

REVIEW ARTICLE

Regional Emergency Stroke Quick-Response (RESQ) Network: A Proposed Paradigm of Malaysia Stroke Care Services

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ABSTRACT

Stroke care service in Malaysia is suboptimal despite the fact that it is one of the commonest cause of death. This is due to several limitations, including lack of resources and funding for the stroke care establishment and the management itself. Alternatively, other regions have come up with numerous ways to combat the difficulties in order to provide better stroke care services. We have identified the overwhelming benefits of creating stroke care units, thrombolysis services, and endovascular thrombectomy. For this reason, we designed a Regional Emergency Stroke Quick Response Network (RESQ) based on the needs of the current situation in Malaysia. With a standardised RESQ training, we hope to achieve close-knitted cooperation in between the emergency medical services, emergency department team and the RESQ, which subsequently will create an ideal improvised stroke care units.

Keywords: RESQ, Stroke, Thrombolysis, Stroke Care Unit, Malaysia

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INTRODUCTION

Stroke topped the second leading cause of both death and morbidity combined in Malaysia (1). To date, stroke is the third most common cause of death in Malaysia (1). It is estimated that in the next 15-20 years, stroke incidence will rise exponentially due to the ageing population. Despite this alarming statistic, most hospitals in Malaysia do not give priority to stroke treatment in terms of space, equipment, tools, medicines, budget, and staffing. Three important services that have a major impact in the treatment of stroke are the development of stroke care unit (SCU), intravenous thrombolysis therapy and recently endovascular thrombectomy (Table I) (2–5).

Stroke Care Unit provides a substantial impact in reducing death and dependency as it covers all stroke admissions (6,7). The thrombolysis and thrombectomy are indicated only for selected patients, its impact is mainly seen on those with severe strokes in preventing permanent disability (5–8). A thrombolysis cost-effectiveness study has shown a significant long-term good outcome impact in acute ischaemic cerebral stroke patients (8). Data

Table I : The RRR and NNT based on Interventions

Intervention	Outcome	Relative Risk Reduction	Number Needed to treat
Stroke Care Unit	Death/dependency	17	28
Thrombolysis	mRS 0-1	20	15
Aspirin	Recurrent stroke/death	10	111
BP lowering in ICH	Death/dependency	6.5	28
Thrombectomy	Death/dependency	70	3

(mRS – modified Rankin Score, BP – blood pressure, ICH – Intracranial Haemorrhage, RRR – Relative Risk Reduction, NNT – Number Needed to Treat)

from Malaysia national stroke registry showed that only 0.65% of stroke patients were treated with thrombolysis (9), there was however no data on the latest number of SCU in Malaysia (8,9). Our thrombolysis rate was low compared to other developed countries, which have rates of 10-20% (10,11), though Malaysia clinical practice guidelines in ischemic stroke management gave a strong recommendation for the development of SCU and thrombolysis services (12).

The overwhelming evidence of the benefits of a SCU has been available for more than 30 years and thrombolysis for more than 20 years. Most of the developing country in Asia faced the similar challenges in acute stroke care such as financial burden, limited resources in terms of neurology and radio-imaging services (2,11,13). Malaysia, as one of the middle-income-group developing

country (same group as Thailand), has smaller number of neurologists (1.78/1,000,000 Malaysian population Vs 5.69/1,000,000 Thai population) and SCUs as compared to Thailand (13). Nonetheless, these obstacles may not exist in most of the developed countries. For example, the SCUs and thrombolysis services were managed by general physicians and geriatricians in the United Kingdom (7). The rate of post thrombolysis bleeding complications can be reduced as low as especially if patients selections were cautious (3,13). The incidence of post thrombolysis intracranial bleed was merely 6% (14). If at all post-thrombolysis intracranial bleed occurred, then it should be managed with relevant blood product transfusion (eg. cryoprecipitate, fresh frozen plasma), vitamin K and tranexamic acid apart from neurosurgical intervention (3). The lack of appropriate facilities and financial support will have to be addressed by the authorities because, without these services, stroke management in this country will be suboptimal. According to the data, we were lagging behind compared to our neighbouring countries such as Thailand, Indonesia, Singapore and Vietnam (13). We have 48 hospitals (24 each in private and public) (Table II) which offered thrombolysis service, however it was not stated whether these centres were equipped with SCUs, stroke wards or multidisciplinary teams (adapted from mystrokehospital.my/locate) (15). There is otherwise availability of stroke wards in University Malaya Medical Centre and Hospital University Kebangsaan Malaysia. Despite of this, our rate of thrombolysis and numbers of SCUs were lower comparing to neighbouring countries based on the data (12,13). We presumed that data were not captured into our national data and registry.

