Original Research Article

Knowledge of stroke management among International Medical University Students in Malaysia: A cross-sectional study

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ABSTRACT

Background: Cerebrovascular accident is the fourth leading cause of death in Malaysia in 2022. Therefore, medical students must recognize the factors associated with stroke management regarding early diagnosis and proper treatment, so no delay in the treatment, and better outcomes. The aim of this study is to assess the knowledge of the International Medical University (IMU) medical students on the management of stroke at acute, hyperacute, and advanced levels.

Materials and Methods: A cross-sectional study of students from the IMU Clinical campus in Seremban, Kluang, and Batu Pahat was performed. A questionnaire has been constructed to collect and gather data on participants' knowledge regarding acute stroke management, consisting of 29 true or false statements, and is adapted from The Acute Stroke Management Questionnaire (ASMaQ), which is used to measure the knowledge of acute stroke management among Malaysia healthcare professionals. Using statistical analysis, we assess the level of knowledge of IMU clinical campus junior medical students (Year 4) and senior medical students (Year 5) about stroke management.

Result: A total number of 150 participants were enrolled, with 82 and 68 participants from junior and senior groups respectively. In terms of academic performance, all senior medical students and most junior medical students achieved passing marks by scoring $\geq$ 17 out of 29 questions correctly. Fisher Exact Test did not display a statistically significant result (p = 0.547, p < 0.05).

Conclusion: The junior and senior medical students have adequate knowledge about acute stroke management. There is no significant difference in acute stroke management knowledge between junior and senior medical students in our study.

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1. Introduction

According to the Department of Statistics, Malaysia, cerebrovascular disease is the fourth leading cause of death (6.5%) in 2022, following COVID-19 infection (19.8%), ischemic heart disease (13.7%) and pneumonia (11.1%).[1] In 2019, there were a total of 47,911 cases of stroke, and 19928 cases of deaths due to stroke, besides the disability occurred in the living patients.[2]

A stroke, also known as a cerebrovascular accident, is a sudden disruption of blood flow to a focal area of the brain, either caused by an obstruction (ischemic stroke) or ruptured blood vessels (hemorrhagic stroke). This can lead to reduced oxygen supply to the brain and cause damage or death of brain tissue. The signs and symptoms of stroke

vary with its location and the size of the artery involved. It results in deficits in sensory, motor, mental, perceptual, and language functions. The motor and sensory deficits will be presented on the contralateral side of the body from the site of the lesion. The signs and symptoms of stroke include sudden weakness or paralysis on one side of the body, sudden loss of sensation or abnormal sensation on the other side, sudden difficulty speaking, confusion, blurring of vision in one eye, and sudden dizziness or loss of balance and coordination. Indeed, the impact of stroke is significant. Hence, it is crucial to understand how to manage acute stroke cases effectively.[3]

According to the Clinical Practice Guidelines (CPG) Management of Ischemic Stroke 3rd edition, 2020 the primary focus of acute stroke management is on early reperfusion therapy. One of the acute management involves adequate tissue oxygenation to prevent hypoxia which can worsen neurological injuries.[4] This can be achieved by providing supplemental oxygen when the patient's oxygen saturation falls below 95%. Regular patient observation which consists of the monitoring of pulmonary function using a pulse oximeter, blood pressure, pulse rate, the National Institutes of Health Stroke Scale (NIHSS) score, head chart assessments, the Glasgow Coma Scale (GCS), and the vigilance for potential complications resulting from the mass effect. This should be tailored to the patient's specific clinical condition and comorbidities. For example, if a patient with acute ischemic stroke has a blood pressure of $\geq 220/120$mmHg has not received IV alteplase or Endovascular thrombectomy (EVT), and has no comorbid conditions requiring gradual reduction of blood pressure by 15% during the first 24 hours after the onset of stroke.[4]

Hyperglycemia following an acute stroke is closely linked to increased mortality and impaired neurological recovery, highlighting the significance of managing blood glucose levels within 4.0 to 7.5 mol/L in the first few hours of acute ischemic stroke. Moreover, nutritional support is vital, particularly in patients with brainstem infarctions or swallowing impairments. Enteral feeding is recommended to start within 7 days of admission and a nasogastric tube should be inserted if the patient fails the swallowing test. Infections, such as pneumonia and urinary tract infections, are common post-stroke complications that should be promptly identified and treated with appropriate antibiotics. Fever management is crucial, with antipyretics recommended to control elevated temperatures. Continence care raised intracranial pressure management, deep vein thrombosis prevention, and seizure management all are essential in the patient's management.[4] Stroke should have been one of the most recognizable diseases among healthcare professionals, nurses, and medical students.

