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Clinical Effect of Intelligent Emergency Nursing Mode in Patients with Severe Traumatic Brain Injury

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Abstract

Objective: Severe traumatic brain injury (sTBI) is one of the common acute and critical diseases in neurosurgery. So we aim to explore the clinical effectiveness of an intelligent emergency care model in patients with severe traumatic brain injury. **Methods:** Eighty patients with severe traumatic brain injury (sTBI) who were treated in Zhuji People's Hospital of Zhejiang Province from January 2019 to December 2021 were selected as the study subjects. The patients were divided into an observation group and a control group with 40 patients in each group according to the random number table method. Patients in the control group received conventional first-aid nursing mode intervention, and the intelligent emergency nursing mode was used for the observation group based on the control group. Comparisons were conducted between the two groups on the time of arrival to the emergency room, the time from the emergency room to the operating room, Glasgow Coma Scale (GCS) score before surgery, GCS score when leaving the Intensive Care Unit (ICU), the average length of ICU stay, the average length of hospital stay, the total hospital costs. **Results:** The time of arrival to the emergency room, the time from the emergency room to the operating room, the average length of ICU stay, the average length of hospital stay, and the total hospital costs in the observation group were significantly lower than those in the control group, and the differences were statistically significant (All $P < 0.05$). At the same time, the GCS score before surgery and the GCS score when leaving the ICU of the observation group was better than the control group, and the difference was statistically significant ($P < 0.05$). **Conclusion:** Intelligent emergency nursing mode can shorten the time of sTBI rescue, the length of ICU

stay, and the average length of hospital stay, reduce the total hospitalization cost, improve the prognosis, with good efficacy, reduce the total cost of hospitalization, and improve the prognosis with better efficacy.

Keywords

Severe Traumatic Brain Injury, Intelligent Emergency Nursing Mode, Curative Effect, Randomized Controlled Trial

1. Introduction

Severe traumatic brain injury (sTBI) is one of the common acute and critical diseases in neurosurgery, with a mortality rate of 30% - 50% [1] and a disability rate of 60% [2]. In the past 30 years, although several road traffic safety laws have been promulgated and the probability of sTBI caused by traffic accidents has decreased, road traffic accidents are still the most common cause of sTBI in China [3]. There are a large number of sTBI patients in China, which poses a great burden to individuals, families, and society [4] [5]. In recent years, emergency nursing has been paid more and more attention. Studies have shown that active and effective emergency nursing can improve the treatment efficiency and prognosis of sTBI [6] [7] [8]. As the Internet is more and more applied in emergency treatment, our hospital has established an intelligent emergency treatment system, including remote pre-hospital guidance, real-time monitoring and feedback, and post-hospital linkage [9] [10]. This study applied intelligent emergency nursing mode to sTBI patients to explore the influence of intelligent first aid nursing on their treatment.

Ethical Review

This study was approved by the clinical ethics committee of the Zhuji People's Hospital of Zhejiang Province (Ethics lot Number: ZJYY-LL-WT-2020382175). This study was in accordance with the principles of the Declaration of Helsinki, and all patients or family members agreed and signed informed consent in writing.

2. Materials and Methods

2.1. General Information

In our hospital from 2019 to 2021, 80 patients with severe traumatic brain injury (sTBI) were seriously selected according to the inclusion criteria: 1) preoperative GCS score was 3 - 8; 2) accord to the guidelines for the surgical management of traumatic brain injury in China with clear indications; 3) age 18 - 75 years old; 4) no other severe visceral diseases; 5) no pregnant and lactating women. They were randomly allocated to either the control group receiving conventional first-aid nursing mode before surgery or the observation group receiving Intelligent Emergency Nursing Model based on the control group (n = 40 per group).

The basic information of the two groups was not statistically significant (P > 0.05, Table 1).

2.2. Intelligent Emergency Nursing Model

The control group received conventional first-aid nursing mode intervention. When receiving a 120 call, rescue workers quickly rushed to the scene of the incident. After assessing the patient's basic condition, the patient was given basic resuscitation care such as keeping the airway open, rapidly establishing intravenous access, monitoring vital signs, and administering oxygen. And cooperate with the doctor for the necessary tests and related treatment. When the patient was brought to the hospital, blood routine, coagulation function, cranial CT, and other relevant tests were performed according to the patient's positive signs as prescribed by the doctor. If the doctor clearly points out that the patient has surgical indications, he shall be sent to the emergency room. Rapidly perform bedside ultrasound, electrocardiogram (ECG), skin test, blood draw, blood and skin preparation, indwelling catheter, and other preoperative preparations on surgical patients. At the same time, the relevant personnel in the operating room were notified to prepare the instruments and check the information. Then sent to the operating room and postoperatively to the NICU for monitoring.