DEVELOPMENT OF RESQ (REGIONAL EMERGENCY STROKE QUICK RESPONSE NETWORK)

The RESQ network strategy was proposed in order to develop SCU and thrombolysis services in hoping that these services can be made available and benefitted more Malaysians. An effective strategy is important as the time window for thrombolysis is less than 4.5 hours (3). An effective in-hospital system is crucial to avoid delay. It is known that up to 1.9 million neurons will die for every one minute of delaying treatment.

The best hospitals to start these services are those with existing CT scan facilities. This is the minimum requirement before others can be added in. These SCUs should be regional in concept and geographically determined to avoid delays in transferring patients. The Emergency Medical Services (EMS) system should be integrated to provide information of the nearest hospital which offers thrombolysis and SCU services once a patient with stroke is identified by the paramedic as a potential candidate to receive thrombolysis treatment. A RESQ team call which consists of the emergency physician, stroke nurse, radiographer, radiologist, general medical or neurology medical officer and

Table II : Lists of hospitals in Malaysia (in 12 states) which provide thrombolysis service

States in Malaysia	Public Hospitals	Private Hospitals
Sarawak	Pusat Jantung Sarawak	Borneo Medical Centre
	Hospital Umum Sarawak	Normal Medical Specialist Centre
	Hospital Sarikei	Kuching Specialist Hospital
	Hospital Miri	
Sabah	Hospital Queen Elizabeth	Gleneagles Kota Kinabalu
Johor	Hospital Sultanah Aminah	Regency Specialist Hospital KPJ Puteri Specialist Hospital
Malacca	Hospital Melaka	
Negeri Sembilan	Hospital Seremban	
Pahang	Hospital Temerloh	
	Hospital Tunku Ampuan	
Terengganu	Hospital Sultanah Nur Zahirah	
Kelantan	Hospital Universiti Sains Malaysia	
	Hospital Raja Perempuan Zainab	
Kedah	Hospital Sultan Abdul Halim	Hospital Pantai Sungai Petani
Penang	Hospital Seberang Jaya	Loh Guan Lye Hospital Island Hospital Pantai Hospital Penang
Perak	Hospital Seri Manjung	Pantai Hospital Ipoh
	Hospital Raja Permaisuri Bainun	Hospital Fatimah
	Hospital Taiping	KPJ Ipoh Specialist Hospital
Selangor	Hospital Tengku Ampuan Rahimah	Sunway Medical Centre
	Hospital Kuala Lumpur	Ara Damansara Medical Centre
	Hospital Sungai Buloh	KPJ Selangor Sepcialist Centre
	Pusat Perubatan Universiti Malaya	AVISENA Specialist Centre
	Hospital Universiti Kebangsaan Malaysia	Gleneagles Specialist Centre
	Hospital Pengajar Universiti Putra Malaysia	Subang Jaya Medical Centre Prince Court Medical Centre Pantai Hospital Kuala Lumpur Thompson Hospital Kota Damansara KPJ Damansara Specialist Centre Assunta Specialist Centre

specialist on call will be activated and on standby to receive the patient. This is to facilitate the in-hospital receiving system and to avoid delay in treatment.

