NNeuR
NATIONAL NEUROLOGY REGISTRY

ANNUAL REPORT OF THE MALAYSIAN STROKE REGISTRY

2009-2016

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Data reported were supplied by National Stroke Registry

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The electronic version of this report can be downloaded at https://www.macr.org.my/nneur

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- Hospital Raja Perempuan Zainab II
- Hospital Umum Sarawak
- Hospital Sultanah Bahiyah
- Hospital Tuanku Fauziah
- Hospital Tengku Ampuan Rahimah
- Hospital Queen Elizabeth
- Hospital Universiti Sains Malaysia
- Hospital Kemaman
- Hospital Kepala Batas
- Hospital Taiping
- Hospital Tunku Ampuan Afzan
- Hospital Sultanah Aminah
- Hospital Kuala Lumpur

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FOREWORD

The National Stroke Registry was initiated in 2009 and since then have contributed to numerous stroke publications in Malaysia. A total of 11,284 stroke cases were reported from 2009 to 2016 from all our source data providers.

This registry is essential as it allows data on our stroke patients to be consolidated and analysed in order for us to better understand the pattern and burden of stroke in Malaysia. This in return will aid in planning and developing strategies to overcome this scourge. The registry too can deepen our understanding on the practice of our healthcare providers to facilitate health policy planning. Since stroke is the 3rd leading cause of death in Malaysia, it is imperative that we gain better insight regarding this disease using local data.

I would like to thank all the 15 source data providers for their relentless effort to consistently contribute to the registry data. I would also like to express my deepest gratitude to our Director of National CRC Dato' Dr Goh Pik Pin for her enormous support, Datuk Dr Hj Rohaizat Hj Yon and Dr Md Khadzir Sheikh Ahmad from Malaysia Health Informatics, Datuk Dr Shahnaz binti Murad and most importantly our Director General Datuk Dr Noor Hisham Abdullah for his patronage.

We strongly welcome full participation from all state hospitals and we look forward to collaborate with universities, army and private hospitals across the country. Hopefully with their future involvement and commitment, this registry will be more representative of stroke data for the whole country.

Dr Zariah Abdul Aziz

Principal Investigator

MEMBERS OF THE STEERING COMMITTEE

The steering committee comprises individuals who are subject matter experts drawn from the various centres that are involved in the MOH and universities. They are convened to decide on the initial data collection process, develop the pro forma and data content as well as guide future development. They ensure that the database has a sound technical as well as scientific basis.

The role of the steering committee is to:

- Establish policy and procedures for the registry's conduct
- Motivate source data providers (SDP) to continue participation in the registry
- Disseminate information about the registry
- Communicate results locally and internationally.
- Approve, and if necessary validate, the statistical analysis plan
- Undertake Quality Control of the reported data
- Determine policy and procedures for the operations of the database.
- Establish the Registry Coordinating Centre and appoint its project team members
- Direct the activities of the Registry Coordinating Centre

Name	Organization
Dr Zariah Abdul Aziz (Chairman)	Sultanah Nur Zahirah Hospital
Dr Irene Looi (Co – Chairman)	Seberang Jaya Hospital
Norsima Nazifah Sidek (Secretary)	Sultanah Nur Zahirah Hospital
Dato' Hanip Md Rafia	Kuala Lumpur Hospital
Prof Hamidon Basri	PPUPM
Dr Yvonne Lee	National CRC

TECHNICAL SUPPORT PERSONNEL

Malaysia National Stroke Registry is based at the CRC, Hospital Sultanah Nur Zahirah, Kuala Terengganu. It coordinates the data collection among the source data providers, and collaborates with the National Clinical Research Centre (CRC) that provides epidemiological and statistical support.

ROLE	**TEAM MEMBER**
Registry Manager	Norsima Nazifah Sidek
Registry support staff	Azizah Awang Mahani Muda Aimie Farhana binti Abdullah
Biostatisticians	Nurakmal Binti Baharum Abdul Muneer Abd Hamid
Web Application Developer	RainGate Sdn Bhd (2009-2012) Altus Solution Sdn Bhd (2013 to current)
Desktop Publisher	RainGate Sdn Bhd (2009-2012) Altus Solution Sdn Bhd (2013 to current)
Database Administrator	RainGate Sdn Bhd (2009-2012) Altus Solution Sdn Bhd (2013 to current)

PARTICIPATING CLINICAL SITES

Site Data Provider	Site investigator
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Hospital Seberang Jaya	Dr Irene Looi
Hospital Raja Perempuan Zainab II	Dr Rose Izura Abd Hamid
Hospital Umum Sarawak	Dr Law Wan Chung Dr Rachel Sim
Hospital Sultanah Bahiyah	Dr Ong Beng Hooi
Hospital Tuanku Fauziah	Dr Radzman Bin Ramli
Hospital Tengku Ampuan Rahimah	Dr.Raymond Tan Yen Leong
Hospital Queen Elizabeth	Dr Lu Ying Shean
Hospital Universiti Sains Malaysia	Dr Kamarul Aryffin Baharuddin
Hospital Kemaman	Dr Ahmad Wazi Ramli Dr Wan Mohd Hafez Wan Hamzah
Hospital Kepala Batas	Dr Chin Chen Joo
Hospital Taiping	Dr Cheah Wee Kooi
Hospital Tengku Ampuan Afzan	Dr Sulaila Basiam
Hospital Sultanah Aminah	Dr .Goh Cheng Beh
Hospital Kuala Lumpur	Dr Siva Seeta Ramaiah

ABBREVIATIONS

NSR National Stroke Registry

CRF Case Report Form

DG Director General of Health, Ministry of Health, Malaysia

CRC Clinical Research Centre

CDM Clinical Database Manager

CDA Clinical Database Assistant

IC Malaysian National Registration Card

JPN Jabatan Pendaftaran Negara

MOH Ministry of Health

SDP Source Data Providers

SC Site Coordinators

INTRODUCTION

Malaysian National Stroke Registry (NSR) is part of the National Neurology Registry alongside the epilepsy registry which was established in the late 2009. It is an initiative supported by the Ministry of Health in hopes of finding a way to improve the delivery of care befitting to Malaysian stroke framework. It also serves as a tool to record Malaysian stroke clinical data and to monitor stroke related practices of evidence-based medicine in all of the participating hospitals. This routine monitoring could promote community awareness and target areas for improvement in specific localities, in which it will later cumulatively translate into a better management strategy as whole for the nation.

The objectives of the National Neurology Registry are to:

(i) Determine the demographic pattern of the stroke patients admitted to the MOH hospital
(ii) Determine the stroke sub-types
(iii) Determine risk factors for stroke for further planning of prevention and control programmes
(iv) Determine stroke management in terms of;
(a) Non-pharmacological
(b) Pharmacological
(v) Determine the stroke complications encountered in hospitals

Registry Design:

This is a multi-centered, observational cohort study designed to evaluate the health outcome of patients with stroke undergoing treatment at participating clinical centres.

Registry study population

The registry study population consists of male or female patients with acute stroke who are to be recruited from participating sites in Malaysia. Participation in this study is voluntary.
All clinical centres or sites that satisfy the following selection criteria will be invited to participate:

1. This registry is open to all clinical sites that provide healthcare services for patients with stroke in Malaysia.

2. Each site should have a Principal Investigator who is also a licensed physician and a qualified, experienced professional with stroke management.

3. Each site must appoint a Site Coordinator (SC). The SC is the person at the participating clinical site who is responsible for all aspects of registry management and data collection at site, and who will liaise with the Registry Manager at the Registry Coordinating Centre.

4. Each site should accept responsibilities for data collection, as well as for ensuring proper record keeping and registry document filing.

5. Each site shall agree to comply with the registry procedures, give full commitment, is willing to be subjected to ongoing review of data by representative of NSR and shall give full cooperation during site audit.

Patient eligibility criteria

All patients with acute stroke undergoing treatment at a participating clinical site are eligible for entry into the registry. In addition, a site may opt to enter existing patients on follow-up at the site into the registry.

Inclusion criteria: All patient with acute stroke

- Age 12 and above years old
- Acute stroke within 2 weeks of onset

Patient shall attend the clinical site as and when required per the standard of care at the site with follow up period of 3 months. Required data shall be collected as they become available.

Analysis

This report presents the analysis of data from the year 2009 until 2016.

A total of 11284 stroke cases were reported from 2009 to 2016 from all SDPs. The contribution from each SDP is as shown in the *table 1*:

Table 1: Contribution of cases by SDPs

SDP	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Hospital Sultanah Nur Zahirah	151	99.3	536	67.0	648	54.0	885	45.0	891	56.8	877	55.5	896	47.9	861	40.1	5,745	50.9
Hospital Seberang Jaya	1	0.7	262	32.8	177	14.8	177	9.0	155	9.9	74	4.7	246	13.1	333	15.5	1,425	12.6
Hospital Universiti Sains Malaysia					39	3.3	52	2.6	5	0.3							96	0.9
Hospital Queen Elizabeth					111	9.3	43	2.2	33	2.1	8	0.5	9	0.5			204	1.8
Hospital Sultanah Bahiyah					169	14.1	241	12.3	83	5.3	79	5.0	109	5.8	70	3.3	751	6.7
Hospital Tuanku Fauziah			2	0.3	10	0.8	87	4.4	85	5.4	62	3.9	146	7.8	57	2.7	449	4.0
Hospital Kuala Lumpur											10	0.6					10	0.1
Hospital Tuanku Ampuan Afzan							39	2.0									39	0.3
Hospital Tengku Ampuan Rahimah					27	2.3	267	13.6									294	2.6
Hospital Sultanah Aminah					19	1.6	6	0.3									25	0.2
Hospital Raja Perempuan Zainab II							147	7.5	288	18.3	313	19.8	82	4.4	289	13.5	1,119	9.9
Hospital Kemaman							23	1.2	23	1.5	46	2.9					92	0.8
Hospital Bintulu									1	0.1							1	0.0
Hospital Umum Sarawak									6	0.4	110	7.0	331	17.7	467	21.8	914	8.1
Hospital Taiping													52	2.8	3	0.1	55	0.5
Hospital Kepala Batas															65	3.0	65	0.6
Total	152	100.0	800	100.0	1,200	100.0	1,967	100.0	1,570	100.0	1,579	100.0	1,871	100.0	2,145	100.0	11,284	100.0

CHAPTER 1 : PATIENT'S CHARACTERISTICS

1. Demographics

The 8 years (2009 to 2016) NSR stroke demographic profiles are described in *table 2*. In total, there were 11,284 reported stroke cases with 55% of them were male. The ethnic distributions were as follows; Malay 85%, Chinese 9%, Indian 3% and others 3%. The disproportionately high number of Malays in our registry possibly depicts the population skew where there was a concerted recruitment of patients from one state (Terengganu) that is heavily populated by the Malays (94.0%)[1]. Thus this is by no means represents the true stroke rate ethnicity of our country.

