Discover! Malaysia's Stroke Care Revolution - Special Edition

Book - June 2019

12 authors, including:

Kurubaran Ganasegeran
Ministry of Health Malaysia
69 PUBLICATIONS 562 CITATIONS

Mohd Fadzly Amar Jamil
21 PUBLICATIONS 125 CITATIONS

Zariah abdul aziz
Ministry of Health Malaysia
13 PUBLICATIONS 56 CITATIONS

Sheamini Sivasampu
Ministry of Health Malaysia
31 PUBLICATIONS 69 CITATIONS

Some of the authors of this publication are also working on these related projects:

Project National Stroke Registry View project
Project The use of WhatsApp in Clinical Practice View project
HIGHLIGHTS

SPECIAL FEATURE
Putting Stroke Care FORWARD:
Datuk Dr Noor Hisham Abdullah

STROKE RESEARCH PRIORITY
Stroke Research in Malaysia: A National Perspective

STROKE IN PRACTICE
Hyperacute Stroke Imaging from the Perspective of Strokeologist

Photo credit: www.123rf.com
Contents

Special Feature

Putting Stroke Care Forward

Datuk Dr Noor Hisham Bin Abdullah

Malaysia Stroke Council President’s Message

Assoc Prof Dr Hoo Fan Kee

Editorial

Dr Kurubaran Ganasegeran

Stroke Research Priorities

Stroke Research in Malaysia: A National Perspective

Datin Dr Sheamini Sivasampu

Stroke Personality

Implementing the Regional Emergency Stroke Quick-response (RESQ) Network in Malaysia

Professor Dr Hamidon Basri

Stroke In Focus

Leveraging National Stroke Registry Data to Transform Healthcare Delivery in Malaysia

Datin Dr Zariah Abdul Aziz

Stroke In Focus

Let Knowledge Defeat Stroke!

Dr Tan Wee Yong

Stroke In Practice

Hyperacute Stroke Imaging from the Perspective of Strokeologist

Dr Wan Asyraf Wan Zaidi

Stroke Services Research

Transforming Stroke Care – The Sarawak’s Experience

Dr Law Wan Chung

In the News

Print Media Compilation

Abstracts Compilation

Selected Abstracts from 1st Malaysia Stroke Conference

Dr Ng Li Yun & Ms Monica Danial

Acknowledgement

We thank the Director-General of Health Malaysia for the permission to publish this bulletin. We acknowledge Dr Goh Pik Pin from Institute of Clinical Research (ICR) and Dr Akhmal Yusoff of Clinical Research Malaysia (CRM) for their support and encouragement to publish this bulletin.

Disclaimer

The opinions expressed in this bulletin are those of the authors and contributors and do not reflect the opinions of those in the editorial board, staffs of Hospital Seberang Jaya or the Ministry of Health Malaysia. The mention of any trade names, commercial products or organizations in this bulletin does not imply endorsement by the editorial board, staffs of Hospital Seberang Jaya or the Ministry of Health Malaysia.

Published by

Clinical Research Center Seberang Jaya Hospital © 2019. All rights reserved. No part of this publication may be reproduced, stored in retrieval systems or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior permission of CRC Seberang Jaya, Jalan Tun Hussein Onn, 13700 Seberang Jaya, Penang. Telephone: +604 3827333 ext. 618/346, E-mail: editorial.discovercrchs@gmail.com

Printed by

Vanda Dynamic Enterprise
723E 1st Floor, Vanda Business Park, Jalan Sungai Dua, 11700 Penang. Telephone: 04-6584515
Putting Stroke Care Forward

Datuk Dr Noor Hisham Bin Abdullah
Honorary Director General of Health Ministry of Health Malaysia

Malaysia’s Stroke Epidemic

Estimates by the Institute for Health Metrics and Evaluation (2017) reported that stroke represents the third leading cause of mortality in Malaysia.¹ The incident trend revolving around stroke was further alarmed by the recent Global Burden of Disease Report (2016) that projected stroke to be the second leading cause of mortality in 2040.²

Preliminary data on the project “Monitoring Stroke Burden in Malaysia (2017)” found that, on average, 92 stroke admissions occurred each day across all Malaysian healthcare facilities nationwide. Of these admissions, 40% of stroke afflicted patients were of younger aged groups (less than 60 years old). This debilitating phenomenon further challenged the Malaysian healthcare services with almost 32 deaths per day. Post-stroke survivors were often burdened with multiple morbidities, with estimates of almost 7 out of 10 stroke-afflicted survivors being activities of daily living (ADL)-dependent. The cost of stroke care management that accounted for 33,812 admissions in 2016 alone escalated to almost RM180 million.³

Overview of Stroke Care Services in Malaysia

Globally, significant progress has been made in the number of options available for the treatment of stroke, resulting in better outcomes for post-stroke survivors. Continuous progress has been achieved in stroke care services offered across the Ministry of Health (MOH) hospitals.

For many years, the medical team has provided stroke care; except for hemorrhagic stroke, which require surgical interventions that are primarily managed by neurosurgeons. Generally 80 percent of stroke incidences in Malaysia are of ischemic type, while the remaining 20 percent are of hemorrhagic types. As such, the medical team handles the bulk of stroke cases. Where available, most stroke cases admitted to MOH hospitals are managed by a neurologist.

At present, all state capital hospitals in Malaysia are assigned with at least one neurologist, except for Kedah and Perlis. Approximately forty-two registered neurologists and neurology fellows are distributed evenly across the various state capital hospitals in Malaysia.¹
Thrombolysis or Thrombectomy?

The US FDA approved the initiation of intravenous (IV) thrombolysis therapy for stroke management in 1995. It was regarded as the “gold standard” of choice for the management of acute stroke. But recent evidences showed that thrombectomies yielded better survival outcomes in comparison to IV thrombolysis. While this alternative seemed convincing, the Malaysian stroke service facilities suffer limited interventional radiologists, posing barriers to execute thrombectomies as first choice of treatment. Efforts are on-going between MOH and the neurology fraternity to nurture more interventional neurologists to fill the demand gaps.

Improving Service Orientation – An Ongoing Process

Greater emphasis to deliver multidisciplinary stroke care has been catalyzed. Establishment of more stroke care units and stroke specialist centers will improve post-stroke outcomes. At present, there are three established stroke centers in the country, but MOH hopes to establish more of such centers in the near future. While rehabilitation specialists are available in every major hospital, increasing the number of these specialists would facilitate better rehabilitation processes for post-stroke survivors. The MOH has been looking at targeted ways to advancing stroke care in the country (Box Exhibit 1).

---

Box Exhibit 1: Ways of Advancing Stroke Care in Malaysia

- Prioritizing the improvement of ambulance services and pre-hospital assessments.
- Establishing better triaging of acute stroke patients at the emergency medicine departments.
- Creating stroke care teams to make timely decisions of appropriate options where possible.
- Advocating neurology consultation services, either in person or via telemedicine.
- Redesigning better stroke care delivery to overcome logistic challenges in remote areas. These include non-availability of designated stroke beds in most hospitals, equipping and identifying adequate number of stroke centers to provide IV thrombolysis, as well as comprehensive stroke centers with the capability to perform thrombectomies.
- Providing adequate rehabilitation centers for post-stroke care. Once established, appropriate tracking, monitoring and reporting of performance measures to benchmark against international standards could be executed.
Striving for Excellence in Research and Collaborations

As Malaysia is gearing towards a nation that pushes the frontier in research, it is important to explore the needs of conducting epidemiological, interventional and outcome research for novel discoveries in stroke. Notwithstanding, Malaysia is one of the few countries in the world that own the National Stroke Registry (NSR) since 2009. There have been around 8 notable publications that have been published from this local registry.

The country needs more groundbreaking research in stroke. Clinical Research Centers (CRCs) in MOH hospitals together with Clinical Research Malaysia (CRM) could establish a platform to connect clinicians within the healthcare industry to initiate more high impact research. Continuous efforts to embark on innovations, patents and new technologies for providing advanced stroke care to patients should be accelerated. Establishing collaborations with CREST – Collaborations in Research Science and Technology to assist in bringing out brilliant ideas to realities in the form of prototype and pilot could create endless possibilities.

