Original Article
The clinical efficacy of optimized emergency nursing for emergency rescue of patients with acute left heart failure

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Abstract: Objective: To apply optimized emergency nursing in the emergency rescue of patients with acute left heart failure, and investigate its clinical efficacy. Methods: This prospective study was performed in 164 patients who were admitted to the Emergency Department of the Hunan Provincial People's Hospital, The First Affiliated Hospital of Hunan Normal University for acute left heart failure. According to a random number table, these patients were divided into the routine nursing group (n=82) which was given conventional nursing care and the optimized emergency nursing group (n=82) which was given optimized emergency nursing care. Improvement rates in half-hour and one-hour, level of plasma N-terminal pro-brain natriuretic peptide, activity of daily living score, incidence of complications, and satisfaction in nursing were compared between the two groups. Results: Improvement rates in half-hour and one-hour, activity of daily living score, and satisfaction in attitude of nursing staff, comprehensiveness, and nursing skills in the optimized emergency nursing group were significantly increased when compared with the routine nursing group, while level of N-terminal pro-brain natriuretic peptide and incidence of complications (6.10% vs. 18.30%) were significantly declined (all P<0.05). Conclusion: Optimized emergency nursing of patients with acute left heart failure contributes to the relieved symptoms, increased clinical efficacy of emergency rescue, improved cardiac function, accelerated recovery of quality of life, and increased satisfaction in nursing. As such it is worthy of clinical application.

Keywords: Optimized emergency nursing, acute left heart failure, recovery of cardiac function, efficacy of emergency rescue, satisfaction in nursing

Introduction

In recent years, as displayed in the latest reports on cardiovascular diseases, the mortality rate of cardiovascular diseases in the entire population is about 100/100,000, while the incidence is close to 8%. With general population aging, the incidence of cardiovascular diseases increases, revealing a positive correlation between age and the incidence of cardiovascular diseases. The incidence of cardiovascular diseases has been growing annually, and it has become the second cause of death [1, 2]. Acute left heart failure refers to the suddenly decreased left ventricular myocardial contractility or the significantly declined cardiac output, which is caused by the increased left ventricular load. Accordingly, perfusion of tissues

and organs is insufficient, and acute pulmonary venous congestion, pulmonary edema, and even cardiogenic shock are observed. Clinical manifestations, such as chest tightness, shortness of breath, and foamy sputum are thus developed [3, 4]. In clinical practice, acute left heart failure is one of the most common critical illnesses. Rapid onset, quick deterioration within a short time, and high mortality rate are the characteristics of the disease [5]. Therefore, active and effective comprehensive treatment is the primary measure to improve the therapeutic effect.

At present, the treatment of acute left heart failure mainly includes the reduction of heart burden, increase of myocardial function, and application of sedatives in eliminating patients'

adverse emotions like nervousness and anxiety [6-8]. Nursing measures also play an important role in saving time and rescuing patients [9]. Previous nursing work is essentially carried out based on the medical advice, and nursing staff passively participate in the nursing work, resulting in delayed treatment to a certain extent. The latest study suggests that optimized emergency nursing can greatly improve the efficiency of nursing work and clinical efficacy of the treatment. However, most current studies are focused on the assessment of single aspects of heart function, resulting in a certain degree of one-sidedness [10]. In this study, we applied optimized emergency nursing in the emergency rescue of patients with acute left heart failure, and investigated its clinical efficacy, hoping to provide more evidence-based medical support for the verification of the effect of this nursing method.

Materials and methods

General information

In total, 164 patients, who were admitted to the Emergency Department of Hunan Provincial People's Hospital, The First Affiliated Hospital of Hunan Normal University due to acute left heart failure from June 2019 to June 2020, were enrolled in this prospective study. According to a random number table, these patients were assigned to the routine nursing group and the optimized emergency nursing group (82 patients in each group). This study was approved by the Ethics Committee of Hunan Provincial People's Hospital, The First Affiliated Hospital of Hunan Normal University. Informed consent was signed by the patients or their family members.

