

Original Article

Clinical effect analysis of pre-hospital emergency treatment for patients with acute cerebrovascular disease

Yuying Yang^{1,6}, Qi'na Wang², Qing Chang³, Qianlong Xue⁴, Hongmei Zhao⁷, Jing Chen⁵, Aixia Song³, Qian Xue³

Departments of ¹Nursing, ²Publicity, ³Neurology, ⁴Emergency, ⁵Medical Imaging, The First Affiliated Hospital of Hebei North University, Zhangjiakou, Hebei Province, China; ⁶Stroke Center Office, ⁷The Third Department of Neurology, The First Affiliated Hospital of Hebei North University, Zhangjiakou, Hebei Province, China

Received February 25, 2020; Accepted April 9, 2020; Epub June 15, 2020; Published June 30, 2020

Abstract: Objective: To explore the clinical effect of pre-hospital emergency treatment for patients with acute cerebrovascular disease (ACVD). Methods: Three hundred cases of ACVD patients admitted to The First Affiliated Hospital of Hebei North University from each of the two selected periods, which were January-November 2018 and January-November 2019 respectively, were retrospectively analyzed. The patients were randomly divided into the control group (n=150, admitted in January-November 2018) and the research group (n=150, admitted in January-November 2019). The patients in the control group were treated with the current admission traditional first-aid measures, while those in the research group were treated with the corresponding emergency and first-aid measures before admission, and the relevant indicators of the two groups were compared and analyzed. Results: After a period of study, it was found that the survival rate of patients in the research group was higher ($P<0.05$), the length of hospitalization was shorter ($P<0.001$), and the incidence of sequelae was significantly reduced ($P<0.05$) compared with the control group. Conclusion: For patients with ACVD, receiving a doctor's emergency treatment before hospitalization and taking corresponding first-aid measures can shorten the recovery period and improve treatment time, and reduce the occurrence of various sequelae. Pre-hospital emergency treatment can effectively improve and enhance the prognosis, quality of life and treatment effect of patients, which is therefore worthy of widespread application and promotion.

Keywords: Acute cerebrovascular disease, pre-hospital emergency treatment, clinical effect

Introduction

In recent years, with the change of living standards and living environment in our country, there has been a peak in acute cerebrovascular disease (ACVD). ACVD, a critical and severe disease that is caused by problems in the blood circulation of the brain, has become a very common disease in clinical practice [1]. Judging from the current situation, ACVD has some distinguishing characteristics, such as an exceedingly urgent onset time, great impact on patients, and easy recurrent [2]. In China today, the population suffering from ACVD keeps increasing, and most of these patients need to be rescued and treated. However, there are some deficiencies in the traditional rescue methods, which means that inappropriate nurs-

ing and treatment will inevitably trigger negative impacts on the patients, resulting in hindered treatment process. This grim situation rings a bell to make clear the need to provide high-quality emergency measures for patients is an important subject for medical workers to solve as soon as possible. Therefore, medical staff must assess patients' actual situation and provide them effective emergency treatment before admission, to seize the best opportunity for treatment, and help the patient minimize pain, so that the patients' condition can be alleviated to a certain extent. Although pre-hospital emergency care is still a relatively new nursing model that has only shown up in recent years in our country, it has won its place in The First Affiliated Hospital of Hebei North University due to its prominent advantages.

Pre-hospital emergency treatment on ACVD patients

Relevant research data showed that active pre-hospital emergency treatment and transfer for patients with ACVD can improve their prognosis [3]. The main purpose of this study is to explore the clinical effect of pre-hospital emergency treatment and transfer on improving the prognosis of ACVD patients. The report is as follows.

