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CASE REPORT: MANAGEMENT OF ISCHEMIC STROKE USING THE CODE STROKE PROTOCOL IN A 60-YEAR-OLD FEMALE

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ABSTRACT

A stroke is defined as a neurological deficit attributed to an acute focal injury of the CNS (i.e., brain, retina, or spinal cord) by a vascular cause. Ischemic stroke is caused by disrupted cerebral blood flow due to thrombotic or embolic events. Stroke risk factors are classified into modifiable factors, such as hypertension, diabetes mellitus, hyperlipidemia, and smoking habits, and non-modifiable factors, such as age, gender, race/ethnicity, and genetic predisposition. This case report discusses a 60-year-old female patient presenting to the emergency department with right-sided body weakness, difficulty swallowing, slurred speech, and a history of uncontrolled hypertension. Physical examination revealed severe hypertension (216/106 mmHg), underweight nutritional status (BMI 17.24 kg/m^2), motor weakness, and a positive Babinski reflex. A head CT scan showed infarction in the pons and left external capsule, consistent with a diagnosis of ischemic stroke due to small vessel occlusion. The patient was managed using the Code Stroke protocol, which included fluid administration, antihypertensives, neuroprotectors, and thrombolytic rTPA. Following therapy, clinical symptoms improved, with a reduction in the NIHSS score from 8 to 5, indicating a positive response. Patient education emphasized the importance of controlling risk factors such as hypertension and hypercholesterolemia and adherence to pharmacological treatments and lifestyle modifications. In conclusion, early diagnosis and the appropriate application of the Code Stroke protocol can enhance clinical outcomes, reduce morbidity and mortality, and prevent long-term complications in ischemic stroke patients. Ischemic stroke highlights the significance of an integrated multidisciplinary approach in stroke management.

Introduction

A stroke is defined as a neurological deficit caused by acute focal injury to the central nervous system (i.e., brain, retina, or spinal cord) associated with vascular damage (infarction or haemorrhage) of the central nervous system (Werring et al., 2024). The Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification system is the most widely used mechanistic subclassification system for patients with cerebral ischemia, defining five subtypes: (1) extensive artery atherosclerosis, (2) cardioembolic, (3) small vessel occlusion, (4) stroke of other specified aetiology, and (5) stroke of undetermined aetiology (Murphy et al., 2020). The aetiology of ischemic stroke is defined as a thrombotic or embolic event that disrupts blood flow to an area of the brain.

Stroke is associated with numerous risk factors, including modifiable and non-modifiable factors (Johansson et al., 2021). Modifiable risk factors encompass medical conditions and behavioural risk factors, such as hypertension, diabetes mellitus, hyperlipidemia, and smoking. Non-modifiable risk factors include age, gender, race/ethnicity, and genetics (Capirossi et al.,

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2023). In 2020, the global prevalence of all stroke subtypes was 89.13 million cases, with acute ischemic stroke accounting for 68.16 million cases. The global incidence of stroke was 11.71 million in 2020, and among all strokes, ischemic stroke accounted for approximately 65% of all cases. Concerning mortality, in 2020, the number of deaths caused by stroke was 7.08 million, with 3.48 million of these being attributable to ischemic stroke (Boehme et al., 2017). Based on data from the 2023 Indonesian Health Survey, it was found that 8.3 per 1000 people in The most vulnerable age group, defined as those over 54 years of age, exhibited the highest incidence of stroke, with an increase of 23.6%, 35.4%, and 41.3% in the incidence of stroke in the 55-64, 65-74, and 75+ age groups, respectively (Ministry of Health BPK, 2023). A study conducted in France in 2019 revealed that patients under 65 exhibited a 1-year survival rate of 93.7%, a 5-year survival rate of 87.7%, and a 10-year survival rate of 82.8% (Romain et al, 2020).