The success of a revolutionized stroke care in Malaysia depends on the commitment and collaborative efforts from various parties, ranging from the public sector to non-governmental organizations (NGOs), private sector and the academia. One successful NGO that has created an impact towards unifying experts around the country to champion better stroke care delivery is the National Stroke Association of Malaysia (NASAM), which was established in 1996 and has grown to about eight centers nationwide to-date.

Emphasis on Primary Prevention and Community Empowerment

Leading the way forward of a revolutionized stroke care is stroke prevention. It is timely to involve public health experts and primary care physicians to combat the rising stroke incidence through monitoring, screening, surveillance, research and the execution of primary prevention measures. While acute stroke physicians and rehabilitation physicians play a central role in stroke management, the importance to escalate public awareness and knowledge regarding stroke should be a focus point to initiate, especially in the current era of us being challenged with lifestyle diseases.

“As we shift from vertical to horizontal service orientations, we need to adopt the concept of “uberization,” transforming creative ideas into policies to deliver value based medicine to our community.”

Datuk Dr Noor Hisham Bin Abdullah
Future Direction

The issues of stroke prevention and stroke treatment are of vital importance to not just the patients and their caregivers but also to the medical profession and the healthcare services. We should empower stroke management to reach all levels of our community. District hospitals are frequently unutilized to deliver appropriate stroke care. Therefore, it is timely to brainstorm with the relevant healthcare professionals and experts to facilitate improved stroke care to be delivered at district hospitals.

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. Patients find difficulty to come to our clinics or hospitals. Therefore, a community level approach should be drafted, similar to maternal and child healthcare approaches, by initiating visits to patients’ homes to provide appropriate stroke care and rehabilitation.

There need to be a paradigm shift of health services from the current vertical to horizontal type of healthcare delivery, that is, to extend stroke care services coverage to the whole society. The focus point is to empower stroke care services at all levels of care that include the primary healthcare services; in addition to its conventional hospital based treatment and management, such as medical and neurosurgery interventions.

As Malaysia is burdened with financial constraints, it is important to adopt the concept of “uberization,” and yield creative ideas and innovations based on current evidence of stroke care to deliver value based medicine with high impact services, at a reasonable cost, but to produce good outcomes from the services we deliver towards the community. We can accommodate the concept of “uberization,” by giving appropriate training and skills to deliver homecare to patients and to accommodate appropriate payment for the stroke care team involved.

References


I am truly delighted with the editorial board efforts of Discover to release this specialized focused edition with the theme “Malaysia’s Stroke Care Revolution.” It was well crafted with contents of high quality. Discover was the brainchild of CRC Hospital Seberang Jaya that aimed to be the first national research magazine under the MOH tagline. The editorial board has been consistently struggling to deliver up-to-date, accurate and sensible content highlights in the field of health research and policies. The inaugural edition hit nationwide in June 2018 with the tagline “A Never Ending Quest!” I hope the editorial board of Discover will strive to continue this noble effort to unify expert researchers and healthcare professional opinions across Malaysia by crafting appropriate theme editions in line with MOH policies and aspirations in healthcare, and to subsequently bring this bulletin to greater heights. CONGRATULATIONS!
On behalf of the Malaysian Stroke Council, it is a pleasure to see the successful release of *Discover*, an official research bulletin by CRC Hospital Seberang Jaya with a specialized theme issue “Malaysia’s Stroke Care Revolution!” The Malaysian Stroke Council highly appreciates this collaborative effort by CRC Hospital Seberang Jaya for being together to champion the council’s aim towards improving stroke care in our country. The debut of this specialized theme bulletin has facilitated multidisciplinary sub-domains from different stroke subject matter expertise in Malaysia.

Stroke, a debilitating disease has plagued our population in recent years. The disease is currently the third leading cause of mortality in Malaysia. With the segregated system of stroke education and training in Malaysia, healthcare personnel in the country often strive to explore new diagnostic and intervention techniques to enhance patient’s stroke care. The release of this bulletin is timely, and would catalyze a platform to bring eminent stroke advocates together for greater knowledge impact and policy change in line with the current nation’s needs.

We are galvanizing the development of stroke network and advancing stroke care with the involvement of the Ministry of Health to enable patients to have greater access to stroke treatment. While we disseminate our vision for an improvised stroke care in the country, we aim to substantiate a consensus on the formation of the Malaysian Stroke Academy, together with the on-going efforts to establish the Malaysian Stroke Research Network to war against the rising stroke incidence in the country.

I congratulate the editorial board of *Discover* for the efforts and high commitment towards unifying experts across the country through this printed supplement, a channel signifying the quest for knowledge dissemination for a revolutionized stroke care in Malaysia.

“Through multi-stakeholder initiatives, we are reaching to a consensus in the formation of the Malaysian Stroke Academy and the Malaysian Stroke Research Network to advance stroke care in the country!”
Announcing Our Expanded Mission: Together, Let’s Battle the War against Stroke with Courage and Harmonization!

We’re One Year Old! When Discover debuted as the first nationwide medical research bulletin twelve months ago, we were extremely fascinated with the rhythm of its breath transmitted, that echoed “A Never Ending Quest!” The principal aim of this bulletin was to provide up-to-date, novel and sensible updates on research to facilitate knowledge transfer between experts for the improvement of patient care, population health and cutting-edge discoveries of new treatment modalities.

Along the road, we were bombarded with headlines from reputed medical journals with the plague of non-communicable diseases hitting the Asian population, and Malaysia suffered the bulk of lifestyle diseases like diabetes, hypertension and obesity. What is more concerning is that these diseases pose substantial threats to more debilitating ailments, such as stroke that currently leads the nation’s third cause of mortality and tops the disability rate. Local stakeholders were puzzled, being it from the government, private or non-governmental organizations on the rapid escalation of stroke incidence in the country, postulating multiple ideas to curb the potential stroke epidemic. At the peak of these conversations, stroke experts, policy makers and public health advocates across the country were assembled together at the 1st Malaysia Stroke Conference held in Penang between 20-21April 2019 to receive a dynamic voice in tackling the rising stroke burden.

As we mature a year older, we felt it was timely to have an expanded mission of Discover, yet being a responsible scientific government supplement, we leaped into a bold initiative to join forces with our counterparts of stroke advocates to release a specialized theme edition entitled “Malaysia’s Stroke Care Revolution!” We aim to unify different minds of leading stroke specialists to pen together their scientific works, opinions, experience and debates in this specialized printed supplement. In this issue, we are honored to feature our Director General of Health’s mandate on putting Malaysia’s stroke care forward. Leading stroke experts Dr Wan Asyraf Wan Zaidi narrates hyperacute stroke imaging from the perspective of strokeologist while Prof Dr Hamidon Basri describes the implementation of RESQ network in Malaysia. Yet, we do have a couple of expert written articles that were clumped together into a specialized section called “Stroke in Focus.” However, we have not forgotten the crux of the matter, research in stroke that were carefully placed within the “Stroke Research Priorities” and “Stroke Services Research” sub-domains, and selected abstracts presented at the recent Malaysia’s Stroke Conference. I hope you enjoy reading our specialized theme edition of Discover!
Stroke Research In Malaysia - 
A National Perspective

Non-communicable diseases (NCDs) such as stroke have always been considered as diseases of affluence. In recent years, the burden of stroke in developing countries has superseded that of developed nations. Of all stroke deaths globally, about 87% arose from low- and middle-income countries.1 A similar trend was observed within the Southeast Asian region, where incidence and mortality rates from stroke were found to be higher in low income countries.2

Malaysia is of no exception to this crisis. Thus, one of the very first steps to combat the rising stroke burden would be to make avail local information on stroke care. This information is essential for many reasons - from healthcare resource planning to quality evaluations of stroke prevention and care in Malaysia.

