

Evaluating Improvement in Acute Stroke Management following Pre-hospital Initiation of Acute Stroke Service

JESSICA AN¹, WAN ASYRAF WZ², NIK AZLAN NM¹

¹Pre-Hospital Care Unit, Department of Emergency Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia

²Neurology Unit, Department of Internal Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia

ABSTRAK

Pemberitahuan pra-hospital kepada pasukan strok dalam memberi amaran mengenai pesakit strok akut yang akan tiba ke hospital dijalankan di beberapa negara di seluruh dunia. Pada masa ini perkara ini tidak diamalkan di Malaysia. Kajian ini menilai kebolehlaksanaan dan kesan terhadap masa yang diambil dari ketibaan pesakit di Jabatan Kecemasan kepada penilaian pasukan strok ketika pemberitahuan pra-hospital digunakan. Tempoh kajian kawalan kes ini adalah di antara Jun 2018 hingga Januari 2019. Fasa kawalan terdiri daripada pasukan strok yang mengaktifkan secara konvensional setelah penilaian di hospital oleh pegawai perubatan kecemasan. Ini kemudian diikuti dengan fasa intervensi di mana pengaktifan pasukan strok dilakukan oleh kakitangan "Prehospital Emergency Care" (PHC) di tempat kejadian. Latihan kakitangan PHC dalam mengenali strok akut didasarkan pada pengenalanpastian kelainan BE-FAST (Imbangan, Mata, Wajah, Lengan dan Ucapan). Objektif kajian ini adalah untuk membandingkan masa antara dua kumpulan untuk waktu tinjauan pasukan strok akut, pintu untuk imbasan 'computerised tomography' (CT) dan waktu untuk trombolisis. Tiga puluh sembilan pesakit dianalisa (kawalan n=29, intervensi n=10). Hasilnya tidak signifikan ($p>0.05$). Waktu purata dalam beberapa minit untuk fasa kawalan vs fasa intervensi adalah seperti berikut: waktu masa tiba pesakit ke penilaian pasukan strok, 25.96 ± 39.16 vs 15.9 ± 13.14 , waktu tiba pesakit ke imbasan CT dijalankan adalah 43.04 ± 40.00 berbanding 25.8 ± 11.35 . Hanya 3 pesakit yang menjalani terapi trombolitik dalam tempoh kajian. Kekangan yang dihadapi adalah data bukan parametrik dengan kekurangan bilangan kes strok akut yang didapati dalam

Address for correspondence and reprint requests: Nik Azlan Nik Muhamad. Department of Emergency Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia. Tel: +6012-3956197 Email: nikazlanmuhamad@hotmail.com

tempoh intervensi. Dengan latihan berterusan di kalangan kakitangan pra-hospital dalam mengesan strok akut, kebolehlaksanaan dapat ditingkatkan.

Kata kunci: Malaysia, prahospital, strok akut

ABSTRACT

Prehospital notification of the stroke team in alerting incoming acute stroke patient has been practiced in several countries worldwide. Currently this is not practiced in Malaysia. This study evaluates feasibility and impact to stroke team door to review time when prehospital notification is employed. Duration of case control study was between June 2018 to January 2019. Control phase consists of conventionally activating stroke team after in-hospital assessment by emergency medical officer. This was then followed by an intervention phase where on scene activation of stroke team was done by the Prehospital Emergency Care (PHC) staff. Training of PHC staff in recognising an acute stroke was based on identification of BE-FAST (Balance, Eyes, Face, Arm and Speech Test) abnormalities. The objectives were to compare the mean between two groups for acute stroke team review time, door to computerised tomography (CT) scan and door to thrombolysis time. Thirty-nine patients were analysed (control n=29, intervention n=10). Results were insignificant ($p>0.05$). Mean time in minutes for control phase vs. intervention phase was as follows: Door to stroke team review time, 25.96 ± 39.16 vs. 15.9 ± 13.14 , door to CT scan was 43.04 ± 40.00 vs. 25.8 ± 11.35 . Only 3 patients underwent thrombolytic therapy during study period. Limitation was non-parametric data with lack of number of acute stroke cases responded during the intervention period. With continual training of pre-hospital staff in detecting acute stroke, feasibility can be improved.

Keywords: acute stroke, Malaysia, prehospital

INTRODUCTION

Stroke awareness and detection among Malaysian population is still poor (Anuar et al. 2014). Reliance on Prehospital Emergency Care (PHC) team is crucial in identifying an acute stroke. Benefits of early thrombolytic therapy is proven, hence, rapid and effective response is critical. Accurate stroke identification by the prehospital

team enables prehospital activation of the receiving hospital stroke team prior to patient arrival (Rajajee & Saver 2005). This allows time for preparation and immediate standby of the managing team.

Universiti Kebangsaan Malaysia Medical Centre (UKMMC) is a tertiary referral hospital in Kuala Lumpur. Acute Stroke thrombolysis service for ischemic stroke started in 2009.