Given the narrow therapeutic window for effective intervention—such as intravenous thrombolysis using rTPA within 3 to 4.5 hours—the urgency of stroke research cannot be overstated. Delays in diagnosis and treatment can lead to irreversible brain injury and long-term disability. This necessitates a continuous emphasis on optimizing early detection systems, enhancing stroke response protocols such as Code Stroke, and advancing clinical innovations that improve patient outcomes. Urgent interdisciplinary research is essential to reduce mortality rates, enhance rehabilitation strategies, and manage the growing burden of stroke globally.

The "code stroke" emergency protocol was developed to facilitate immediate evaluation of patients suspected of experiencing cerebrovascular events (Freeman & Khosravani, 2024). The objective of this protocol is to enhance the efficacy of reperfusion therapy for ischemic stroke to reduce mortality. The protocol incorporates a set of criteria for administering rTPA thrombolytics, which must be met for treatment to be administered (Demaerschalk et al., 2016). Notably, despite having a higher initial NIHSS score, 40% of patients who received rTPA treatment based on the physician's decision exhibited positive outcomes. This case study delineates the clinical course of a 60-year-old female patient afflicted with ischemic stroke, hypertension, and hypercholesterolemia, with a meticulous dissection of the progression of the disease and the therapeutic interventions administered to the patient.

The aim of this study is to report and analyze the management of ischemic stroke using the Code Stroke protocol in a 60-year-old female patient, with a focus on the impact of early intervention, diagnostic accuracy, and clinical outcomes. This case highlights the practical application of stroke management guidelines and contributes to the ongoing discussion on the effectiveness of acute care protocols in improving patient prognosis.

Method

This study employs a descriptive case study design aimed at providing a detailed account of the diagnosis, management, and clinical outcomes of a patient with ischemic stroke treated using the Code Stroke protocol. The design is suitable for exploring rare or notable clinical presentations and evaluating intervention responses in a real-world hospital setting.

The sample in this report consists of a single patient, a 60-year-old female, who presented to the emergency department of RSD K.M.R.T Wongsonegoro Semarang with clinical signs of acute ischemic stroke. The patient was selected purposively due to the relevance of her condition and treatment approach in illustrating the effectiveness of the Code Stroke protocol.

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The key variables observed and reported include: 1) Independent variable: Implementation of the Code Stroke protocol (including rTPA administration, monitoring, and medications). 2) Dependent variables: Patient's neurological status (NIHSS score), blood pressure, motor strength, and recovery progression. 3) Supporting variables: Laboratory findings, radiological results, and medication adherence.

Data were collected through: 1) Clinical observation and physical examination (motor strength, cranial nerve assessment, vital signs). 2) Medical records, including laboratory tests, imaging results (CT scan, X-ray), and treatment history. 3) Standardized clinical scales, notably the National Institutes of Health Stroke Scale (NIHSS), used to measure stroke severity.

The data were analyzed using qualitative descriptive analysis, highlighting the correlation between the clinical presentation, intervention (Code Stroke), and the observed outcomes. Changes in NIHSS score before and after treatment were used to measure clinical improvement, while other findings were interpreted in the context of existing literature and treatment guidelines.

Results

A 60-year-old female patient presents with complaints of weakness in the right upper and lower limbs, which are limited to movement for one hour. Limited movement is accompanied by difficulty in swallowing and slightly slurred speech. Prior to the onset of this weakness, the patient experienced headaches. Notably, the patient reports no history of similar complaints. The patient's medical history includes hypertension, which was diagnosed two years prior. The patient reports currently taking medication for hypertension, specifically Amlodipine 10 mg, although not as a routine part of her medical care. The patient's occupation is that of a housewife, and she reports spending three times per day eating various side dishes. The patient reports no current smoking or alcohol use.