3% of our stroke patients were single with the other 11.2 % being either widowed, divorced or status unknown. 49.4% had none or only primary school education.

Table 2: Stroke population distribution by demographics.

The mean (SD) age for stroke was 62.5 (12.6) years. These figures are comparable to the reported mean age for stroke population in other Asian countries eg Indonesia, 58.8 years[2], Thailand,65 years [3], India,63 years [4] , China ,66.4 year [5] and Singapore, 67 years [6] although just they are a little bit younger than that of Thailand. However we are relatively younger compared to the USA, 69.2 years [7] and UK, 74. 2 years [8]

2. Age and Gender Disparities

Figure 1 portrays the preponderance of stroke cases as the population aged. As expected, the elderly comprised the majority; 60% being older than 60 years and 26% were in between 50 and 59 years. There were 13.6% cases below the age of 49.

The mean age for male with stroke ranged from 60.7 to 63.6 years whereas for female, it was 60.3 to 65.2 years. Furthermore, the number of men always transcended that of women in almost all age stratifications with the exception in age over 70, women predominated by over 9.5%.

Biological changes that come with old age may affect existing age/gender association with stroke risk factors. The prevalence of hypertension and cardiovascular complications usually arise with increasing age. Increased high blood pressure is greatly attributed to the changes to the cardiovascular system, structure of arteries and large artery stiffness that is associated with aging. By the age of 60–69 years, women have a higher risk of developing hypertension due to menopause [9] which may contribute to the slight female predominance above age 70.

Table 2: Stroke population distribution by demographics

Demographics	2009		2010		2011		2012		2013		2014		2015		2016		Total	
Age (in years)																		
n	152		800		1,200		1,965		1,557		1,564		1,861		2,140		11,239	
Mean (SD)	62.2	(12.10)	62.9	(12.2)	62.8	(12.6)	62.7	(12.8)	63.0	(13.0)	62.0	(12.4)	62.3	(12.7)	62.0	(12.3)	62.5	(12.6)
Median (Min. - Max.)	62.0	(30 , 91)	63.0	(0 , 96)	63.3	(0 , 95)	64.0	(15 , 101)	63.5	(0 , 100)	62.4	(0 , 97)	62.8	(0 , 101)	62.4	(14 , 95)	63.0	(0 , 101)
IQR	16		16		18		19		18		17		18		17		18	
Sex																		
Male	88	57.9	411	51.4	635	52.9	1,112	56.5	901	57.4	857	54.3	1,036	55.4	1,280	59.7	6,320	56.0
Female	64	42.1	389	48.6	565	47.1	855	43.5	669	42.6	722	45.7	835	44.6	865	40.3	4,964	44.0
Total	152	100.0	800	100.0	1,200	100.0	1,967	100.0	1,570	100.0	1,579	100.0	1,871	100.0	2,145	100.0	11,284	100.0
Ethnicity																		
Malay	145	95.4	642	81.2	911	76.7	1,567	81.0	1,374	88.7	1,405	89.8	1,480	79.7	1,675	78.3	9,199	82.3
Chinese	5	3.3	106	13.4	151	12.7	209	10.8	119	7.7	95	6.1	219	11.8	261	12.2	1,165	10.4
Indian	1	0.7	39	4.9	42	3.5	114	5.9	13	0.8	17	1.1	30	1.6	43	2.0	299	2.7
Orang Asli	1	0.7			2	0.2			1	0.1							4	0.0
Kadazan					43	3.6	20	1.0	19	1.2	2	0.1	5	0.3	1	0.0	90	0.8
Melanau													3	0.2	3	0.1	6	0.1
Murut						0.0	1	0.1									1	0.0
Bajau					18	1.5	5	0.3	3	0.2	1	0.1	2	0.1			29	0.3
Bidayuh									2	0.1	18	1.2	52	2.8	75	3.5	147	1.3
Iban									1	0.1	18	1.2	59	3.2	74	3.5	152	1.4
Other Malaysian			4	0.5	20	1.7	19	1.0	17	1.1	9	0.6	6	0.3	6	0.3	81	0.7
Total	152	100.0	791	100.0	1,187	100.0	1,935	100.0	1,549	100.0	1,565	100.0	1,856	100.0	2,138	100.0	11,173	100.0

Demographics	2009		2010		2011		2012		2013		2014		2015		2016		Total	
Nationality	-	-																
Malaysian	152	*100.0*	791	*98.9*	1,187	*98.9*	1,935	*98.4*	1,549	*98.7*	1,565	*99.1*	1,856	*99.4*	2,138	*99.7*	11,173	*99.0*
Foreigner	0	*0.0*	9	*1.1*	13	*1.1*	32	*1.6*	21	*1.3*	14	*0.9*	12	*0.6*	7	*0.3*	108	*1.0*
Total	152	*100.0*	800	*100.0*	1,200	*100.0*	1,967	*100.0*	1,570	*100.0*	1,579	*100.0*	1,868	*100.0*	2,145	*100.0*	11,281	*100.0*
Marital status	-	-																
Single	6	*3.9*	34	*4.3*	47	*3.9*	45	*2.3*	45	*2.9*	35	*2.2*	62	*3.3*	61	*2.8*	335	*3.0*
Married	133	*87.5*	690	*86.3*	1,051	*87.6*	1,668	*84.8*	1,396	*88.9*	1,344	*85.1*	1,608	*85.9*	1,791	*83.5*	9,681	*85.8*
Others	13	*8.6*	76	*9.5*	102	*8.5*	254	*12.9*	129	*8.2*	200	*12.7*	201	*10.7*	293	*13.7*	1,268	*11.2*
Total	152	*100.0*	800	*100.0*	1,200	*100.0*	1,967	*100.0*	1,570	*100.0*	1,579	*100.0*	1,871	*100.0*	2,145	*100.0*	11,284	*100.0*
Education level	-	-																
Nil	30	*19.7*	94	*11.8*	126	*10.5*	169	*8.6*	284	*18.1*	308	*19.5*	370	*19.8*	358	*16.7*	1,739	*15.4*
Primary	65	*42.8*	355	*44.4*	484	*40.3*	669	*34.0*	562	*35.8*	541	*34.3*	597	*31.9*	563	*26.2*	3,836	*34.0*
Secondary	33	*21.7*	173	*21.6*	288	*24.0*	443	*22.5*	380	*24.2*	333	*21.1*	355	*19.0*	521	*24.3*	2,526	*22.4*
Tertiary	2	*1.3*	14	*1.8*	50	*4.2*	43	*2.2*	39	*2.5*	34	*2.2*	26	*1.4*	39	*1.8*	247	*2.2*
Unknown	22	*14.5*	164	*20.5*	252	*21.0*	643	*32.7*	305	*19.4*	363	*23.0*	523	*28.0*	664	*31.0*	2,936	*26.0*
Total	152	*100.0*	800	*100.0*	1,200	*100.0*	1,967	*100.0*	1,570	*100.0*	1,579	*100.0*	1,871	*100.0*	2,145	*100.0*	11,284	*100.0*

Figure 1: Stroke distribution by age group

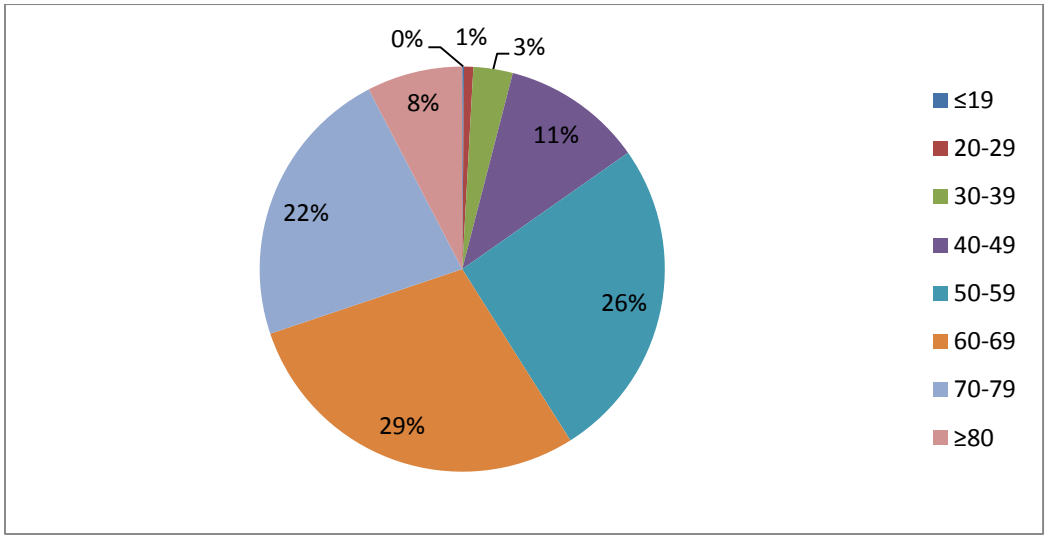
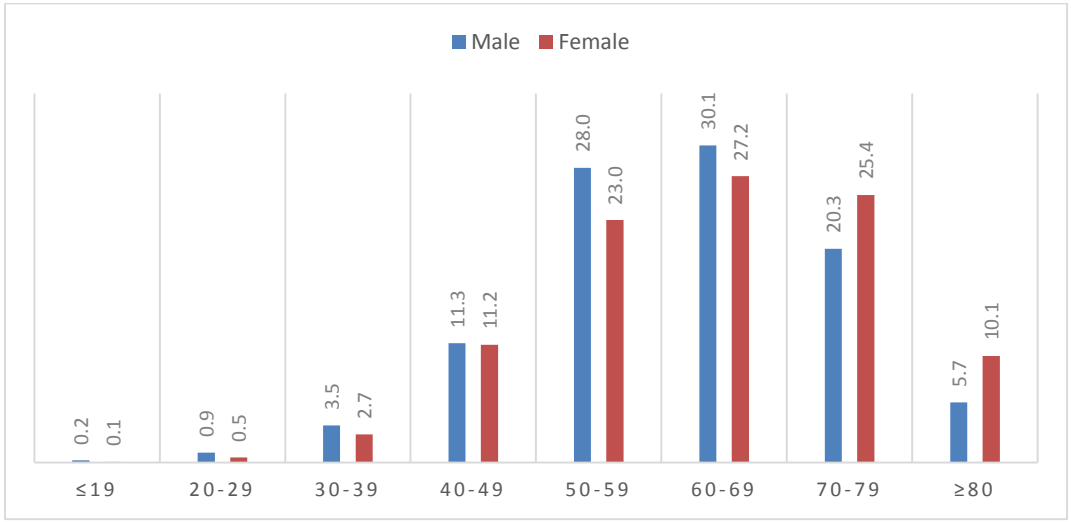


