

# Analysis of Dominant Factors Affecting Pre-Hospital Stroke Management in Kupang City

**Yoany Maria Vianney Bitu Aty**

<https://orcid.org/0000-0003-4004-8634>

Department of Nursing of Ministry of Health  
Polytechnic, Kupang; Indonesia  
vivi\_aty@yahoo.co.id

**Florentianus Tat**

<https://orcid.org/0000-0003-0792-2537>

Department of Nursing of Ministry of  
Health Polytechnic, Kupang; Indonesia  
florentianustat@yahoo.co.id

**Elisabeth Herwanti**

<https://orcid.org/0000-0002-0409-7650>

Department of Nursing of Ministry of Health  
Polytechnic, Kupang; Indonesia  
elisabeth\_herwanti@yahoo.com

**Pius Selasa**

<https://orcid.org/0000-0003-3264-7004>

Department of Nursing of Ministry of  
Health Polytechnic, Kupang; Indonesia  
piusselasa@gmail.com

**Trifonia Srinurwela**

<https://orcid.org/0009-0003-3992-3689>

Department of Nursing of Ministry of Health  
Polytechnic, Kupang; Indonesia  
ivonakam@yahoo.com

## Abstract

The incidence of stroke is increasing every year, and effective management comprises both pre-hospital and hospital care. The key to successful management is for families to recognise the clinical symptoms and promptly seek medical attention. Delayed assistance frequently leads to complications, underscoring the importance of timely intervention to save lives and prevent long-term disabilities. The key to successful management is identifying a stroke and prompt transportation to a medical facility. This study used a quantitative approach with a cross-sectional design, and the total sample was 300 people, while data analysis was performed using the Chi-Square test and logistic regression. The results showed that the family decision-making time in taking a stroke patient to the hospital, individually or collectively, significantly affected the Accuracy of Pre-Hospital Stroke Patient Management with a value of  $P$  (Sig)  $< 0.05$ . The magnitude of the influence was indicated by the value of EXP (B), also known as ODDS RATIO (OR). Specifically, the Decision-Making Time by the family to take stroke patients to the hospital exhibited an OR of 20.714.

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This implied that respondents capable of making the right decision to take stroke patients to the hospital were 20.714 times more likely to be accurate in pre-hospital stroke patient management. Based on the results, it can be concluded that the dominant factor influencing pre-hospital stroke attack management is the family decision-making time to take the stroke patient to the hospital. Therefore, the Kupang City government needs to improve ambulance facilities for the public, making it easier to access services, specifically in emergencies.

**Keywords:** Treatment; Stroke; pre-hospital; Kupang City

## Background

Stroke is a major non-communicable disease ranking third globally and second leading cause of death after coronary heart disease. Worldwide, approximately 50 million people suffer from stroke, with about 9 million experiencing severe disabilities (Saraswati, D, 2021). The primary consequence is the occurrence of physical disabilities, both mild and severe. The prevalence of stroke-related deaths across all hospitals in Indonesia is estimated at 15.4% (Ministry of Health, 2021).

In 2018, the stroke incidence rate in Indonesia was estimated at approximately 10.9 per million. Specifically, in the East Nusa Tenggara province, the prevalence among individuals aged  $\geq 15$  years was 6.1% (Indonesian Ministry of Health, 2019). Several Riskesdas surveys have consistently reported the proportion of non-communicable diseases such as stroke, hypertension, and diabetes. In 2007, 2013, and 2018, stroke occupied the top position, followed by hypertension. This condition persisted for a decade, although there was a decrease in 2018 compared to 2013 (Saraswati, D, 2021). Data indicated that the percentage of healthy families was 18.6%, or an IKS (Family Health Index) of 0.186, categorising Kupang as an unhealthy city. Among the factors contributing to this classification were high smoking habits, with "families having no smokers," accounting for 48.6% of surveyed households, meaning that only 1,810 out of 3,726 families had no smoking member. Additionally, the category of "hypertensive patients receiving regular treatment" was estimated at 23.9%, meaning that out of 988 families with hypertensive patients, only 236 received regular treatment (Center for HR Planning and Utilization et al., 2018). These unhealthy lifestyle habits serve as triggers for stroke occurrences. Data from the Kupang City Health Office showed 247 stroke patients spread across 11 community health centres. Among these, the Public Health Center Bakunase recorded 59 cases, the highest number in Kupang (Muskananfolia et al., 2021).