We understand that it is a dynamic process to implement RESQ units. We need time, resources and expertise for its growth to be more accessible and available. However, we wish to highlight that it is not necessary to create new beds in order to set up a stroke unit. One can always re-design and re-allocate the pre-existing beds in the wards (especially in general medical and neurology wards). The ultimate purpose is to group all newly diagnosed stroke patients in close proximity in an organised manner which will enhance patients' care benefit, in terms of improving patients' survival outcomes and increases staffs' skills and expertise in anaging and caring for stroke patients (6,7,16) .

STRATEGIES IN SELECTING RESQ UNITS

The initial implementation of SCU requires the readiness of an organization such as prior identification of the historical patient volumes and forecasted needs for stroke care. The proximity and capacity of other stroke services in the region should also be taken into consideration as patients should be transported to available or nearby stroke centres for prompt evaluation and care. An immediate treatment within the first few hours following the onset of ischaemic stroke has shown to improve the outcome by altering the effect of thrombolysis (17). A team of human resources with stroke expertise that includes physicians, therapists and nurses should be promptly planned in a systematic way. This is followed by the construction of physical resources: available spaces, the ability to allocate beds, therapy equipment, monitoring equipment, and staff amenities. The number of dedicated beds and monitoring equipment should be sufficient to accommodate the expected number of stroke admissions. A stable financial resources either from the hospital or the regional health care system are important to be able to support this cause continuously.

A multidisciplinary team including physicians, neurologists, nurses, therapists, and administrative staff should be identified for initial planning of the SCU whereby they will be responsible for the primary organization and execution of the unit. The team should establish the criteria and requirements of the SCU based on evidence from clinical practice guidelines, randomized controlled trials and expert consensus. This includes determining the target population, necessary equipment and infrastructure, diagnostic and therapeutic interventions, skilled nursing care and rehabilitation plans (18).

A case study from Australia recommended that hospitals which admitting more than 100 acute stroke patients per year should prioritize the establishment of a stroke unit as stroke patients in mixed wards were less likely

to receive necessary diagnostic and therapeutic care in due time (19). Thus, assessing and projecting the total number of stroke volumes and services executed in the catchment region is required prior to the development of SCU. The location of the facility should be well-planned within a geographically defined area as to where most stroke patients are currently being managed and the beds should be occupied exclusively by stroke patients (20). Consideration should also be given to the need for new beds or to re-allocate existing beds only. The minimum number of beds required for SCU could be determined by projecting the expected length of stay per year during both the acute and rehabilitation phases in the catchment region. For example, experts from the European Stroke Organization recommended a minimum of 4 beds in the acute stroke monitoring section for providing 24-hour continuous monitoring of vital parameters (18). Further studies reported that an increase of 10 to 14 stroke unit beds could reduce the number of delayed patients from 1 in every 7 patients to 1 in every 50 patients (21). However, these numbers may vary locally depending on the number of available stroke units and access to rehabilitation care in the region. In order to sustain an effective stroke unit, medium and long-range needs are to be considered as there will be more capacity demands when the stroke system matures.

The establishment of the RESQ implementation team should apply a multidisciplinary approach with the involvement of human resources regarding staffing and labour relations. The RESQ team comprises a RESQ unit manager, physicians (neurologists, radiologists, general physicians, geriatrician, and medical rehabilitation physician), specialized nurses, pharmacists, speech therapists, physiotherapists, speech and swallowing therapists, occupational therapists, emergency department (ED) representatives, and social workers. The team should be trained and have expertise in stroke management to provide coordinated multidisciplinary care to the patients (18). The importance of an organized multidisciplinary team is demonstrated in a randomized clinical trial that reported stroke patients receiving organized stroke care are more likely to have a longer life span after the stroke (20).