Figure 2: Stroke population distribution by age group and sex



It is a common knowledge that stroke is seen more common in men than women for most age groups. However, the female gender bias in the extreme of age is to be expected since Malaysian women have a longer life span than that of Malaysian men.

In the latest national census, Malaysian female had lived 77.4 years long whereas the men only lived on average until 72.7 years old.[11]

CHAPTER 2: RISK FACTORS

Hypertension (67.0%), diabetes (39.6%), cigarette smoking (25.2%), and hyperlipidemia (23.0%) were the commonest risk factors in our stroke population. The order in which the risk factors prevailed over one another remained fairly the same throughout the five years period. Our prevalence of hypertension in stroke patient is lower when compare to other countries for hypertension; Singapore (78.5%)[12], India (83.2%)[13] and Indonesia (73.9%)[14], however for diabetes mellitus, ours is higher than Thailand (24.6%)[15], and Indonesia (17.3%)[14] but almost similar to Singapore (37.6%)[12] and India (50.0%) [13].

Interestingly, only 3% of them were diagnosed with atrial fibrillation. This figure is much lower compared to another countries such as Thailand (10.4%)[15], Singapore(17.7%)[12] as well as one local study done in a single teaching hospital in Kuala Lumpur (10.6%) [16] .

However, if we analysed the risk factor profile by gender, female with stroke had more of HTN, DM, AF and HPL whereas, male stroke population have higher proportion of cigarette smoker and person with IHD. Our finding are similar to report by Singapore Registry Annual Report 2012[12].

Risk factors based on region also shown various trend.

Table 3: Stroke risk factors

Risk factor	n	%
Hypertension	8152	69.9
Diabetes	4819	41.4
Hyperlipidaemia	2798	24.0
Smoker	3063	26.3
Ischemic heart disease	1254	10.8
Atrial fibrillation	391	3.4
Family history of stroke	671	5.8
Alcohol	222	1.9

Table 4: Stroke risk factor profile by sex

Risk factor	Male	Female	p-value
Hypertension	66.5%	74.7%	<0.001
Diabetes	37.9%	46.2%	<0.001
Hyperlipidaemia	22.4%	26.6%	<0.001
Smoker	48.7%	5.2%	<0.001
Ischemic heart disease	12.6%	9.1%	<0.001
Atrial fibrillation	2.9%	3.8%	0.005
Family history of stroke	5.8%	5.6%	0.548

Table 5: Stroke risk factor profile by region

Risk factor	East Coast	North Region	Central	South region	East Malaysia	P value
Hypertension	**73.4%**	67.2%	51.2%	61.5%	64.1%	<0.001
Diabetes	43.0%	42.8%	40.1%	**43.6%**	29.6%	<0.001
Hyperlipidaemia	**30.2%**	16.6%	7.3%	5.1%	12.8%	<0.001
Smoker	35.2%	35.2%	29.4%	31.6%	**44.7%**	<0.001
Ischemic heart disease	13.2%	8.6%	9.9%	**17.9%**	3.2%	<0.001
Atrial fibrillation	2.9%	2.7%	2.4%	2.6%	**7.6%**	<0.001
Family history of stroke	**7.4%**	2.9%	1.4%	2.6%	3.9%	<0.001

CHAPTER 3 : EVENT AT EMERGENCY DEPARTMENT

Table 6 shown the blood pressure, pulse rate, glucometer, BMI, GCS and NIHSS of patients upon admission. The median GCS (15) associate well with median NIHSS score (6). Based on NIHSS classification, only 18.6% of patient admitted with moderately severe and severe stroke (table 7). The glucose level was slightly high presumably due to stress induced hyperglycaemia phenomenon. Comparison between two types of stroke, blood pressure was predictably higher in haemorrhagic stroke as well as glucose level in ischemic stroke.

Table 6: Clinical parameter upon admission at emergency department

Stroke presentation		
Systolic blood pressure (mmHg)		
n	11284	
Mean (SD)	167	(34.1)
Diastolic blood pressure (mmHg)		
n	11284	
Mean (SD)	92	(19.7)
Pulse rate (beats/min)		
n	11284	
Mean (SD)	85	(20.2)
Glucometer (mmol/L)		
n	5988	
Mean (SD)	9.4	(5.7)
BMI		
n	1173	
Mean (SD)	25.3	(5.1)
Glasgow ComaScale		
n	11637	
Median (IQR)	15	(3)
NIHSS		
n	8193	
Median (IQR)	6	(10)

Table 7: Comparison of SBP,DBP, random blood glucose and BMI between IS and ICH

	Ischemic Stroke	***ICH,***	***P value***
Systolic blood pressure (mmHg), Mean (SD)	164.2(32.9)	183.8(35.1)	**<0.001**
Diastolic blood pressure (mmHg), Mean (SD)	89.8(18.6)	101.6(21.9)	**<0.001**
Glucometer (mmol/L), Mean (SD)	9.5(5.8)	8.8(5.3)	**0.001**
BMI, Mean (SD)	25.1(4.5)	25.4(4.9)	0.427

Table 8: NIHSS classification

NIHSS classification	**n**	**%**
No Stroke (0)	734	8.7
Mild (1-4)	2985	35.3
Moderate (5-15)	3163	37.4
Moderately severe(16-20)	616	7.3
Severe (21-42)	951	11.3

Table 9: Duration of onset to needle (DNT)in hour

Duration (time of onset to time of arrival to ED)*	**Hour**
n	10893
Mean (SD)	27.0(57.4)
Median (IQR)	7.6(22.8)
Duration door to scan (time of arrival to ED - time of first scan)*	
n	10561
Mean (SD)	10.2(24.0)
Median (IQR)	2.0(8.3)
Duration door to needle (time arrival to ED - time of thrombolytic therapy)**	
n	138
Mean(SD)	2.2(0.9)
Median (IQR)	2.2(1.3)

*All patient

**Patient HSNZ,SGH,HSJ received thrombolytic therapy only

CHAPTER 4 : STROKE CLASSIFICATION

About 76% of our registered stroke cases are the ischemic strokes; TIA in 2%.The rate for hemorrhagic stroke had been consistent at about 17% annually. Using the Trial of ORG 1072 in Acute Ischaemic Stroke Treatment (TOAST) aetiologic stroke classification, approximately 43% of strokes are due to large vessel disease; 35%, small vessel disease (lacunar strokes); 6.0% embolism from the heart (cardio-embolic strokes) and the remainder are undetermined or missing. The percentage of cardioembolic stroke in our population is significantly lower compared to study done in Europe (27%) [17] and in Korea (20.6%)[18]. We may have missed our cardio-embolic stroke patients if the investigation to look for evidence of atrial fibrillation and cardiac abnormality was not done adequately. Cardioembolic stroke characteristically is associated with large strokes and posterior circulation strokes.

Cardioembolic stroke causing lacunar infarcts are rare, however we have 52 (9.9%) such cases (table 9). The neuroimaging showed evidence for lacunar infarcts with no evidence for source of cardiac embolism using echocardiogram.

According to the Oxfordshire Community Stroke Project (OCSP) classification which based on the clinical presentation, Partial Anterior Circulation Infarct (PACI) and Lacunar Infarct (LACI) are the predominant clinical manifestation in 32% and 35% of all ischemic stroke cases respectively whereas Total Anterior Circulation Infarct (TACI) comprises about 15% of them. This is consistent with the current knowledge that stroke due to intracranial atherosclerosis and small-vessel occlusion are more common in Asian population compared to western population. TACI has been associated with the poorest outcome in the OCSP study, having the highest mortality and disability rate, longer hospital stay, and more stroke related complications. On the other hand, LACI carries the best possible clinical outcome.