Materials and methods

General information

Here, a controlled study was conducted from January to November 2018 and from January to November 2019, when 150 patients with ACVD treated in The First Affiliated Hospital of Hebei North University were selected for retrospective analysis. Patients admitted from January to November 2018 were selected as the control group (n=150), while those admitted from January to November 2019 were enrolled as the research group (n=150). The patients in the control group were treated with traditional first-aid measures, that is; the emergency doctors got to know the basic conditions of the patients, and then took corresponding treatment measures. While the patients in the research group were given corresponding emergency and first aid measures before hospitalization; that is, the medical staff first learned about the patient's medical history and current symptoms from the patient's family, and the emergency doctor measured the patient's breathing, pulse and blood pressure. Finally, the related indexes of the two groups were compared and analyzed. The study was approved by the Medical Ethics Committee of The First Affiliated Hospital of Hebei North University, and written informed consent was obtained from each participant. There was no statistical difference in the general information between the two groups ($P>0.05$), which was comparable.

Inclusion and exclusion criteria

Inclusion criteria: All participants were diagnosed with acute intracerebral hemorrhage in strict accordance with the diagnostic criteria specified in *Neurology, the Seventh Edition of the "Twelfth Five-Year Plan" textbook of the Ministry of Health*; which was characterized by emotional agitation or sudden onset during exercise, rapid occurrence of local brain cell

dysfunction, and often accompanied with headache and vomiting discomfort [4]. After computed tomography (CT) examination and magnetic resonance imaging (MRI) examination, the patient's condition was confirmed to meet the diagnostic criteria of ACVD and as such was diagnosed. There was no dysfunction of heart, kidney or other organs in the patients.

Exclusion criteria: Patients transferred to The First Affiliated Hospital of Hebei North University after diagnosis and treatment in other hospitals; Patients with other malignant diseases.

Methods

Control group: Upon admission, the emergency department doctors investigated the basic situation of the patients, and then took corresponding treatment measures.

Research group: (1) On the way to the scene, the medical staff contacted the patient's family members by telephone to inquire about the basic condition of the patient, such as the time and cause of onset, clinical symptoms and disease history. (2) Upon arriving at the scene, the medical staff first checked the patient's consciousness and pupil size while measuring the basic physical signs such as breath, pulse and blood pressure, and used NIHSS scale to evaluate the patient's disease severity. (3) The patient's head was then raised by 30° , and the secretions and vomit in the patient's mouth and nose were completely removed to ensure that his/her respiratory tract was unobstructed. If there were symptoms of dyspnea, the patient was also given oxygen inhalation by nasal catheter or a mask, and the oxygen concentration was set to 40%. Affected by the disease, glossocoma often occurred in acute cerebrovascular disease patients, in which case, the medical staff used tongue forceps to pull the tongue out and set up an oropharyngeal airway at the same time. (4) After the patient's condition was evaluated and confirmed to be slightly stable, the patient was transferred to the ambulance as soon as possible. On the way to hospital, the medical staff also contacted the emergency department in time to prepare for the relevant rescue measures of the patient.

Evaluation indicators

In this study, we recorded the emergency situation of patients in the two groups, including the

Pre-hospital emergency treatment on ACVD patients

Table 1. Comparison of the basic conditions between the two groups ($\bar{x} \pm sd$)

Group	Age (years)	APACHE II score
Control group (n=150)	71.11±10.76	7.91±2.18
Research group (n=150)	70.85±12.71	8.11±2.41
T	0.151	0.572
P	0.891	0.572

Note: APACHE II, Acute Physiology Chronic Health Evaluation II.

Table 2. Comparison of the rescue success rate between the two groups (%)

Group	Survive	Die
Research group (n=150)	148 (98.67%)	2 (1.33%)
Control group (n=150)	139 (92.67%)	11 (7.33%)
χ^2	6.513	
P	0.011	

Table 3. Comparison of rescue and hospitalization time between the two groups ($\bar{x} \pm sd$)

Group	Rescue time (min)	Hospitalization time (d)
Research group (n=150)	45.64±14.15	9.64±2.38
Control group (n=150)	70.73±27.81	11.73±2.92
T	4.961	3.533
P	<0.001	<0.001

rescue success rate, rescue time and hospitalization time, prognostic quality of life score, symptom remission and incidence of sequelae.

