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The Impact of the Emergency Stroke Green Channel Application on the Treatment Time and Rescue Effect of Patients with Acute Ischemic Stroke

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Abstract: *Objective:* To explore the application effect of the emergency stroke green channel in the treatment of patients with acute ischemic stroke. *Methods:* 40 patients with acute ischemic stroke who called 120 vehicles between December 2023 and December 2024 were selected as the reference group (conventional emergency treatment process), and 40 patients with acute ischemic stroke during the same period were selected as the intervention group (emergency stroke green channel treatment process) to analyze the effectiveness of the intervention. *Results:* The intervention group had a better time from admission to thrombolysis, time from admission to imaging examination, time from admission to endovascular treatment, neurological deficit score, mRS score and incidence of adverse reactions, and there was a gap between the intervention group and the reference group ($P < 0.05$). *Conclusion:* The emergency stroke green channel can significantly shorten the treatment time of patients with acute ischemic stroke, improve the rescue effect, improve the prognosis, and is safe.

Keywords: Emergency stroke green channel; Acute ischemic stroke; Treatment time; Rescue effect

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1. Introduction

Acute ischemic stroke is the most common type of stroke. Its pathogenesis is caused by acute occlusion of cerebral blood vessels, which leads to instantaneous ischemia and hypoxia in the brain tissue, which quickly enters a critical state. Nerve cells are damaged within a few minutes of ischemia. Once the brain blood flow is not reperfused in time, as the ischemia time prolongs, a large number of nerve cells will cause severe neurological deficits due to irreversible necrosis, causing limb hemiplegia, aphasia, dementia, and even endangering the patient's life. The disability rate is extremely high [1]. Therefore, in acute ischemic stroke, time is of the essence. Restoring brain tissue reperfusion as early as possible to reduce brain tissue damage is the key to improving patient prognosis, but the current traditional emergency and hospital emergency treatment procedures have many shortcomings [2]. From the patient's onset to calling an ambulance, visiting the hospital, to registration, examination, diagnosis, and finally to thrombolysis and endovascular treatment,

any link is delayed. For example, patients and their families do not have sufficient knowledge of the indications of stroke at the time of onset and do not seek professional medical treatment in time; pre-hospital emergency transportation encounters traffic jams or is far away from the hospital [3]; internal connections within the hospital are not smooth, such as various examinations and consultation processes are too cumbersome, etc., which may lead to missed time windows for thrombolysis and endovascular treatment; even if the golden treatment time is exceeded, even active treatment. It is also difficult to achieve good neurological function recovery as a better way to treat stroke [4]. The emergency stroke green channel has been widely implemented at home and abroad in recent years. It can integrate different departments and give full play to their complementary advantages of efficiency, shortening the time from admission to medication. At the same time, the green channel simplifies the procedures for registration and other examinations, implements the priority treatment principle for each patient, and then uses advanced imaging technology to quickly make a diagnosis and provide accurate treatment for stroke patients [5]. This study aims to analyze the clinical effectiveness of the emergency stroke green channel in the treatment of acute ischemic stroke, and to provide suggestions for clinical treatment.

2. Materials and methods

2.1. General information

Forty patients with acute ischemic stroke between December 2023 and December 2024 were selected as the reference group, and 40 patients with acute ischemic stroke during the same period were selected as the intervention group. The data comparability between the groups was high $P > 0.05$ (**Table 1**).

Table 1. Comparison of general information between the two groups (mean ± SD, %)

Features	Reference group ($n = 40$)	Intervention group ($n = 40$)	Statistical value (t/χ^2)	P value
Age (years, mean ± SD)	62.3 ± 10.4	63.1 ± 10.7	0.354	0.724
Male (example, %)	24 (60.0)	25 (62.5)	0.074	0.786
Female (example, %)	16 (40.0)	15 (37.5)	0.074	0.786
Duration of disease (years, mean ± SD)	5.5 ± 2.2	5.8 ± 2.5	0.618	0.538

Inclusion criteria: (1) Meet the diagnostic criteria for acute ischemic stroke; (2) Aged between 18 and 80 years old; (3) The onset time is within 4.5 hours; (4) Sign an informed consent form.

Exclusion criteria: (1) Patients with severe heart, liver, and kidney failure; (2) Patients with contraindications for intravenous thrombolytic therapy; (3) Patients who have participated in other clinical trials within the past month.

2.2. Method

Reference group: After the patient arrives at the emergency room, the triage nurse completes the patient's initial evaluation, registration, treatment, and examination. The doctor diagnoses and treats the patient, asks for medical history and physical examination, and prescribes necessary auxiliary examinations, such as head CT, blood tests, etc. After the examination results are reported, the neurologist will evaluate whether thrombolysis or endovascular treatment meets the indications and conduct further diagnosis and treatment.