Figure 3: Stroke classification by WHO, OCSP and TOAST

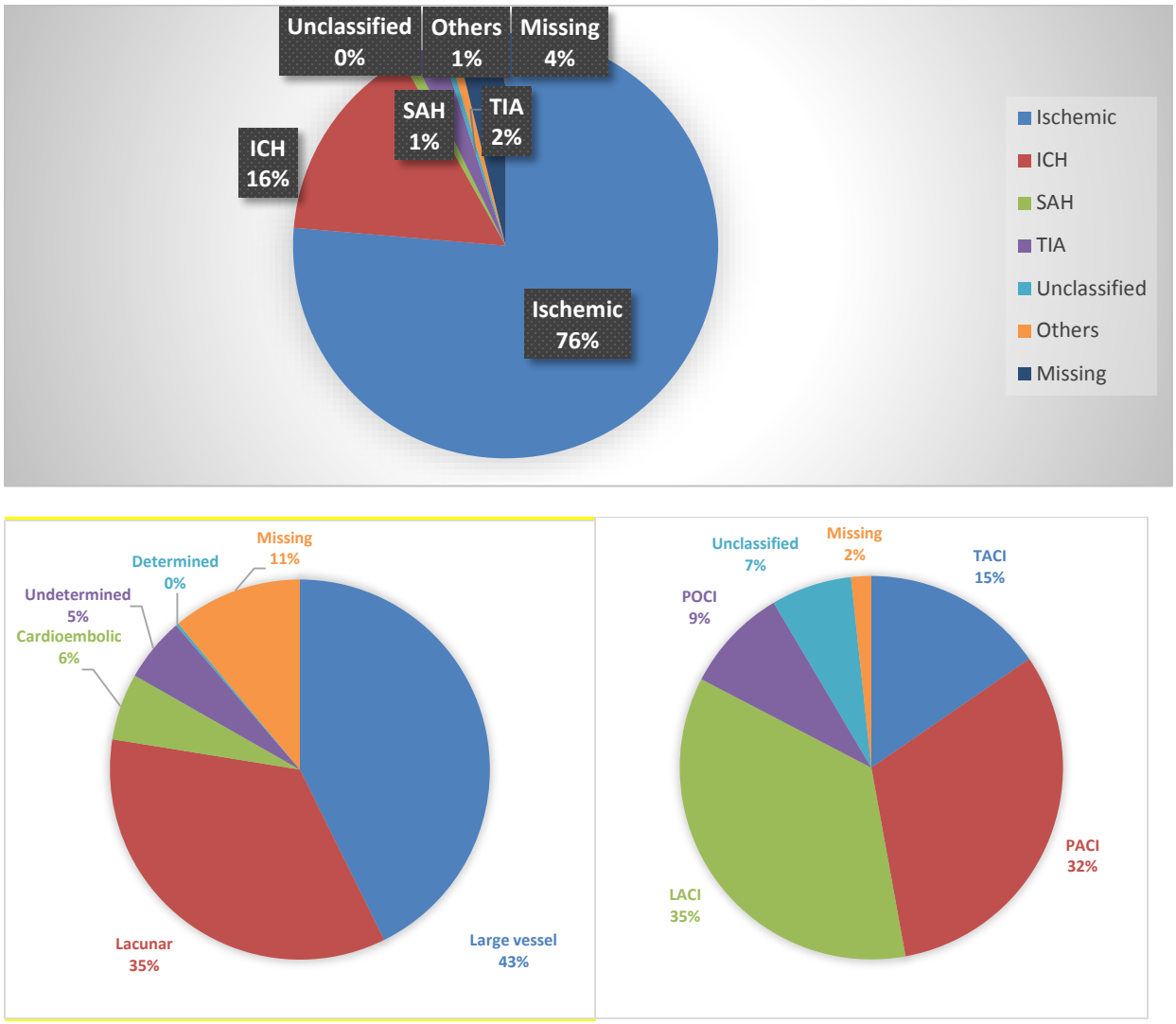


Table 10 : OCSP classification in cardioembolic stroke patient

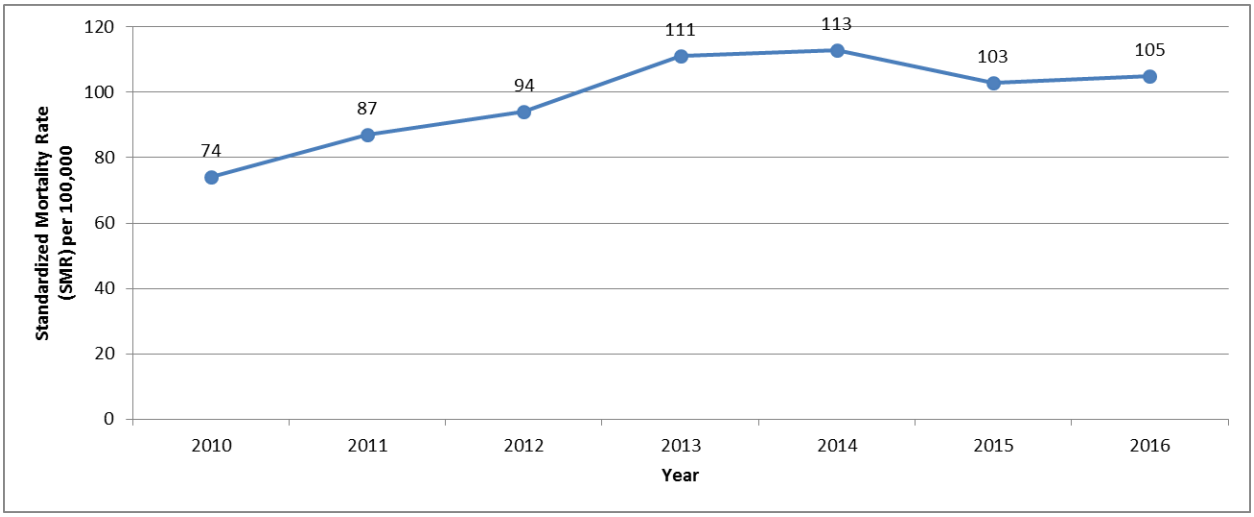
OCSP	n	%
LACI	52	9.9
PACI	188	35.9
TACI	193	36.9
POCI	74	14.1
Not classified	16	3.1

CHAPTER 5 : STROKE OUTCOME

1. Overall Mortality

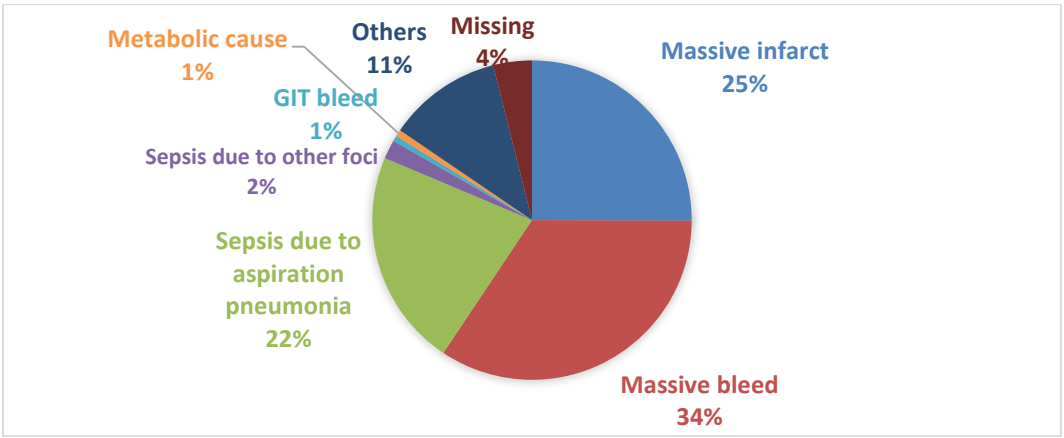
Between the year 2009 and 2016, the overall stroke mortality rate has increased (*Figure 4*). The causes of death are depicted in the Figure 5. Massive bleeding constituted about 1/3 of cases and less than 50% were due to massive cerebral infarct and aspiration pneumonia.

Figure 4: Stroke Age adjusted all-cause mortality rate



**The SMR calculation uses indirect methods. The standard population is the total number of stroke incidence, and the total stroke death registered.

Figure 5: Causes of death in stroke patients



2. Disability

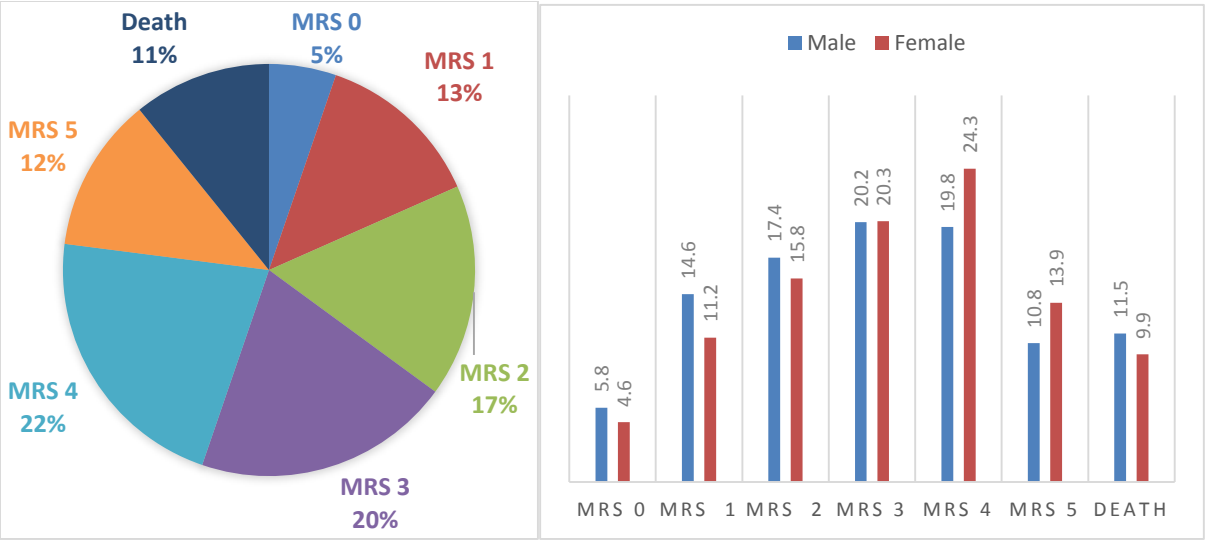
About 35% of the stroke patients were completely independent (MRS 0 to 2) at discharge with good outcome. On the other hand, about 54% of Malaysian stroke population needed some form of assistance (MRS 3 to 5) for activity of daily living due to various degree of physical or cognitive disability.