Inclusion criteria: All patients met the diagnostic criterion defined in guidelines for the Diagnosis and Treatment of Acute Heart Failure, which was compiled by American Heart Association. These criteria include: (1) a history of underlying cardiac disease; (2) acute pulmonary edema; (3) cardiogenic shock; (4) reliable laboratory indicators. Patients met two or more criterions were diagnosed as having acute left heart failure [11]; patients aged between 60 and 80 years old; patients who had a history of first-onset acute heart failure.

Exclusion criteria: Patients who required clinical intervention for acute coronary syndrome;

patients who had underlying diseases, and thus a poor prognosis; patients who failed to communicate effectively due to hearing or speech impairment; patients who had liver, kidney or other major organ dysfunction; patients with a history of immune system diseases; patients who had malignant tumors or cachexia; patients who received cardiac surgery.

Methods

Treatment: After hospital admission, patients in both groups received conventional treatment, which was given in accordance with the medical advice. The treatment mainly included: performing an electrocardiogram; monitoring vital signs; providing low-flow oxygen inhalation through the double-nasal plug (oxygen masks or oxygen masks combined with double-nasal plug was supplied, if necessary). As for the treatment, diuretics were used to reduce the burden of the heart; digitalis-like drugs were used to strengthen cardiac function; nitrate-based drugs were applied to expand coronary arteries; theophylline-type drugs were used to stop asthma.

Routine nursing: In the routine nursing group, patients received routine nursing. The nursing was primarily composed of the following aspects: based on the medical advice, open venous access was obtained; blood was drawn to complete various laboratory examinations; the number of patrols was increased to maintain immediate rescue for patients when their condition worsened.

Optimized emergency nursing: Patients in the optimized emergency nursing group received optimized emergency nursing. In this model, a normalized, predictable, standardized, and procedural active nursing system, which was led by the team leader, was developed to change the previous passive execution of the medical advice. The nursing consisted of 3 aspects. Firstly, posture nursing. Patients' condition was the first thing to be assessed when they arrived. Patients with suspected left heart failure were provided with a wheelchair. In this case, patients had sagging lower limbs, reduced amount of venous blood returning to the heart, and heart failure symptoms. At the same time, patients received basic treatment. Instruction and usage of the drugs were carefully checked to administrate correctly. Secondly, vital signs nursing. The main clinical manifestation of

acute left heart failure is dyspnea, which is induced by acute pulmonary edema. Therefore, oxygen supplementation is the primary treatment. Alcohol was given to humidify oxygen when the airway was clear and patients were not allergic. Cardiopulmonary bypass, oxygen flow, and inhalant oxygen concentration were adjusted to ensure that the terminal oxygen saturation was above 95%. Thirdly, psychology nursing was performed. Due to difficulties in breathing, patients with heart failure suffered from adverse emotions like anxiety and nervousness. Besides actively providing sedation treatment, nursing staff were supposed to popularize knowledge on the diagnosis and treatment of heart failure to increase their determination in defeating the disease. Moreover, an upper extremity vein was chosen as the site for puncture. Blood was drawn and collected after successful puncture, reducing repeated puncture and saving time.

Outcome measures

Main outcome measures: Improvement rate: According to the improvement of clinical symptoms and the result of physical examination, improvement rate was divided into markedly effective, effective, and ineffective [12]. Markedly effective: all symptoms disappeared and heart function increased significantly (returned to grade 1 or above). Effective: symptoms were significantly alleviated and heart function was obviously improved. Ineffective: symptoms and heart function showed no improvement after intervention and even became worse. Improvement rates in half-hour and one-hour were calculated according to the following equation: improvement rate = (markedly effective + effective)/the total number of patients * 100%.