In the intervention group, the treatment process of the emergency stroke green channel was used. The specific measures include:

(1) Rapid triage and preliminary assessment: After the 120 emergency doctors arrived at the scene, they initially judged the condition and suspected that they were patients with acute ischemic stroke. They informed the patient of the hospital where he was going through the smart emergency system or stroke group chat. After the patient

entered the emergency hall, the emergency clinic opens a green channel for stroke, and the stroke team conducts an emergency assessment. The triage nurse's assessment requires that routine examinations (vital signs, NIHSS scores, etc.) be completed within 5 minutes after the patient arrives at the emergency department, and the neurologist and radiologist are notified. The purpose of the preliminary assessment is to clearly evaluate possible acute ischemic stroke patients and prepare for the next examination and treatment [6].

(2) Priority examination and rapid diagnosis: After admission, the patient is urgently sent to the CT room for brain CT examination, and preparations for sampling and thrombolysis are completed at the same time. Brain CT examination is an important detection method for acute ischemic stroke and can promptly rule out other diseases such as cerebral hemorrhage. During the examination, medical staff simultaneously completed blood sample collection and completed preparations for thrombolysis. After the CT examination, the radiology department will issue a preliminary diagnostic opinion within 10 minutes for neurologists to make a timely diagnosis and treatment plans.

(3) Rapid decision-making and thrombolytic treatment [7]. Within 10 minutes of the CT report, the neurologist will pre-evaluate the patient and make a decision on whether to perform thrombolysis and/or endovascular treatment. Thrombolytic therapy is one of the main treatments for acute ischemic stroke. It can effectively restore blood supply to the patient's brain and reduce the area ofbrain tissue necrosis [8]. Thrombolytic treatment is generally performed in the CT room or emergency room to minimize treatment time. After it was determined that there were no contraindications to thrombolysis, the patient was immediately given thrombolytic therapy (rt-PA) and administered according to the recommended dosage and method.

(4) Multidisciplinary collaboration and endovascular treatment: Patients who are suitable for endovascular treatment, such as those who cannot undergo thrombolytic treatment or who fail thrombolytic treatment, are directly sent to the endovascular treatment operating room to receive mechanical thrombus removal, angioplasty, etc., to restore blood flow in a short time and improve brain tissue perfusion. The relevant interventional operating rooms are immediately ready, and surgical treatment can be performed promptly upon the patient's arrival. The interventional treatment team consists of neurologists, interventional radiologists, and anesthesiologists [9].

(5) Optimization process and continuous improvement: The implementation of the green channel for emergency stroke requires full collaboration between the pre-hospital and hospital, continuous improvement, and monitoring of each link of the green channel to ensure efficient operation of the green channel [10].

2.3. Observation indicators

(1) DNT: the time from emergency to the start of thrombolysis, in minutes.

(2) Imaging examination time: the time from emergency to CT completion, in minutes.

(3) Endovascular treatment time: the time from emergency to the start of treatment, in minutes.

(4) NIHSS score: score before and after treatment. A high score indicates severe functional impairment.

(5) mRS score: Score 90 days after treatment, 0-6 points, with lower scores indicating better prognosis.

(6) Incidence of adverse reactions: record bleeding, allergies, infections, etc.

2.4. Statistics and methods

All survey data were processed by SPSS 23.0 software. The data were displayed in the form of (mean ± SD, %). The difference was detected with t and χ^2. If $P < 0.05$, it means there is a significant difference between the groups.

3. Results

3.1. Comparison of treatment time between the two groups

The treatment time of the intervention group was shorter, and there was a gap between the intervention group and the

reference group ($P < 0.05$) (**Table 2**).

Table 2. Comparison of treatment time between two groups (mean ± SD, minutes)

Group	n	DNT	Time from admission to imaging examination	Time from admission to endovascular treatment
Reference group	40	65.2 ± 12.3	40.5 ± 8.7	120.3 ± 20.5
Intervention group	40	30.5 ± 6.7	20.3 ± 5.2	90.2 ± 15.3
t value	-	15.318	12.733	7.676
P value	-	0.000	0.000	0.000

3.2. Comparison of neurological function scores between the two groups

The neurological function score of the intervention group was better, and there was a gap between the intervention group and the reference group ($P < 0.05$) (**Table 3**).

Table 3. Comparison of neurological function scores between the two groups (mean ± SD)

Group	n	NIHSS score (before treatment)	NIHSS score (24 hours after treatment)	mRS score (90 days after treatment)
Reference group	40	12.5 ± 3.2	8.5 ± 2.5	3.5 ± 1.2
Intervention group	40	12.7 ± 3.5	5.2 ± 1.8	2.1 ± 0.8
t value	-	0.279	7.133	6.077
P value	-	0.781	0.000	0.000

3.3. Comparison of the incidence of adverse reactions between the two groups

The incidence of adverse reactions in the intervention group was lower, and there was a gap between the intervention group and the reference group ($P < 0.05$) (**Table 4**).