Higher percentage of moderately severe (MRS 4) to severe (MRS 5) disability were seen among the female compared to the male however there were more death (all cause) in male stroke inpatients compared to the female counterpart.

Based on stroke types, death outcome was 8.6% in ischemic stroke and 26.6% in hemorrhagic stroke.

For female stroke survivors, presumably being homemarkers, more severe stroke outcome observed in that population could inflict additional social issues which may affect the family members.

Figure 6: Disability at discharge by MRS



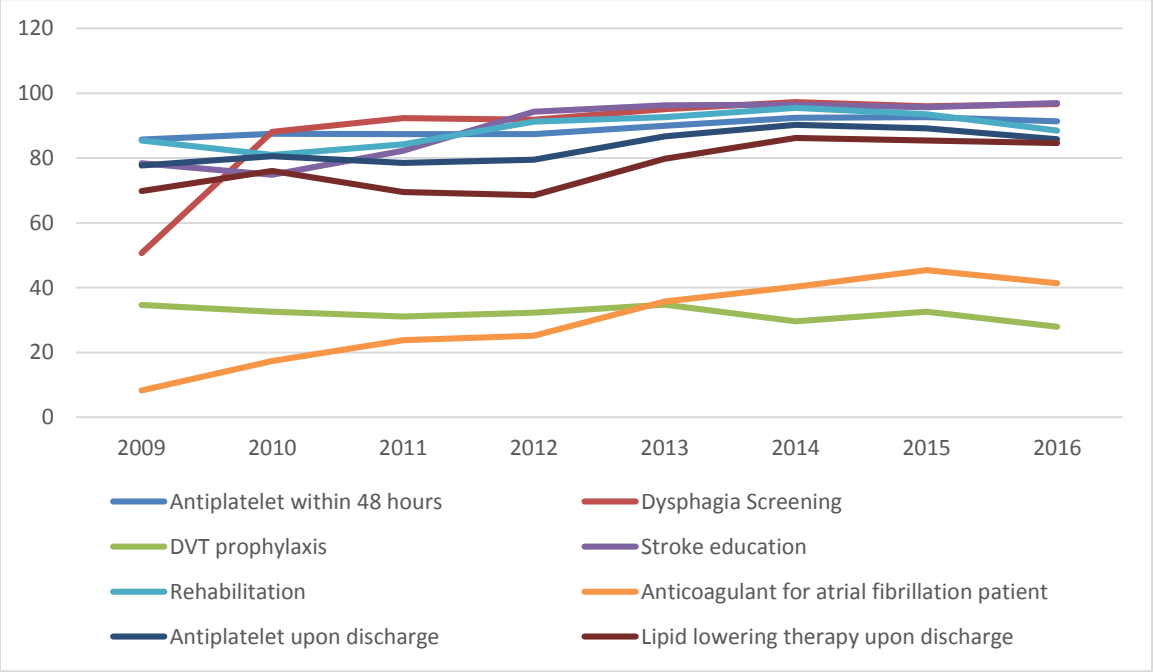
CHAPTER 6 : KEY PERFORMANCE INDEX

1. Overall Performance

The performance for all SDPs is summarized in the figure 5.Since 2009 the performance on most key indicators has improved. The issue of concern here is the lack of use of VTE deterrent therapy and anticoagulation for atrial fibrillation. The poor performance for these 2 areas suggest not that they were rarely practiced rather the unwillingness of the involved patients to comply with such management plan for many personal reasons.

There are also few other areas that can be refurbished, one of which is rehabilitation. A lot of severely disabled patient who could greatly benefit from rehab, deteriorate further due to mere accessibility issue.

Figure 7: Key performance indices for acute stroke management 2010-2014 (all SDPs)



CHAPTER 7:

1. Pre-hospital service

Only 20.8% of those who came via ambulance and 28.6% via own transport arrived within 3 hour window period. Although almost 60% of stroke patients were utilizing ambulance services, the median time from onset of symptom to arrival at ED was 7.8 hours. More effort must be made to spread awareness of the golden 4.5 hour window period.

Table 8: Arrival time at acute stroke facility by different mode of transportation

Time of arrival (in Hours)	Ambulance		Own transport		Others	
	n	%	n	%	n	%
≤3 hours	1,160	20.8	1,576	28.6	18	32.1
>3 hours	2,845	51.1	2,083	37.8	16	28.6
>24 hours	1,398	25.1	1,367	24.8	8	14.3
Median time (IQR)	7.8 (21.98)		7.4 (24.49)		4.6 (14.50)	

Others: public transport; social services: police, old folks home; family members

The reason for late arrival is given by the *table 13*

Table 9: Reason for late arrival

Reasons	Arrived at ED>3 hours	
	n	%
Ignorance	1,846	23.0
Traffic jam	23	0.3
No transport	385	4.8
Geographical location	1,020	12.7
No caregivers	413	5.2
Others	289	3.6

ED=Emergency department

REFERENCES

1. *Data asas*. (2017). Kuala Terengganu: Unit Perancang Ekonomi Negeri Terengganu. Retrieved from http://upen.terengganu.gov.my/index.php/data-asas-2016/category/1-muatturun
2. Kusuima, Y., Venketasubramanian, N., Kiemas, L. S., & Misbach, J. (2009). Burden of Stroke in Indonesia. *International Journal of Stroke,4*(5), 379-380. doi:10.1111/j.1747-4949.2009.00326.x
3. Suwanwela, N. C. (2014). Stroke Epidemiology in Thailand. *Journal of Stroke,16*(1), 1. doi:10.5853/jos.2014.16.1.1
4. Wasay, M., Khatri, I. A., & Kaul, S. (2014). Stroke in South Asian countries. *Nature Reviews Neurology,10*(3), 135-143. doi:10.1038/nrneurol.2014.13
5. Wang, W., Jiang, B., Sun, H., Ru, X., Sun, D., Wang, L., . Feigin, V. L. (2017). Prevalence, Incidence, and Mortality of Stroke in China. *Circulation,135*(8), 759-771. doi:10.1161/circulationaha.116.025250
6. Singapore, National Registry of Diseases Office. (2016, May 25). *Stroke Registry Report 2014*. Retrieved June 5, 2018.
7. Kissela, B. M., Khoury, J. C., Alwell, K., Moomaw, C. J., Woo, D., Adeoye, O., . . . Kleindorfer, D. O. (2012). Age at stroke: Temporal trends in stroke incidence in a large, biracial population. *Neurology,79*(17), 1781-1787. doi:10.1212/wnl.0b013e318270401d
8. Lee, S., Shafe, A. C., & Cowie, M. R. (2011). UK stroke incidence, mortality and cardiovascular risk management 1999-2008: Time-trend analysis from the General Practice Research Database. *BMJ Open,1*(2). doi:10.1136/bmjopen-2011-000269
9. Reckelhoff, J. F. (2001). Gender Differences in the Regulation of Blood Pressure. *Hypertension,37*(5), 1199-1208. doi:10.1161/01.hyp.37.5.1199
10. Andersen, K. K., Andersen, Z. J., & Olsen, T. S. (2010). Age- and Gender-Specific Prevalence of Cardiovascular Risk Factors in 40 102 Patients With First-Ever Ischemic Stroke. *Stroke,41*(12), 2768-2774. doi:10.1161/strokeaha.110.595785
11. Department of Statistics Malaysia Official Portal. (n.d.). Retrieved from https://www.dosm.gov.my/v1/
12. Singapore Stroke Registry Report No. 4 Trends In Stroke In Singapore 2005 – 2013

13. Sridharan, S. E., Unnikrishnan, J., Sukumaran, S., Sylaja, P., Nayak, S. D., Sarma, P. S., & Radhakrishnan, K. (2009). Incidence, Types, Risk Factors, and Outcome of Stroke in a Developing Country. *Stroke,40*(4), 1212-1218. doi:10.1161/strokeaha.108.531293
14. Misbach, J., & Wendra, A. (2000). Clinical pattern of hospitalized strokes in 28 hospitals in Indonesia. *Medical Journal of Indonesia,*29. doi:10.13181/mji.v9i1.647
15. Nilanont, Y., Nidhinandana, S., Suwanwela, N. C., Hanchaiphiboolkul, S., Pimpak, T., Tatsanavivat, P., Poungvarin, N. (2014). Quality of Acute Ischemic Stroke Care in Thailand: A Prospective Multicenter Countrywide Cohort Study. *Journal of Stroke and Cerebrovascular Diseases,23*(2), 213-219. doi:10.1016/j.jstrokecerebrovasdis.2012.12.001
16. Chee, K. H., & Sin, T. K. (2014). Impact of atrial fibrillation among stroke patients in a Malaysian teaching hospital. *Medical Journal of Malaysia,69*(3), 119-123. Retrieved November 5, 2018, from http://repository.um.edu.my/41241/1/1_00031R1 RE1.pdf
17. Kolominsky-Rabas, P. L., Weber, M., Gefeller, O., Neundoerfer, B., & Heuschmann, P. U. (2001). Epidemiology of Ischemic Stroke Subtypes According to TOAST Criteria. *Stroke,32*(12), 2735-2740. doi:10.1161/hs1201.100209
18. Ko, Y., Lee, S., Chung, J., Han, M., Park, J., Kang, K., Bae, H. (2014). MRI-based Algorithm for Acute Ischemic Stroke Subtype Classification. *Journal of Stroke,16*(3), 161. doi:10.5853/jos.2014.16.3.161

LIST OF PUBLICATIONS

1. S Norsima Nazifah, I Khairul Azmi, B B Hamidon, I Looi, A A Zariah, M R Hanip; **National Stroke Registry (NSR): Terengganu and Seberang Jaya Experience** ; Med J Malaysia Vol 67 No 3 June 2012

2. Aziz ZA, Lee YY, Ngah BA, Sidek NN, Looi I, Hanip MR, Basri HB. **Acute Stroke Registry Malaysia, 2010-2014: Results from the National Neurology Registry.** J Stroke Cerebrovasc Dis. 2015 Dec;24(12):2701-9. doi: 10.1016/j.jstrokecerebrovasdis.2015.07.025. Epub 2015 Aug 31.