Secondary outcome measures: Level of plasma N-terminal pro-brain natriuretic peptide (NT-proBNP): A volume of 6-8 mL of fasting venous blood was collected from patients in both groups before and after intervention. After centrifuging at 3,000 rpm for 10 min, blood serum (plasma) was separated from whole blood. The level of NT-proBNP was measured using fluorescence immunoassay (YZB/USA 2233-2006, BioMerieux Vidas, France). Activity of daily living (ADL): The daily living ability of patients in both groups was evaluated by ADL.

The scale was composed of 3 items (toilet usage, low mobility, and basic living ability), which included 10 aspects. The total score was 100 points, which corresponded to normal daily living ability; the lower the score was, the worse the daily living ability [13].

Incidence of complications: Cardiogenic shock, lower extremity edema, hypoxemia, and pulmonary edema were the main complications. The incidence of complications = cases of complications/the total number of patients * 100%.

Satisfaction in nursing: The assessment of discharged patients in North America on satisfaction in nursing work and its influencing factors was used to perform the evaluation [14]. Attitude of nursing staff, comprehensiveness, and nursing skills were the 3 aspects of the evaluation. There were 25 items, with each item scoring 1-4 points. The higher the score was, the higher the satisfaction in nursing.

Statistical methods

Data were analyzed using SPSS statistical software version 20.0. The enumeration data were expressed as number/percentage (n/%); comparison was conducted with chi-square test. The normally distributed measurement data were calculated as mean ± standard deviation ($\bar{x}$ ± sd); independent sample t test was used for inter-group comparison, while paired t-test was applied for before-after comparison within the same group. The difference was statistically significant when *P* value was less than 0.05.

Results

Baseline data

There were no significant differences concerning gender, age, comorbidity, underling diseases, and cardiac function grading between the two groups (all P>0.05, **Table 1**).

Improvement rates in half-hour and one-hour

As shown in **Table 2**, improvement rates in half-hour and one-hour in the optimized emergency nursing group were significantly higher than those in the routine nursing group (both P<0.05), suggesting that optimized emergency nursing could alleviate patients' clinical symptoms within a short time.

Table 1. Baseline data ($\bar{x} \pm sd$)

Group	Optimized emergency nursing group	Routine nursing group	x^2/t	P
Gender			0.076	1.875
Male	54	57		
Female	28	25		
Age (years)	67.4±4.0	66.9±3.8	0.774	0.440
Comorbidity				
Hypertension	29	27	0.108	0.742
Diabetes	17	16	0.038	0.846
Underling diseases			0.960	0.619
Dilated heart disease	55	49		
Coronary heart disease	20	24		
Others	7	9		
Cardiac function			1.022	0.600
Grade I-II	29	23		
Grade III	31	35		
Grade IV	22	24		

Table 2. Improvement rates in half-hour and one-hour (n, %)

Group	Improvement rates in half-hour	Improvement rates in one-hour
Optimized emergency nursing group (n=82)	21 (25.61%)	42 (51.22%)
Routine nursing group (n=82)	7 (8.54%)	23 (28.05%)
$χ^2$	6.557	9.200
P	0.010	0.002

Level of NT-proBNP

As displayed in **Figure 1**, the levels of NT-proBNP in both groups after intervention were significantly lower than those before intervention (both P<0.001). The level of NT-proBNP in the optimized emergency nursing group after intervention was significantly decreased when compared with the routine nursing group (P<0.05).

ADL score

As illustrated in **Figure 2**, ADL scores in both groups after intervention were significantly higher than those before intervention (both P<0.001). ADL score in the optimized emergency nursing group after intervention was significantly increased when compared with the routine nursing group (P<0.05).

Incidence of complications

Incidence of complications in the optimized emergency nursing group was significantly lower than that in the routine nursing group (6.10% vs. 18.30%, P<0.05, **Table 3**), indicating

that, to a certain extent, optimized emergency nursing could reduce the incidence of complications.

Satisfaction in nursing

Satisfaction in attitude of nursing staff, comprehensiveness, and nursing skills in the optimized emergency nursing group were significantly higher than those in the routine nursing group (all P<0.05, **Table 4**).