There are a number of infrastructural and organizational requirements that would need to be addressed by the RESQ implementation team before transferring it into routine clinical practice. An organised services within the facility including evaluation of the patient in the ED and ICU for preliminary diagnosis and treatments, inpatient and outpatient mobilization and rehabilitation services, and clinic follow-ups. These required a proper development of documentation and communication tool such as evidence-based stroke care protocols, a standardized and valid assessment tools, pathways, check-lists, and patient charts (16). The information recorded is crucial in determining the management

plan and sequence of events from admission. The establishment of a stroke-specific clerking document has significantly improved the quality of information recorded and benefits the patients by early identification of stroke and monitoring progression of symptoms, following earlier rehabilitation, which therefore reduced any potential complications (22).

The RESQ team should also develop criteria for patient admission to the unit which is exclusively only for stroke patients, the expected length of stay starting from admission to rehabilitation, frequent multidisciplinary team meetings to share updates and plan care and lastly discharge criteria such as patients who are medically stable, with mild or moderate disability can continue rehabilitation services at home (23). The proper equipment and supplies, unit identification and signage should also be determined. This constitutes an operative laboratory with all basic tests, radiology services with at least a CT scan, a 24-hour operating ED and ICU, electrocardiogram (ECG) to identify patients with acute myocardial infarction, transesophageal echocardiography and transthoracic echocardiography for the detection of cardiac comorbidities, and access to MRI on-site (18).

All medical and nursing staff requires continuous medical education and training in stroke management as appropriate, varying from workshops, seminars, and training. This includes formal practical training on SCU before working independently and the service quality could be monitored by regular audits, feedback, and surveys (18,24). Besides that, the SCU can provide a platform for clinical research opportunities which benefits both the patients and staffs' in the understanding and improvement of stroke care services. A study in Australia reported hospitals with stroke units and more than 200 admissions per year had greater involvement in stroke research and the patients that participated received better quality of care and are more likely to survive (25). Finally, consideration should be given to the use of tele-video conferencing technology for outreach, clinical consultation or education (23), which could improve patient's care, management and outcomes, also reduce health-care costs (26).

A SCU should maintain an on-going measurement, monitoring system with practical documentation using a standardized performance indicators to maintain the quality of care. These performance indicators, or also called quality indicators or key performance indicators (KPIs) is important in providing an adequate standard of care to patients (27). The key process and outcome performance measures for SCU recommended by the Stroke Council, Malaysian Society of Neurosciences (12) are as follows:

- i. Initiate deep vein thrombosis prophylaxis
- ii. Discharged on anti-thrombotic therapy
- iii. Patients with atrial fibrillation receive anti-

coagulations

- iv. Thrombolytic therapy administered
- v. Anti-thrombotic therapy received by the end of hospital day two
- vi. Discharged on cholesterol-reducing medicine
- vii. Dysphagia screening
- viii. Stroke education
- ix. Assessed for rehabilitation

(*thrombectomy was obtained as strong evidence only after the year 2015)

There will be needs for recent comprehensive information on KPIs for stroke care with ongoing developments in clinical guidelines (28). Data sources must therefore be established by optimizing the use of administrative data systems within the facility, and by associating the demand and feasibility of specific, targeted data collection of SCU indicators (23). However, implementation of the indicators into routine practice would be challenging and requires regular observation (26,27). This could be managed by determining the frequency of monitoring and reporting to the administration, staff, and patients on performance measures(16). Performance monitoring includes variance tracking, length of stay, RESQ key time intervals, patient satisfaction, staff satisfaction, rate of re-admission, and mortality.

RESQ STANDARDS FOR PRE-HOSPITAL AND EMERGENCY DEPARTMENT

Stroke patients must be transported to a stroke unit without delay to increase the possibility of an early treatment and good outcome. Reducing delays from onset of symptoms to admission by performing a rapid assessment, diagnostic work-up and decision-making are necessary for potential therapeutic benefits and initiation of thrombolysis (24). RESQ standards pertaining to pre-hospital and ED stroke care involves overall evaluation, interventions, transfer service, and interactions beginning from initial contact with the ambulance paramedics, to ED admission until transfer to the appropriate primary and secondary RESQ units.