The patient exhibited a blood pressure reading of 216/106 mmHg following a thorough medical examination. The patient's vital signs were within normal parameters, and the patient's weight was recorded at 42.5 kilograms, with a height of 157 centimetres. The patient's nutritional status was determined to be underweight, with a BMI of 17.24 kg/m2. A subsequent evaluation of cranial nerves VII and X revealed slurred speech, mild dysarthria, and slight dysphagia. A motor examination of the upper and lower limbs on the right side revealed weakness and limited movement, with motor strength scores of 222/555 and 222/555, respectively. A sensory examination revealed decreased tactile, pain, and temperature sensitivity. The Babinski pathological reflex was positive in the right lower limb, and the patient's National Institutes of Health Stroke Scale (NIHSS) value when examined in the emergency room (ER) was 8, indicating a moderate neurological deficit (6-14).

Laboratory examination revealed a slight increase in the number of leukocytes (11.3/µL), random blood sugar (112 mg/dL), calcium (1.25 mmol/L), and total cholesterol (205 mg/dL). The patient also exhibited elevated levels of urea (43.2 mg/dL), creatinine (1.04 mg/dL), and other key laboratory parameters, including activated partial thromboplastin time (APTT; 23.9 s) and prothrombin time (PT; 10.5 s). A chest X-ray radiology examination revealed aortic elongation and vascular patterns

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that were compacted. Spots were observed in both the perihilar and right paracardial regions. The CT scan results revealed infarction in the pons and left external capsule, calcification in the cerebellum, and duplex maxillary sinusitis and mastoiditis.

Table 1. Blood tests on 11/29/24

Parameter		Result	Reference Value	Unit
A. Hemtologi				
Darah Rutin				
-	Hemoglobin	13,4	11,7 – 15,5	g/dL
-	Hematocrit	39,50	35 – 47	%
-	Platelets	302	150-400	/uL
-	Erythrocytes	4,49	4,2-5,4	/uL
-	Leukocytes	11,3*	3,6-11,0	/uL
Blood clotting				
-	APTT	23,9*	26.0 – 34.0	detik
-	PT	10,5*	11.0 – 15.0	detik
B. Kimia				
GDS (IGD)		112*	70-110	mg/dL
Urea		43,2*	17,0-43,0	mg/dL
Creatinine		1,04*	0,5-0,8	mg/dL
Uric Acid		4,9	2.4-7.4	mg/dL
Total Cholesterol		205*	<200	mg/dL
Triglycerides		137	<=150	mg/dL
Potassium		4,10	3,50-5,0	mmol/L
Sodium		144,0	135,0-147,0	mmol/L
Calcium		1,25	1,00- 1,15	mmol/L
Cardiac biomarkers (02/12/25)				
-	Troponin I	0.003	AMI >0.10	ug/L

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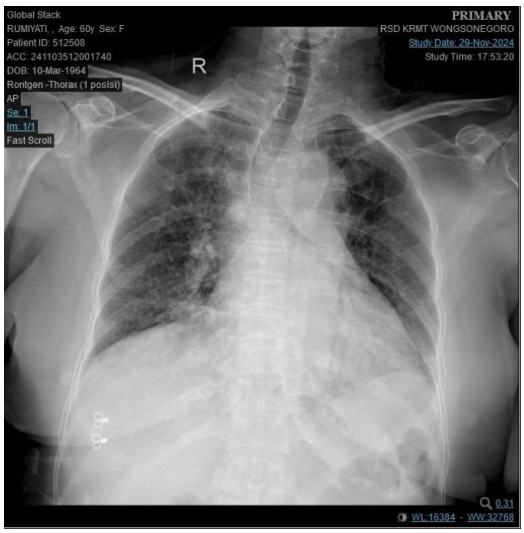