Discussion

The main pathogenesis of acute left heart failure is excessive cardiac preload, which is caused by acute diffuse myocardial injury, acute restriction of the left ventricular diastole, mechanical obstruction of the outflow tract, or acute prolapse of the valve. Ultimately, left ventricular heart failure is developed [15]. Rapid onset and quick deterioration within a short time are the characteristics of the disease. It is also reported that mild heart failure can cause damage in the health of patients, while severe heart failure can cause death. The incidence of
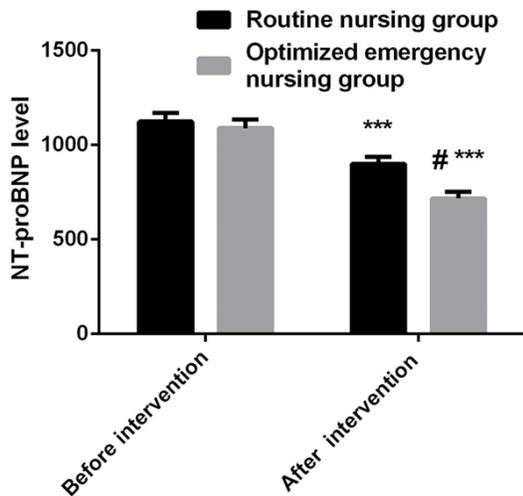
Figure 1. Comparison of NT-proBNP levels in the two groups before and after intervention. Compared with before intervention, ***P<0.001; compared with Routine nursing group, #P<0.05. NT-proBNP: N-terminal pro-brain natriuretic peptide.
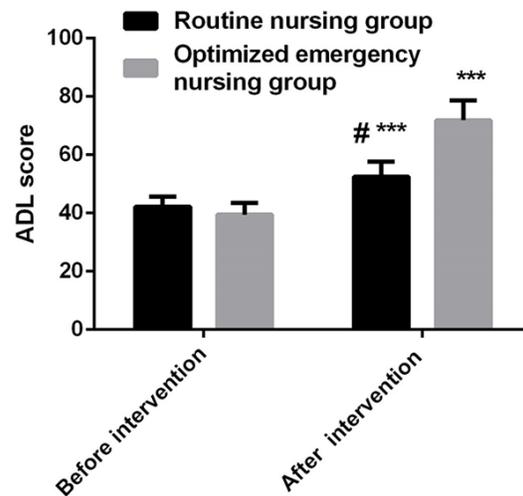
Figure 2. Comparison of ADL scores in the two groups before and after intervention. Compared with before intervention, ***P<0.001; compared with Routine nursing group, #P<0.05. ADL: activity of daily living.

chronic diseases, such as hypertension, diabetes, and obesity has been increasing since the start of the 21st century. Accordingly, the incidence of left heart failure has been increasing year by year. Therefore, it is of important clinical significance to improve treatment [16].

Stability, order, and speed are the main factors affecting the rescue of patients with acute left heart failure. The treatment rate is ultimately improved if patients are rescued at an early date. Routine nursing is focused on the passive execution of the medical advice and is unable to actively stimulate motivation, causing reduced clinical efficacy. Optimizing emergency nursing and updating, reconstructing, and kneading previous rescue procedure contribute to the formation of predictable nursing. As a result, the clinical efficacy is improved. The main clinical manifestation of acute left heart failure is dyspnea, which is induced by pulmonary circulation dysfunction. Forced sitting position, chest tightness and shortness of breath, cough, and cyanosis are thus developed. Therefore, the relief of these symptoms is also focused on the improvement of patients' respiratory function. In this study, patients in the optimized emergency nursing group received predictable nursing (Wheelchair was the first choice, while ambulance the second). It means that posture nursing was performed as early as possible. Accordingly, the amount of

