based or hospital stroke registries with an additional seven more registries mainly from high income countries identified in 2017, but cross-national comparisons were limited by

inconsistent definitions and suboptimal coverage.[6-7] Recently, the Registry of Stroke Care Quality (RES-Q) was launched enabling international benchmarking across 103 countries through a common dataset.[8] Malaysia is one of the countries participating in RES-Q. A total of 35 hospitals within Malaysia have registered with a total of >9000 patients enrolled till 2023.[8] Locally adapted large-scale sustained registries can generate generalizable findings to advance stroke prevention and care.

NSR in Malaysia

The NSR was initiated in 2009 by the MOH, Malaysia as part of the National Neurology Registry to monitor practices, promote evidence-based care and identify areas for improvement nationally.[1] By capturing data from consenting patients older than 12 years with stroke onset within the last two weeks, it enables examining real-world outcomes. Participation is voluntary, but open to all public and private hospitals managing strokes. Patients are followed up for three months. Through December 2016, NSR accumulated details on 11,284 stroke hospitalizations from 15 sites.[1] The findings have been disseminated in publications, national meetings, and clinical practice guidelines.

Impact of NSR on Advancing Stroke Care in Malaysia

NSR studies have enhanced understanding of risk factor profiles, quality gaps and prognosis among the local stroke population. Appendix 1 summarizes major research findings from publications using data derived from the NSR Malaysia. Synthesizing results across these studies highlights progress made and continuing challenges in improving stroke care.

Delays in Care

Multiple studies have used the registry data to investigate prehospital delays in acute stroke treatment. Approximately 75% of patients had delayed hospital arrival more than 3 hours after symptom onset.[9] Contributing factors included milder stroke symptoms, ignorance, and use of private transport.[1,9,10] Public education campaigns stressing the need to seek urgent care even for mild stroke symptoms could help reduce onset-to-door times. In-hospital delays from door-to-imaging have also been examined. The median time to CT scanning was 4 hours, with only one third of ischaemic stroke patients being scanned within 4.5 hours.[11] Prioritization scores have been proposed to triage patients for urgent CT imaging when capacity is limited.[11]

Adherence to Guidelines

Registry data has revealed suboptimal adherence to clinical guidelines. Only 39% of patients with atrial fibrillation (AF) received anticoagulation and 39% received venous thromboembolism (VTE) prophylaxis.[12] Prescription of antihypertensives for secondary prevention was around 50%.[13] The main areas of suboptimal key performance indicator (KPI) adherence (non adherence rate >25%) were deep vein thrombosis (DVT) prophylaxis (82.8%), anticoagulation for AF patients (49.8%), and rehabilitation (26.2%).[14] Non-adherence to performance measures was linked to higher mortality.[14] Quality improvement efforts must continue to increase evidence-based prevention and treatment.

Risk Factors and Recurrence

Ischemic heart disease has been identified as an independent predictor of recurrent stroke, especially in patients with diabetes.[15,16] Elevated triglycerides were also associated with recurrence.[17] Targeting modifiable vascular risk factors is key for secondary stroke prevention. One study developed a predictive model for recurrence based on risk factor profiles.[18]

Outcomes

Encouraging trends in reduced mortality and improved functional independence at hospital discharge have been observed from 2009 to 2017.[19] However, thrombolysis rates remain low at around 20%, signaling room for improvement in hyperacute management.[20]

The NSR Malaysia has enabled important research characterizing stroke epidemiology, treatments, outcomes and prognostic factors. Key findings include opportunities to enhance preventive care and reduce delays. Mortality has declined but functional recovery remains poor for many patients. Continued commitment to translating registry insights into clinical improvements is critical for optimal stroke care delivery and outcomes.

Limitations and Recommendations for the National Stroke Registry (NSR) Malaysia

Limitations:

- Data entry can be impractical, especially for district hospitals, due to the comprehensive nature of the NSR and its wide range of parameters.
- Certain parameters captured in the RES-Q are absent in the current NSR, resulting in redundant data entry for hospital staffs participating in both systems. Appendix 2 summarizes the comparison between NSR Malaysia and RES-Q Registry parameters.
- Lack of motivation and sustainability in maintaining the registry due to insufficient dedicated manpower, inconsistent encouragement, and monitoring.
- Many staff members remain unaware of the registry's importance, hindering its effectiveness.
- Concerns regarding data privacy persist, necessitating vigilant oversight in registry maintenance efforts.