Table 4. Comparison of the incidence of adverse reactions between the two groups (n, %)

Group	n	Bleeding	Allergy	infection	Total number of adverse reactions	Adverse reaction incidence rate (%)
Reference group	40	3	2	1	6	15.00
Intervention group	40	1	0	0	1	2.50
χ^2	-	-	-	-		3.858
P	-	-	-	-		0.049

4. Discussion

AIS is the most common type of stroke. Its pathogenesis is due to cerebral blood vessel obstruction, which leads to hypoxia in brain tissue and causes abnormal changes in neurological function. For AIS patients, timely opening of blood vessels and restoration of blood perfusion of brain tissue can reduce ischemic damage. The traditional emergency treatment process has many delays, which lead to delays in thrombolysis and endovascular interventional treatment of AIS, which has serious

adverse effects on patient recovery [11]. The treatment window for AIS is very short, usually limited to within 4.5 hours of onset. Applying thrombolytic therapy during this period is one of the most effective methods to restore cerebral blood flow. Normally, in the traditional emergency rescue process, patients arrive at the emergency department and go through triage, registration, treatment, and examination. Each link will be delayed due to various reasons. For example, there may be missed diagnoses in the triage link after arriving at the emergency department; there may be delays in registration and treatment after triage due to queuing [12]. In the examination link, the treatment time will be delayed due to the presence of patient examination equipment or the time for reporting examination results. In the traditional emergency rescue process, the prolonged time for patient consultation results in a long time between arrival at the emergency department and thrombolytic treatment, resulting in poor prognosis, such as poor thrombolytic treatment effect [13].

The so-called stroke green channel is to shorten the first thrombolysis time for patients with acute ischemic cerebral infarction and thereby improve the efficacy, and establish a seamless connection between the pre-hospital and hospital departments [14]. The concept of time in the practice of this disease is the brain, emphasizing that acute stroke treatment is “timed by seconds”, and based on the status and geographical distribution of my country’s health system, a stroke emergency network composed of relevant medical institutions is built; any hospital can set up a “stroke emergency center”, and first 120 doctors conduct a preliminary assessment of the patient (i.e. outpatient-emergency time) [15]. After the patient arrives at the emergency room, the emergency doctor quickly treats the suspected stroke patient to minimize triage time, avoid wasting medical resources, and allow patients with acute ischemic stroke to enjoy shortened treatment time per minute (i.e., emergency department visit time).

The process is as follows: Once a stroke is suspected, the 120 doctor informs the patient’s condition at the hospital to be reached through the smart emergency system, and at the same time informs the family member of the condition on the way, and the examination and treatment plan that may be required after arriving at the hospital, so that the family member knows in advance. The emergency physician immediately called for support from the outpatient department’s professional stroke team responsible for bedside work in the emergency room and emergency department, including emergency physicians, neurologists, radiographers, and nurses [16]. Members of the professional stroke team quickly devoted themselves to patient-related work. They collected medical history, evaluated the neurological function evaluation form, and the time from onset to admission to the emergency room as quickly as possible in the triage room, and completed the scoring and report within 10 minutes. At this time, the triage nurse simultaneously establishes intravenous access, collects blood samples, and submits relevant procedures such as the informed consent form for stroke thrombolytic treatment and the allergy history assessment form, so as to better initiate emergency treatment [17]. At the same time, relevant clinicians immediately receive emergency examinations when the patient undergoes an intravascular scan of the neck. The patient is sent directly to the CT examination room, completes a 15-minute CT scan, and waits in the CT room for the doctor in charge and the operator of the stroke treatment center to provide appropriate care and assistance in the clinic. The operator quickly extracts the neck blood vessel data and is required to do so within 10 minutes after the patient arrives in the emergency room. The hospital will make an assessment within the hospital and communicate with the patient’s family, and send the first PACS order to the patient through computer and PACS network communication [18]; for patients who require endovascular treatment, we will communicate with the interventional room team in advance and shorten the time from patient admission to femoral artery puncture during the fixed route transportation via the green channel, ensuring that the DNT (onset to puncture time) is within 90 minutes [19]. This multi-disciplinary cooperation, layer-by-layer, and seamless green channel model for stroke breaks through the “information islands” and “time barriers” of traditional medical treatment, and secures a valuable time window for the patient’s neurological function to be re-injured. The experimental results showed that the intervention group had better time from admission to thrombolysis, time from admission to imaging examination, time from admission to endovascular treatment, neurological deficit score, mRS score and incidence of adverse reactions, and there was a gap with the reference group ($P < 0.05$). It showed that the emergency stroke greenway can significantly shorten the diagnosis and treatment time of patients with acute ischemic stroke, improve treatment efficiency, improve prognostic outcomes, and has good safety [20].

5. Conclusion

In summary, the emergency stroke green channel can significantly speed up the total time for patients to receive acute ischemic stroke treatment, increase the treatment rate, improve the prognosis rate, and is very safe.

About the author

Chen Kang (1987-), male, Han nationality, native of Changzhou, Jiangsu Province, undergraduate, attending emergency physician, research direction is emergency medicine.

Disclosure statement

The author declares no conflict of interest.

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