The World Health Organization (WHO) attributes the increasing prevalence of non-communicable diseases, including stroke, to four risk factors, namely unhealthy eating patterns, lack of physical activity/exercise, smoking, and alcohol consumption (Indonesian Ministry of Health, 2021). Hypertension is a risk factor for the occurrence of ischemic stroke, with higher blood pressure increasing the likelihood of a stroke occurrence (Tamburian et al., 2020). The consequences of hypertension include



narrowing blood vessels, resulting in bursting and blockage, and disrupting the flow of blood carrying oxygen and nutrients to the brain. This potentially leads to the death of brain cells and tissues, ultimately triggering a stroke. As stated by a previous study, stroke patients often have a history of hypertension due to an unhealthy lifestyle. (Hisni et al., 2022)

A history of heart disease is another risk factor for stroke associated with unhealthy lifestyle choices, such as consuming high-carbohydrate foods, high-sodium foods, fats, lack of exercise/physical activity, and smoking (Hisni et al., 2022). Additionally, diabetes mellitus also increases the likelihood of having a stroke (Indonesian Ministry of Health, 2018). Other related factors include vascular issues arising from diabetes, coupled with a history of hypertension and irregular eating habits (Permatasari, 2020).

To mitigate the incidence of stroke, the Ministry of Health is actively implementing risk factor control programs. Public health centres play a significant role in these efforts by controlling stroke occurrences. Public health centres carry out Disease prevention and control comprehensively and integratively through Public Health Efforts (UKM) and Individual Health Efforts (UKP) (Indonesian Ministry of Health, 2021).

Successful stroke treatment greatly depends on the speed, accuracy, and precision when providing early assistance (Septiana et al., 2020). This was also emphasised by the Ministry of Health (Ministry of Health, 2014). The “golden period” for these actions is approximately  $\pm 3$  hours. This implies that within the first 3 hours after experiencing a stroke, patients should receive comprehensive and optimal therapy from the hospital emergency response team to achieve the best treatment outcomes. Family members, the community, or healthcare professionals can provide initial care. The first people to encounter the patient are typically family members (Sari and Yuliano, 2019). The actions taken within the family are part of pre-hospital management, comprising care at home and before referral to the hospital.

Stroke management in emergencies is often called "Time is brain," emphasising the need for prompt action. Family members and close relatives should prioritise identifying complaints and symptoms, including sensory abnormalities on one side of the body, sudden hemiparesis and blindness, diplopia, aphasia, vertigo, dysphagia, dysarthria, ataxia, seizures, or a sudden decrease in consciousness (Setianingsih et al., 2019). The community must understand stroke management to minimise complications such as patient disabilities or deaths (Sari and Yuliano, 2019).

Hariyanti, Harsono, and Prabandari (2015) explained that some patients arrive within 3 hours after the stroke onset, while others seek healthcare more than 24 hours after the attack. The factors causing this delay include underestimating the early signs, living alone, being far from healthcare facilities, and lacking transportation (Hariyanti and Prabandari, 2015).



Correct and timely initial management of a stroke can reduce disability rates by 30% (Setianingsih et al., 2019). This is significantly influenced by the level of knowledge in identifying risk factors and having family members or close people as a strong support system. Families with a history of previous strokes are more experienced in anticipating and providing assistance during subsequent cases (Sari and Yuliano, 2019).

Many stroke patients often experience complications due to the delay in assistance provided. This incidence is associated with several factors, including slow decision-making for treatment by the family, lack of coordination, communication, family support, and inadequate healthcare facilities (Septiana et al., 2020). Numerous members of the community are still unaware of the signs and symptoms of acute stroke. Another common issue in the community is attitudes, behaviours, and low levels of education, which can also contribute to delays in stroke management. Furthermore, the lack of knowledge and understanding about signs and symptoms can be a serious problem, specifically for families experiencing a first stroke case (Septiana et al., 2020).