Prognostic quality of life score [5]: The Generic Quality of Life Inventory-74 (GQOLI-74) was employed for evaluation. The higher the score, the higher the prognostic quality of life for the patients.

Efficacy evaluation criteria [6, 7]: Markedly effective refers to that after emergency first aid, the coma and drowsiness symptoms basically disappear, the blood pressure returns to the normal level, and the CT reexamination shows that the cerebral infarction bleeding volume and area are significantly reduced. Effective refers to that after emergency aid, the patient's coma, drowsiness symptoms, and blood pressure level are significantly improved, but do not return to normal, and cerebral infarction bleeding volume and area do not in-

crease. Ineffective means that after emergency treatment, the patient's improvement in coma, drowsiness, blood pressure level and cerebral infarction bleeding volume and area are not obvious, and some patients' conditions may even aggravate. Total effective = markedly effective + effective.

The total score of Acute Physiology Chronic Health Evaluation II (APACHEII) ranged from 0 to 71 points [8, 9].

Statistical analysis

All the research data were analyzed by SPSS 22.0 statistical software (IBM, USA). The measurement data were tested for normality, and those following normal distribution were expressed as mean \pm standard deviation (SD), and the inter-group comparison of the counting data was performed by the t-test. The counting data were described in the form of number of cases/percentage (n/%) and verified by the chi-square test. $P < 0.05$ indicates that the difference is statistically significant.

Results

Comparison of patients' age and APACHE II scores between the two groups

There was no significant difference in age ($t=0.151$, $P=0.891$) or APACHE II scores ($t=0.572$, $P=0.572$) between the research group and the control group (**Table 1**).

Comparison of rescue success rate between the two groups

Through the analysis of the relevant data, it was found that the survival rate of the research group was 98.67%, which was significantly higher than that of the control group (92.67%) ($P < 0.05$). The mortality rate of the research group (1.33%) was noticeably lower than that of the control group (7.33%), with statistically significant difference ($P < 0.05$) (**Table 2**).

Comparison of rescue and hospitalization time between the two groups

The rescue time (45.64±14.15) and hospitalization time (9.64±2.38) in the research group were significantly less than those in the control group, with statistically significant differences ($P < 0.001$) (**Table 3**).

Pre-hospital emergency treatment on ACVD patients

Table 4. Comparison of prognostic quality of life score between the two groups ($\bar{x} \pm sd$)

Group	Research group (n=30)	Control group (n=30)	t	P
Psychological functioning				
Before intervention	44.8±4.11	45.2±4.23	0.445	0.658
After intervention	59.9±6.41	46.8±5.64	0.061	0.000
Physical functioning				
Before intervention	43.8±4.06	42.4±4.58	1.500	0.137
After intervention	59.3±7.24	46.9±5.47	8.961	0.000
Material life				
Before intervention	45.8±4.27	45.7±5.39	0.095	0.924
After intervention	60.8±8.05	52.8±4.44	4.942	0.000

Table 5. Comparison of symptom remission between the two groups (%)

Group	Markedly effective	Effective	Ineffective	Total effective
Research group (n=150)	140 (93.33%)	6 (4.00%)	4 (2.67%)	146 (97.33%)
Control group (n=150)	109 (72.67%)	15 (10.00%)	26 (17.33%)	124 (82.67%)
χ^2	4.695			
P	0.023			

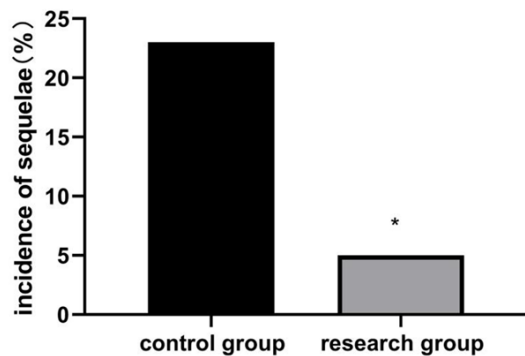


Figure 1. Comparison of the incidence of sequelae between the two groups. Compared with control group, *P<0.05.