A recent study in Malaysia on knowledge of acute ischemic stroke management shows that many healthcare professionals (HCPs) might not be aware of the update recommended in the management of stroke patients.[1] Another study on nursing students in Malaysia showed that they have better knowledge regarding stroke disease but require further information on stroke-related nursing skills.[5] However, similar studies have not been conducted among medical students who will become doctors in the future and who need to know the factors related to stroke treatment in terms of early signs and symptoms, types of diagnosis, and appropriate treatment in order to prevent delays in treatment and provide better outcomes. Therefore, we aimed to assess the knowledge of the International Medical University (IMU) medical students on the management of stroke at acute, hyperacute, and advanced levels.

2. Materials and Methods

2.1. Study design and setting

A cross-sectional study was carried out from May 2023 to October 2023 at the IMU Clinical campus, which is located at Seremban, Batu Pahat, and Kluang. The target population of this study comprises medical students of semesters 7, and 8 (Year 4) who are considered juniors as in the curriculum they study how to take a history, examine the Patients and little ideas about management &semesters 9,10 (Year 5) they study the same topics but in more details in management in semester 9, in semester 10 they are shadow Houseman in hospitals to prepare as a future doctors, and most of the hospitals have an advanced stroke care units.

2.2. Sample size and sampling

We approximated a total of 240 medical students by estimating 60 students per semester across 4 semesters. For the participants' selection, we used convenient sampling based on the inclusion criteria. The estimation sample size of participants is calculated using OpenEpi software, we arrived at a sample size of 148 participants, comprising 74 participants from semesters 7 and 8, and 74 participants from semesters 9 and 10. In our research, we received responses from 150 students, with 82 participants from semesters 7 and 8, and 68 participants from semesters 9 and 10.

2.3. Inclusion and exclusion criteria

We included IMU medical students who are in the years 4 and 5 clinical phase, while the IMU medical students in years 1,2 and 3 were excluded.

Table 1: Demographic characteristics of the respondents (n:150)

Socio-demographic characteristics		Frequency n (%)
Age	21	8 (5.3)
	22	26 (17.3)
	23	61 (40.7)
	24	29 (19.3)
	25	21 (14.0)
	26	4 (2.7)
	28	1 (0.7)
Gender	Male	56 (37.3)
	Female	94 (62.7)
Ethnicity*	Chinese	101(67.3)
	Malay	18 (12.0)
	Indian	19 (12.7)
	Non- Malaysian	12 (8.0)
Student type	Malaysian students	138 (91.3)
	Non- Malaysian students	12 (8.0)
Current semester	Semester 7	44 (29.3)
	Semester 8	38 (25.3)
	Semester 9	33 (22.0)
	Semester 10	35 (23.3)

Table 2: Participants who achieved passing marks.

Semester	Score Pass ≥ 17		Total
	Fail	Pass	
7/8	1	81	82
9/10	0	68	68
Total	1	149	150

Table 3: Fisher exact test

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	0.835[a]	1	0.361	1.000	0.547	
Continuity Correction[b]	0.000	1	1.000			
Likelihood Ratio	1.213	1	0.271	1.000	0.547	
Fisher's Exact Test				1.000	0.547	
Linear-by-Linear Association	0.829[c]	1	0.362	1.000	0.547	0.547
N of Valid Cases	150					