Sometimes, delayed arrival occurs because patients hope the symptoms and signs disappear. Other factors contributing to delay include living alone, distance from healthcare facilities, and lack of transportation. Pre-hospital management begins when the patient or anyone observing the patient recognises the signs and symptoms of a stroke and immediately calls 911. However, rapid assessment and available transportation are still not optimal, resulting in patients arriving at the hospital outside the “golden period.” (Hariyanti and Prabandari, 2015)

Family knowledge about stroke risk factors remains insufficient, resulting in suboptimal behaviour toward initial management. This is evidenced by the delayed response wherein patients are taken to the hospital more than 3 hours after the onset of the attack (Rosemary and Handayani, 2020). The longer the time interval between the onset of the stroke and the administration of therapy, the worse the prognosis. Proper management can save lives and prevent long-term disabilities. The key to successful stroke management is identifying the condition and ensuring swift transportation (Phipps and Cronin, 2020). Based on interviews with five families, the respondents were unaware of stroke signs and symptoms. Knowledge of how to provide first aid to patients or family members experiencing a stroke was also poor. Therefore, this study aimed to determine the dominant factors influencing pre-hospital stroke attack management.

## Method

This study employed a quantitative approach with a cross-sectional design. The target population included residents of Kupang City, with an estimated 1,200 stroke patients based on the 5% prevalence rate from basic health research 2018 data, within a total population of 28,430 stroke cases in East Nusa Tenggara. A sample size of 300 individuals was determined using Multistage Random Sampling.



Data were collected using a structured questionnaire, which underwent validation and reliability testing. Ten questionnaires were distributed, and reliability testing identified one invalid question. Cronbach's Alpha coefficient was calculated to assess internal consistency reliability, yielding a value of 0.70.

The questionnaire comprised several parts: Part 1 focused on gathering respondents' characteristics.

Part 2: Evaluated knowledge about pre-hospital stroke management through eight questions with scoring criteria of two for correct and one for incorrect answers. Scores ranged from 8 to 16.

Part 3: Assessed community confidence in performing pre-hospital stroke management via eight questions, scoring breakdowns of three, two, and one for confident, somewhat confident, and not confident responses, respectively. Scores ranged from 8 to 24.

Part 4: Explored perceptions about the decision to perform pre-hospital stroke management and decision-making time for family members to transport a stroke patient to the hospital. This section included ten statements scored on a scale of three for agree, two for somewhat agree, and one for disagree, with scores ranging from 10 to 30 and 14 statements with similar scoring criteria for decision-making time, ranging from 14 to 42.

Ethical approval was obtained from the ethics committee of the Kupang Ministry of Health Polytechnic (approval number LB.02.03/1/01236/2023). Respondents were selected based on predetermined inclusion and exclusion criteria. Informed consent was obtained from participants through a request sheet. Clear instructions were provided for questionnaire completion.

Descriptive statistics were used to analyse the distribution of data. The relationship between independent and dependent variables was assessed using the Chi-Square test. Multivariate analysis, specifically logistic regression, was employed to identify determinant factors predicting the dependent variable.

## Result

**Table 1:** Age, gender, religion, education, stroke patients in the family, distance from home to health facilities, exposure to information about stroke



<b>Age</b>	<b>n</b>	<b>%</b>
18 - 24	19	6,3
25 - 45	109	36,3
46 - 52	45	15
53 - 59	49	16,3
>60	78	26
Total	300	100
<b>Gender</b>	<b>n</b>	<b>%</b>
Male	165	55.0
Female	135	45.0
Total	300	100.0
<b>Education</b>	<b>n</b>	<b>%</b>
Elementary School	17	5.7
Junior High School	25	8.3
Senior High School	166	55.3
D3/S1	91	30.3
No school	1	.3
Total	300	100.0
<b>Stroke Patients in the Family</b>	<b>n</b>	<b>%</b>
Husband	64	21.3
Wife	68	22.7
Parents and child	125	41.7
Close Family	37	12.3
Neighbor	4	1.3
Patient/Respondent Himself	2	0.7
Total	300	100.0
<b>Distance from home to health facilities</b>	<b>n</b>	<b>%</b>
1 - 5 KM	168	56.0
> 5 KM	115	38.3
< 1 KM	17	5.7
Total	300	100.0
<b>Have you ever received information about a stroke?</b>	<b>n</b>	<b>%</b>
No	205	68.3
Yes	95	31.7
Total	300	100.0

Table 2 shows that the most common age group was the 24-45-year-old category (36.3%), with ten respondents, while the least represented was the 18-24-year-old



category, consisting of 19. The majority were males, totalling 165 (55.0%), while the distribution of females was 135 (45.0%).