This includes forming an acute stroke team and incorporating computerised tomography (CT) perfusion as a part of UKMMC stroke protocol. From January 2010 to December 2011, the time from symptom to CT perfusion scan was delayed at an average of 211 minutes. (Hashim et al. 2013). Prehospital activation of stroke team has been proven elsewhere as a method to shorten delay in door to needle time (Zhang et al. 2018)

To the best of our knowledge, prehospital activation of stroke team has not yet been implemented in Malaysian hospitals. No data is available in feasibility and improvement of door to stroke team review, CT scan and thrombolytic therapy following prehospital stroke team activation in Malaysia. Readiness and reliability on a developing young pre-hospital care system in diagnosing and confidence in alerting stroke team could be assessed.

This study acts as a pioneer study in prehospital activation of stroke team in Malaysia. Expected result are shorter door to stroke team review, CT and thrombolysis time. Training of PHC staff in detecting acute stroke and methods in alerting stroke team was done prior to intervention. If the protocol was feasible, routine implementation can be done. Objective of this case control study was to compare mean time of door to CT scan, door to stroke team review and door to thrombolytic therapy between control and intervention phase.

MATERIALS AND METHODS

Time was recorded in minutes. Control phase was during the initial 4 months (1st June 2018 to 30th September 2018). In this phase, conventional acute stroke service initiation was maintained. Patient with suspicion of acute stroke was brought to Emergency Department (ED), triaged to the red zone and assessed by the emergency medical officer/emergency specialist. Once a diagnosis of acute stroke had been made, the Emergency Department Call Center (EDCC) was instructed to inform acute stroke team.

The next 4 months was the intervention phase (1st October 2018 to 31st January 2019). This incorporated the balance, eye, facial asymmetry, arm drift, slurry speech and time (BE-FAST) protocol in prehospital detection of stroke. Any imbalance, visual disturbance, facial asymmetry, arm drift, slurry speech and time within the thrombolytic window (<6 hours) detected was a positive result. BE-FAST was validated by Aroor et al. (2017) in reducing percentage of missed stroke from 14% to 4.4% with addition of balance disturbance and visual symptoms. The protocol was standardised for prehospital staff use. In September 2018, all paramedics working with the prehospital care team of UKMMC were given a lecture on detecting stroke in accordance to BE-FAST guidelines. Briefing on the usage of the PHC stroke assessment form was included. This was followed by simulated scenarios as a practical session to test ability of PHC staff in complying to the protocol.

During the intervention phase, paramedics from the PHC team

employed the BE-FAST protocol when responding to a suspected stroke victim. Paramedics that detected any of these signs at response site was to alert the stroke team via informing the EDCC. Time was recorded from the arrival of patient to the designated objectives (performing CT scan, stroke team review and initiation of thrombolytic therapy). The Neurology Department and the acute stroke team were informed regarding this study. Results was analysed using statistical software PSPP (Free Software Foundation, Boston, MA, USA) and

significance was calculated according to type of continuous data distribution.

RESULTS

Thirty-nine patients were eligible for this study. Table 1 shows descriptive and demographic characteristics of patients. There were a total of 19 (48.7%) male patients and 20 (51.3%) female patients. The largest ethnicity of the patients involved were Chinese (53.8%) followed by Malays (35.9%) and Indians (10.3%). The minimum age of the patients involved was 28

Table 1: Descriptive and demographic characteristics of patients.

	Control Group	Intervention Group	Total	Total Percentage %	Min	Max	Mean
Number of patients	29	10	39	Intervention group - 25.6% control group - 74.4%	-	-	-
Sex							
Male	13	6	19	48.7%	-	-	-
Female	16	4	20	51.3%	-	-	-
Ethnicity							
Malay	11	3	14	35.9%	-	-	-
Chinese	14	7	21	53.8%	-	-	-
Indian	4	0	4	10.3%	-	-	-
Age							
Min, Max and Median	-	-	-	-	28	85	63.13
Family Support							
Good	38	-	38	97.4%	-	-	-
Poor	-	1	1	2.6%	-	-	-
Comorbids							
No. of patients with DM			22	56.4%			
No. of Patients with HPT			28	71.8%			
Number of existing patients in resus							
Min and Max					1	4	
Number of staff working							
Min and Max					5	6	

Table 2: Door time to neurology consult, CT scan and thrombolysis

	Number of patients	Minimum time (mins)	Maximum time (mins)	Mean time (mins)	Standard deviation
Time to neurology consult	38	0	214	23.32	34.365
Time to CT scan	38	7	199	38.50	35.713
Time to thrombolysis	3	80	215	132.67	72.224

and the maximum age was 85 with the mean age being 63. Main risk factor identified was hypertension (N=28, 71.8%) and diabetes mellitus (N=22, 56.4%). The minimum number of staffs working in resus throughout the study was 5 and the maximum number was 6.