The observation group received Intelligent Emergency Nursing Model based on the control group. 1): Teleportation of pre-admission patient information: That is, the information of the patient is collected through the Internet information collection device configured by a doctor, the camera tool of the mobile terminal, and the camera configured in the 120-ambulance. The real-time information collected from the patient is then transmitted to the hospital emergency network platform synchronously, and emergency nursing staff further develop emergency care measures in advance based on the situation provided on-site, including the preparation of emergency equipment, drugs, etc. At the same time, coordinate the hospital emergency resuscitation room resources, CT, and other auxiliary examination equipment to shorten the emergency time. The electronic emergency case of the patient is filled in through the tablet computer, and the pre-admission emergency medication regimen and related care measures are recorded for the reference of the in-hospital medical staff. 2): Sharing of information on emergency patients within hospitals: When a patient arrives at the hospital, the emergency department is directly responsible for developing an initial post-admission care and treatment plan based on the data provided by the

Table 1. Compare the basic information between the two groups.

group		observation group (n = 40)	control group (n = 40)	statistic	P
Gender [n (%)]	Male	26 (65.00)	27 (67.50)	$\chi^2 = 0.056$	0.813
	Female	14 (35.00)	13 (32.50)		
Age (years)		46.75 ± 4.46	45.43 ± 4.12	t = 1.380	0.171

emergency web platform. The emergency information of patients before admission is completely transmitted to the emergency center of the hospital through the emergency network platform, in which patients with clear indications for surgery are forwarded to the neurosurgeon in charge. We also share all the information about the patient before admission, during transport, and during the consultation and treatment in the emergency department to the neurosurgeons through the emergency network platform for their reference. 3): The medical staff acted together throughout the process: During the whole emergency process, medical and nursing cooperate with each other to complete the patient's pre-hospital emergency and to ensure timely information transmission.

2.3. Observation Target and Quality Control

Time of arrival to the emergency room, time from the emergency room to the operating room, GCS score before surgery, GCS score when leaving the ICU, the average length of ICU stay, the average length of hospital stay, and total hospital costs were analyzed.

Surgical operation requires a senior attending physician or above. The preoperative neurosurgeon is responsible for a series of transport and operation after receiving the patient, organizing rescue, and routine delivery to NICU after surgery. The surgeon is responsible for the management of patients before and after surgery.

2.4. Statistical Analysis

All experimental data were processed with SPSS 25.0 statistical software. All data are consistent with normality distribution and variance homogeneous test. Measurement data are reported as mean ± standard deviation. Differences between the two groups were compared using an independent t-test, while the same group, used a paired-sample T-test. Enumeration data are reported as a percentile (N [%]), and the χ^2 test was used for comparison. A P value < 0.05 was described as statistically significant.

3. Result

3.1. Compare the Arrival to the Emergency Room Time, from Emergency Room to the Operating Room Time, the Average Length of ICU Staying, the Average Length of Hospital Stay and the Total Hospital Costs between the Two Groups

The arrival at the emergency room time in the observation group and control group was not significantly different (P > 0.05). Compared with the control group, from the emergency room to the operating room time, the average length of ICU stay and the average length of hospital stay in the observation group were considerably shortened (P < 0.05), and total hospital costs were considerably decreased (P < 0.05) (Table 2).