Based on the results, 166 (55%) respondents had a high school education, while 1 (0.3%) was uneducated. 148 (49.3%) were self-employed/entrepreneurs, and 8 (2.7%) were RT mothers. The majority, 125 (41.7%), reported having family members, including parents and their children, who have experienced a stroke, while 2 were patients themselves.

The average distance between respondents' homes and health facilities ranged from 1-5 KM among 168 (56.0%), while about 17 (5.7%) had a distance of < 1 KM. Approximately 68.3% or 205 respondents had never received information about stroke, while 95 (31.7%) had received information.

**Table 2:** Level of Knowledge, confidence, perception, decision-making time, and community accuracy regarding pre-hospital stroke management

<b>Knowledge</b>	<b>n</b>	<b>%</b>
Good	298	99.3
Not enough	2	.7
Total	300	100.0
<b>Community Confidence</b>	<b>n</b>	<b>%</b>
Certain	259	86.3
Not sure	41	13.7
Total	300	100.0
<b>Perception of Stroke Management</b>	<b>n</b>	<b>%</b>
Positive	289	96.3
Negative	11	3.7
Total	300	100.0
<b>Decision Time</b>	<b>n</b>	<b>%</b>
Right Decision	297	99.0
Incorrect Decision	3	1.0
Total	300	100.0
<b>Accuracy of Pre-Hospital Treatment</b>	<b>n</b>	<b>%</b>
Appropriate	292	97.3
Not exactly	8	2.7
Total	300	100.0

Table 2 shows that 99.3% or 298 respondents had good knowledge of stroke management at home, while 2 had insufficient knowledge. Furthermore, 86.3% or 259



respondents, had the confidence to carry out pre-hospital stroke treatment, and 41 (13.7%) had no confidence. 289 (96.3%) had positive perceptions regarding the decision to carry out pre-hospital stroke treatment, while 11 others had negative perceptions. The majority, namely 297 (99%), made the right decision to take stroke patients to hospital, and only 3 (1%) made the wrong decision. The results also showed that 292 (97.3%) respondents accurately handled pre-hospital stroke sufferers, while the remaining eight were inaccurate.

**Table 3:** Multivariate logistic regression analysis

No	Variable	Coefficient	P Value	OR
1	Knowledge	-18.557	0.999	0.000
2	Community Confidence	0.324	0.742	1.382 (0.202 - 9.473)
3	Perception of Stroke Management	1.642	0.172	5.167 (0.562 - 47.506)
4	Family Decision-Making Time to Take Stroke Patients to Hospital	3.031	0.018	20.714 (1.675 - 256.114)

The multivariate logistic regression analysis results in Table 2 show that the independent variables (Knowledge, Community Confidence, and Perception of Stroke Management) have a P-value (Sig) > 0.05. In other words, these three variables did not have a significant influence either individually or collectively on the dependent variable, namely the accuracy of pre-hospital stroke patient management. Based on the results, only the variable "Family Decision-Making Time to Take Stroke Patients to the Hospital" demonstrated a significant effect, individually and collectively. The magnitude of the influence was indicated by the value of EXP (B), also known as the ODDS RATIO (OR). This variable had an OR of 20.714, meaning that respondents capable of making the right decision were 20.714 times more likely to achieve accurate pre-hospital stroke patient management than those who made the wrong decision.

## Discussion

Based on the results, knowledge of pre-hospital stroke management was categorised mainly as good. People with insufficient knowledge tend to be less accurate in pre-hospital stroke patient management. According to a previous study, the families were most knowledgeable about recognising speech-related symptoms, while arm-related symptoms and time-sensitive detection were comparatively lower (Ainiyah et al., 2021). Understanding symptoms is crucial for recognising a stroke attack and ensuring prompt visitation to the emergency room or hospital (Rachmawati et al., 2017).

This knowledge is expected to improve due to the educational efforts conducted by various parties for families. Stroke education campaigns have been reported to enhance



patients' and families' awareness of the correct response. As a previous study stated, these campaigns have short-term impacts on knowledge of symptoms (Ragoschke-Schumm et al., 2014).

Knowledge of early detection is crucial for families at risk, such as those with hypertension and diabetes. Family knowledge includes the ability to recognise symptoms of a stroke, including sudden slurred speech, muscle cramps in the extremities, difficulty in speaking, blurred vision, difficulty in swallowing, and even loss of consciousness.