Prognostic quality of life score of patients in the two groups

After emergency treatment, the overall prognostic quality of life score in the research group was 428.53 ± 44.12 , which was superior to the score of 322.15 ± 35.60 in the control group ($P < 0.01$) (Table 4).

Comparison of symptom remission between the two groups

After the emergency treatment, the overall treatment efficiency of the research group was 97.33%, which was significantly higher than

82.67% of the control group ($\chi^2=4.695$, $P < 0.05$) (Table 5).

Comparison of the incidence of sequelae between the two groups

The incidence of sequelae in the research group was markedly lower than that in the control group, and the difference was statistically significant ($P < 0.05$) (Figure 1).

Discussion

The disability rate and fatality rate of ACVD are high, and those who are suffering from it are always in acute and critical condition. Therefore, it is of great significance to carry out effective emergency treatment, which can utilize the best time window for treatment opportunity, control the progress of patients' condition, and improve the treatment efficacy [10, 11]. Based on this, our hospital made the following recommendations in the process of pre-hospital emergency treatment for ACVD patients: On the way to the patient, the medical staff first communicated with the patient's family member by telephone, instructed the family member not to move the patient, and ascertained the patient's basic information such as onset time, cause, clinical symptoms, and history of the disease. At the scene, patient's airway was ensured to be unobstructed first while quickly establishing

Pre-hospital emergency treatment on ACVD patients

a venous channel, and only when the patient's condition was slightly stable was the patient smoothly transferred to the ambulance and transferred to the emergency department for further treatment. All these measures not only buy valuable time for the first aid of patients, but also effectively prevent their condition from deteriorating during the transfer process [12, 13]. The results of this study showed that after treatment, the time from onset to emergency treatment in the research group was shorter and the prognostic quality of life was higher compared with the control group.

ACVD, which is caused by problems in the blood circulation in the brain, has become very common among critical diseases in the current clinical practice [14]. The most distinctive feature of ACVD is the short onset time. The results of a large number of clinical trials and survey data analysis revealed that the morbidity and mortality of ACVD patients were very high [15]. Therefore, using reasonable rescue measures is critical to improving the success rate of rescue. According to the study of Di LA, De FM, Campanile M, et al. pre-hospital emergency treatment could improve the rescue success rate [16]. In the present study, the survival rate of patients in the research group was remarkably higher than that in the control group, which is basically consistent with the results of Di LA et al.

Pre-hospital emergency treatment can help emergency doctors assess patients' conditions and take simple emergency measures first, and then formulate a more scientific emergency plan for patients. Then, through communication between emergency doctors and resident physicians, patients' conditions can be handed over better, so as to facilitate follow-up rescue and treatment for patients [17, 18]. Through this study, it was found that after diagnosis and rescue measures before admission, the rescue time and hospitalization time of patients after admission were significantly shorter than those who were routinely hospitalized. Therefore, pre-hospital emergency measures are conducive to improving the treatment effects.

Pre-hospital emergency treatment can ensure more valuable treatment time for patients' recovery, follow-up medical rescue and rehabilitation work [19]. In the current study, it can be

found that in the follow-up rehabilitation process, the patients who received pre-hospital emergency first aid measures had significantly better rehabilitation effects than those in the control group, which was basically consistent with the clinical study of Mijr et al.

The incidence of sequelae in the research group was lower than that in the control group, which is fundamentally in line with the results of Blom L et al.; that is, the incidence of sequelae in patients using pre-hospital emergency treatment was significantly lower than that in patients using routine first aid measures. It can be seen that the application of pre-hospital emergency measures for ACVD patients can effectively improve the success rate of treatment and provide assistance for their follow-up and rehabilitation of chronic diseases [20]. However, as this study is a single center-based study with narrowed sample size, it is necessary to develop multi-center cooperation and further expand the sample size.

