ORIGINAL ARTICLE

Analysis of the effect of continuous care combined with health education on patients with severe pneumonia and respiratory failure in children and their families

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Abstract

Objective: To investigate the impact of continuous nursing care combined with health education on severe pneumonia paediatric cases and their families.

Method: The study was conducted at Children's Health Department of Tangshan Maternal and Child Health Hospital, China from May 2021 to May 2023, and comprised paediatric inpatients of either gender with severe pneumonia that was complicated by respiratory failure. The subjects were randomly assigned to either intervention group A receiving continuous nursing care combined with health education, or control group B receiving regular nursing care. Clinical data, such as symptom relief times, length of hospital stay, medication compliance, blood gas indicators, paediatric critical illness scores, acute physiology and chronic health evaluation scores, and paediatric quality of life scores, were noted. Data was analysed using SPSS 21.

Results: Of the 78 patients, 39(50%) were in intervention group A; 23(59%) boys and 16(41%) girls with mean age 3.64±0.53 years and mean disease duration 7.13±1.47 days. The other 39(50%) patients were in control group B; 21(54%) boys and 18(46%) girls with mean age 3.69±0.47 years and mean disease duration 7.23±1.31 days ($p>0.05$). Group A showed significantly shorter times for the disappearance of lung rales, hair forceps, dyspnoea, and length of hospital stay compared to group B ($p<0.05$). Both groups had significant increase in partial arterial oxygen pressure and blood oxygen saturation levels and decrease in partial carbon dioxide pressure levels after receiving nursing care ($p<0.05$). Group A had better outcomes than group B ($p<0.05$). Similar outcomes were noted for paediatric critical illness scores, acute physiology and chronic health evaluation scores, and paediatric quality of life scores ($p<0.05$).

Conclusion: Continuous care combined with health education significantly reduced symptom relief and hospitalisation times, improved blood gas indicators and overall health in children with severe pneumonia and respiratory failure. This was due to better compliance behaviour and health awareness among their families.

Keywords: Continuing care, Health education, Severe pneumonia in children, Respiratory failure.

(JPMA 75: S-26 [Suppl. 02]; 2025) **DOI: https://doi.org/10.47391/JPMA.SRPH-05**

Introduction

In children, severe pneumonia is a common respiratory illness. Typically, mycoplasmal, viral and bacterial infections are the reason. The disease has the characteristics of sudden onset, rapid disease progression, and critical condition.[1] Its high death rate makes it a significant hazard to children's lives, health and safety. Children with severe pneumonia often suffer from serious complications, such as heart failure, respiratory failure and toxic shock, which can further aggravate the condition of the children, enhance the difficulty of treatment, and increase the mortality rate.[2] Thus, the emphasis and hot spot of paediatric attention at this point is investigating a strategy that can effectively improve the clinical therapeutic effect and boost the prognosis of children with severe pneumonia that is complicated by respiratory failure. In addition to clinical symptomatic treatment, effective nursing intervention measures are of great significance to improve clinical efficacy.[3] However, traditional nursing intervention focusses more on the patient's life and health, lacks a systematic approach and pertinence, and easily ignores the overall intervention of clinical treatment, which often makes it difficult to achieve the expected effects. Continuing nursing intervention is the continuation of nursing work from the hospital to the family.[4,5] It can be achieved by conducting a comprehensive analysis of the patient's condition and evaluating whether nursing intervention measures need to be adjusted in order to develop a comprehensive nursing plan.[6] This is conducive to ensuring the scientific and systematic guidance of nursing work, and can provide a foundation for the management of out-of-hospital care for children with severe pneumonia.[7,8] Most patients, family members and

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medical personnel now appreciate the benefits of ongoing care.[9] Research studies on the continuation of therapy for children with severe pneumonia exacerbated by respiratory failure are still scarce, nonetheless.[10,11] There is a need to conduct research on the impact of health education along with ongoing care on patients and their families.[12] By providing continuous care and health education, better clinical outcomes, enhanced blood gas indicators, and better compliance with treatment protocols can be achieved.[13,14]

The current study was planned to investigate the impact of continuous nursing care combined with health education on severe pneumonia paediatric patients and their families.