A quick search on “stroke” AND “Malaysia” in PubMed and the Malaysian Medical Repository retrieved slightly over 400 articles each. Nevertheless, majority of the studies performed were single-centered and conducted at a single point of time.

The Institute for Clinical Research (ICR) has embarked on research projects on stroke with its current focus being aligned to the elements listed within the World Stroke Organization Stroke Services Framework.3 Amongst the current ongoing projects are estimations of incidence, 28-days mortality and the risk of early readmissions from stroke, as well as predicting outcomes of different antiplatelet therapy for secondary prevention after ischemic stroke and transient ischemic attack. Collaborations have been established with the National Registration Department, Health Informatics Centre, National Stroke Registry, Pusat Perubatan Universiti Kebangsaan Malaysia and several hospitals on the ground. These projects are aimed to provide feedback on different aspects of stroke care in the quest to steer efforts for the improvement of stroke care delivery in the country.

References
The line up of the EXCOS are as follows:

**President**: Assoc Prof Dr Hoo Fan Kee

**Vice President**: Dr Wan Asyraf Wan Zaidi, Dr Law Wan Chung

**Secretary**: Dr Tan Wee Yong

**Treasurer**: Dr Looi Irene

**Exco**: Dr Zariah Abdul Aziz, Dr Khairul Azmi Ibrahim

**Honorary Adviser**: Prof Dr Hamidon Basri
Implementing the Regional Emergency Stroke Quick-response (RESQ) Network in Malaysia

Stroke is a devastating disease. It is the leading cause of disability in the world. Carers and family members are severely affected in many ways including time, energy and finances. In the United States, the medical and non-medical costs of caring for patients with stroke during the first year after stroke accounted to about USD 30 billion per year, or approximately USD 50,000 per patient. A lot more is burdened on the patient and carers.

Recent advances in thrombolysis and thrombectomy has clearly shown a strong impact on the treatment in restoring function of severely disabled acute stroke patients. The number needed to treat (NNT) was only 3 which is 10 times more potent as compared to the intervention in acute myocardial infarction (NNT = 30), and >100 times potent as compared to giving aspirin to prevent a stroke (NNT = 111). Impressively, early recovery is seen in 80% of cases within 24 hours.

Australian researchers have built an economic model which concluded that in order to have 1 year of perfect health (1 QALY- quality adjusted life-years), the cost of thrombectomy or thrombolysis is AUD 12,000. This is reasonable and not as expensive as compared to renal dialysis; in which the cost is AUD 50,000 to achieve 1 QALY. This mode of therapy is even more relevant when the time window was extended to 24 hours (previously 6 hours) only in early 2018 (DAWN and DEFUSE 3 trials). Several studies have shown that the effects are significantly seen in high volume centres (>120 cases per year). Therefore, a core principal hospital should be identified to serve several satellite hospitals limited by the time (not geographical) window.

Due to these recent advances, it is important for Malaysia to strategize the stroke services to improve the outcome of stroke patients. From the National Stroke Registry (NSR), it is estimated to have about 30,000 new stroke patients per year. Only about half of these patients will suffer from severe stroke. When properly treated with thrombectomy, about a third will be able to return to normal function which is about 5000 patients. Saving 5000 lives a year from being bed-ridden is very impactful to the nation. Therefore, serious efforts to start the thrombolysis or thrombectomy services nationwide should be done in Malaysia.
The proposed strategy is termed as Regional Emergency Stroke Quick-response (RESQ) Network

The stroke RESQ Network includes:

**PRINCIPAL** high-volume stroke RESQ centre dedicated for hyperacute stroke service with dedicated ER, stroke RESQ unit and stroke ICU. Targeted 120-150 cases per year. HPUPM (Hospital Pengajar UPM) has been earmarked and planned for this purpose. This core RESQ hospital will be a catalyst for training the appropriate stroke interventionist.

**SATELLITE** hospitals within a selected time-based area are identified. These hospitals are proposed to involve both private and public hospitals which is equipped with CT scan facilities.

**PARTNERSHIP** and pooling of resources. This include joint calls, training, drugs, stents, rehabilitation, etc. Thrombolysis can be done at the satellite RESQ hospital before transferring the patient to the principal RESQ hospital for thrombectomy to prevent delays.

**EXPANSION.** The single principal RESQ hospital (with its satellite hospitals) is expected to multiply later according to regions; (e.g. East Malaysia, North, East and South of Peninsular Malaysia) after the personnel have been properly trained.

**BRANDING.** RESQ to initiate, sustain and enhance the stroke services nationwide and perhaps regionally to our neighbouring countries. Based on the powerful and impressive data, it is our duty to the nation to make this happen.
Leveraging National Stroke Registry Data To Transform Healthcare Delivery In Malaysia

Introduction

The National Stroke Registry (NSR) was established in 2009 with the support from key opinion leaders and stakeholders from the Ministry of Health Malaysia. Registry data is essential to support the transformation of stroke care for better patient outcomes and resource allocations.

Current Findings

In the recent Stroke Registry Report (2009-2016), NSR captured over 11000 patients from sixteen participating source data providers (SDP). Stroke predominantly affected men (56%). Slightly over than 40% of the total cohort sustained stroke below the age of 60 years. Young stroke is defined as stroke that occurs between the ages of 19 and 50. In the recent NSR report, young stroke constituted 16% of the total cohort. Hypertension remained the major risk factor (70%), followed by diabetes (41%) and hyperlipidemia (24%). These comorbid conditions observed a similar trend with other countries like Singapore, Thailand, Indonesia, India and the USA. Patients with atrial fibrillation had severe stroke, poor functional outcomes, increased stroke complications and higher mortality rates.

Thrombolytic therapy was approved for use in November 2012. However, only four public hospitals till date had access to this therapy, namely Hospital Seberang Jaya, Hospital Kuala Lumpur, Hospital Sultanah Nur Zahirah and Hospital Umum Sarawak. The use of thrombolytic therapy was well documented in the NSR. A deep dive exploring the effectiveness of this therapy in the clinical practice is crucial to enable neurologist to justify the value for money. Such justifications are necessary to expand patient access to thrombolytic therapies in the future.

Future Direction

Malaysia is experiencing a shortage of neurologist in the country. Incidence of ischemic stroke was 96.2 per 100,000 in the year 2014. At this moment, we have 66 neurologists in the country, with only 17 practicing in public hospitals, while the remaining practice neurology at university (22) and private hospitals (27). As Malaysia aims to achieve a target doctor-patient ratio of 1:400 by 2020, the Director General of Health Malaysia, Datuk Dr Noor Hisham bin Abdullah stated the need to have 200 more neurologists for adequate patient care at the recent Malaysia Stroke Conference, held in April 2019.
Stroke prevention is crucial to reduce the burden of stroke in the country. From the NSR data, only 21% of our stroke patients arrived within 3 hours of onset. The median time from symptoms onset to ED arrival was staggering, at 7 hours or more, either by ambulance or own transport. Reasons for late arrival were symptoms ignorance and inability to recognize stroke manifestations. It is essential for everyone to assume a role in educating our community and patients on FAST (Face, Arms, Speech, Time) warning signs of stroke.

NSR plays an important role in measuring healthcare delivery and supporting quality care improvement. The NSR committee welcomes all state hospitals, universities, army and private hospitals to explore potential collaboration opportunities. Together we can transform stroke care and build a healthier Malaysia.

References
The Malaysian Stroke Council’s (MSC) main agenda for the year 2019 is to establish more stroke ready hospitals in Malaysia; either from the private or public health hospitals. One of the main problems identified towards realizing this agenda is the knowledge required to manage acute stroke; such as the process of selecting eligible cases for reperfusion therapy. While many healthcare workers are enthusiastically working together to provide quality stroke care, some expressed low confidence level in managing acute stroke cases.

We identified these circumstances as rate limiting factors towards establishing more stroke ready hospitals. As such, the MSC has decided to publish a standardized training module for doctors who are interested to manage acute stroke care. Emergency physicians, internal medicine physicians and neurologists who are interested in acute stroke care management are encouraged to undergo this specialized training module as part of a competency training module.