Figure 1. AP projection chest X-ray

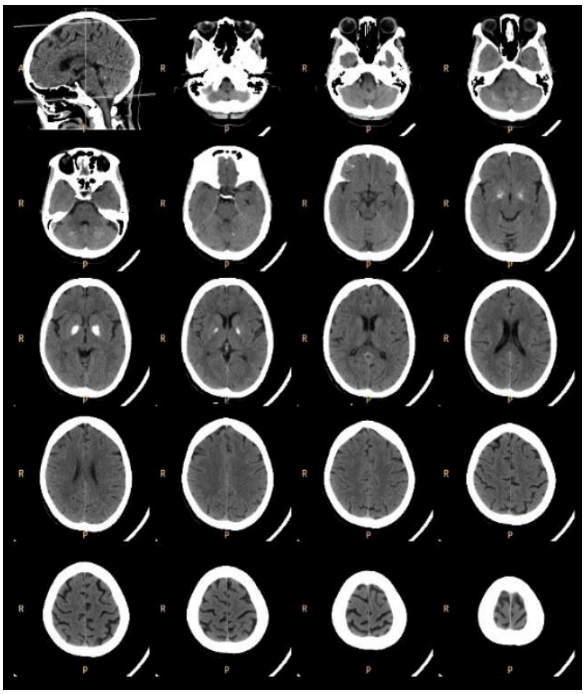

Figure 2. Non-contrast CT scan of the head

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The patient was diagnosed with non-hemorrhagic stroke, right hemiparesis, hypercholesterolemia, hypertension, bronchopneumonia, and acute myocardial infarction based on anamnesis, physical examination, and supporting examination. The patient was managed in the emergency installation following the Code Stroke protocol. Initial management of the patient included the following: blood pressure (BP) monitoring every 15 minutes, administration of Ringer Lactate infusion fluid (500 ml/8 hours), Ranitidine injection (50 mg/12 hours), citicoline injection (500 mg/12 hours), mecobalamin injection (500 mg/24 hours), nicardipine sp 0.5 meq, and Ate. Place injection 0.6-0.9 mcq/kgBW, 10% bolus, and the remainder was administered over the course of 1 hour, using the smallest dose of 0.6 mcq/kgBW and the patient's body weight of 42.5 kg was obtained; the bolus of 2.55 cc and the SP of 22.95 cc were administered over the course of 1 hour. Following the administration of rTPA, the patient exhibited a marked improvement in his complaints, as evidenced by a decrease in NIHSS score from 5 to 0. After the initial management in the emergency room, the patient was transferred to the ward and underwent further management in the form of Aspilet, administered orally at a dose of 80 mg every 24 hours (given 1x24 hours after the administration of rTPA), and Atorvastatin, administered orally at a dose of 20 mg. Ceftriaxone injection 1 gr/12 hours, Citicoline injection 500 mg/12 hours, Amlodipine orally 10 mg/24 hours, Candesartan 16 mg/24 hours, and Nitrocaf Retard 2.5 mg/24 hours. Following a treatment period of six days, the patient was discharged, exhibiting enhanced motor strength and an improved NIHSS score (reduced from a score of 8 in the emergency room to 5 upon discharge). The patient was prescribed medication in the following forms: Aspilet, 80 mg once daily; Atorvastatin, 20 mg once daily; Cefixime, 200 mg once daily; and Amlodipine, once daily. 10 mg/24 hours, Nitrokaf R orally 2.5 mg/24 hours (a.i. acute myocardial infarction based on advice from an internal medicine specialist), Acetylcysteine orally 200 mg/12 hours (a.i. bronchopneumonia based on advice from an internal medicine specialist), and was referred to the medical rehabilitation department for physiotherapy.

Discussion

Acute stroke is defined as the abrupt manifestation of focal neurological deficits within the vascular region of the brain, retina, or spinal cord, precipitated by underlying cerebrovascular disease (Hui et al., 2024); (Warlow, et al., 2019). Cerebrovascular disease is frequently associated with ischemic events in the brain, which are often precipitated by multiple risk factors, including hypertension, diabetes mellitus, smoking, obesity, atrial fibrillation, and drug use (Flora & Nayak, 2019). Cerebrovascular disease is often precipitated by risk factors such as hypertension, diabetes mellitus, smoking, and atrial fibrillation. The current case study supports this theory, as the patient had a history of uncontrolled hypertension—a recognized trigger of ischemic stroke.