Recommendations:

- Implementation of a new NSR project, which is currently in progress, to address these limitations. The goals of the new NSR project include:

i. Demonstrate progress in stroke care through data analysis.
ii. Identify gaps and areas lacking comprehensive data by harmonising the current NSR and RES-Q and ensuring the inclusion of necessary national KPIs.
iii. Introduce a simplified, user-friendly version of the stroke registry to facilitate efficient data collection and encourage wider participation from healthcare facilities.
iv. Advocate for dedicated funding and resources by highlighting the significance and potential benefits of a coordinated NSR.
v. Enable detailed data analysis to inform evidence-based decision-making, drive quality improvement initiatives, and enhance the overall quality of stroke care nationwide.

Additional Recommendations:

- Appoint Stroke Champions in every state, with possible expansion to district hospitals where feasible, to improve monitoring and encouragement for stroke registry data submission. The Stroke Champion is a neurologist or physician identified to lead stroke services in each state. This role involves serving as a mediator between the state and various stakeholders, including the MOH Malaysia. The Stroke Champion is also the primary contact for stroke data in the state and may be responsible for conducting training and audits to improve stroke care.
- Encourage participation in the Stroke Preceptorship Programme among young and dynamic neurologist fellows, who would collaborate closely with selected district hospital medical department heads for training and registry/audits.
- Emphasize the importance of stroke registries during regular stroke workshops.
- Establish awards like the Stroke Rising Stars and Angels Awards to recognize outstanding performances among stroke champions and incentivize participation in the stroke registry. For example, World Stroke Organization (WSO) partners with ANGELS initiative do give out WSO Angels Awards quarterly to recognize and promote best practice in stroke care. There are three different levels for WSO Angels Awards which are "Gold Status", "Platinum Status" and "Diamond Status". The award level achieved will depend on the data captured by the hospital in the last three months.
- Mandate registry participation with adequate reimbursements and data manager support.
- Implement governance policies ensuring rigorous privacy protections and access oversight.
- Secure funding for ongoing development, analyses, and feedback systems.
- Develop practical web-interfaces, dynamic data checks, and interactive visualizations.
- Provide training modules on interpreting reports and applying findings for audits and practice improvement.
- Engage stakeholders through multidisciplinary expert panels to formulate and track progress on registry-informed quality targets.

CONCLUSION

Despite limitations, Malaysia's concerted efforts towards establishing the NSR have helped uncover management and prognosis patterns, inequalities among subgroups and temporal shifts. This has paved the pathway for enlightened policies and programs to alleviate the stroke burden through equitable access to quality evidence-based services. With continued strive towards a well-governed, adequately funded national registry with widespread participation, Malaysia is well poised to lead transformations in regional stroke care.

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CONFLICT OF INTEREST

The authors declare they have no conflicts of interest.

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ETHICAL APPROVAL

Ethical approval for the survey [NMRR ID-24-00730-TKM (IIR)] was obtained from the Medical Research and Ethics Committee, Ministry of Health Malaysia prior to the conduct of the research. Approval from the Director General of Health Malaysia was granted for manuscript publication.

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Appendix 1: Key Research Findings from Publications Using Malaysian NSR Data