The council has studied various models of acute stroke care across different countries in the region, particularly from Thailand, Indonesia, the Philippines, Australia, United Kingdom and Singapore. As medicine is best practiced according to local clinical guidelines and circumstances, the council has evaluated the pros and cons of the various models identified from each country that would be suitable to be adopted in Malaysia.

The training model will comprise an online learning module facilitated by lectures and interactive sessions. These modules will emphasize on the diagnosis, treatment, the selection of appropriate candidate for reperfusion therapy and secondary stroke prevention. It is estimated to be a two days course, which will conclude with a competency test.

The council hopes to finalize the training module by the second quarter of the year and to subsequently launch the training module to those interested by the end of this year.

Lastly, let knowledge defeat stroke!
Hyperacute stroke treatment evolved rapidly from the conventional reperfusion treatment via clot busting agent, to r-tPA (Alteplase), and much recently, the introduction of endovascular clot retrieval (ECR) stents. Intravenous thrombolysis was approved by the United States back in 1995. Based on published guidelines by the National Institute of Neurological Diseases and Stroke in 1995, it was suggested that intravenous thrombolysis could be initiated up to three hours from the onset of stroke. The intravenous thrombolytic treatment (IVT) was later approved to be initiated up to 4.5 hours from the onset of stroke symptoms in accordance to the ECASS III study. Much recently, endovascular thrombectomy (EVT) was approved to be initiated up to six hours from the onset of stroke. These guidelines was referenced from recent landmark trials.¹ The treatment window for EVT was extended up to 24 hours from the onset of stroke or last known to be well according to the DAWN trial. Succinctly, we looked forward to the findings of the EXTEND trial, which adopted a lengthen r-tPA treatment window.¹ ²

Stroke is one of the leading cause of mortality and morbidity in developing countries. Despite this known fact, the availability of hyperacute stroke treatment (IVTs or EVT) are limited to date. Available data suggests that Asian populations differed slightly as compared to Caucasians; there were high number of patients who sustained intracranial atherosclerotic vascular disease; a situation that posed greater challenge to cope. Therefore, it is important for us to aptly select appropriate patients for reperfusion treatment to ensure cost effectiveness with utmost safety. Apart from clinical inclusion and exclusion criteria, imaging assessment is a tantamount tool to assess the severity of stroke. Imaging modalities that developed rapidly has guided better patient selections prior to EVT, thus facilitating better treatment outcomes and prognosis.
Non-contrasted Computed CT Brain (NCCT)

NCCT is still the most important hyperacute stroke treatment assessment tool to date. For a suspected stroke patient, the readily available NCCT would be able to immediately differentiate an ischemic or hemorrhagic stroke. Initial hyperacute stroke reperfusion studies connote that 1/3 MCA area involvement was used as the exclusion criteria for IVT (Table 1). This criteria was later improvised by the validated Alberta Stroke Program Early CT changes Score (ASPECTS), to determine the prognosis of stroke patients. ASPECTS of less than 7 may correlate with more than 1/3 MCA territory involvement.

But one of the pitfalls for the NCCT is the wide inter-rater variability shown across neurologists, neuroradiologists, radiologists and trainees.\(^3\)

A low ASPECTS score of <7 may still be associated with a good penumbra (Figure 1), likewise vice versa, a good ASPECTS score facilitated with an established stroke and reperfusion treatment is likely to be futile. Nevertheless, it is important to emphasize the NCCT interpretation as one of the fundamental skills required to execute hyperacute stroke treatment (Table 2 denotes a typical HU for CT brain interpretation).

Figure 1: (a) NCCT of a young patient presented with left total anterior circulation syndrome with ASPECTS of 6 (obvious loss of basal ganglia and insular ribbon) and left lateral ventricle compression, this exclude intracerebral hemorrhage and indicate a severe stroke with NIHSS of 20. (b) NCCT at window 40 and level 40 showed left MCA dense artery sign >45 HU (66 HU). (c) CBV and TTP map of the same patient showed significant penumbra and was given intravenous r-tPA with mRS 2 at 3 months post-stroke. [Images copyright by the author: Wan Asyraf, Discover, 2019; 2(1)].

The NCCT should be done within 25 minutes from arrival (Door-to-CT <25 minutes). Decision for intravenous r-tPA treatment should be made immediately, thus it is important for the stroke team physician to be able to interpret the NCCT rapidly for hyperacute cases.
Role of Vascular Imaging and CT Brain Perfusion

While NCCT interpretation and decision to thrombolysis is still in progress, the patient should proceed for an immediate CT angiogram from the arch of aorta to the vertex, with or without prior CT brain perfusion to determine the presence of large vessel occlusion (Figure 1c). Vascular imaging could assist us to determine the underlying etiology, i.e. carotid artery stenosis, intracranial atherosclerosis, Moyamoya disease and others. Therefore a proper cerebral vascular imaging plays an important role in assisting secondary prevention or further therapeutic treatment, even after the hyperacute phase.

The above recommendation will only be valid if a proper protocol is carried out and there are no significant delays in thrombolysis treatment. Several studies have shown that patient selection based on the penumbra while simultaneously assessing the collateral status prior to reperfusion treatment had resulted in better patient outcomes. This technology may allow us to treat a wake up stroke, unknown onset of stroke and extension of treatment window.4

References

Problem Statement

Stroke posits a global public health enigma. The Malaysian scenario was more debilitating with prevalence data between 2007 and 2017 exhibited stroke as the third leading cause of mortality among Malaysians.\(^1\) With an increasing incidence trend, stroke is projected to be the second leading cause of mortality in the country by 2040.\(^2\)

Addressing Gaps in Current Stroke Service Delivery

The preliminary step to combat the rising stroke incidence in Malaysia is to urgently address the inadequacy and non-optimization of health service resource usage. Primary and secondary stroke prevention strategies should be executed aggressively, with widespread coverage of standard acute stroke care across all health facilities in Malaysia.

In principle, the delivery of standard stroke care should comprise of adequate primary and comprehensive stroke centres. Primary stroke centres are often equipped to provide emergent stroke care solutions; such as to administer clot-busting therapies.

These centres are capacitated to provide subsequent intensive evaluation and care as compared to the averaged stroke-ready hospitals that facilitates stabilization of a stroke afflicted patient. From the context severity, primary stroke centres will refer patients to comprehensive stroke centres to initiate advanced care. These centres have cutting-edge neurosurgical interventions and treatment of stroke, beyond to those stroke caused by ischemia, such as cerebral haemorrhage. These centres will also facilitate specialized neurological intensive care units.

In Malaysia, there are currently three primary stroke centres under the Ministry of Health flagship, which are mainly the Kuala Lumpur Hospital, the Sultanah Nur Zahirah Hospital and the Sarawak General Hospital.

Figure 1: Primary Stroke Centres in Malaysia

Dr Law Wan Chung
Neurologist
Sarawak General Hospital
Malaysia
Pilot Findings from Sarawak

Based on the pilot study carried out in Sarawak General Hospital in 2018, it was concluded that the establishment of an acute stroke unit with the availability of reperfusion therapy would reduce stroke morbidity and mortality, and succinctly reduce the healthcare expenditure of the hospital. The findings showed a 26% increase in the independent group, a 23% reduction in dependent group, a 2.4% reduction in mortalities and about 9% of reduction in recurrent stroke incidence and the length of stay for stroke (Figure 2).3

<table>
<thead>
<tr>
<th>Current care delivery, no stroke unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor outcome</td>
</tr>
<tr>
<td>Independent</td>
</tr>
<tr>
<td>Dependent</td>
</tr>
<tr>
<td>Mortality</td>
</tr>
<tr>
<td>Recurrent</td>
</tr>
<tr>
<td>Length of Stay</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SGH with acute stroke unit – reperfusion therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved outcome</td>
</tr>
<tr>
<td>Independent</td>
</tr>
<tr>
<td>Dependent</td>
</tr>
<tr>
<td>Mortality</td>
</tr>
<tr>
<td>Recurrent</td>
</tr>
<tr>
<td>Length of Stay</td>
</tr>
</tbody>
</table>

Figure 2: Outcome Comparison between Stroke Care Delivery without Stroke Unit and with SGH Acute Stroke Unit

“The establishment of an acute stroke care unit with reperfusion therapy in Sarawak General Hospital has reduced significant post-stroke morbidity, mortality and healthcare expenditures”
Future Direction

It is timely to redesign a better stroke care delivery for Malaysia with the aim to reduce the burden of stroke through enhanced preventive strategies, better treatment modalities and improved long term care. The rejuvenated design structure should be crafted to improve better access to hyperacute care and the overall quality of stroke management, while maximizing utilization of existing resources to provide patient-centred care with optimized health outcomes, provide value-based care at a reasonable cost and enable active participation of stroke centre in the National Stroke Registry for better monitoring and auditing of stroke service.