blood returning to the heart was reduced, the comfort was increased, and the possibility of patients falling out of bed (An adverse event of nursing) when they were irritable was also declined to a certain extent [17, 18]. Oxygen masks and alcohol humidification were provided for these patients. High-flow and high-concentration oxygen was supplied through the pressurization of oxygen masks, increasing the oxygen partial pressure. To a certain extent, hypoxemia was then relieved. The alveolar surface tension was reduced by alcohol humidification, making the alveoli rupture and accelerating breath and ventilation. Ultimately, the clinical efficacy of oxygen therapy was improved. Similarly, our results displayed improvement rates in half-hour and one-hour in the optimized emergency nursing group were significantly higher than those in the routine nursing group, suggesting that optimized emergency nursing could improve the clinical efficacy. This was consistent with other results reported previously [19].

At present, NT-proBNP level is the direct examination indicator reflecting heart function. Its dynamic changes directly correspond to patients' heart function, and it is also an objective indicator commonly used to assess heart function [20]. In our study, NT-proBNP levels in both groups after intervention were significantly lower than those before intervention, display-

Table 3. Incidence of complications (n, %)

Group	Complications				Incidence of complications
	Cardiogenic shock	Lower limb edema	Hypoxemia	Pulmonary edema	
Optimized emergency nursing group	1 (1.22%)	1 (1.22%)	1 (1.22%)	2 (2.44%)	5 (6.10%)
Routine nursing group	3 (3.66%)	3 (3.66%)	2 (2.44%)	7 (8.54%)	15 (18.30%)
χ^2			4.612		
P			0.032		

Table 4. Satisfaction in nursing ($\overline{x} \pm sd$)

Group	Attitude of nursing staff	Comprehensiveness	Nursing skills
Optimized emergency nursing group	95.33±4.56	96.55±4.73	95.74±4.38
Routine nursing group	93.79±3.92	94.78±5.09	93.58±3.22
t	2.319	2.307	3.598
P	0.022	0.022	<0.001

ing the effectiveness of the intervention. In addition, the decline in the optimized emergency nursing group was more than that in the routine nursing group, corroborating that optimized emergency nursing can improve clinical efficacy [21].

ADL score is the most reliable indicator assessing the daily living ability of patients with left heart failure. After receiving active and effective basic treatment, patients' heart function is significantly improved. Moreover, patients' clinical symptoms are obviously relieved, improving the quality of daily life. Our results showed that ADL score in the optimized emergency nursing group after intervention was significantly higher than that in the routine nursing group, which was consistent with the results reported by Svenøy et al. [22].

The internal relationship between optimized emergency nursing and complications was further explored in this study. Incidence of complications in the optimized emergency nursing group was significantly decreased when compared with the routine nursing group. It was related to the efficient rescue procedure of optimized emergency nursing. A similar conclusion was made in previous studies.

Satisfaction in nursing is an important indicator for the assessment of nursing work. Optimized emergency nursing was given based on patients' condition, and targeted nursing measures were actively taken. Left heart failure related nursing was actively performed since the time of patients' admission to the hospital.

Nursing staff actively participated in the whole process. What's more, people to people exchanges were performed between patients and nursing staff, so as to grasp the changes in patients' inner feelings, relieve adverse emotions like anxiety and nervousness, improve affection, and reduce gaps. Ultimately, a harmonious relationship between patients and nursing staff was established. In our study, satisfaction in nursing in the optimized emergency nursing group was significantly higher than that in the routine nursing group. This was consistent with the results reported by Kheang et al. [21].

However, this is a single-centered study conducted in a small number of patients. A randomized, controlled, and multi-centered study is needed to be performed in a large number of patients to verify its clinical efficacy. Also, subsequent study will focus on the improvement of the follow-up normalized nursing of patients with acute left heart failure.

In summary, we confirmed that optimized emergency nursing of patients with left heart failure is beneficial for significantly improved clinical manifestations, enhanced heart function, reduced NT-proBNP level, and increased daily living ability; denoting that it could be an adjuvant therapy for patients with acute left heart failure.

Disclosure of conflict of interest

None.

Optimized emergency nursing for patients with acute left heart failure

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