Study	Key Findings	Author, Year
National Stroke Registry (NSR): Terengganu and Seberang Jaya experience	- Only 38.6% received VTE prophylaxis - 39.4% with AF received anticoagulation	Nazifah et al., 2012[12]
Acute Stroke Registry Malaysia, 2010-2014: Results from the National Neurology Registry	- Incidence increased dramatically from 2010-2014 - Need for risk factor control to prevent further increase in stroke burden	Aziz et al., 2015[21]
Factors associated with delay in seeking treatment by patients with acute stroke: The National Neurology Registry (NNeuR) of Malaysia	- 75.7% had delayed arrival (>3 hrs) - Patients with mild/moderate stroke had longer delays than severe stroke	Neelamegam et al., 2015[9]
Clinical characteristics of atrial fibrillation in first-ever ischaemic stroke patients; results from Malaysia National Neurology Registry	- AF associated with more severe stroke, poorer outcomes and higher mortality	Aziz et al., 2016[22]
Gender disparities and thrombolysis use among patient with first-ever ischaemic stroke in Malaysia	- Females older at stroke onset, had more severe strokes, poorer outcomes - Lower thrombolysis rates in females	Aziz et al., 2016[23]
Use of a diagnostic score to prioritize Computed Tomographic (CT) Imaging for patients suspected of ischaemic stroke who may benefit from thrombolytic therapy	- Only 33% of the ischemic stroke patients had CT imaging within 4.5 hours - The median door-to-scan time was 4 hours - Proposed Siriraj Stroke Score to prioritize CT imaging for ischaemic stroke	Hwong et al., 2016[11]
Use of antihypertensive drugs and ischaemic stroke severity - is there a role for angiotensin-ii?	- No difference in stroke severity between Angiotensin II vs Angiotensin II suppressors	Hwong et al., 2016[24]
Annual report of the Malaysian Stroke Registry 2009-2016	- Median time from symptom onset to hospital arrival was 7.6 hours. - Only 21% arrived within 3 hours of onset - Common reasons for delay: ignorance about symptoms, mild symptoms, geographical barriers - Overall mortality increased from 74 to 105 per 100,000 from 2010 to 2016 - 35% were independent (MRS 0-2), 54% disabled (MRS 3-5), 11% died by discharge - Poor adherence to VTE prophylaxis and anticoagulation guidelines	Available from: https://www.neuro.org.my[1]
Prescription of secondary preventive drugs after ischaemic stroke: results from the Malaysian National Stroke Registry	- <50% prescribed antihypertensives and 1/3 prescribed anticoagulants	Hwong et al., 2017[13]
Gender differences and risk factors of recurrent stroke in Type 2 Diabetic Malaysian population with history of stroke: the observation from Malaysian National Neurology Registry	- Ischaemic heart disease significantly associated with recurrence in both males and females	Aziz et al., 2019[15]
Trends in stroke outcomes at hospital discharge in first-ever stroke patients: Observations from the Malaysia National Stroke Registry (2009-2017)	- Improved functional outcomes from 2009 to 2017 - Decreased mortality over time	Chen et al., 2019[19]
A hospital-based study on ischaemic stroke characteristics, management, and outcomes in Sarawak: Where do we stand?	- 18.8% thrombolysis rate - 57% good functional outcomes at discharge - High Get With The Guidelines (GWTG) - Stroke compliance	King et al., 2020[20]
Impact of adherence to key performance indicators on mortality among patients managed for ischaemic stroke	- The main areas of suboptimal KPI adherence (nonadherence rate >25%) were DVT prophylaxis (82.8%), anticoagulation for AF patients (49.8%), and rehabilitation (26.2%). - Suboptimal KPI adherence associated with higher mortality	Mohammed et al., 2020[14]
Modelling the prognostic effect of glucose and lipid profiles on stroke recurrence in Malaysia: an event-history analysis	- Triglycerides consistently associated with stroke recurrence	Chen et al., 2020[17]

Appendix 1: Key Research Findings from publications using Malaysian NSR data

Study	Key Findings	Author, Year
Predictors of recurrent ischemic stroke in obese patients with Type 2 Diabetes Mellitus: a population-based study	- Ischaemic heart disease, hypertension, antihypertensives associated with recurrence in obese patients with type 2 diabetes mellitus	Albitar et al., 2020[25]
Socio-demographics and clinical characteristics affecting pre-hospital delays in acute stroke patients: A 6-year registry study from a Malaysian stroke hospital	- Shorter delays in Chinese patients and ambulance users - Longer delays with lacunar infarcts	Loh et al., 2020[10]
Population-based study comparing predictors of ischaemic stroke recurrence after index ischaemic stroke in non-elderly adults with or without diabetes	- Ischaemic heart disease main predictor regardless of diabetes status	Elhefnawy et al., 2021[16]
Predictive model of recurrent ischaemic stroke: model development from real-world data	- 4.32% had recurrent stroke within 7 years - Model predicted hazard over time and with risk factors	Elhefnawy et al., 2023[18]
Antiplatelet therapy for secondary prevention in patients with ischaemic stroke and transient ischaemic attack: a retrospective cohort study in Malaysia	- DAPT reduced risk of stroke, myocardial infarction, or death compared to SAPT at 1-year follow-up (hazard ratio 0.48, 95% CI 0.25-0.91). - DAPT reduced risk of recurrent stroke compared to SAPT at 1 year (hazard ratio 0.38, 95% CI 0.16-0.92)	Rahman et al, 2024[26]

Appendix 2: Comparison between NSR Malaysia and RES-Q Registry Parameters

This table compares the unique parameters captured in each stroke registry system. Parameters that are common to both systems are not shown. Understanding these differences helps to explain why healthcare providers need to enter data twice when participating in both systems.

Category	NSR Only	RES-Q Only
Demographics	Ethnicity	None
Stroke Presentation	None	• Wake-up stroke status • From where patient arrived to the hospital (home/ another stroke treating centre/ any other hospital)
Medical History	None	• Congestive cardiac failure • Hormone therapy • HIV infection • COVID-19
Initial Assessment	None	• Baseline Modified Rankin Scale (mRS) prior to stroke
Brain Imaging	None	• ASPECT score • Previous infarct detection • Blood vessel occlusion on Computed Tomography Angiography (CTA) / Magnetic Resonance Angiography (MRA)
Treatment Details	None	• Reasons for not performing: - Intravenous thrombolysis (IVT) - Mechanical thrombectomy (MT)
Post Acute Care	None	• Fever (equal or more than 37.5) in the first 72 hours of admission • Glucose level of equal or more than 10mmol/L in the first 48 hours of admission
Hospital Stay Information	• Length of stay	• None