3.2. Compare the GCS Score between the Two Groups

The GCS score before surgery in the observation group and control group was

Table 2. Compare the arrival to the emergency room time, from emergency room to the operating room time, the average length of ICU staying, the average length of hospital stay and the total hospital costs between the two groups.

group	observation group (n = 40)	control group (n = 40)	statistic	P
arrival to the emergency room time (min)	31.48 ± 4.36	30.52 ± 2.82	t = 1.165	0.248
from emergency room to the operating room time (min)	33.01 ± 3.94	44.67 ± 3.30	t = −14.346	0
average length of ICU stay (d)				
average length of hospital stay (d)	18.30 ± 2.89	23.73 ± 2.50	t = −8.972	t = −2.652
total hospital costs (wan yuan)	6.62 ± 1.33	7.39 ± 1.26	0	0.01

Table 3. Compare the GCS score between the two groups.

group	observation group (n = 40)	control group (n = 40)	statistic	P
GCS score before surgery	5.85 ± 1.33	5.95 ± 1.22	t = −0.350	0.727
GCS score when leaving the ICU	10.83 ± 1.78	9.85 ± 1.51	t = 2.639	0.01
statistic	t = −34.219	t = −34.794		
P	0	0		

not significantly different (P > 0.05). In Table 3, Compared with the control group, GCS scores when leaving the ICU in the observation group were considerably increased (P < 0.05).

4. Discussion

The prognosis of sTBI is not only related to the primary injury caused by direct violence, but also includes a series of secondary neurological impairments after brain injury, which is also an important cause of death or disability in patients with brain injury [11]. sTBI patients are at risk of secondary brain injury even before they arrive at the hospital, so management in the pre-hospital phase after the initial trauma is important to improve their prognoses [12]. According to relevant studies, one hour after the onset of acute severe craniocerebral injury is the peak stage of patient death, accounting for about 60% of the total number of deaths from the disease. However, if patients are not treated promptly and effectively within 10 minutes after the onset of the disease, the survival rate of patients will be greatly reduced [13] [14] [15], so pre-hospital emergency care for

patients with sTBI has been given much attention. Likewise, the care of the pre-hospital emergency patient is a very important aspect. General routine clinical care has some shortcomings: such as lack of relevance and systematization, cumbersome intervention process, untimely handover, and inaccurate handover information, which affects patient treatment and prognosis. Therefore, we need to explore an active and effective intervention to improve the prognosis and survival rate of patients. Patients have been reported to be more satisfied in terms of quality of survival [16], prognosis, and hospital costs after using the Emergency Nursing Model [17] [18].

The Intelligent Emergency Nursing Model is a new type of care that combines the Internet with traditional care to improve the quality of patient care prior to hospital admission [19] [20]. In this study, it was confirmed that the observation group applying the Intelligent Emergency Nursing Model had a shorter time in the emergency room and total hospitalization days for patients in the observation group compared with the control group. And the total hospitalization costs were lower than those of the control group. The GCS score was first introduced by Teasdale and Jennett and remains the most common basis for assessing the level of consciousness used by clinicians worldwide, with scores that reflect the patient's true state. According to the GCS score, patients can be classified into three types according to the severity of their disease: 13 - 15 as mild, 9 - 12 as moderate, and 3 - 8 as severe. A GCS score of ≤4 represents a poor prognosis for the patient. The GCS score has been reported to be closely related to the prognosis of patients with sTBI and is also an important basis for the treatment of patients prior to hospital admission and during transport [21] [22]. In this study, patients with the same GCS scores in both groups were discharged from the NICU with significantly higher GCS scores after using the Intelligent Emergency Nursing Model than those using the conventional emergency care pathway, which indicates that the Intelligent Emergency Nursing Model was superior to conventional emergency care in improving patient prognosis.

5. Conclusions

As one of the most common critical illnesses in neurosurgery, sTBI has a very high rate of disability and death if not treated in a timely manner. It not only affects the quality of survival of the individual patient, but also places a burden on the family and society. The Intelligent Emergency Nursing Model is a modern emergency care model combining the Internet and traditional care, which greatly improves the quality of emergency care by combining Internet technology with traditional care. The Intelligent Emergency Nursing Model, as an active and effective care modality, significantly shortens the pre-hospital emergency time of patients, reduces the number of days of hospitalization, lowers the total cost of hospitalization, reduces the social and medical burden, and significantly improves the prognosis of patients. It demonstrates that active and effective care may play a critical role for patients with sTBI. Therefore, for patients with sTBI,

we advocate the use of the Intelligent Emergency Nursing Model for pre-hospital emergency care.

Although our research has achieved milestones, there are certain shortcomings. Therefore, we will next do a long follow-up of both groups of patients to consolidate our confidence in the Intelligent Emergency Nursing Model. We will also conduct a series of multicenter, large sample clinical studies to confirm the indispensable role of active and effective emergency care in the rescue of critically ill patients.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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