Patients and Methods

The study was conducted at Children's Health Department of Tangshan Maternal and Child Health Hospital, China from May 2021 to May 2023. After approval from the institutional ethics review committee, the sample was raised using simple random sampling technique.[15] Those included were paediatric inpatients of either gender with severe pneumonia that was complicated by respiratory failure as diagnosed and assessed on the basis of X-ray scans and laboratory tests. Only those patients were enrolled who met the discharge indications after hospitalisation, and whose families signed the informed consent form. Those excluded were patients with worsening conditions, those with respiratory failure caused by other causes, those with incomplete clinical data, those with congenital diseases, patients with family members having mental disorders that affected their ability to communicate normally, those with other lung lesions, and patients whose parents did not sign the consent form.

The subjects were randomly assigned to either intervention group A or control group B. Children in both groups received conventional anti-infection, oxygen inhalation, sedation and anti-asthmatic treatment. The control group used routine nursing intervention to pay close attention to the children's condition and changes in vital signs, and promptly cleaned the secretions in the children's airways. At the same time, health education was provided, and disease knowledge was given to the children's family members according to the children's conditions.

The intervention group received continuing care combined with health education care having specific content, like establishing a continuing care team. Experienced nursing staff was selected to form a continuing care team, with the head nurse as the team leader. After a joint discussion and literature review,[16,17] a relevant continuing care plan was formulated. It was necessary to establish an exclusive file for children with severe pneumonia, record their age, gender, condition, and other essential information in detail, and an appropriate continuing care plan was formulated for the children.

After the children were admitted to the hospital for treatment, a colourful brochure with easy-to-understand pictures and text was given to them and their families, including disease-related knowledge, treatment purposes, treatment plans, precautions, medication and diet guidance, etc., explaining to children and their families and guiding them to read carefully, and informing them of the benefits of active treatment. Children were engaged through music, games, and other aspects, bringing them closer to the nursing staff, opening their hearts, and alleviating negative emotions. If a child was found to be resistant and uncooperative during the treatment process, brightly coloured pictures and texts were used to attract the child's attention, and then storytelling was used to divert attention and increase the child's confidence in treatment. In case of some family member being less patient and uncooperative, the nursing staff used relevant graphic material to carefully explain the disease, inform them of the importance of nursing cooperation, and patiently provided answers to the questions raised by the family members.

A severe pneumonia knowledge and health promotion platform was established. It was divided into online and offline channels. Family members of the patients were invited to participate in online platforms, such as WeChat and QQ (an instant messaging and social platform), which were aimed at promoting knowledge related to severe pneumonia, potential adverse reactions, and independent treatment measures. This platform was the responsibility of the nursing staff and physicians, and actively answered questions raised by the patients. Offline lectures were held to explain knowledge related to severe pneumonia and post-discharge habits, environmental medication, diet, expectorant therapy, and rehabilitation activities.

With respect to home care, the patients were advised to consume more foods rich in protein and vitamins, and to avoid spicy, greasy, salty, raw and cold foods. Children needed to drink more water. At the same time, the family members of the children were instructed on how to observe the symptoms of the disease, and send them to the doctor immediately if any abnormalities were found. They were also instructed to use the medicines rationally. If the children were distressed or resistant to taking the medicine, the family members were told that they needed to be patiently comforted. They could only engage in outdoor activities after the condition had stablised.

Qualified medical staff was selected to conduct home visits

to children with severe pneumonia to understand further the children's diet, mood, medication status, etc., and at the same time provide on-site guidance to the children's families on diet and other aspects.

Arterial blood samples (1mL) were obtained from both groups of children at baseline and post-intervention, and their partial arterial oxygen pressure (PaO_2), partial arterial carbon dioxide ($PaCO_2$), and blood oxygen saturation (SaO_2) levels were measured using a blood gas analyser.

Clinical data, such as symptom relief times, length of hospital stay (LOS), medication compliance, blood gas indicators, paediatric critical illness scores (PCIS),[18] acute physiology and chronic health evaluation-II (APACHE-II) scores[19] and paediatric quality of life (PQL) scores[20] were noted.

Compliance behaviour was compared between the two groups with respect to medication, diet, daily routine and medical activities. The family members of the children in both the groups were evaluated for health knowledge using an institutional tool.

Data was analysed using SPSS 21. Data was expressed as either frequencies and percentages or as mean ± standard deviation, as appropriate. Pairwise comparisons were made using chi-square test or the t-test, as appropriate. P<0.05 was considered statistically significant.

Results

Of the 78 patients, 39(50%) were in intervention group A; 23(59%) boys and 16(41%) girls with mean age 3.64±0.53 years and mean disease duration 7.13±1.47 days. The other 39(50%) patients were in control group B; 21(54%) boys and 18(46%) girls with mean age 3.69±0.47 years and mean disease duration 7.23±1.31 days (p>0.05) (Table 1).