Table 4: Stroke knowledge questionnaire output

		Semester		Total 150
		7/8 n: 82 (%)	9/10 n: 68 (%)	
General Stroke Knowledge				
1. Acute confusion may be a sign of a stroke	True	80 (97.6)	63 (92.6)	143 (95.3)
	False	2 (2.4)	5 (7.4)	7 (4.7)
2. Hypoglycaemia can mimic acute stroke	True	72 (87.8)	65 (95.6)	137 (91.3)
	False	10 (12.2)	3 (4.4)	13 (8.7)
3. Stroke patients can present with visual disturbances	True	79 (96.3)	68 (100.0)	147 (98.0)
	False	3 (3.7)	0 (0.0)	3 (2.0)
4. Stroke patients can present with limb numbness	True	81 (98.8)	65 (95.6)	146 (97.3)
	False	1 (1.2)	3 (4.4)	4 (2.7)
5. Unsteadiness of gait can be a sign of a stroke	True	82 (100.0)	68 (100.0)	150 (100.0)
	False	0 (0.0)	0 (0.0)	0 (0.0)
6. Acute stroke can present with a reduced level of consciousness	True	80 (97.6)	66 (97.1)	146 (97.3)
	False	2 (2.4)	2 (2.9)	4 (2.7)
7. The Glasgow Coma Scale (GCS) is a tool to assess the level of consciousness	True	82 (100.0)	68 (100.0)	150 (100.0)
	False	0 (0.0)	0 (0.0)	0 (0.0)
8. A full neurological examination must be performed immediately in patients presenting acutely with symptoms suggestive of stroke.	True	71 (86.6)	64 (94.1)	135 (90.0)
	False	11 (13.4)	4 (5.9)	15 (10.0)
9. High blood pressure must be lowered to normal values in acute stroke	True	49 (59.8)	21 (30.9)	70 (46.7)
	False	33 (40.2)	47 (69.1)	80 (53.3)
10. FAST (Facial drooping, Arm weakness, Speech difficulties, and Time) is an effective tool to make common among the general public.	True	81 (98.8)	68 (100.0)	149 (99.3)
	False	1 (1.2)	0 (0.0)	1 (0.7)
Hyperacute stroke management				
1. Stroke is a medical emergency only within 4.5 hours of stroke onset.	True	37 (45.1)	36 (52.9)	73 (48.7)
	False	45 (54.9)	32 (47.1)	77 (51.3)
2. All acute stroke patients must undergo a brain CT immediately.	True	70 (85.4)	64 (94.1)	134 (89.3)
	False	12 (14.6)	4 (5.9)	16 (10.7)
3. All suspected stroke patients must be referred to the neurology team immediately.	True	64 (78.0)	52 (76.5)	116 (77.3)
	False	18 (22.0)	16 (23.5)	34 (22.7)
4. The earlier the treatment, the better the outcome for stroke.	True	82 (100.0)	68 (100.0)	150(100.0)
	False	0 (0.0)	0 (0.0)	0 (0.0)
5. Thrombolysis therapy is given intravenously to break down clots.	True	77 (93.9)	66 (97.1)	143 (95.3)
	False	5 (6.1)	2 (2.9)	7 (4.7)
6. Patients presenting within 3.5 - 4 hours of stroke onset constitute a category of stroke patient known as the "hyperacute stroke patient	True	60 (73.2)	51 (75.0)	111 (74.0)
	False	22 (26.8)	17 (25)	39 (26.0)
7. The coagulation profile must be screened before thrombolysis	True	64 (78.0)	56 (82.4)	120 (80.0)
	False	18 (22.0)	12 (17.6)	30 (20.0)
8. All acute stroke patients must have a 12 leads ECG before thrombolysis	True	58 (70.7)	49 (72.1)	107 (71.3)
	False	24 (29.3)	19 (27.9)	43 (28.7)

Table 4 continued

9. Intracranial haemorrhage is a contraindication for thrombolysis therapy	True	78 (95.1)	66 (97.1)	144 (96.0)
	False	4 (4.9)	2 (2.9)	6 (4.0)