In particular, persistent hypertension, defined as uncontrolled hypertension, has been identified as a significant risk factor for stroke, particularly among individuals over the age of 50 (Hui et al., 2024). In the present case, it was observed that the patient exhibited uncontrolled hypertension, which was identified as a contributing factor to the presented complaints. Furthermore, the patient exhibited shortened blood clotting times, as indicated by APPT and PT, which could be a contributing factor to the occurrence of ischemic stroke, as previously reported by Lin et al. in 2015. This study indicated that reduced blood clotting time increased acute ischemic stroke incidence by 1.86 times (Lin et al., 2015). Demonstrated that patients with shorter clotting times were 1.86 times more likely to develop ischemic stroke.

The Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification system is a comprehensive framework that categorizes ischemic stroke into five distinct

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subtypes: (1) significant artery atherosclerosis, (2) cardioembolic, (3) small vessel occlusion, (4) stroke of other determined aetiology, and (5) stroke of undetermined aetiology (Murphy et al., 2020). Categorized strokes into five types, with this case aligning with the small vessel occlusion subtype—often referred to as lacunar infarction. This is supported by the CT scan showing infarction in the pons and external capsule, consistent with lacunar stroke characteristics.

Age is another significant factor. According to the 2023 Indonesian Health Survey, , individuals over 54 years are at heightened risk of stroke. The patient's age (60 years) reinforces the relationship between aging and stroke prevalence. The Code Stroke protocol is an emergency response system intended to facilitate timely thrombolysis for ischemic stroke. Toscano et al. (2020) emphasized its role in rapid evaluation and treatment, while Demaerschalk et al. (2016) outlined inclusion criteria for rTPA administration. In our case, the patient met these criteria (NIHSS >6, ischemia on CT, symptom onset <3 hours), validating the use of rTPA. Marko et al. (2020) found that patients who received rTPA per protocol had significantly better outcomes. This correlates with the current patient's clinical improvement, as her NIHSS score improved from 8 to 5 following treatment.

In the case of small vessel occlusion, patients with stroke are typically classified as having lacunar infarction, a type of stroke characterized by the blockage of a small blood vessel within the brain. A history of diabetes mellitus or hypertension is a supporting factor in the clinical diagnosis. Furthermore, CT or MRI findings are normal or show relevant subcortical, brainstem, or hemispheric lesions with a diameter of <1.5 cm (Hui et al., 2024). Lacunar infarctions frequently manifest in deep subcortical brain structures, such as the thalamus, basal ganglia, pons, and the white matter of the internal capsule (Prokopiv & Fartushna, 2021). Notably, lacunar infarctions can be asymptomatic, with the clinical presentation contingent on the affected brain area (Saceleanu et al., 2023). In lacunar infarction within the centrum semiovale, the absence of symptoms may render the condition incidentally detected on brain imaging for other indications (Tang, 2020). However, certain lacunar infarctions, such as those affecting the posterior leg of the internal capsule or pons, can manifest with severe hemiplegia. Cortical findings include neglect, visual disturbances, aphasia, and behavioural changes. Rarely are lacunar strokes affecting memory, language, and judgment (Gore et al., 2024). The findings obtained from the patient support the classification of ischemic stroke as a minor vessel occlusion stroke. The patient exhibited symptoms of right hemiparesis and lameness on half of the face, as well as speech and swallowing disorders. Notably, the patient did not demonstrate memory, language, or judgment symptoms, which aligns with existing theories. Consequently, the CT scan revealed an infarct image in the pons and left external capsule, thereby corroborating the prevailing theory concerning the location of the lesion in cases of small vessel occlusion. According to data from the 2023 SKI, the age group with the highest susceptibility to stroke is >54 years, with a 23.6% prevalence of stroke in the 55-64 age group (Ministry of Health BPK, 2023). The patient's age of 60 years aligns with this high-risk category, indicating a significant likelihood of stroke occurrence.