Group A showed a significant improvement in clinical outcomes compared to group B (p<0.05) (Table 2, Figure 1).

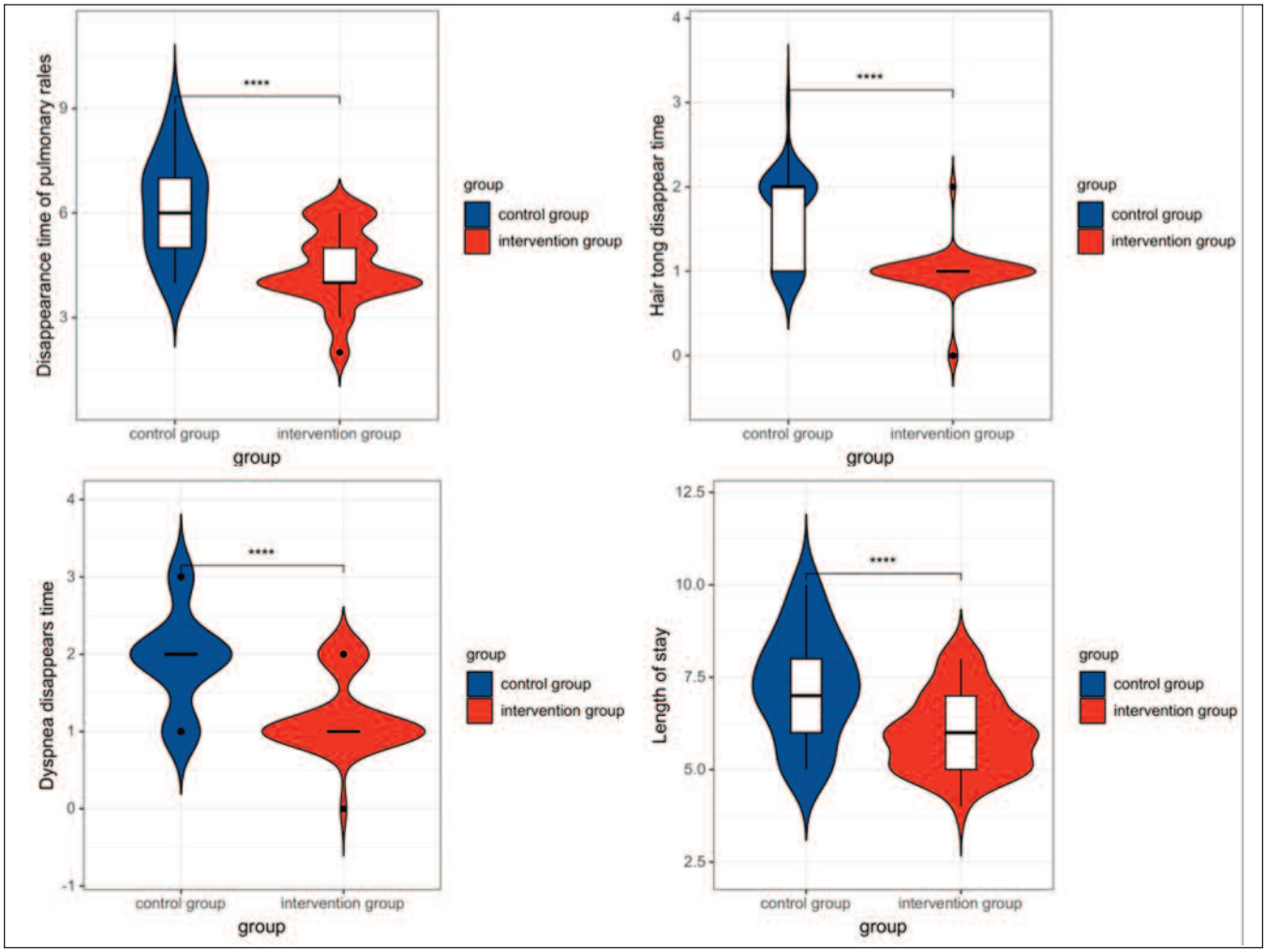

Figure-1: Violin plot comparing the clinical symptom remission time and length of hospitali stay of children in the two groups.

Post-intervention, both the groups showed significant improvements in blood gas indicators ($p<0.05$), but the values were significantly better for group A compared to

Table-1: Baseline data.