Table 2 shows overall door time to acute stroke team review, CT scan and thrombolysis. The number of patients who had a neurological consult in total was 38 patients with the minimum time from arrival being 0 minutes and the maximum time being 214 minutes. The standard deviation was 34.365. A total of 38 patients out of 39 in the study underwent a CT scan with the minimum time to CT scan being 7 minutes and the maximum time 199 minutes. The mean time to CT scan was 38.50 minutes. The standard deviation was 35.713. A total of 3 patients underwent thrombolysis with the minimum time to thrombolysis being 80 minutes and the maximum time 215 minutes. The mean time was 132.67 minutes and the standard

deviation was 72.224.

Table 3 shows the mean time taken from ED arrival to neurological consultation between the intervention and control groups. Out of 39 patients, 38 patients were analysed with the remaining one not included in the analysis due to missing data. The mean time taken for acute stroke team to attend to the patients was 25.96 minutes for the patients who were brought via the conventional pathway in phase one (control group). In phase two (intervention group) the mean time taken for neurology team to attend to the patients was 15.90 minutes.

According to Table 3, skewness and kurtosis when divided by its standard deviation shows a result of more than 1.96. Hence, the distribution of data is not normal. Hence, in comparing between the two phases, non-parametric method of calculation Mann-Whitney U test was employed. Significance for door to neurology consult between the two phases was 0.265 (p>0.05). Door to CT time between the two phases was also not

Table 3: Difference between no stroke pre-notification and with stroke pre-notification

Outcome Criteria	Pre intervention	Post intervention	T test	P-value
Mean door to CT time	43.04 minutes	25.8 minutes	-1.323	0.194
Mean door to stroke team assessment / consultation	25.96 minutes	15.9 minutes	-.791	0.434

significant ($p=0.169$)

DISCUSSION

Data obtained from comparing two groups of pre-hospital notification and no notification was inadequate to make any significant conclusion. Only 10 cases were pre-notified compared to 28 patients that followed the normal protocol. Mean time taken for acute stroke team to review patients from arrival was 15.9 minutes in intervention phase in comparison to 25.96 minutes in control phase. There was a 10-minute difference between the two groups. This is comparable with a study done in China by Zhang et al. (2018) where EMS (Emergency Medical System) with pre-notification group showed both a significantly shorter door to needle time of (41.3 ± 10.7 min vs 51.9 ± 23.8 min, $t=2.583$, $p=0.012$). Although the P-value is not significant, there was a mean improvement in the timing between the control and intervention groups. The goal standard set for any acute stroke patients arriving in ED to neurology team consultation is at 15 minutes from the time of arrival (Jauch et al. 2013)

The minimum time taken to CT scan was 7 minutes and the maximum was 199 minutes. It was noted that the delay of the patient going for the CT scan was due to multiple factors, including technical issues with the CT scan machine, delays in diagnosis due to unclear history as well as unstable patients requiring urgent interventions such as intubation prior to CT scan. There was no statistical significance between the number of patients in resus

and the timing of the CT scan. It was noted that the mean time taken from door to CT scan was 43.04 minutes for control phase vs. 25.80 minutes in intervention phase. Although the P-value was not significant, there was an improvement in mean timing between the control and intervention groups. The goal standard set for any acute stroke patients arriving in ED to CT scan is at 25 minutes from the time of arrival (Jauch et al. 2013).

Only 3 patients received thrombolysis. Minimum time taken for thrombolysis was 80 minutes and the maximum time was 215 minutes. The numbers of patients were inadequate for a comparison analysis. Goal standard to thrombolysis for any acute stroke patient is within the first 60 minutes from arrival to ED (Jauch et al. 2013). From the descriptive data of these three patients, we noted that there is a significant improvement needed to achieve the gold standard target of 60 minutes.

Number of patients eligible for the second phase were limited due to lack of prehospital stroke cases during that period. Researchers concluded that paramedics involved were not confident to activate stroke in a prehospital setting. From the feedback received, factors of lack of stroke team activation include being a pioneer study in UKMMC. In addition to this paramedic were reluctant due to the fear of penalisation for inappropriate stroke team activation. This was despite having positive BE-FAST and correctly diagnosing acute stroke as recorded in the PHC forms. Regardless of multiple briefing sessions

held, paramedics failed to apply the protocol most of the time. This can be comparable to the low confidence level reported among PHC staff in administering thrombolytic therapy in a tertiary center in Malaysia (Nik Azlan et al. 2019) This can be improved by regular updates and teaching session for prehospital paramedics, as shown in past studies that with proper training, detection of pre-hospital stroke can be more accurate and reliable (Shire et al. 2017; Bray et al. 2005)

CONCLUSION

Prehospital activation of acute stroke did not show any significant difference due to lack of sample size. Further training and simulation exercises for prehospital care paramedics on stroke detection are recommended in order to improve the feasibility of this protocol.

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