Advanced Stroke Management

|				
1.Hypoglycaemia does not mimic symptoms of acute ischaemic stroke.	True	10 (12.2)	8 (11.8)	18 (12.0)
	False	72 (87.8)	60 (88.2)	132 8.0)
2.The use of comprehensive specialized stroke care centres (stroke units) that incorporates rehabilitation services can reduce mortality and disabilities among stroke patients	True	79 (96.3)	66 (100.0)	145 (98.0)
	False	3 (3.7)	0 (0.0)	3 (2.0)
3. Acute general management in stroke includes supportive care and treatment of acute complications to improve the mortality rate and functional disability	True	80 (97.6)	66 (97.1)	146 (97.3)
	False	2 (2.4)	2 (2.9)	4 (2.7)
4.Intravenous alteplase is recommended for the definite onset stroke for up to 4.5 hours from the onset.	True	74 (90.2)	66 (97.1)	140 (93.3)
	False	8 (9.8)	2 (2.9)	10 (6.7)
5.Mechanical thrombectomy is administered for clot removal in acute stroke.	True	53 (64.6)	54 (79.4)	107 (71.3)
	False	29 (35.4)	14 (20.6)	43 (28.7)
6. Assessment of patients with suspected acute stroke in the emergency department should be prioritized to expediate the diagnosis of stroke and to determine the appropriate acute stroke interventions	True	80 (97.6)	68 (100.0)	148 (98.7)
	False	2 (2.4)	0 (0.0)	2 (1.3)
7. Acute stroke symptoms can be potentially reversed with the administration of thrombolysis or with mechanical thrombectomy.	True	75 (91.5)	60 (88.2)	135 (90.0)
	False	7 (8.5)	8 (11.8)	15 10.0)
8. Mechanical thrombectomy can be performed after thrombolysis therapy.	True	58 (70.7)	47 (69.1)	105 (70.0)
	False	24 (29.3)	21 (30.9)	44 (30.0)
9.Thrombolysis and mechanical thrombectomy can only be administered within a therapeutic window	True	66 (80.5)	51 (75.0)	117 (78.5)
	False	16 (19.5)	16 (24.0)	32 21.5)
10. Wake-up strokes are not eligible for thrombolysis or mechanical thrombectomy.	True	41 (50.0)	34 (50.0)	75 (50.0)
	False	41 (50.0)	34 (50.0)	75 (50.0)
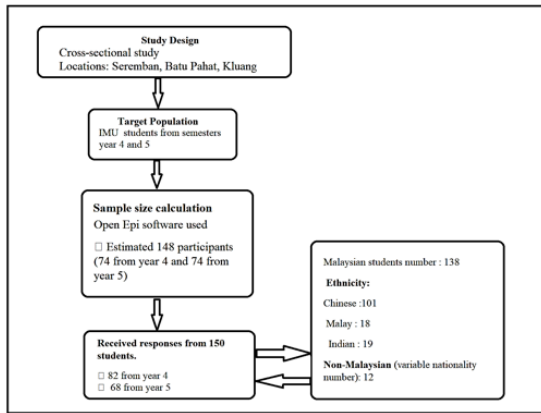
Figure 1: Study flow chart.

Figure 2: Participants who achieved passing marks.

2.4. Questionnaire

A questionnaire has been designed to collect and gather data on the participants' knowledge regarding acute stroke management, consisting of 29 true or false statements. The questions are adapted from the Acute Stroke Management Questionnaire (ASMaQ),[2] which is used to measure the knowledge of acute stroke management among Malaysian healthcare professionals**.** The questionnaire is divided into three domains: General Stroke Knowledge (GSK), Hyperacute Stroke Management (HSM), and Advanced Stroke Management (ASM). An emergency medicine specialist is convened to assess the validity and reliability of our questionnaire. The passing marks for participants were determined using the Angoff standard-setting method which involved 10 IMU staff members from different departments. The passing mark was set at 58.62%, requiring the participants to answer 17 out of 29 questions correctly.

2.5. Ethical aspect

A consent form and study information sheet were provided together with the questionnaire to collect information. The names and email addresses of all students were obtained with consent to ensure their confidentiality.