Early and timely treatment of patients with ACVD combined with effective first aid measures can effectively suppress the disease. In view of the characteristics of high incidence, high mortality and disability of ACVD, the following preventive measures are proposed: (1) dietary management: instead of eating greasy food, fresh vegetables and protein-rich beans are advocated for; (2) emotional management: keep stable emotions, avoid emotional roller coasters, and reasonably adjust bad emotions; (3) follow doctor's advice and keep taking drugs to control blood pressure; (4) keep warm, mind your health, and have at least one physical examination each year; (5) keep exercising to improve physical fitness [21].

To sum up, it can be found through the results of this study that pre-hospital emergency treatment can effectively improve the success rate of rescue, shorten the recovery period and treatment time while reducing the occurrence of sequelae in patients with ACVD. This suggests that pre-hospital emergency treatment can effectively improve patients' prognosis, quality of life and treatment effect, which means that the pre-hospital emergency treatment is worthy of extensive application and promotion.

Disclosure of conflict of interest

None.

Address correspondence to: Aixia Song and Qian Xue, Department of Neurology, The First Affiliated Hospital of Hebei North University, No. 12 Changqing Road, Zhangjiakou 075000, Hebei Province, China. Tel: +86-15530396748; E-mail: songaixiabf1h@163.com (AS); Tel: +86-15530396542; E-mail: xueqianbf1h@163.com (QX)

References

[1] Sánchez EP, Hernández L and Vergara JP. Crisis afásica simulando un ataque cerebrovascular isquémico agudo en el Servicio de Neurología del Hospital de San José de Bogotá DC. *Repertorio de Medicina y Cirugía* 2016; 25: 174-177.

[2] Tugcu A, Jin Z, Homma S, Elkind MS, Rundek T, Yoshita M, DeCarli C, Nakanishi K, Shames S, Wright CB, Sacco RL and Di Tullio MR. Atherosclerotic plaques in the aortic arch and subclinical cerebrovascular disease. *Stroke* 2016; 47: 2813-2819.

[3] Doggen CJ, Zwerink M, Droste HM, Brouwers PJ, Houwelingen GK, Eenennaam FL and Egberink RE. Prehospital paths and hospital arrival time of patients with acute coronary syndrome or stroke. A prospective observational study. *BMC Emerg Med* 2016; 9: 3.

[4] Darby RR and Caplan D. “Cat-gras” delusion: a unique misidentification syndrome and a novel explanation. *Neurocase* 2016; 22: 251-256.

[5] Farahmand S, Karimialavijeh E, Vahedi HS and Jahanshir A. Emergency medicine as a growing career in Iran: an Internet-based survey. *World J Emerg Med* 2016; 7: 196-202.

[6] Kim YS, Park SS, Bae HJ, Cho AH, Cho YJ, Han MK, Heo JH, Kang K, Kim DE, Kim HY, Kim GM, Kwon SU, Kwon HM, Lee BC, Lee KB, Lee SH, Lee SH, Lee YS, Nam HS, Oh MS, Park JM, Rha JH, Yu KH and Yoon BW. Stroke awareness decreases prehospital delay after acute ischemic stroke in Korea. *BMC Neurol* 2011; 11: 2.

[7] Bagot KL, Bladin CF, Vu M, Kim J, Hand PJ, Campbell B, Walker A, Donnan GA, Dewey HM and Cadilhac DA; VST collaborators. Exploring the benefits of a stroke telemedicine programme: an organisational and societal perspective. *J Telemed Telecare* 2016; 22: 489-494.

[8] Jury SC and Kornberg AJ. Integrating telehealth in to “business as usual”: is it really possible? *J Telemed Telecare* 2016; 22: 499-503.