Team	n	Gender Male/Female	Age (years)	Course of Disease (d)
Control	39	21/18	3.69±0.47	7.23±1.31
Intervention	39	23/16	3.64±0.53	7.13±1.47
x^2 / *t*-test		0.209	0.450	0.325
p-value		0.648	0.654	0.746

Table-2: Clinical symptom relief time and length of hospital stay in the two groups.

Group	n	Time for the disappearance of pulmonary rales (d)	Hair tong disappear time (d)	Time to disappear from dyspnoea (d)	Length of stay (d)
Control	39	6.18±1.41	1.67±0.53	1.93±0.62	7.28±1.47
Intervention	39	4.44±1.07	0.97±0.28	1.21±0.47	6.00±1.03
t-value		6.145	7.216	5.747	4.470
p-value		0.000	0.000	0.000	0.000

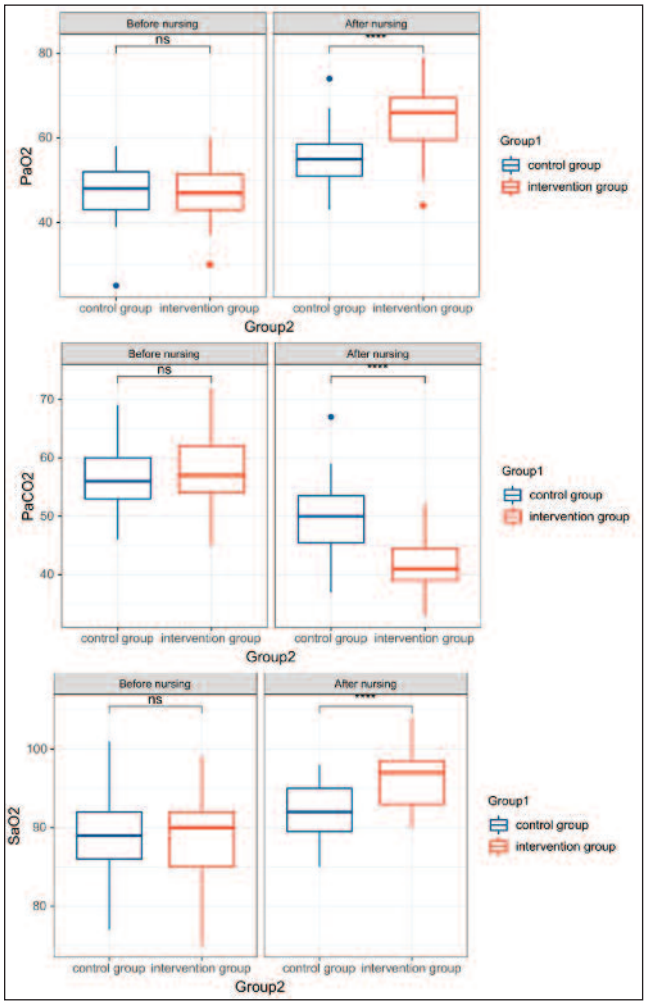

Figure-2: Box plot comparing the standards of PaO_2, $PaCO_2$ and SaO_2 in the two groups. **** $p<0.0001$.