2.6. Statistical analysis

The data collected was entered into Microsoft Excel and exported into Statistical Package for Social Science (SPSS) version 20 for statistical analysis. Categorical data was shown as percentages and the Chi-Square test was used to make the comparison between groups of categorical data.

2.7. Ethical approval

The study was approved at the 267th IMU Joint Committee on Research and Ethics Meeting on 25 May 2023.

3. Results

There are a total of 150 participants from IMU Clinical Campus students enrolled in this study, with 82 participants from the junior category (semester 7 & semester 8) and 68 participants from the senior category (semester 9 and semester 10). Description of the socio-demographic details of the respondents in the study in (Table 1 & Figure 1). The participants consisted of 94 females (62.7%) and 56 males (37.3%), their age range from 21 to 28 years old, with a mean age of 23.31. Among all the participants in the study, most of them were Malaysians from different ethnic groups as Malaysians of Chinese origin(n:101), followed by Malaysians of Indian origin(n:19), and original Malaysians called Malay(n:18).138 participants were Malaysian students, and 13 participants were students from other different Countries.

The proportion of participants who achieved passing marks by answering 17 out of 29 questions correctly is shown in Table 2. All senior medical students (n:68) and most of the junior medical students (n:81) scored ≥ 17 questions correctly. Table 3 shows the Fisher's Exact Test to assess if there are any associations between two groups of medical students and the number of students who achieve passing marks. It is a valuable test in this research as the sample size in this study is small. The Fisher's Exact Test is statistically not significant (p:0.547, p<0.05), therefore there is no sufficient evidence to reject the null hypothesis that stated year 4 and year 5 medical students do not have an adequate level of knowledge regarding acute stroke management.

4. General Stroke Knowledge

Most respondents have adequate knowledge about general stroke knowledge. More than 90% of medical students know that acute confusion may be a sign of stroke (95.3%),

and hypoglycemia can mimic stroke (91.3%). Besides, they also understand that patients with acute stroke can be presented with visual disturbances (98%), limb numbness (97.3%), reduced level of consciousness (97.3%) and FAST (Facial drooping, Arm weakness, Speech difficulties, and Time) is an effective tool to make common among the public (99.3%). All the participants know that unsteadiness of gait is one of the clinical signs of stroke and the Glasgow Coma Scale (GCS) is a tool to assess the level of consciousness. However, only 10% of the respondents know a full neurological examination does not need to be performed immediately in patients presenting acutely with symptoms. Less than 50% of the respondents (46.7%) acquired knowledge that high blood pressure must not be lowered to normal values in acute stroke.

4.1. Hyperacute stroke management

More than 50% of the respondents (51.3%) understand that stroke is not a medical emergency only within 4.5 hours of stroke onset. Most of the respondents (89.3%) understand that all acute stroke patients must undergo a brain CT immediately. 77.3% of the respondents know that all suspected stroke patients must be referred to the neurology team immediately. All the respondents know that the earlier the treatment, the better the outcome of stroke. Most of the respondents (95.3%) understand that thrombolysis therapy is given intravenously to break down clots. 74% of the respondents know that patients presenting within 3.5 - 4 hours of stroke onset constitute a category of stroke patient known as the "hyperacute stroke patient". 80% of the respondents did not know that it is not a must to screen the coagulation profile before thrombolysis and 71.3% of the respondents did not know it is not a must to have a 12 leads ECG done for all acute stroke patients before thrombolysis. 96% of the respondents understand that intracranial hemorrhage is a contraindication for thrombolysis therapy.

4.2. Advanced stroke management

Most students (88%) correctly answered the question hypoglycaemia does not mimic symptoms of acute ischaemic stroke. 2% of the respondents did not recognize that the use of comprehensive specialized stroke care centers (stroke units) that incorporate rehabilitation services can reduce mortality and disabilities among stroke patients. There is also a similar percentage of 2.7% of the respondents who did not recognize that acute general management in stroke includes supportive care and treatment of acute complications to improve the mortality rate and functional disability.143 out of 150 students(93.3%), understood that Intravenous Alteplase (fibrinolytic agent, it is a tissue plasminogen activator converts plasminogen to the proteolytic enzyme plasmin,