Phase 1 (2019-2020) of this new stroke care delivery model would focus on setting up of primary stroke centres at all state-level hospitals in Malaysia and to identify regional comprehensive stroke centres. Multi-disciplinary team engagement is vital to educate them with up-to-date stroke care through annual national or regional stroke conferences. It is important to develop a standardized acute stroke care treatment guideline for all stroke centres in Malaysia. We need to ensure that necessary required trainings such as echo training for thrombolysis assessment and administration as well as endovascular and intervention neurology are delivered. In 2019, we aim to get a 3% thrombolysis rate for the existing primary stroke centres while the new centres will be set a target of 1%. It is hoped that all the fourteen state level hospitals in Malaysia will be able to achieve a 3% thrombolysis target rate in 2020.

For Phase 2 (2021-2024), the focus will be on the setting up of comprehensive stroke centres. More primary stroke centres will be formed in all specialist hospitals with neuroimaging facilities accessible for the Malaysian population.

Conclusion

We can achieve the targeted milestones via multidisciplinary stroke partnerships across the primary care and emergency care specialists, referring providers, post-acute stroke care team, rehabilitation experts, stakeholders from the government and private collaborations, taxpayers, as well as community-based organizations Involvement.

References

Neurologist shortage hampering stroke treatments

GEORGE TOWN. Malaysia is facing a shortage of neurologists and this is hampering the effort to treat stroke patients whose number is on the rise.

There is an average of 92 admissions each day to Malaysian healthcare facilities. About 42% of them are below the age of 60, Health Ministry director-general Datuk Dr. Noor Hisham Abdullah said.

“However, there are only 107 neurologists in the Health Ministry, universities and private sector. We need at least another 200 neurologists to handle stroke patients,” he said.

“In 2016 alone, there were 33,812 admissions costing the government RM5.5bn,” he said when opening the 1st Malaysia Stroke Conference here yesterday.

Dr. Hisham said stroke posed a big challenge to Malaysian healthcare services with about 33 deaths per day.

As for survivors, they were burdened with multiple problems, he said.

“Seven out of 10 stroke survivors are activities of daily living (ADL) dependents and only three are back to normal after treatment,” he said.

(ADL refers to basic everyday tasks such as taking care of personal hygiene, dressing and eating.)

At present, said Dr. Noor Hisham, all state hospitals nationwide have at least one neurologist, except for Kedah and Perlis.

“We are currently recruiting around 10 neurology trainees, the result of some neurologists from the service to join the private sector has posed substantial challenges,” he said.

Dr. Hisham said the setting up of stroke units and stroke specialist centres would help in the rehabilitation of stroke survivors.

Stroke in the Older Old: Characteristics and Outcome in Patients Aged ≥ 80 Years with a First-Ever Ischaemic Stroke

Jun N Keng¹, Kah Y Wong¹, Jia N Ling¹, Nor I’Saedon¹, Maw P Tan¹, Hui M Khor¹, Ai-Vyn Chin¹, Shahrul B Kamaruzzaman¹, Kit M Tan¹
¹Division of Geriatric Medicine, Medical Department, University of Malaya Medical Centre, Kuala Lumpur, Malaysia

**Introduction:**
Clinical presentation and outcomes of older stroke patients may differ with increasing age. Few studies have described the characteristics of older-old stroke patients, especially in the South-East Asian population.

**Objective:**
We aimed to study the clinical presentation, risk factors and outcomes in older-old stroke patients aged ≥ 80 years with a first-ever ischaemic stroke in comparison to the younger-old.

**Methods:**
All stroke patients with a first-ever ischaemic stroke admitted to the geriatric medicine unit between April 2013 and October 2017 were studied retrospectively. Patients aged ≥ 80 years were compared with those aged 65–79 years old in terms of their baseline characteristics, risk factors, stroke aetiology and outcomes.

**Results:**
A total of 207 patients were included with a mean age of 82.3±6 years. The older-old stroke patients were more likely to be females (67.6% vs 50.8%, p=0.02). Atrial fibrillation (AF) was significantly more common in the older-old (hazard ratio, 2.98; 95% confidence interval, 1.36–6.55) but anticoagulation for AF prior to admission was more frequent in the younger-old (33.3% vs 8.7%, p= 0.043). The older-old had a higher rate of inpatient mortality (19% vs 7.7%, p = 0.037).

**Discussion and conclusion:**
The older-old stroke patients have different risk profiles and outcomes. Understanding their stroke characteristics may help to improve targeted stroke prevention strategies and the quality of stroke management.

Adopting Triangulation Practice in Developing Survey to Understand the Unmet Needs of Stroke Survivors and Stroke Caregivers in Malaysia

Nor Shahrina Mohd Zawawi¹,³, Noor Azah Abd Aziz², Marion F.Walker¹, Rebecca Fisher¹, Kartini Ahmad³
¹Division of Rehabilitation and Ageing, University of Nottingham, UK
²Faculty of Medicine, National University of Malaysia (UKM)
³Faculty of Health Sciences, National University of Malaysia (UKM)

**Introduction:**
Facilitating stroke survivors and their caregivers to lead a life after stroke require service providers to think about their different needs, which may be beyond the medical and rehabilitation aspects. In Malaysia, knowledge about the local needs of stroke survivors and their caregivers is scarce. Therefore, it is undetermined if the present services adequately meet their daily needs.

**Methods:**
We adopted triangulation approach in developing survey tool to identify the unmet needs of stroke survivors and stroke caregivers in Malaysia. Through this approach, we started with a narrative review that analysed unmet needs of stroke survivors and stroke caregivers in the literature. We then proceeded with interview sessions among the stroke survivors and stroke caregivers (n=9) to explore their self-perception of unfulfilled needs towards their living of after stroke, and subsequently collaborated with the author of the UK Stroke Survivors Needs Survey for the development of the survey tool. Finally, we carried out content validation, followed by face validation.

**Results:**
Two survey forms were developed to identify the unmet needs of stroke survivors and stroke caregivers. They were developed in English and were translated to Malay language, and retranslated back to English. Each survey contained six categories on different needs of survivors and caregivers.

**Discussion and conclusion:**
These survey tools, developed from multi resources and validated within the local Malaysian context will provide an inventory of unmet needs of stroke caregivers and stroke survivors in the country to facilitate better understanding of long-term stroke scenario in the community.
Hospital-Based Stroke Outcomes in Malaysia: Changes over the Last Decade

Xin-Wee Chen1,2, Mohd Nazri Shafei2, Zariah Abdul Aziz3, norsima nazifah sidek4, Kamarul Imran Musa2

1Public Health Medicine Department, Faculty of Medicine, Universiti Teknologi MARA
2Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia
3Neurology Unit, General Medicine Department, Hospital Sultanah Nur Zahirah
4Clinical Research Centre, Hospital Sultanah Nur Zahirah

Introduction:
Rising incidence of stroke is not uncommon in many developing countries. Stroke is an enormous public health problem, for its sequela in killing and crippling men.

Objective:
The purpose of the present study was to describe and analyze the changes in hospital-based stroke outcomes that may have occurred over the last decade.