The capacity to provide stroke care at home can be acquired through family experience. This is supported by the fact that most respondents had completed high school and belonged to the 60 - 66 age group. Furthermore, improved knowledge often results from receiving stroke education, as it enhances cognitive abilities and broadens the scope of thinking. Families with more awareness of symptoms are expected to provide care assistance to members with a stroke (Jusuf et al., 2023).

Knowledge and the ability to detect strokes early did not correlate, primarily due to the limited access to education among the respondents. Additionally, stroke symptoms can vary significantly among individuals, including sudden loss of consciousness, cramps in the extremities, slurred speech, severe headaches, blurred vision, as well as difficulty in speaking and walking.

Most families of stroke patients were found to have confidence in carrying out pre-hospital stroke management. Good knowledge significantly influences self-confidence, which refers to the ability to control individual thoughts, feelings, and behaviour. This characteristic is influenced by knowledge, education level, and age. Individuals with higher knowledge and education levels tend to have greater self-efficacy, further shaped by past experiences and social or verbal persuasion (Santosa and Trisnain, 2019). Furthermore, self-efficacy creates a positive mindset (Lianto, 2019), and individuals with good self-confidence exhibit improved task performance (Bandura, 2012).

When faced with a stroke attack, family members may experience varying feelings and beliefs about handling the situation. However, their confidence in assisting a family member increased through experience, knowledge, and education.

The results indicated that most respondents had a positive and appropriate perception of the decision to provide pre-hospital stroke management. Perception greatly influences decision-making. Serious perceptions about an illness facilitate promptness in seeking assistance (Rahmawati et al., 2018). In other words, the greater the perception of an illness, the faster the decision-making process, allowing for prompt care and an increased chance of survival (Rahmawati et al., 2018).



The decision to provide pre-hospital stroke management was greatly influenced by the clinical manifestations experienced by family members. The signs and symptoms can differ from the knowledge acquired through other sources of information, and this difference often leads to delays in seeking treatment (Brunton et al., 2019).

The signs and symptoms experienced by stroke patients may also not match their expectations, leading to delays in receiving immediate intervention (Yoon, 2002). Many individuals fail to recognise the symptoms of stroke, often dismissing it as a minor ailment. This condition deprives the patients of receiving intensive treatment (Boulanger et al., 2018).

The results showed that most respondents were accurate in the timing of family decisions to take stroke patients to the hospital. However, the means of transportation used was a car, and not an ambulance due to the ease of accessibility. The ideal means of transportation for transporting stroke patients according to the 2018 American Stroke Association (ASA) guidelines is an ambulance. Patients suspected of having a stroke should immediately be taken to the nearest health service facility for immediate treatment (Powers et al., 2018).

The decision to promptly bring stroke patients to the hospital also stemmed from the strong familial relationship between respondents and their families, consisting of parents and children. Family members are the closest people who accompany and support stroke patients from the incident scene to the emergency room (Hidayat et al., 2020).

Based on the results, most healthcare facilities were within 1-5 kilometres of the respondents. This relatively short distance prompts families to respond quickly in bringing patients to the nearest hospital or community health centre. The "golden period" for treatment is within 3 hours after experiencing a stroke, meaning that patients should receive comprehensive and optimal therapy from the emergency medical team within this timeframe (Bahnasy et al., 2019). Delaying treatments beyond 3 hours increases the risk of long-term disability and other complications.

Families play a crucial role in providing pre-hospital care, with fast decision-making resulting in more optimal outcomes. The multivariate logistic regression analysis results showed that knowledge, community confidence, and perception of stroke management did not significantly influence the accuracy of pre-hospital stroke management. The decisive factor was the family decision-making time to bring stroke patients to the hospital, individually or collectively.

Knowledge, attitude, and confidence influenced the behaviour of bringing stroke patients to the nearest healthcare facility. As stated by a previous study, good knowledge plays a crucial role in shaping attitudes and confidence (Bukan et al., 2020). Stroke patients who experienced an attack at home were immediately taken by their families to



the nearest healthcare facility. However, using non-standardized vehicles for transportation resulted in neglecting the “golden period”.