which lyses fibrin as well as fibrinogen), is recommended for the definite onset stroke for up to 4.5 hours from the onset. However, there is only 71.3% of the respondents understand that mechanical thrombectomy is administered for clot removal in acute stroke. Most of the respondents know that the assessment of patients with suspected acute stroke in the emergency department should be prioritized to expedite the diagnosis of stroke and to determine the appropriate acute stroke interventions, it is the most correctly answered question with only 1.3% of respondents getting it wrong. Around 10% of respondents did not know that Acute stroke symptoms can be potentially reversed with the administration of thrombolysis or with mechanical thrombectomy. 70% of respondents understood that mechanical thrombectomy can be performed after thrombolysis therapy. Similarly, 78.5% of the respondents understood that thrombolysis and mechanical thrombectomy can only be administered within a therapeutic window. Only half the respondents acknowledge that wake-up strokes are not eligible for thrombolysis or mechanical thrombectomy.

5. Discussion

In our questionnaire results, we found many students had wrong ideas that need to be sorted out such as Stroke is a medical emergency only within 4.5 hours of stroke onset, which is not true as still after that considered an emergency. Also, all acute stroke patients must have an ECG before thrombolysis, which is False. High blood pressure must be lowered to normal values in acute stroke is not correct as an initial step in treatment. Also misunderstanding about the uses of Mechanical thrombectomy can be performed after thrombolysis therapy, which is true. Wake-up strokes are not eligible for thrombolysis or mechanical thrombectomy, which is wrong.

Patients suspected of experiencing acute stroke should undergo a rapid neurological examination to identify focal neurological deficits using a validated scale such as FAST. Rapid neurological assessment is essential to quickly assess and identify whether the patient is experiencing an ischaemic stroke as well as to minimize the time delays in immediate interventions.[6]

In a question about high blood pressure must be quickly lowered to normal values in acute stroke 59.8%, and 30.9% of juniors and seniors respectively answered it was true which is wrong. As should be carefully lowered.Our study results was higher in comparison to another study by Albart et al. among Malaysian (HCPs) which was 25.5%.[1]

Current *clinical practice guidelines* (CPG)in management of hypertension 5th edition 2018 stated that the treatment of hypertension in acute ischemic stroke should be delayed for several days or up to 2 weeks, except in specific conditions such as hypertensive encephalopathy, severe left ventricle failure, acute renal

failure, acute myocardial infarction, aortic dissection, acute pulmonary edema or repeated blood pressure readings revealed elevated values(SBP > 220mmHg and DBP > 120 mmHg).[7] Excess blood pressure reductions (> 20%) have been associated with potential neurological and functional deterioration. Hence, some medical students wrongly might assume that returning blood pressure to normal ranges is a standard approach for optimal patient care.

6. General stroke Management

a study conducted in *German stroke centers* highlighted that standard coagulation tests such as prothrombin time (PT) and activated partial thromboplastin time (aPTT) are not reliable indicators of the actual oral anticoagulant drug levels in patients. These tests may be not suitable for guiding thrombolysis decisions.[8]

In Malaysia CPG, a coagulation profile is one of the investigations required if thrombolysis is considered. While it is essential to obtain coagulation profiles for all ischeemic stroke patients, it is not compulsory and the initiation of thrombolysis in patients with acute ischemic stroke should not be delayed and should be within the 4.5-hour time window. The reason why most medical students think the coagulation profile must be screened before thrombolysis might be because they may be not aware of the limitations of non-specific coagulation tests and the evolving recommendations regarding thrombolysis in patients with acute ischemic stroke.[4]

6.1. Hyperacute stroke

In a question about ECG must be done before thrombolysis, which is False statement 70.7%, and 72.1% of juniors and seniors respectively answered it wrong which is lower in comparison to another study by Albart et al. among Malaysian (HCPs) which was 93.1%.[1] Obtaining a 12 leads ECG before thrombolysis is associated with longer delay and worse outcomes in patients presenting to emergency medical services (EMS) with acute stroke.