[9] Stevanovic A, Beckers SK, Czaplík M, Bergrath S, Coburn M, Brokmann JC, Hilgers RD, Rossaint R and Group TC. Telemedical support for

prehospital Emergency Medical Service (TEMS trial): study protocol for a randomized controlled trial. *Trials* 2017; 18: 43.

[10] Di Lieto A, De Falco M, Campanile M, Török M, Gábor S, Scaramellino M, Schiraldi P and Cio-ciola F. Regional and international prenatal telemedicine network for computerized antepartum cardiotocography. *Telemed J E Health* 2008; 14: 49-54.

[11] Blom L, Laflamme L and Mölsted Alvenson H. Expectations of medical specialists about image-based teleconsultation - a qualitative study on acute burns in South Africa. *PLoS One* 2018; 13: e0194278.

[12] Burmeister JE, Scapini A, da Rosa Miltersteiner D, da Costa MG and Campos BM. Glucose-added dialysis fluid prevents asymptomatic hypoglycaemia in regular haemodialysis. *Nephrol Dial Transplant* 2007; 22: 1184-1189.

[13] Adams HP Jr, del Zoppo G, Alberts MJ, Bhatt DL, Brass L, Furlan A, Grubb RL, Higashida RT, Jauch EC, Kidwell C, Lyden PD, Morgenstern LB, Qureshi AI, Rosenwasser RH, Scott PA and Wijdicks EF; American Heart Association; American Stroke Association Stroke Council; Clinical Cardiology Council; Cardiovascular Radiology and Intervention Council; Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups. Guidelines for the early management of adults with ischemic stroke: a guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups: the American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists. *Circulation* 2007; 115: e478-e534.

[14] He AH, Churilov L, Mitchell PJ, Dowling RJ and Yan B. Every 15-min delay in recanalization by intra-arterial therapy in acute ischemic stroke increases risk of poor outcome. *Int J Stroke* 2015; 10: 1062-1067.

[15] Lansberg MG, Schrooten M, Bluhmki E, Thijs VN and Saver JL. Treatment time-specific number needed to treat estimates for tissue plasminogen activator therapy in acute stroke based on shifts over the entire range of the modified Rankin Scale. *Stroke* 2009; 40: 2079-2084.

[16] Denti L, Artoni A, Scoditti U, Gatti E, Bussolati C and Ceda GP. Pre-hospital delay as determinant of ischemic stroke outcome in an Italian cohort of patients not receiving thrombolysis. *J Stroke Cerebrovasc Dis* 2016; 25: 1458-1466.

Pre-hospital emergency treatment on ACVD patients

- [17] Sommer P, Seyfang L, Posekany A, Ferrari J, Lang W, Fertl E, Serles W, Töll T, Kiechl S and Greisenegger S. Prehospital and intra-hospital time delays in posterior circulation stroke: results from the Austrian Stroke Unit Registry. *J Neurol* 2017; 264: 131-138.
- [18] Zhou Y, Yang T, Gong Y, Li W, Chen Y, Li J, Wang M, Yin X, Hu B and Lu Z. Pre-hospital delay after acute ischemic stroke in central urban china: prevalence and risk factors. *Mol Neurobiol* 2017; 54: 3007-3016.
- [19] Inatomi Y, Yonehara T, Hashimoto Y, Hirano T and Uchino M. Pre-hospital delay in the use of intravenous rt-PA for acute ischemic stroke in Japan. *J Neurol Sci* 2008; 270: 127-132.
- [20] Tanaka Y, Nakajima M, Hirano T and Uchino M. Factors influencing pre-hospital delay after ischemic stroke and transient ischemic attack. *Intern Med* 2009; 48: 1739-1744.
- [21] Abraham SV, Krishnan SV, Thaha F, Balakrishnan JM, Thomas T and Palatty BU. Factors delaying management of acute stroke: an Indian scenario. *Int J Crit Illn Inj Sci* 2017; 7: 224-230.