Methods:
Records of adult patients notified as first episode of stroke from the hospital-based stroke registry were reviewed for the outcomes at discharge. The primary outcome abstracted was the Modified Rankin Scale, which was subsequently categorized as follows: functional independence, functional dependence and death. The comparison of proportions for the overall and by stratum of sex between years (from 2009 to 2017) were analysed.

Results:
Complete data was obtained from 9361 patients (mean(SD) age: 62.1(12.72) years) studied. Overall, 36.2% of the patients were independent at discharge, 53.1% suffered from moderate to severe disabilities and became dependent. Data revealed that 10.8% of the patients died during hospitalization. The proportions of hospital-based stroke outcomes had changed significantly over time (p<0.001). Similar changes were seen in both males and females.

Discussion and conclusion:
The hospital-based stroke outcomes in Malaysia experienced a significant change over the last decade. This analysis found evidence for future direction to improve stroke treatment, enhance the quality of post-stroke care and prevent stroke events.

Detection of White Matter Lesions by Massive Training Artificial Immune Recognition System

Hang S Pheng1, Ong K Haur2, Norzaini R M Zain3

1Department of Mathematical Sciences, Faculty of Science, Universiti Teknologi Malaysia, Johor
2School of Computing, Faculty of Engineering, Universiti Teknologi Malaysia, Johor
3Radiology Department, Hospital Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur

Introduction:
The presence of White Matter Lesions (WML) is an important indicator of stroke, multiple sclerosis, dementia and other brain-related disorders. The assessment and diagnosis of WML can be done through Magnetic Resonance Imaging (MRI). However, manual delineation of lesions by neuroradiologist on MRI are always time consuming and laborious. Thus, computer aided scheme is essential to assist the neuroradiologist in WML detection.

Objective:
In this study, a machine learning approach - Massive Training Artificial Immune Recognition System (MTAIRS) was proposed to detect WML on MRI.

Methods:
MTAIRS was developed based on pixel machine learning and Artificial Immune Recognition System (AIRS) to detect WML on medical images. The main advantage of MTAIRS was the avoidance of several pre-processing steps to prevent loss of image information in the classification phase.

Results:
Based on the preliminary results, MTAIRS was found to provide adequate visualisation of WML and a comparative quantitative analysis in WML detection. The classification sensitivity for lesion detection was 87.9% (276/314) and non-lesion was 96.7% (405/420). The results were computed based on the number of pixels that well classified WML area on MRI.

Discussion and conclusion:
MTAIRS algorithm showed the ability to detect WML on MRI. It provided descriptions of non-lesions in the output images.
Prevalence of Aspirin Resistance in the District Hospitals

Loo LK¹, Lee YL², Mohd Rusli A³, Chin CJ³, Kok HY¹, Ch’ng ASH¹,², Looi I¹,²
¹Department of Medicine, Seberang Jaya Hospital, Pulau Pinang, Malaysia
²Clinical Research Centre, Seberang Jaya Hospital, Pulau Pinang, Malaysia

**Introduction:**
Aspirin is the main medical treatment for secondary prevention in coronary artery disease or ischaemic stroke patients. There were significant incidence of recurrent ischaemic events in those patients. Inter-individual variability of platelet aggregation in response to aspirin may explain some of the events.

**Objective:**
The aim of this study was to evaluate the prevalence of aspirin resistance in those patients and their associated factors.

**Methods:**
This cross-sectional study was conducted at the neurology and medical outpatient clinic in Seberang Jaya and Bukit Mertajam hospitals from 1st till 31st July 2017. Patients with documented history of coronary artery disease and history of cerebrovascular events, being at least 7 days on aspirin therapy with no other antiplatelet drugs were included. Aspirin resistance was determined by using the Verify Now Rapid Platelet Function Assay (RPFA) machine. Patients with aspirin reaction unit (ARU) above 550 were identified as aspirin resistant. Statistical analysis was performed using IBM SPSS version 22 and R statistical software version 3.5.0.

**Results:**
A total of 97 patients were recruited. Males (n=72, 74.2%) and Malays (n=41, 42.3%) were predominant. Mean(SD) age was 60.3(11.2) years. 26 (26.8%) patients were aspirin resistant. There was a significant association between diabetes mellitus and aspirin resistance (χ²=4.65, p=0.031). No other significant relationships between patients with aspirin resistance and their baseline socio-demographic characteristics were identified.

**Discussion and conclusion:**
Prevalence of aspirin resistance in this study was 26.8%. Factors associated with aspirin resistance were alcohol intake and diabetes mellitus. Prospective studies should be conducted to look into the clinical implications of biochemical aspirin resistance to clinical aspirin failure.

Use of Stroke Registry and Data Linkage for Comparative Effectiveness Research: Overview and Methodology

Norazida Ab Rahman¹, Sarah Hui Li Pang¹, Amy Wen Yea Hwong¹, Sheamini Sivasampu¹, Wan Chung Law²
¹National Clinical Research Centre, Kuala Lumpur, Malaysia
²Neurology Unit, Sarawak General Hospital, Sarawak, Malaysia

**Introduction:**
Data on stroke patients in Malaysia are routinely collected via stroke registry. These include patient demographics, risk factors, clinical presentation and stroke details. Leveraging existing stroke registry data and integrating it with other sources of patient information to develop a population-based stroke cohort will create a robust dataset for longitudinal outcomes research.

**Objective:**
We describe methods used to design and conduct a comparative effectiveness research of various antiplatelet therapy regimens for secondary prevention in ischaemic stroke and transient ischaemic attack (TIA) patients in Malaysia.

**Methods:**
Data from the National Stroke Registry (NSR) and Pusat Perubatan Universiti Kebangsaan Malaysia (PPUKN) Stroke Registry was used. Both prospective registries were established to collect data on stroke patients admitted to hospitals in Malaysia. Stroke patients were identified among patients enrolled in the registries. A common identifier was used to match data with other sources.

**Results:**
A total of 5887 stroke patients diagnosed with first ischaemic stroke or TIA between 2014 and 2017 were identified for record linkage. Data on stroke patients was further expanded to include detailed information on the course of treatment and stroke outcomes through medical chart reviews and linkage to other data sources such as pharmacy databases and the National Death Register. This involves selection of additional data variables, development of data collection tools, training, medical records abstraction, data matching and quality assurance. Some challenges encountered include data access, lack of unified record keeping systems across hospitals in Malaysia, missing records and logistic issues.

**Discussion and conclusion:**
Stroke registry facilitates population based stroke research and linkages to other databases. This enhance utility of the registry to investigate broader range of research questions. The ability to link registry with data from multiple other sources provide unique opportunities to measure stroke care and outcomes.
Knowledge of Stroke among Adult Patients Attending Clinics in University Malaya Medical Centre (UMMC)

Tharshne Shankmugam¹, Lim Jing Ran², Wong Li Ping³, Haridah Alias³, Tan Kit Mun⁴

¹MBBS, Newcastle University Medicine Malaysia
²Medical Programme Undergraduate, Faculty of Medicine, University of Malaya
³Department of Social and Preventative Medicine, Faculty of Medicine, University of Malaya
⁴Division of Geriatric Medicine, Faculty of Medicine, University of Malaya

Introduction:
Stroke prevention and rapid access to medical treatment such as thrombolysis is vital to reduce impairments due to stroke. This requires good level of stroke knowledge among the public.

Objective:
This study aimed to determine patients’ level of stroke knowledge in UMMC.

Methods:
A cross-sectional study using interviewer-administered questionnaire was conducted in UMMC’s outpatient clinics from July 2018 to January 2019. Data on patient’s demographic characteristics and eight knowledge domains on stroke were recorded.