The results showed that several families could not detect stroke symptoms. In most cases, when an attack occurs at home, some family members lay the patient down on the bed, apply oil, wait for the condition to stabilise, and then proceed to the hospital. According to the Center for Data and Information of the Indonesian Ministry of Health (2019), patients should be directed to the nearest hospital with a dedicated stroke centre. Visiting clinics is discouraged, as it may cause delays in receiving appropriate care (Wahab and Sijid, 2021). In Kupang City, no stroke centre is available; hence, patients who arrive at the hospital are immediately taken to the Emergency Department (ED) to be treated by the medical team. Ideally, people experiencing stroke symptoms should promptly contact an ambulance or the local emergency services number (Boulanger et al., 2018). The chances of recovery greatly depend on effective pre-hospital and emergency department coordination. Management and stabilisation must begin at home to reduce delays in treatment (Triwijayanti, 2023).

The government has provided the ambulance service known as "Brigade Kupang Sehat" since 2017 and continues to operate. The resources provided by the Kupang City Health Department and the Brigade Kupang Sehat team consist of 4 ambulance vehicles. These ambulances are well-equipped with emergency response facilities, including oxygen tanks, infusion bottles, blood pressure monitoring devices, electrocardiogram (EKG) machines, and emergency medications. The human resources comprised eight doctors, 26 nurses/midwives who have undergone GELS/PPGD (Emergency Patient Management) training, eight drivers, and two sanitation officers. This institution also provides home-based patient services, with approximately 10–15 minutes response time. However, despite these efforts, many residents still perceived uneven distribution of healthcare services. The Brigade Kupang Sehat team's lack of infrastructure and human resources influenced this perception (Try Sutyo Sanjaya Pali et al., 2022). Due to the limited facilities, infrastructure, and human resources working in the emergency unit, many residents often transport stroke patients to the hospital using non-ambulatory vehicles.

This study's limitation was its failure to examine the duration of travel time when transporting stroke patients to the hospital. It also did not review the specific medical procedures carried out on patients in transit.

## Conclusion

The findings of this study shed light on several important aspects of pre-hospital stroke management in Kupang City.

The study revealed that respondents' overall knowledge of pre-hospital stroke management was relatively good. However, there were discrepancies in recognising



specific stroke symptoms, indicating areas where further education and awareness campaigns may be beneficial.

Family members were crucial in the decision-making process regarding pre-hospital stroke management. Despite good knowledge levels, some families could not promptly recognise stroke symptoms and initiate appropriate action.

Respondents' positive perceptions and high confidence levels regarding pre-hospital stroke management were observed. However, these factors did not significantly influence the accuracy of pre-hospital stroke management.

The majority of stroke patients were transported to healthcare facilities using non-standardized vehicles, potentially delaying access to timely treatment. While most healthcare facilities were within a short distance, the lack of specialised stroke centres posed challenges in delivering optimal care.

The government's efforts, such as establishing Brigade Kupang Sehat and providing ambulances, have aimed to improve pre-hospital care. However, perceptions of uneven distribution of healthcare services persist, highlighting the need for further investment in infrastructure and human resources.

## Recommendations

1. **Enhanced Education and Awareness Campaigns:** Develop and implement targeted educational initiatives to improve awareness and recognition of stroke symptoms among the general population. These campaigns should focus on specific symptoms found to be less recognised in this study, such as arm-related symptoms and time-sensitive detection.
2. **Family Training Programs:** Design educational programs that empower families with the knowledge and skills to promptly recognise stroke symptoms and initiate appropriate actions. These programs could include hands-on training sessions and the distribution of educational materials tailored to the local context.
3. **Community Engagement Activities:** Engage community leaders and organisations in raising awareness about pre-hospital stroke management. Collaborate with local institutions, such as schools, religious centres, and community groups, to disseminate information and promote healthy stroke prevention and management behaviours.
4. **Standardisation of Transportation Services:** Advocate for standardising transportation services for stroke patients, emphasising using ambulances equipped with the necessary medical facilities. Work with relevant stakeholders



to ensure efficient access to ambulance services and address infrastructure or resource gaps that may hinder timely transportation to healthcare facilities.

5. **Investment in Stroke Care Facilities:** Advocate for increased healthcare infrastructure investment to establish specialised Kupang City stroke centres. These centres should provide comprehensive stroke care, including acute treatment, rehabilitation, and community education programs.
6. **Monitoring and Evaluation:** Implement systems for ongoing monitoring and evaluation of pre-hospital stroke management initiatives. Collect data on key performance indicators, such as response times, patient outcomes, and community awareness levels, to assess the effectiveness of interventions and inform future decision-making.

## Declarations

**Conflict of interest:** The authors declare no potential financial or other conflicts of interest.

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