Code stroke is an emergency protocol for assessing patients suspected of experiencing cerebrovascular events (Micieli et al., 2020). The protocol aims to increase

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and optimize the chances of cerebral reperfusion to reduce stroke mortality (Demaerschalk et al., 2016). The protocol's inclusion and exclusion criteria must be met for treatment using rTPA to be carried out. According to the inclusion and exclusion criteria for administering rTPA as outlined by Demaerschalk et al., the patient in question met these criteria, thereby allowing for the administration of rTPA.A study by Hsiao et al. revealed that 51 out of 193 patients with cerebral infarction met the criteria for thrombolytic therapy, with 50 receiving tPA treatment based on their physician's decision. The increase in NIHSS score during hospitalization was most significant in patients who received tPA treatment based on the doctor's decision (from 13 to 6) compared to patients without tPA treatment (from 3 to 2), and those who received tPA treatment that did not meet the inclusion and exclusion criteria resulted in a worsening of the NIHSS value (decreased from 27 to 36). Clinical deterioration occurred in 31 of 193 patients (17%), with the most pronounced cases occurring among patients who received tPA treatment that did not meet the inclusion and exclusion criteria (Hsiao et al., 2015). By the theory, our patient met the inclusion criteria and was not included in the exclusion. The inclusion criteria included the following: an onset time of less than three hours, a diagnosis of ischemic stroke resulting in significant neurological deficits (NIHSS score > 6), and the presence of ischemia as indicated by CT scan findings. Following the administration of rTPA, the patient exhibited signs of improvement, with an NIHSS score that decreased from 8 to 5. Additionally, there was a clinical improvement, as evidenced by an enhancement in the patient's motor strength.

Conclusion

Individuals presenting to the emergency room with complaints of weakness in half of the body may be experiencing a stroke, which, as previously discussed, can be categorized into two primary types: ischemic and hemorrhagic. A precise diagnosis can be made based on the anamnesis results, physical examination, and additional diagnostic procedures, ensuring the patient receives appropriate treatment. This case report details the case of a 60-year-old female patient who presented at RSD K.M.R.T Wongsonegoro Semarang with complaints of weakness in the right upper and lower limbs, which were still able to be moved for approximately one hour in the supine position. The patient also exhibited symptoms of dysphagia and mild dysarthria. A headache preceded the onset of weakness in the right limbs.

A physical examination revealed a blood pressure reading of 216/106. The patient's nutritional status was underweight, with a body weight of 42.5 kilograms and a height of 157 centimetres. A thorough examination of the cranial nerves revealed paresis of the VII and X nerves. Motor examination results indicated motor weakness in the upper and lower limbs on the right side, with limited movement, yielding a value of 222/555. A thorough examination revealed decreased tactile, pain, and temperature sensitivity. The Babinsky pathological reflex was positive in the patient's right lower limbs. The patient's National Institutes of Health Stroke Scale (NIHSS) value upon evaluation in the emergency room (ER) was 8. Laboratory examinations revealed slow blood clotting. A CT scan revealed an image of an ischemic stroke. This finding indicates that the patient experienced an ischemic stroke with an onset time of one hour, thereby meeting the criteria for the implementation of the stroke code protocol. The protocol is initiated upon observing improvement in the patient's complaints. Patients must receive education regarding the risk factors that can precipitate an ischemic stroke, which can be caused by underlying diseases such as hypertension, as seen in this patient. Ischemic strokes have the potential to adversely impact the quality of life of patients if not adequately treated.

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Therefore, patients must receive not only proper treatment but also make lifestyle modifications. Patients should be educated about the importance of compliance and the benefits of pharmacological and non-pharmacological treatment, physiotherapy, and potential complications that may occur.

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