3. Aziz ZA, Lee YY, Sidek NN, Ngah BA, Looi I, Hanip MR, Basri HB; **Gender disparities and thrombolysis use among patient with first-ever ischemic stroke in Malaysia.** Neurol Res. 2016 May;38(5):406-13. doi: 10.1080/01616412.2016.1178948. Epub 2016 May

4. **Cheah Wee Kooi, Hor Chee Peng, Zariah Abdul Aziz, Irene Looi; A Review of Stroke Research in Malaysia from 2000 – 2014.** Med J Malaysia Vol 71 Supplement 1 June 2016

5. Aziz ZA, Sidek NN, Ngah BA, Looi I, Hanip MR, et al. **Clinical Characteristics of Atrial Fibrillation in First-ever Ischemic Stroke Patients; Results from Malaysia National Neurology Registry** ;Int J Cardiovasc Res 5:5. doi:10.4172/2324-8602.1000278 (September 14, 2016).

6. Wen Yea Hwong,Michiel L. Bots,Sharmini Selvarajah,L. Jaap Kappelle,Zariah Abdul Aziz,Norsima Nazifah Sidek,Ilonca Vaartjes; **Use of a Diagnostic Score to Prioritize Computed Tomographic (CT) Imaging for Patients Suspected of Ischemic Stroke Who May Benefit from Thrombolytic Therapy** ; PLoS ONE 11(10): e0165330. doi:10.1371/journal.pone.0165330(October 21, 2016)

7. Wen Yea Hwong,Michiel L. Bots,Sharmini Selvarajah,Zariah Abdul Aziz,Norsima Nazifah Sidek,Wilko Spiering,L. Jaap Kappelle,Ilonca Vaartjes; **Use of Antihypertensive Drugs and Ischemic Stroke Severity – Is There a Role for Angiotensin-II?:** PLoS ONE 11(10): e0165330. doi:10.1371/journal.pone.0165330(November 15, 2016)

NNeuR NATIONAL NEUROLOGY REGISTRY

NATIONAL NEUROLOGY REGISTRY (STROKE & EPILEPSY)

HEADER

1	Reporting Centre	
2 **	Date of Notification	

Patient Stroke Notification Part 1 (Section 1-4)

SECTION 1: PATIENT DETAILS & DEMOGRAPHICS

1 **	Name		
2	R/N No		
3 **	NRIC	MyKad	
		Old IC	
		Other ID No	
		Specify document type (if others)	○ Passport ○ Armed Force ID ○ Work Permit ○ Drivers License ○ Police ID Card ○ Others ○ Not available
		Other ID document type, specify	
	Address	Postcode	Town/ City
		State	○ Johor Darul Takzim ○ Kedah Darul Aman ○ Kelantan Darul Naim ○ Melaka ○ Negeri Sembilan Darul Khusus ○ Pahang Darul Makmur ○ Perak Darul Ridzuan ○ Perlis Indera Kayangan ○ Pulau Pinang ○ Sabah ○ Sarawak ○ Selangor Darul Ehsan ○ Terengganu Darul Iman ○ Wilayah Persekutuan (Kuala Lumpur) ○ Wilayah Persekutuan (Labuan) ○ Wilayah Persekutuan (Putrajaya) ○ NA (foreign) ○ Not available
4	Contact No	Home No	Handphone
5 **	Date of Birth	Birth Date	☐ Estimated/Presumed Year 6 Age (auto calculate)
7 **	Gender	○ Male ○ Female	
8 **	Ethnic Group	○ Malay ○ Chinese ○ Indian ○ Orang Asli ○ Kadazan/ Dusun ○ Melanau ○ Murut ○ Bajau ○ Bidayuh ○ Iban ○ Orang Ulu ○ Other Malaysian, specify ○ Foreigner, specify country ○ Unknown ○ Not Available	
		Other Malaysian, specify	Foreigner, specify country
9	Education Level	○ Nil ○ Primary ○ Secondary ○ Tertiary ○ Unknown	
10	Marital status	○ Single ○ Married ○ Divorced ○ Widowed ○ Unknown	
11	Occupation	☐ Legislator senior officials, managers	☐ Skilled agricultural, fishery workers
		☐ Technicians, associate professionals	☐ Plant and machine operators and assemblers
		☐ Service workers, shop and market sales workers	☐ Housewife
		☐ Craft and related trade workers	☐ Others, specify
		☐ Elementary occupations	☐ Unknown
		☐ Professional	☐ Unemployed
		☐ Clerical workers	☐ Retired

SECTION 2: DIAGNOSIS

1 **	Epilepsy	☐ Epilepsy
		☐ Stroke

SECTION 3: MODE OF ARRIVAL

1	Mode of arrival	○ Ambulance ○ Own transport ○ Others, specify ○ Not available	
		Others, sepcify	

SECTION 4: VITAL SIGN AT EMERGENCY DEPT (ED)

1	Height (cm)		2	Weight (kg)		3	BMI (kg/m²)	
4 **	BP (mmHg)	Systolic / Diastolic		/		5 **	Pulse rate (beats/min)	
6	Oxygen saturation (%)		☐	Not available				

7 Glasgow Coma Scale

a.	Eye Opening	○ 4-Spontaneous--open with blinking at baseline ○ 3-To verbal stimuli, command, speech ○ 2-To pain only (not applied to face) ○ 1-No response ○ Not available	
b.	Verbal response	○ 5-Oriented ○ 4-Confused conversation, but able to answer questions ○ 3-Inappropriate words ○ 2-Incomprehensible sound ○ 1-No response ○ Not available	☐ T Intubated
c.	Motor response	○ 6-Obeys commands for movement ○ 5-Purposeful movement to painful stimulus ○ 4-Withdraws in response to pain ○ 3-Flexion in response to pain (decorticate posturing) ○ 2-Extension response in response to pain (decerebrate posturing) ○ 1-No response ○ Not available	
d.	Total Score (Autocalculate)		Total Score (interpretation) ○ Severe ○ Moderate ○ Mild ○ Missing

8	Glucometer reading (mmol/L)		9	Temperature (°C)				
10	Handedness	○ Right	○ Left	○ Ambidextrous	○ Not available			
11 **	Stroke event	○ First	○ Recurrent	○ Not available				
	a. If recurrent, Number of previous stroke / TIA							
12	a. ** Date of symptom/s onset		☐ NA	b. Time of symptom/s onset (24 hour clock)		☐ NA		
13	a. ** Date of arrival to ED		☐ NA	b. Time of arrival to ED (24 hour clock)		☐ NA		
14	a. Date medical/neurology team consulted		☐ NA	b. Time medical/neurology team consulted (24 hour clock)		☐ NA		
15	a. Date surgical / neurosurgical team consulted		☐ NA	b. Time surgical / neurosurgical team consulted (24 hour clock)		☐ NA		
16	Duration (time of onset to time of arrival to ED)	Hours		Mins				

17 Arrival within 3 hours

○ Yes ○ No ○ Not available

If No, specify reason

☐	Ignorance	☐	Traffic jam	☐	No transport
☐	Geographical location	☐	No caregiver	☐	Others, specify

18 **	Date and time of Admission		b. Time of Admission (24 hour clock)
19	Location of admission	○ Neuro ICU ○ General ICU ○ HDW ○ Ward ○ Acute stroke ward ○ Others, specify ○ Not available	
	Others, specify		

Patient Stroke Notification Part 2

SECTION 5: RISK FACTORS

1 ** Risk Factor

- ☐ None
- ☐ Hypertension
  - Hypertension, duration: ○ <1 year ○ 1-5 years ○ 6-10 years ○ > 10 years ○ Unknown ○ Not available
- ☐ Diabetes Mellitus
  - Diabetes, duration: ○ <1 year ○ 1-5 years ○ 6-10 years ○ > 10 years ○ Unknown ○ Not available
- ☐ Smoker
  - Smoking Status: ○ Never ○ Former (quit > 30 days) ○ Current ○ Unknown

Duration (years)	Number of sticks (sticks / day)	(Unit packs / year) Number of sticks/ day (sticks) X duration of smoking (years) / 20
		=

- ☐ Hyperlipidemia
- ☐ Ischemic heart disease
- ☐ Atrial fibrillation
- ☐ Alcohol
- ☐ Hyperuricaemia
- ☐ Obesity (BMI >= 25.0)
- ☐ Peripheral Arterial Disease
- ☐ Family history of stroke
- ☐ Sedentary Lifestyle
- ☐ OCP
- ☐ Sleep Apnoea
- ☐ Others, specify

SECTION 6: CLINICAL MANIFESTATIONS APPARENT AT START OF EVENT

1 **	Headache	○ Yes ○ No	○ Not available
2 **	Nausea or Vomitting	○ Yes ○ No	○ Not available
3 **	Vertigo or Giddiness	○ Yes ○ No	○ Not available
4 **	Altered sensorium	○ Yes ○ No	○ Not available
5 **	Visual alteration	○ Yes ○ No	○ Not available
6 **	Speech disturbances	○ Yes ○ No	○ Not available
7 **	Hemiparesis	○ Yes ○ No	○ Not available
8 **	Tetraparesis	○ Yes ○ No	○ Not available
9 **	Monoparesis	○ Yes ○ No	○ Not available
10 **	Seizure	○ Yes ○ No	○ Not available