1. Paramedics that arrive on-scene must be able to screen and manage potential stroke patients during transfer with a standard pre-arrival protocol with the RESQ unit regarding the prioritization for stroke patients. Measurement of vital signs and pre-assessment for symptoms of stroke should be conducted. Several validated instruments are available for prehospital assessment such as Face, Arm and Speech Test (FAST) that assess 3 key elements (facial weakness, arm weakness, and speech disturbance) can be administered quickly and requires little training, has proven to achieve diagnostic accuracy and high levels of detection (26,27).

2. Subsequently, paramedics will provide the necessary evaluation to the patient and begin prompt transport to appropriate RESQ units, favourably within

an hour. A pre-notification alert is needed by the receiving RESQ unit to activate protocols, necessary equipment preparations and to inform physicians and relevant personnel on the arrival of the patient (23).

3. It is crucial that ED physicians are aware of the patient's presentations prior to their arrival to initiate necessary management. Paramedics should provide essential information during the pre-hospital phase such as time of stroke onset or last point in time without the symptom, comorbidities, current medications, vital signs, and socio-demographics (23). A structured handover framework could improve the validity and expedite information transfer between paramedics and RESQ (28).

4. The triage times and management on arrival of patients in the ED is variable, a 15 minutes decrease in treatment delay could result in a greater likelihood of good recovery and better quality of life after stroke (29).

5. A RESQ neuroradiology service standards should be established to provide immediate or fast track access for suspected stroke patients to brain imaging prior to initiating any therapy. We aim to do CT scan within 20 minutes (3) in all acute stroke patients with a complete interpretation of the brain imaging (mainly to exclude intracranial haemorrhage). As for the patients with low index suspicious of stroke, they should receive a CT scan within 12 hours of arrival (18). A delay in initiation of treatment could be reduced by minimizing the time interval from ED presentation to initial brain imaging (30).

6. Patients evaluated with ischemic stroke and are eligible for intravenous thrombolysis should receive the treatment by trained and experienced specialist staff. An immediate administration of thrombolysis is significantly related to a better outcome and could minimize the risk of haemorrhage with a recommended target arrival (door) to treatment (needle) time within 60 minutes and 4.5 hours from onset of the symptom (30). Furthermore, thrombolysis initiated within 1.5 to 3 hours of the onset of symptom was associated with favourable outcome (OR, 1.55) compared to within 3 to 4.5 hours (OR, 1.40) and beyond 4.5 hours (OR, 1.15) (30,31). Studies reported multi-component quality improvements such as a revised treatment protocol, clinical decision support tools and training sessions in thrombolytic administration were associated with a decrease door-to-needle (DTN) time to less than 60 minutes along with improvements in clinical outcomes (32–35).

7. The RESQ stroke service should also execute a protocol for utilizing telemedicine for assessment and treatment intervention of the patient in cases where neurologists are not available on-scene. Telemedicine in stroke care is also beneficial in providing support to

remote regions that lack expertise and accessibility to specific treatments (35). The assessment by telemedicine neurologists and the decision for thrombolysis treatment are proven to be both reliable and accurate, comparable to assessments provided by neurologists on-site (36).

PRIMARY AND SECONDARY RESQ UNITS

The acronym RESQ is coined to re-brand the SCU into a regional concept by adapting to the Malaysia healthcare system. This is also in line with the recent landmark trial and the subsequent meta-analysis showing that endovascular thrombectomy is very effective in reversing stroke disability (37–39). Therefore the RESQ strategy takes into account and identified the centres with basic CT scan facilities and general physicians versus the more well-equipped centres with neurologist, neuro-interventionists and/or neurosurgeons. Patients will be channelled to these RESQ centres with a two-tiered concept either a primary or secondary RESQ unit as shown in Figure 1. Table III describes the criteria of a primary and secondary RESQ Unit.