A cohort study shows median time from EMS call to arrival at the hospital was 5 minutes and the median time EMS personnel spent on scene before transportation to the hospital was 7 minutes.[9] Based on the clinical presentation, if the patient presents with chest pain and shortness of breath, which are suggestive of both stroke and acute coronary syndrome. According to the CPG on the management of ischemic stroke in Malaysia, ECG is a mandatory investigation, but it is not clarified whether the ECG should be done before or after thrombolysis. The overall goal is to rapidly initiate appropriate treatment for ischemic stroke while ensuring patient safety.

A question about Stroke is a medical emergency only within 4-5 hours of stroke onset. Which is false 45.1%,52.9% of juniors and seniors respectively give a wrong answer. which is lower in comparison to another study by Albart et al. among Malaysian (HCPs) which was 70%.[1]

6.2. Advanced stroke management,

In a question about the uses of mechanical thrombectomy for clot removal in acute stroke, which is true 35.4%, and 20.6% of juniors and seniors respectively gave a wrong answer. In comparison to another study by Albart et al. among Malaysian (HCPs) was 31.1%.[1]

In a question about the Mechanical thrombectomy can be performed after thrombolysis therapy, which is true 30 % of both groups gave a wrong answer. which is lower than another study done by Albart et al. among Malaysians (HCPs) which was 62%.[1]

In the past, the time to administer intravenous thrombolysis for stroke is generally limited to within 4.5 hours after the onset of symptoms and the time to initiate a mechanical thrombectomy is within 6 hours of the onset of symptoms.[10] Thus, patients with wake-up strokes, whose exact time of onset is unknown, have been ineligible for thrombolytic treatment. According to a systematic review done by *Roaldsen et al,* it was found that both intravenous thrombolytic treatment and endovascular thrombectomy improved functional outcomes of patients with wake-up stroke.[11] Hence, the statement "Wake-up strokes are not eligible for thrombolysis nor mechanical thrombectomy" is false. In our study, 50% of students gave a wrong answer which is lower than another study by Albart et al. among Malaysians (HCPs) which was 73.2%.[1]

A study carried out by Albart et al.2022 stated that approximately 76% of Malaysian healthcare professionals (HCPs) had good overall knowledge of stroke. The highest proportion of good knowledge was noted for General Stroke Knowledge (88.5%), followed by Advanced (61.2%), and Hyperacute Stroke Management (58.1%). However, since there are rapid advances in the management of stroke, most of the HCPs might not be aware of the latest recommended management of stroke.[12]

In a study done about Stroke Knowledge at International Islamic University Malaysia, Nursing Students showed that 50% had experience in taking care of stroke patients. The results highlighted that nursing students have good stroke knowledge but a moderate score for information needs on stroke.[5]

6.3. Limitations in the study

This study has certain limitations. Firstly, there are a total of 356 medical students in their final years at IMU clinical campus, and only 150 medical students were participating in the research, therefore the results might not represent all the students in IMU clinical campus. Those who responded might have better knowledge than

non-responders. Secondly, the questionnaire was distributed to the participants via email and WhatsApp, there was no time limitation in completing the questionnaire. The lack of time limitation and supervision might provide the opportunity for the participants to search for the answers from an online source, which might potentially influence the accuracy of the results in representing the level of knowledge regarding stroke management. Thirdly, the questionnaire has certain limitations. Most of the items in the questionnaire are general. It did not include the thrombolytic medication dosages and contraindications for treatment. Finally, Students were found to have good knowledge of Stroke management; this might not reflect their actual practice. Therefore, further research is needed to evaluate their practice in their future career after graduation.

7. Conclusion

The junior and senior medical students have adequate knowledge about acute stroke management. Stroke should have been one of the most recognizable diseases among Malaysian medical students. The medical students who will be future physicians need to be aware of the latest stroke management and make a prompt referral to an appropriate facility. Therefore, more stroke patients will benefit from advanced stroke care.

7.1. Authors' contributions

All the authors critically reviewed the manuscript for its content, contributed to the interpretation and presentation of the review, and approved the final version of the manuscript.

8. Source of Funding

9. Conflict of Interest

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