SECTION 7: PHYSICAL EXAMS

1 **	Physical Examination	○ Done	○ Not Done	○ Not available	

						Score (autofill)
2	NIH Stroke Scale	**NIH Stroke Scale**				
	1A. Consciousness	○ 0=Alert	○ 1=Sleepiness	○ 2=Stupor	○ 3=Coma	○ Not available
	1B. Questions	○ 0 = Answers both questions	○ 1 = Answers to only one question	○ 2 = Answers neither questions	○ Not available	○ Missing
	1C. Commands	○ 0 = Performs both tasks	○ 1 = Performs only one task	○ 2 = Performs neither tasks	○ Not available	
	2. Gaze	○ 0= Normal	○ 1 = Partial gaze palsy	○ 2 = Forced deviation, or total gaze paresis	○ Not available	
	3. Visual field	○ 0 = No visual loss	○ 1 = Partial hemianopia	○ 2 = Complete hemianopia	○ 3 = Bilateral hemianopia	○ Not available
	4. Facial palsy	○ 0 = Normal	○ 1 = Minor facial paralysis	○ 2 = Partial facial paralysis	○ 3 = Complete facial paralysis	○ Not available
	5. Arm strength — Left	○ 0 = No drift	○ 1 = Drift down before 10 seconds	○ 2 = Some effort against gravity	○ 3 = No effort against gravity	○ 4 = No movement. ○ UN = Limp amputated ○ Not available
	5. Arm strength — Right	○ 0 = No drift	○ 1 = Drift down before 10 seconds	○ 2 = Some effort against gravity	○ 3 = No effort against gravity	○ 4 = No movement. ○ UN = Limp amputated ○ Not available
	6. Leg strength — Left	○ 0 = No drift	○ 1 = Drift down before 5 seconds	○ 2 = Some effort against gravity	○ 3 = No effort against gravity	○ 4 = No movement. ○ UN = Limp amputated ○ Not available
	6. Leg strength — Right	○ 0 = No drift	○ 1 = Drift down before 5 seconds	○ 2 = Some effort against gravity	○ 3 = No effort against gravity	○ 4 = No movement. ○ UN = Limp amputated ○ Not available
	7. Ataxia	○ 0 = Absent	○ 1 = Ataxia in only one limb	○ 2 = Ataxia in two limbs	○ UN = Limp amputated	○ Not available
	8. Sensory	○ 0 = Normal	○ 1 = Mild to moderate sensory loss	○ 2 = Severe to complete sensory loss	○ Not available	
	9. Language	○ 0 = No aphasia	○ 1 = Mild to moderate aphasia	○ 2 = Severe aphasia	○ 3 = Mute or global aphasia	○ Not available
	10. Dysarthria	○ 0 = Normal	○ 1 = Mild to moderate dysarthria	○ 2 = Severe dysarthria or anarthria	○ UN = Intubated	○ Not available
	11. Inattention	○ 0 = No abnormality	○ 1 = Mild inattention	○ 2 = Severe inattention	○ Not available	
		Total Score (Autocalculated but editable)				
	Total Score (Interpretation)	○ 0 =No stroke	○ 1-4=Mild stroke	○ 5-15=Moderate stroke	○ 16-20=Moderate / Severe stroke	○ 21-42=Severe stroke

SECTION 8: STROKE CLASSIFICATIONS

1 **	WHO	○ Ischaemic	○ ICH	○ SAH	○ TIA
		○ Unclassified	○ Others, specify	○ Not available	
		If Others, specify			
2	OCSP	○ TACI	○ PACI	○ LACI	○ POCI
		○ Unclassified	○ Not applicable		
3	TOAST	○ Large vessel	○ Lacunar	○ Cardioembolic	○ Undetermined
		○ Determined	○ Not applicable		
4	Location	a. Location	○ Right	○ Left	○ Bilateral ○ Uncertain
		b. Brain Region	○ Hemisphere	○ Cerebellar	○ Brain stem

Patient Stroke Notification Part 3

SECTION 9.1 : PRIOR MEDICATION

1 ** **Prior medication**

○ Yes ○ No ○ Unknown

☐ **Antiplatelet**

- ☐ **Aspirin** — **Aspirin dose**: ○ 75 mg OD ○ 100 mg OD ○ 150 mg OD ○ 300 mg OD ○ Not available
- ☐ **Ticlopidine** ☐ **Clopidogrel** ☐ **Dipyridamole**
- ☐ **Triflusal** ☐ **Cilostazol**

☐ **Anticoagulant**

- ☐ **Warfarin** ☐ **Dabigatran** ☐ **Rivaroxaban** ☐ **Apixaban**
- ☐ **Heparin (Unfractionated)**
- ☐ **LMWH**

☐ **ACE inhibitors**

Active ingredient: ○ Perindopril ○ Enalapril ○ Captopril ○ Ramipril ○ Others, specify ○ Not available

Others specify

☐ **ARB**

Active ingredient: ○ Losartan ○ Irbersartan ○ Valsartan ○ Telmisartan ○ Others, specify ○ Not available

Others specify

☐ **CCB**

Active ingredient: ○ Amlodipine ○ Felodipine ○ Nifedipine ○ Nimodipine ○ Others, specify ○ Not available

Others specify

☐ **Beta blockers**

Active ingredient: ○ Metoprolol ○ Atenolol ○ Propanolol ○ Bisoprolol ○ Carvedilol ○ Others, specify ○ Not available

Others specify

☐ **Alpha blockers**

Active ingredient: ○ Prazosin ○ Terazocin ○ Others, specify ○ Not available

Others, specify

☐ **Diuretics**

Active ingredient: ○ Frusemide ○ Chlorothiazide ○ Moduretic ○ Indapamide ○ Hydrochlorothiazide ○ Others, specify ○ Not available

Others, specify

☐ **Lipid Lowering Therapy**

Active ingredient: ○ Lovastatin ○ Simvastatin ○ Atorvastatin ○ Pravastatin ○ Rosuvastatin ○ Ezetemide ○ Gemfibrozil ○ Others, specify ○ Not available

Others, specify

☐ **Antidiabetics**

- ☐ **Insulin**
- ☐ **Oral**
  - ☐ **Metformin**
  - ☐ **Sulfonylurea** — **If Sulfonylurea**: ○ Glimepiride ○ Gliclazide ○ Glibenclamide ○ Not Available
  - ☐ **DPP 4 Inhibitor** — **If DPP 4 Inhibitor**: ○ Sitagliptin ○ Vildagliptin ○ Linagliptin ○ Oxaligliptin ○ Not Available
  - ☐ **Acarbose**
  - ☐ **Others, specify**

☐ **Supplementary Medicine**

- ☐ **Lecithin**
- ☐ **Omega 3**
- ☐ **Others, specify**

☐ **Others, specify**

☐ **Complementary / traditional medicine**

Morisky Scale

Question		Score
1. Do you sometimes forget to take your medicine?	○ Yes ○ No ○ Not available	
2. Thinking over the past two weeks, were there any days when you did not take your medicine?	○ Yes ○ No ○ Not available	
3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	○ Yes ○ No ○ Not available	
4. When you travel or leave home, do you sometimes forget to bring along your medication?	○ Yes ○ No ○ Not available	
5. Did you take your medicine yesterday	○ Yes ○ No ○ Not available	
6. When you feel like your is under control, do you sometimes stop taking your medicine?	○ Yes ○ No ○ Not available	
7. Do you ever feel hassled about sticking to your treatment plan?	○ Yes ○ No ○ Not available	
8. How often do you have difficulty remembering to take all your medications?	○ Never/Rarely ○ Once in a while ○ Sometimes ○ Usually ○ All the time ○ Not available	
Morisky Total Score		

Morisky Score Interpretation: ○ Low Adherence ○ Medium Adherence ○ High Adherence ○ Not available

- **a. How long defaulted treatment**: (months) (years)
- **b. Reason**: ○ Attitude (fed up/ignorance) ○ Poverty (no transport, poor support from caregiver) ○ Previous dominant stroke ○ Others, specify ○ Not available
  - **If other reason, specify**

SECTION 9.2 : MEDICATION AT DISCHARGE

1 ** **Medication at discharge**

○ Yes ○ No ○ Unknown

☐ **Antiplatelet**

- ☐ **Aspirin**
  - **Aspirin dose**: ○ 75 mg OD ○ 100 mg OD ○ 150 mg OD ○ 300 mg OD ○ Not available
- ☐ **Ticlopidine** ☐ **Clopidogrel** ☐ **Dipyridamole**
- ☐ **Cilostazol** ☐ **Triflusal**

☐ **Anticoagulant**

- ☐ **Warfarin** ☐ **Dabigatran** ☐ **Rivaroxaban** ☐ **Apixaban**
- ☐ **Heparin (Unfractionated)**
- ☐ **LMWH**

☐ **ACE inhibitors**

Active ingredient: ○ Perindopril ○ Enalapril ○ Captopril ○ Ramipril ○ Others, specify ○ Not available

Others specify

☐ **ARB**

Active ingredient: ○ Losartan ○ Irbersartan ○ Valsartan ○ Telmisartan ○ Others, specify ○ Not available

Others specify

☐ **CCB**

Active ingredient: ○ Amlodipine ○ Felodipine ○ Nifedipine ○ Nimodipine ○ Others, specify ○ Not available

Others specify

☐ **Beta blockers**

Active ingredient: ○ Metoprolol ○ Atenolol ○ Propanolol ○ Bisoprolol ○ Carvedilol ○ Others, specify ○ Not available

Others specify

☐ **Alpha blockers**

Active ingredient: ○ Prazosin ○ Terazocin ○ Others, specify ○ Not available

Others, specify

☐ **Diuretics**

Active ingredient: ○ Frusemide ○ Chlorothiazide ○ Moduretic ○ Indapamide ○ Hydrochlorothiazide ○ Others, specify ○ Not available

Others, specify

☐ **Lipid Lowering Therapy**

Active ingredient: ○ Lovastatin ○ Simvastatin ○ Atorvastatin ○ Pravastatin ○ Rosuvastatin ○ Ezetemide ○ Gemfibrozil ○ Others, specify ○ Not available