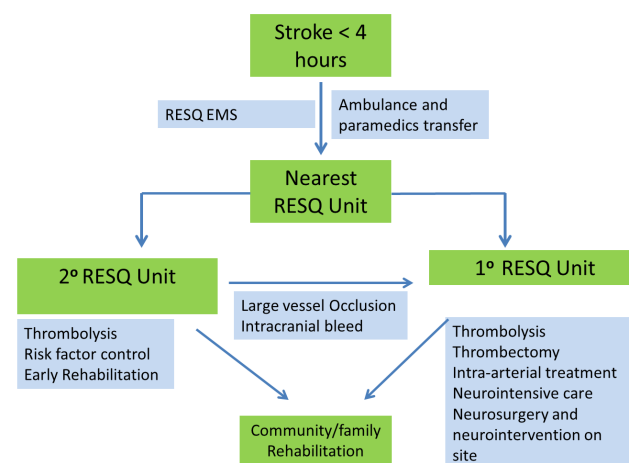


Figure 1: A definite network between EMS, pre-hospital staffs, RESQ units and hospitals. Patients with stroke of less than 4 hours are identified and transferred to either a primary or secondary RESQ units (1° - Primary, 2°- Secondary, RESQ-Regional Emergency Stroke Quick Response Network, EMS Emergency Medical Services)

The primary RESQ Units should be able to provide a regular training workshop for all health personnel involved. These training workshops should focus on the appropriate groups and be held at regular intervals. The module includes:

- i. Hands-on thrombolysis kit training
- ii. Training and certification for NIHSS and modified Rankin Score (mRS)
- iii. Standardised brain imaging interpretation training, such as CT and MRI brain
- iv. Standardised real-time scenarios

RESQ UNIT STANDARDS

1. All patients suspected of having an acute stroke

Table III : Criteria of a primary and secondary RESQ Unit

	Criteria
Primary RESQ Unit	1. Centres with specialized resources and personnel available at all times (24 hours a day, 365 days a year) to provide assessment and management of stroke patients
	2. Established written stroke protocols for emergency services, in-hospital care and rehabilitation
	3. Able to offer thrombolytic and/or thrombectomy therapy to suitable ischemic stroke patients; rapid neurovascular imaging and expert interpretation; and coordinated processes for patient transition to ongoing rehabilitation, secondary prevention and community reintegration services.
	4. Neurosurgical facilities and interventional radiology services
	5. Neuro-intensive care facilities
	6. Leadership role in establishing partnerships with secondary RESQ units and other local hospitals for supporting stroke care services
	7. Performance measurement system in place to monitor the quality of stroke care and patient outcomes
	8. Provide training and certification
Secondary RESQ Unit	1. Facilities with clinicians who have stroke expertise. The clinician can include physicians, emergency physicians or geriatrician who undergoes training in certified training centres with structured modules.
	2. Established written stroke protocols for emergency services, acute care and/or rehabilitation
	3. Ability to offer thrombolytic therapy to suitable ischemic stroke patients and/or protocols to transfer appropriate patients to a Primary RESQ Unit
	4. Ability to perform rapid neurovascular imaging and timely access to expert interpretation
	5. Coordinated processes for patient transition to on-going rehabilitation and secondary prevention

will have immediate access to the RESQ Unit under the management of a multidisciplinary stroke team. Our target is more than 90% of patients are direct admissions, and at least 90% of their length of stays are in SCU. The admission to SCU should be less than 4 hours from hospital arrival. Multi-disciplinary team meeting should hold at least once in every week, to discuss the progression of the patients and their appropriate transfers of care.

2. The RESQ Unit shall provide facilities for continuous physiological monitoring during acute illness. General monitoring and management of physiological parameters (blood pressure, pulse rate and rhythm monitoring, saturation oxygen using pulse oximeter, sugar profile) and basic neurological status (pupil size, glasgow coma scale) should be carried out on regular bases (at least four hours). Continuous monitoring (at least hourly) should be available for patients with severe stroke.