Results:
Of the 810 respondents (mean ± SD of age was 47.6 ± 18.2 years), 39 (4.8%) had a stroke and 488 (60.2%) knew someone with a stroke. The median knowledge score of stroke was 38.5/60 (interquartile range 30 to 44). Most respondents (>90%) recognized sudden one-sided paralysis as a stroke symptom, high blood pressure as a risk factor and controlling high blood pressure as prevention. Two-thirds wrongly perceived the heart as the organ where stroke occurs, chest pain and shortness of breath as symptoms of stroke and taking multivitamins as effective for stroke prevention. Half of the respondents were unaware of antiplatelets for acute treatment. 42% did not identify diabetes as a risk factor. Higher knowledge levels were associated with older aged group (>55 years), being in relationship/married, professionals, being tertiary educated, knowing someone with a stroke and having comorbidities of stroke risk factors (p<0.05).

Discussion and conclusion:
This study revealed that the level of stroke knowledge among UMMC patients was low. There is a need for community educational programs to fill the gaps and misconceptions.

Experience and Outcomes of Acute Stroke Thrombolysis in Neurologist vs Non-Neurologist Hospital - A Comparative Study between Hospital Seberang Jaya and Hospital Taiping

Sin Hong Chew¹, Irene Looi²,³, Wee Kooi Cheah³, Zariah Binti Abdul Aziz⁴

¹Department of Medicine
²Clinical Research Centre, Hospital Seberang Jaya, Penang
³Department of Medicine and Clinical Research Centre, Hospital Taiping
⁴Department of Neurology, Hospital Sultanah Nur Zainab, Kuala Terengganu, Malaysia.

Introduction:
Thrombolysis therapy with intravenous alteplase has been shown to be an effective treatment for acute ischaemic stroke (AIS). Unfortunately, treatment prescription is often limited by the availability of neurologists in Malaysia.

Objective:
To evaluate and compare the outcomes of acute stroke thrombolysis therapy between Hospital Seberang Jaya (HSJ-a neurologist hospital) and Hospital Taiping (HT-a non-neurologist hospital). The primary outcome measure was the percentage of patients with good functional outcomes at 3 months, defined as a score of 0 to 2 on the modified Rankin scale (mRS). The secondary outcome measure was the rate of symptomatic intracranial haemorrhage.

Methods:
This retrospective study involved all AIS patients who were admitted and given thrombolysis therapy in HSJ and HT between 2012 and 1st November 2018. Clinical data were extracted from admission records, National Stroke Registry and pharmacist records. Functional outcomes were determined by structured phone interviews.

Results:
A total of 32 AIS patients were given thrombolysis therapy in this study; 20 patients (63.5%) were treated in HSJ whilst 12 patients (37.5%) were treated in HT. The median National Institute of Health Stroke Scale (NIHSS) was 14 in HSJ and 10.5 in HT. 31.6% of patients from HSJ and 58.3% of patients from HT achieved mRS of 0-2 at 3 months (p=0.141). In terms of safety outcomes, the rate of symptomatic intracranial bleeding was 15.8% in HSJ and 25% in HT (p=0.527).

Discussion and conclusion:
Non-neurologist hospital can provide thrombolysis service to AIS patients safely and effectively.
**Risk Assessment of Familial Caregivers Using the Stroke Riskometer Application©: Preliminary Findings from a Primary-Care Based Longer Term Stroke Care Facility**

**Radhiyah Hussin**$^{1,2}$, Ezura Madiana Md Monoto$^1$, Mohd Fairuz Ali$^1$, Aznida Firzah Abdul Aziz$^1$

$^1$Department of Family Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia  
$^2$Ministry of Health Malaysia

**Introduction:**
Familial risk of stroke is well documented. Primary care physicians take on the role of primary prevention to advocate healthy lifestyle practices to family members of stroke patients.

**Objective:**
This study aimed to estimate the risk of stroke among familial caregivers using the Stroke Riskometer Application© to aid in personalised stroke prevention advice.

**Methods:**
Purposive sampling was conducted at Klinik Lanjutan Strok, Klinik Primer PPUKM Cheras from December 2018 till present. All blood-related caregivers of stroke patients, aged ≥18 years, able to operate a smartphone and literate in either English or Malay were recruited. Pregnant caregivers or those diagnosed/receiving treatment for depression; or if patient resides in a nursing home were excluded. The researcher-assisted questionnaires included a socio-demographic proforma, calculation of stroke risks and profiling of current lifestyle practices using Stroke Riskometer© Application (SRA) and Life’s Simple 7 (LS7) questionnaires respectively.

**Results:**
To date, 26 participants have been recruited. Mean age of caregivers was 49 (SD 10.5) years. For smartphone usage, 57.7% of the respondents cited previous experience of using health-related mobile applications. The mean stroke risk at 5 years and 10 years were 2.6 (SD 1.5)% and 4.5 (SD 2.9)% respectively. Mean LS7 score was 6.9 (SD 1.9). All respondents rarely exercise and do not consume healthy diet. Mean BMI was 27.7 (SD 7.5). Mean systolic BP was 131.8 (SD 16.6) mmHg. 30% cited total cholesterol levels > 6.21 mmol/L and 19.2% were current active smokers.

**Discussion and conclusion:**
Preliminary findings suggest that the risk of stroke among familial caregivers was low in a group which largely practice unhealthy lifestyles.

---

**Characteristics, Care and Outcomes of Acute Ischemic Stroke Patients in Sarawak**

**King Teck Long**$^{1,2}$, Zaw Win Moe$^{3}$, Tiong Lee Len$^{1}$, Law Wan Chung$^{3}$

$^1$Clinical Research Centre, Sarawak General Hospital, Kuching, Sarawak  
$^2$Pharmacy Department, Sarawak General Hospital, Kuching, Sarawak  
$^3$Neurology Unit, Medical Department, Sarawak General Hospital, Kuching, Sarawak

**Introduction:**
Stroke is the third leading cause of death in Malaysia. Although Malaysian stroke data is accessible, stroke findings from Sarawak remained unavailable.

**Objective:**
This study aimed to assess the characteristics, care and outcomes of acute ischaemic stroke (AIS) patients in Sarawak.

**Methods:**
AIS cases admitted to Sarawak General Hospital (SGH) from June 2013 to August 2018 were extracted from the National Neurology Registry. Baseline characteristics, stroke severity and classification, acute treatment, secondary prevention and clinical outcomes were assessed and analysed. Multiple logistic regression analysis was performed to determine the predictors of poor outcomes of after stroke.

**Results:**
A total of 1442 patients were identified as AIS with a mean±SD of age as 60.1±13.2 years. Majority were males (64.8%). Hypertension was the most prevalent risk factor, followed by dyslipidaemia and diabetes. Median National Institutes of Health Stroke Scale (NIHSS) upon arrival was 7(3-13). On admission, 18.7% received intravenous thrombolysis and 89.8% received antiplatelet within 48 hours. Median length of stay in SGH was 4(2-8) days. About 11% developed in-hospital complications. Majority (57%) were discharged with a modified Rankin score (mRS) of 0-2. However, 14.4% had poor outcomes (discharged mRS of 5-6), of which 6.7% died during hospitalisation. Older age, higher NIHSS score, atrial fibrillation and in-hospital complications were predictors of poor stroke outcomes in SGH.

**Discussion and conclusion:**
AIS outcomes in SGH were attributed towards adherence to acute stroke care guidelines. Cardiovascular risk factor control and improvement in accessibility and quality of stroke care are necessary to reduce the burden of stroke in Sarawak.
Long Term Care of Stroke Survivors - Identifying Circumstances in Which Referral to Specialists May be Beneficial Using a RAND Appropriateness Method

Lisa Lim, Ricky Mullis, Martin Roland, Jonathan Mant
Primary Care Unit, Department of Public Health and Primary Care, University of Cambridge, Cambridge, United Kingdom

Introduction:
There is formal guidance in the UK about what long-term care stroke survivors should receive, but a lack of guidance about where this should happen and who should deliver it.

Objective:
The purpose of this study was to explore when a re-referral from primary care to specialist services is appropriate in this patient group.

Methods:
A modified RAND-Appropriateness method was used to gain consensus from a range of stroke specialist and generalist clinicians. Ten panelists rated fictional patient scenarios based on long-term post-stroke needs. Round 1 was an online questionnaire in which panelists rated the scenarios for: (a) need for referral to specialist care and (b) if referral was deemed necessary, need for this to be specifically to a stroke specialist. Round 2 was a face-to-face panel meeting in which panelists were presented with aggregate scores, invited to discuss and then re-rate the scenarios.