Others, specify

☐ **Antidiabetics**

- ☐ **Insulin**
- ☐ **Oral**
  - ☐ **Metformin**
  - ☐ **Sulfonylurea**
    - **If Sulfonylurea**: ○ Glimepiride ○ Gliclazide ○ Glibenclamide ○ Not Available
  - ☐ **DPP 4 Inhibitor**
    - **If DPP 4 Inhibitor**: ○ Sitagliptin ○ Vildagliptin ○ Linagliptin ○ Oxaligliptin ○ Not Available
  - ☐ **Acarbose**
  - ☐ **Others, specify**

☐ **Others, specify**

SECTION 9.3 : STROKE KPI

2a) Anti- platelet within 48 hrs	Was patients given antiplatelet within 48 hours?	○ Yes ○ No If No, specify reason ☐ Haemorrhagic transformation ☐ Bleeding events (eg. hematuria, upper GI bleed) ☐ Others, specify
2b) Dysphagia screening	Was patient screened for dysphagia prior to oral intake?	○ Yes ○ No
2c) DVT prophylaxis	Were patients given DVT prophylaxis? NIH Stroke Scale for leg strength ≥3 @ MRC power ≤2/5	○ Yes ○ No If No, specify reason ☐ Contraindicated ☐ Refusal ☐ Other reason DVT Prophylaxis not given
2d) Stroke Education	Did patients or carers receive stroke education regarding • Risk factors for stroke • Stroke warning symptoms • Medication • Rehabilitation • Follow up?	○ Yes ○ No
2e) Rehabilitation	Is there any documentation in patient's file that specific plans for rehabilitation were made(during in-patient and upon discharge)?	○ Yes ○ No
2f) Anticoagulant for Atrial fibrillation patient	• Risk factor Atrial fibrillation • ECG atrial fibrillation • cardioembolic stroke	○ Yes ○ No If No, specify reason ☐ Contraindicated ☐ Refusal ☐ Other reason, specify
2g) Antiplatelet upon discharge		○ Yes ○ No
2h) Lipid lowering therapy upon discharge		○ Yes ○ No

SECTION 10 : ACUTE MANAGEMENT

1 Acute Management — ○ Yes ○ No ○ Not available

a) Thrombolysis	○ Yes ○ No ○ Not available Date of Thrombolysis (dd/mm/yy) ____ Time of Thrombolysis (24 hours clock) ____
b) IV Therapy	○ Yes ○ No ○ Not available ☐ Anti-Hypertension ☐ IV Labetalol ☐ IV Nimodipine ☐ IV Nitroprusside ☐ IV Nitroglycerine ☐ IV Nicardipine ☐ IV Isosorbide Mononitrate (Isoket) ☐ Insulin ☐ Mannitol ☐ Heparin ☐ Inotropic Drug ☐ Noradrenaline ☐ Dobutamine ☐ Dopamine
c) Intubation	○ Yes ○ No ○ Not available
d) Surgical Intervention	☐ Craniectomy ☐ VP shunt ☐ Clot evacuation ☐ Others, specify
e) Other procedures	☐ Intra-arterial thrombolysis Date (dd/mm/yy) ____ Time (24 hours clock) ____ ☐ Mechanical thrombectomy Date (dd/mm/yy) ____ Time (24 hours clock) ____
f) In hospital transferred out	○ Yes ○ No ○ Not available Location: ○ Neuro ICU ○ General ICU ○ HDW ○ Ward ○ Acute stroke ward ○ Others, specify ○ Not available If Others, specify ____

Patient Stroke Notification Part 4

SECTION 11: 1st HEMATOLOGY & OTHER LABORATORY RESULTS

1st hematology and other laboratory results available?	○ Yes ○ No ○ Not available

	Hematology & other laboratory	Value	Tick if Not Done		Hematology & other laboratory	Value	Tick if Not Done
1	Hemoglobin (g/dL)		☐	6	HDL (mmol/L)		☐
2	Glucose (mmol/L)		☐	7	LDL (mmol/L)		☐
	Fasting or Non fasting	○ Fasting ○ Non fasting ○ Not available					
3	Creatinine (umol/L)		☐	8	Triglycerides (mmol/L)		☐
4	Uric acid (umol/L)		☐	9	INR		☐
5	Total cholesterol (mmol/L)		☐	10	HbAIC (%)		☐
				11	Platelet (10^9/L)		☐

SECTION 12: INVESTIGATIONS

1 **	CT Scan	a. Date of first scan (dd/mm/yy)		b. Time of first scan (24 hours)	
		c. Duration of onset to CT Scan	Hours Mins	d. Neuroimaging findings	○ Normal ○ Abnormal ○ Not available
2	First ECG upon admission	a. Date of ECG (dd/mm/yy)		b. Time of ECG (24 hours)	
		c. ECG Findings	○ Normal ○ Abnormal ○ Not available		
		If ECG Findings Abnormal	○ Atrial fibrillation ○ Left ventricular hypertrophy ○ Ishemic changes ○ Others, specify ○ Not available		
		Others, specify			

3	Imaging and Other Investigation	☐	MRI	Findings	○ Normal	○ Abnormal ○ Not available
		☐	Carotid Doppler	Findings	○ Normal	○ Abnormal ○ Not available
		☐	TCD	Findings	○ Normal	○ Abnormal ○ Not available
		☐	Cerebral angiography	Findings	○ Normal	○ Abnormal ○ Not available
		☐	Angio MR	Findings	○ Normal	○ Abnormal ○ Not available
		☐	Angio CT	Findings	○ Normal	○ Abnormal ○ Not available
		☐	ECHO	Findings	○ Normal	○ Abnormal ○ Not available
		☐	Holter	Findings	○ Normal	○ Abnormal ○ Not available

SECTION 13: OUTCOME

1 ** Stroke complications during hospitalization

☐ None		☐ Decubitus ulcer		☐ Sepsis, Specify	
☐ Stroke associated pneumonia		☐ Cardiac Complication, specify		☐ Deep vein thrombosis	
☐ Gastrointestinal bleed		☐ Seizure		☐ Pulmonary Embolism	
☐ Neuropsychiatric Complication, specify		☐ Ventilated Associated Pneumonia		☐ Other, specify	

2 ** Modified Rankin scale

- ○ 0= No symptoms at all
- ○ 1=No significant disability despite symptoms; able to carry out all usual duties and activities
- ○ 2=Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
- ○ 3=Moderate disability; requiring some help, but able to walk without assistance
- ○ 4=Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted
- ○ 5=Severe disability; bed ridden, incontinent and requiring constant nursing and attention
- ○ 6=Death
- ○ Not available

3 ** Date of discharge (dd/mm/yy) _____ **4 Length of stay (days)** _____

5 Discharge destination

- ○ Home
- ○ Old folks home (charity)
- ○ Nursing home
- ○ Others, specify
- ○ Not available

If others, specify _____

6 ** Outcome

- ○ Alive
- ○ Death
- ○ Transfer to a new centre
- ○ Not Available

If Alive :

a. Follow Up

- ○ Yes
- ○ No
- ○ Not available

Follow Up Destination

- ○ Neurology/ Stroke clinic
- ○ MOPD
- ○ GP/ Private
- ○ Klinik Kesihatan
- ○ AOR
- ○ Others, specify
- ○ Not available

If Klinik Kesihatan, Specify Destination _____

If others, specify _____

Estimated date of the next follow up (dd/mm/yy) _____

If Death :

a. Date of death _____

b. Cause of death

- ○ Massive infarct
- ○ Massive bleed
- ○ Cardiac cause
- ○ Sepsis due to aspiration pneumonia
- ○ Sepsis due to other foci
- ○ GIT bleed
- ○ Metabolic cause eg renal failure
- ○ Others, specify
- ○ Not available

If others, specify _____

If Transfer to a new centre :

a. Name of centre transferred to _____

If others, specify _____

Office Use				
Patient Name				
Identification Card Number	MyKad / Mykid		Old IC	
	Other ID document no		Specify type (eg. passport, armed force ID)	

1	Reporting Centre	

Patient Stroke Follow Up

SECTION 1 : DATE OF ASSESSMENT / FOLLOW UP / OUTCOME

1 **	Date of assessment / visit / Follow up (dd/mm/yy)	☐ Not applicable
2	Follow up month	○ Month 3 ○ Month 12 ○ Others ○ Not Available If Other Month

SECTION 2 : PATIENT STATUS

1 **	Patient status	○ Alive ○ Death ○ Transfer to a new centre ○ Lost to follow up ○ Others, specify ○ Not Available	
	Date of death/Date of transfer/ Date of last contact /follow-up (dd/mm/yy)		
	If Death, Primary cause of death	a. Neurologic cause	○ Yes ○ No ○ Not available
		b. Another cause	○ Yes ○ No ○ Not available
		If another cause, Yes	○ Recurrent stroke ○ Cardiovascular related death ○ Sepsis ○ Others, specify ○ Not available Others, specify
	If Transfer to a new centre, Name of centre		
	If Others, specify		
2 **	Modified Rankin scale	○ 0= No symptoms at all ○ 1=No significant disability despite symptoms; able to carry out all usual duties and activities ○ 2=Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance ○ 3=Moderate disability; requiring some help, but able to walk without assistance ○ 4=Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted ○ 5=Severe disability; bed ridden, incontinent and requiring constant nursing and attention ○ 6=Death ○ Not available	
3 **	BP (mmHg)	Systolic / Diastolic / ☐ Not available	
4	Glucometer reading (mmol/L)		
5	Complications	☐ None ☐ Seizure ☐ Spasticity ☐ Cardiac Complication, specify ☐ Decubitus ulcer ☐ Pneumonia ☐ Neurocognitive ☐ Others, specify	
6	Readmission	○ Yes ○ No ○ Not available Reason for Readmission: ○ Acute stroke ○ Stroke related complications ○ Non-Stroke related complications ○ Not available	