3. The SCU should have at least twice daily ward rounds. The management, assessment and clinical diagnosis of all patients should be reviewed. Acute stroke patients should receive a daily assessment of the stroke medical care team. The medical doctor should conduct ward round every day including the weekends, led by a neurologist/stroke specialist/medical specialist who are trained or have experienced in stroke care management.

4. The RESQ Unit should provide adequate qualified

nursing staff to ensure the quality of nursing care is not compromised. Patients with acute stroke or who have undergone acute stroke treatment (intravenous thrombolysis and/or endovascular thrombectomy) should receive intensive monitoring and nursing input during the first 72 hours of admission. Our target is to have a minimum nurse to patient ratio of 1:2.

5. A swallow screening assessment should be performed for all patients on the day of admission, by the appropriately trained and competent staff. Our target is to perform this assessment before any food, fluids or medication is administered orally or within four hours of admission. After 24 hours of admission, a complete and thorough assessment should be carried out to confirm dysphagia or in uncertain cases.

6. All patients should encourage for early immobilisation as early as possible if no contraindication (such as reduced conscious level, unstable blood pressure).

7. The RESQ Unit should develop a guideline for the placement and management of urinary catheter in acute stroke patients. Urinary catheters should be avoided unless is necessary (e.g. urinary retention). There should be a clear justification to use a urinary catheter.

8. The risk of venous thromboembolism should be determined and treated accordingly for all patients. The immobile patients (unable to mobilise to the toilet

without the aid of another person) should be given continuous intermittent pneumatic compression as proven in CLOTS III trial (40) if no contraindication.

9. Each RESQ unit should have a team of dedicated therapists (comprises of a physiotherapist, a speech therapist, an occupational therapist) who will be able to deliver their services every day. All patients should receive at least forty-five minutes of physiotherapy and/or speech therapy and/or occupational therapy visits in a day.

10. There should be at least one pharmacist assign to each RESQ unit for regular input, such as reviewing any drug interactions and facilitate patient concordance on discharge.

11. There should have regular support from nutrition team in every RESQ unit, to give nutritional advice and tube-feeding interventions. Assessment of dysphagia and nutritional status on admission and weekly throughout the patient's stay in SCU. The decisions on the insertion of percutaneous endogastric tube should be taken only after a multi-disciplinary group discussion (3,11).

12. An evidence-based up-to-date guidelines on the management of post-stroke complications and protocols on secondary stroke prevention should be readily available in each unit.

13. All RESQ unit should have a rehabilitation unit, which should be made available for all patients with stroke. The rehabilitation team should consist of a rehabilitation medical officer or specialist, physiotherapist, occupational therapist, speech therapist and a nurse. There should be a well-designed, tailored-made programme of stroke educations for medical staffs, patients and their family members.

14. Patients with stroke who are haemodynamically stable with stroke are transferred from the SCU to the general/neurology/rehabilitation ward without delay. All RESQ unit should establish a protocol of transfer to ensure a smooth transfer of care. The delay in the patient's transfer process should be avoided and patient's management should not be compromised.

RESQ DISCHARGE AND FOLLOW-UPS

1. The patient should only be discharged when they (the patient's carer and patients) are ready. Relevant equipment (eg. ripple mattress, nasogastric tube feeding, etc) and training for the appropriate care should be done before discharged.

2. All patients should be discharged with a follow-up appointment. A clear protocol of a follow-up assessment should be in place, as well as a 6 monthly assessment by stroke MDT, especially for patients with persisting disability.

3. All patients should receive advice regarding driving in both written and verbal form based on the Road Transport Department Malaysia's regulations.

4. Stroke key performance index is reviewed before discharge, and appropriate forms are filled up.

CONCLUSION

The stroke service in Malaysia is currently suboptimal and serious measures need to be taken for improvement. This includes major state hospitals, university hospitals and those with speciality services. Hospitals with potential to become primary RESQ units which will become an important centre of reference should be identified. We hope RESQ standards can be a benchmark and reference point while setting up stroke care units and improvise the current stroke services to the level that is at par with our neighbouring countries.

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