Results:
17 scenarios comprising of 69 potential referral decisions were discussed. Consensus was achieved for 59 (86%) referral decisions. 44 of these were deemed appropriate for referral to specialist care, of which 19 were indicated for referral to a stroke-specialist.

Discussion and conclusion:
There was broad agreement about when a stroke survivor requires re-referral to specialist care, but less agreement about destination of referral. There is scope for further work to explore better ways of working between primary and secondary care services to best meet the needs of stroke survivors at each stage of their stroke journey.

Attitude Towards Stroke and Perceived Health Seeking Behavior for Stroke in Adult Patients Attending Outpatient Clinics in University of Malaya Medical Centre (UMMC)

Tan YR1, Pan KM1, Lim SH1, Haridah Alias2, Wong LP2, Tan KM3
1Medical Undergraduate Programme, Faculty of Medicine, University of Malaya
2Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya
3Division of Geriatric Medicine, Department of Medicine, Faculty of Medicine, University of Malaya

Introduction:
Attitude towards stroke and perceived health seeking behavior for stroke may differ among patients in our multicultural country.

Objective:
This study aimed to determine attitude of patients and their perceived health seeking behavior for stroke.

Methods:
A cross-sectional study using interviewer-administered questionnaire was conducted in clinics of University Malaya Medical Center (UMMC) from July 2018 to January 2019. Data on patients’ demographics, 20 attitude items and 20 items on perceived health seeking behavior for stroke were recorded and analysed.

Results:
810 respondents (69.5% females; mean±SD of age was 47.6±18.2 years) participated. The median stroke attitude score was 16 of possible 20. 89% of the 276 participants aged 18-30 years had low attitude score of 0-16. Majority of the respondents with attitude score of 0-16 were: Malays (80.2%), skilled workers (94.9%), having primary education or less (86.7%), did not know anyone with stroke (86.3%), had no high cholesterol (82.9%) or heart disease (81.5%) and had not attended stroke awareness campaigns or received printed materials on stroke in the past year (83.3%). 99.5% will seek immediate medical attention after a stroke, while 97.8% wanted to go to the nearest hospital emergency department. 92.1% wanted to call an ambulance. 477 patients (58.9%) wanted to consider alternative treatment, 75.7% opted for acupuncture, 60% for Malay traditional massage and 53.5% for Chinese herbs or medicines.

Discussion and conclusion:
This study revealed the attitude towards stroke and perceived health seeking behavior for stroke among UMMC outpatients. The information is valuable for planning future targeted public health educational campaigns on stroke.
Emerging Value of Platelet Function Testing at Predicting the Risk of Recurrent Vascular Events and Outcomes After TIA / Ischaemic Stroke: A Systematic Review of the Literature

Lim Su Yin
Taylor's University School of Medicine

**Introduction:**
The value of testing for ‘high on-treatment platelet reactivity’ (HTPR) to predict outcomes in TIA/ischemic stroke patients on antiplatelet therapy is unclear.

**Methods:**
A systematic literature review was performed to collate relevant data on the relationship between ex-vivo HTPR testing and recurrent vascular events or outcomes in ischemic cerebrovascular disease (CVD) patients on antiplatelet therapy. We focused on data from commonly available whole blood platelet function analysers and platelet aggregometry. P<0.05 was considered statistically significant.

**Results:**
Sixty-seven of 1168 articles were assessed; 23 met inclusion criteria: PFA-100® (n=9); VerifyNow® (n=8); Multiplate® (n=1); Thrombelastograph Haemostasis Analyser® (n=1); TOA-PL-100 (n=1); and Aggregometry (n=5). Six studies found a higher risk (p<0.001), two found no increase in the risk of recurrent stroke (p=1.00) between patients with vs. those without aspirin-HTPR, whereas seven were inconclusive. Aspirin-HTPR was associated with more severe stroke at baseline (p=0.005; n=4), early deterioration (p=0.017; n=3), poorer outcomes (p=0.047; n=2), larger infarct size (p<0.001; n=2), new DWI lesions (p=0.04; n=1) and higher mortality (p=0.038; n=1) of after stroke. There was no relationship between Dipyridamole- or Clopidogrel-HTPR status and outcomes in 2 small studies (PFA-100); Clopidogrel-HTPR was associated with recurrent stroke in one study (VerifyNow).

**Discussion and conclusion:**
Emerging data from small-medium sized studies indicate that HTPR-status may predict outcomes on antiplatelet therapy in CVD. Adequately sized, prospective, multicenter studies are needed to determine whether altering antiplatelet therapy in patients with HTPR on platelet function tests in whole blood reduces the risk of recurrent vascular events, functional outcomes or survival following TIA/ischemic stroke.

Abstracts Compiled By:

Dr Ng Li Yun
Medical Officer
Clinical Research Centre
Seberang Jaya Hospital

Ms. Monica Danial
Research Officer
Clinical Research Centre
Seberang Jaya Hospital
2nd Malaysian Stroke Conference

Mark the date on your calendar:
7th - 9th August 2020

See you in Kuala Lumpur
The National Institutes of Health (NIH) was established in 1995. NIH comprises of six research institutes namely the Institute for Medical Research (IMR), Institute for Clinical Research (ICR), Institute for Public Health (IPH), Institute for Health Management (IHM), Institute for Health Systems Research (IHSR) and Institute for Behavioral Health Research (IHBR).

The new NIH Complex housed in Setia Alam has 26 blocks and built on a 40-acre piece of land. With this new structural lay out, it is envisaged to increase cohesiveness between NIH researchers and enhance inter-institutional cooperation. Furthermore NIH will be able to offer a broad range of opportunities for health research collaboration with other agencies to conduct high impact research towards improving the quality of healthcare services.

Under the approved NIH restructuring, the NIH Secretariat has been dissolved and became Research Policy and Planning Division. However, the core functions of the previous NIH Secretariat remain.

<table>
<thead>
<tr>
<th>SECRETARIAT</th>
<th>OFFICER IN CHARGE</th>
<th>NEW E-MAIL ADD</th>
<th>NEW CONTACT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMRR Secretariat</td>
<td>Dr Asyraf Syahmi Mohd Noor</td>
<td><a href="mailto:nmrr@moh.gov.my">nmrr@moh.gov.my</a></td>
<td>03-33628205/8403</td>
</tr>
<tr>
<td>MREC Secretariat</td>
<td>Dr Lee Keng Yee</td>
<td><a href="mailto:mrecsec@moh.gov.my">mrecsec@moh.gov.my</a></td>
<td>03-33628407</td>
</tr>
<tr>
<td></td>
<td>Dr Christie Machial</td>
<td><a href="mailto:mrecsae@moh.gov.my">mrecsae@moh.gov.my</a></td>
<td>03-33628407</td>
</tr>
<tr>
<td></td>
<td>Dr Lam Mynn Dee</td>
<td><a href="mailto:mrecir@moh.gov.my">mrecir@moh.gov.my</a></td>
<td>03-33628402</td>
</tr>
<tr>
<td>MOH Research Grant (MRG)</td>
<td>Pn. Roslinda Abu Sapian</td>
<td><a href="mailto:nihmrg@moh.gov.my">nihmrg@moh.gov.my</a></td>
<td>03-33628405</td>
</tr>
<tr>
<td>Secretariat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPP-NIH Secretariat</td>
<td>Cik Nurul Syarbani Eliana Musa</td>
<td><a href="mailto:jppnih@moh.gov.my">jppnih@moh.gov.my</a></td>
<td>03-33628316</td>
</tr>
<tr>
<td>NIH Publication Secretariat</td>
<td>En. Mohd Idris Bin Omar</td>
<td><a href="mailto:nihpub@moh.gov.my">nihpub@moh.gov.my</a></td>
<td>03-33628404/8431</td>
</tr>
</tbody>
</table>