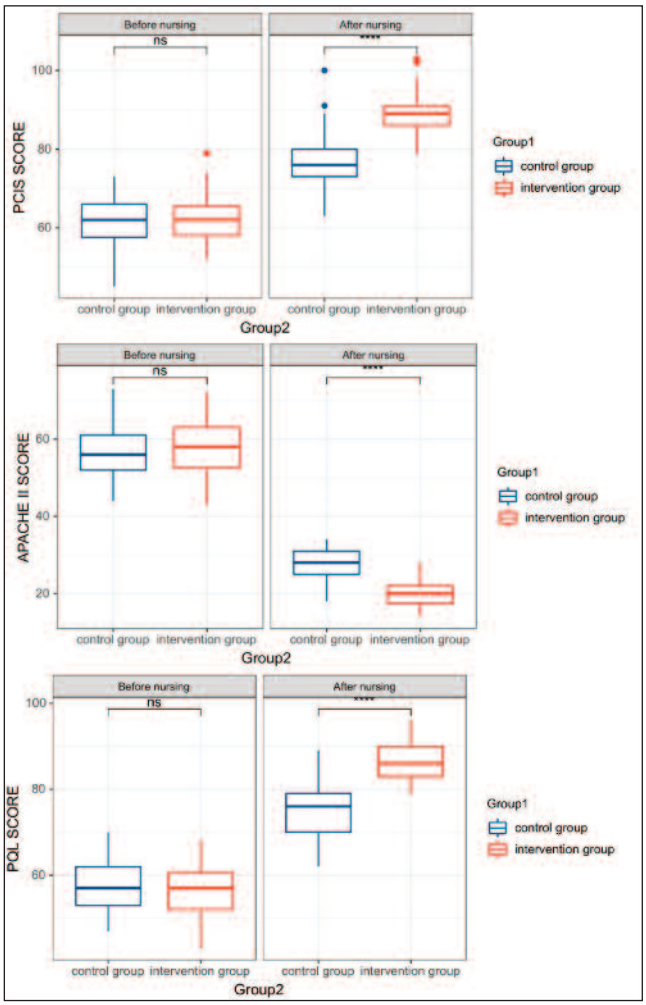

Figure-3: Box plot comparing the groups with respect to PCIS, APACHE II and PQL scores. **** p<0.0001.

PCIS: *Paediatric critical illness score,* ***APACHE II:*** *Acute physiology and chronic health score II,* ***PQL:*** *Paediatric quality of life.*

Table-3: Blood gas indicators of the two groups.

Team	Time	PaO_2 (mmHg)	$PaCO_2$ (mmHg)	SaO_2 (%)
Control (n=39)	Before care	47.26±6.09	57.49±5.87	89.27±5.70
	After care	55.34±6.78*	49.07±5.24*	92.13±3.27*
Intervention (n=39)	Before care	47.64±6.50	57.76±6.02	88.98±5.82
	After care	64.47±7.36*#	41.32±4.34*#	96.10±3.40*#

*Comparison with pre-nursing phase, $p<0.05$; # comparison with the control group after receiving nursing care, $p<0.05$.

Table-4: Intergroup cpmporison of PCIS, APACHE II and PQL scores.

Group	Time	PCIS score	APACHE II score	PQL score
Control (n=39)	Before care	61.54±6.39	57.21±7.18	57.64±5.98
	After care	77.46±7.08 *	27.87±3.93 *	74.46±6.35 *
Intervention (n=39)	Before care	62.00±6.55	57.64±7.30	56.74±6.06
	After care	89.00±5.81*#	19.77±3.41*#	86.28±4.25*#

* Comparison with pre-nursing phase, $p<0.05$; # comparison with the control group after receiving nursing care, $p<0.05$.PCIS: Paediatric critical illness score, APACHE II: Acute physiology and chronic health score II, PQL: Paediatric quality of life.

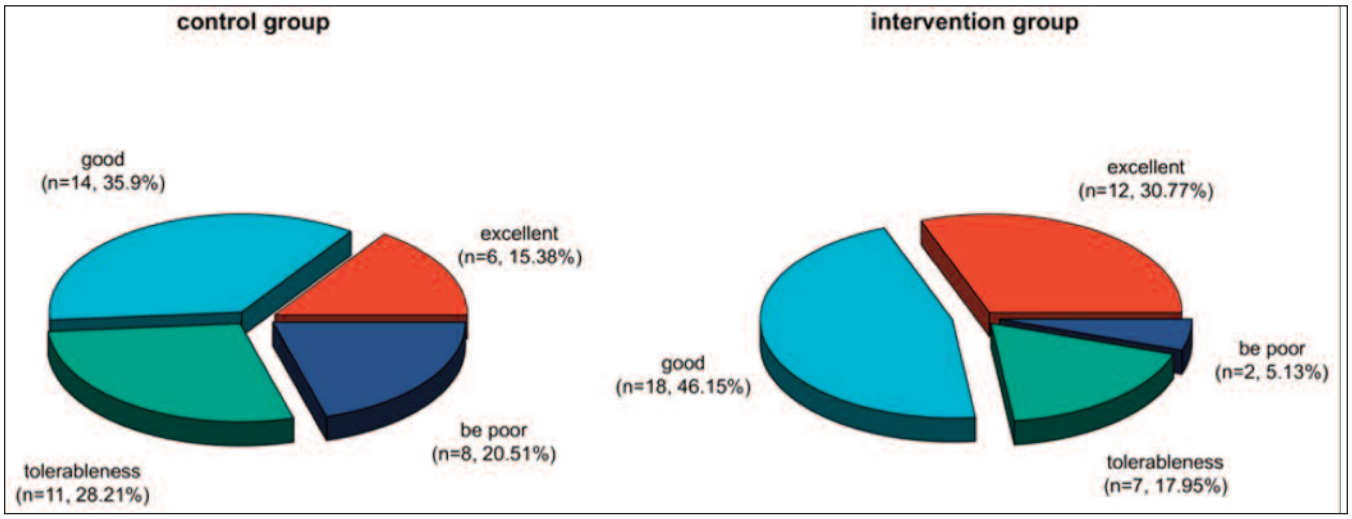

Figure-4: Three-dimensional (3D) pie chart comparing the groups regarding health awareness.

Table-5: Medical compliance behaviour of the study groups.

Team	n	Take medicine as prescribed	Follow medical advice and diet	Follow the doctor's schedule	Medical compliance activities
Control team	39	33 (84.62)	32(82.05)	30(76.92)	34 (87.18)
Intervention team	39	38(100.00)	37 (94.87)	36 (92.31)	38(100.00)
x^2		6.340	4.850	7.120	5.210
p-value		0.012	0.028	0.008	0.022

Table-6: Health awareness among family members of the patients.

Team	n	excellent	good	Can	Difference
Control	39	6(15.38)	14 (35.90)	11 (28.21)	8(20.51)
Intervention	39	12(30.77)	18 (46.15)	7(17.95)	2 (5.13)
x^2			4.129		
p-value			0.042		

group B ($p<0.05$) (Table 3, Figure 2).

Post-intervention, there was a significant rise in PCIS and PQL scores in both the groups , and a meaningful drop in the APACHE-II scores compared to the baseline ($p<0.05$), but the scores were significantly better for group A compared to group B ($p<0.05$) (Table 4, Figure 3).

Group A subjects showed significantly better compliance behaviour in terms of daily schedule, diet, medications and activities compared to group B controls ($p<0.05$) (Table 5).

Post-intervention, higher health awareness was noted in the family members of group A children compared to those related to the children in group B ($p<0.05$) (Table 6, Figure 4).

Discussion

Children are prone to severe pneumonia, which can be complicated respiratory failure in severe cases. Correcting hypoxia and managing sequelae are the cornerstones of clinical care for children with severe pneumonia exacerbated by respiratory failure. However, when children are young and have insufficient cognitive ability, it leads to low treatment compliance. In addition, non-cooperation of some family members also affect the clinical efficacy, leading to the extension of the treatment cycle and reduction in the quality of life.[21,22] As such, it is crucial to provide adequate nursing care to such children and their families in order to enhance patient outcome and clinical efficacy. Continuous nursing intervention is the continuation of nursing work from the hospital to the home. After being discharged, patients continue to receive care, which can enhance their life quality. This nursing method is mainly carried out through the use of family members, hospital phone follow-up, and follow-up visits, as well as the use of the internet and other channels, which is conducive to ensuring the continuity of professional nursing content, and providing patients with care that meets their needs.[23,24]

In the current study, following nursing care, the intervention group showed better results across the board compared to the control group, indicating that continuous nursing care intervention combined with health education could effectively promote better outcomes. This is because this nursing method is more comprehensive compared to conventional nursing methods.

Severe pneumonia combined with respiratory failure is complicated, and the course of the disease is prolonged. Children are prone to falling victim to negative emotions, such as being aggressive and uncooperative, which seriously affects the treatment and also poses a threat to their safety.[25] The current study showed that following nursing care, the intervention group's PCIS and PQL scores were much higher than those of the control group, while

their APACHE-II scores were considerably lower (p<0.05).

Furthermore, it has been proposed that the continuous nursing care in conjunction with health education can enhance children's medical compliance behaviour when they have respiratory failure and severe pneumonia. In addition, home care under the guidance of nursing staff has a positive impact on the recovery of children with severe pneumonia.[26]

The role of family members in such cases is critical. When the patient's condition is relatively severe, due to the lack of cognitive ability and treatment knowledge of family members, they are prone to developing negative emotions, such as anxiety and impulsiveness, which can affect clinical treatment.[27] The current study found that the health awareness of family members of children in the intervention group was considerably higher than that of family members of children in the control group (p<0.05). The establishment of online and offline communication platforms could provide problem-solving services to children's families, which is beneficial for improving their understanding of disease knowledge.[28]

The current study has limitations as the sample size was not calculated, which could have affected the power of the study and the generalisability of the findings.

Conclusion

Continuing nursing care combined with health education could effectively shorten the clinical symptom relief time and length of hospitalisation of children with severe pneumonia and respiratory failure, enhance blood gas indicators and body health status, improve compliance behaviour of children, improve quality of life, and increase the health awareness of children's families.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

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