

Effects of Family-participation-based Continuous Nursing Combined with Respiratory Function Training on Recurrence of Children with Wheezing Diseases

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Abstract: *Objective:* To explore the effects of family-participation-based continuous nursing combined with respiratory function training on family-management ability, training compliance and recurrence in children suffering from wheezing diseases. *Methods:* A total of 96 children with wheezing diseases admitted to the Department of Pediatrics of Yancheng Maternity and Child-Health Hospital from January 2025 to March 2026 were selected as research subjects. They were divided into control group and observation group by random-number-table method, with 48 cases in each group. The two groups were compared in terms of family-management-ability scores before and after intervention, training compliance, wheezing recurrence and medical-visit conditions within 3 months, and family-member nursing satisfaction. *Results:* Before intervention, there was no statistically significant difference in each-dimension scores and total scores of family-management ability between the two groups ($p > 0.05$). After 3-month intervention, the observation group obtained higher scores than the control group in disease cognition, medication management, respiratory-training implementation, environmental management, symptom monitoring and total score, with statistically significant differences ($p < 0.001$). The excellent-compliance rate of training in the observation group was 91.67 %, higher than 66.67 % in the control group ($p < 0.05$). During the 3-month follow-up, the wheezing-recurrence rate and emergency-visit rate of the observation group were 10.42 % and 8.33 % respectively, both lower than 31.25 % and 25.00 % of the control group, showing statistically significant differences ($p < 0.05$). The readmission rate of the observation group was lower than that of the control group, but the difference had no statistical significance ($p > 0.05$). The family-member nursing-satisfaction rate of the observation group was 95.83 %, higher than 79.17 % of the control group, with statistically significant difference ($p < 0.05$). *Conclusion:* Family-participation-based continuous nursing combined with respiratory function training can improve family-management ability and training compliance of children with wheezing diseases, reduce wheezing-recurrence rate and emergency-visit rate, and raise family-member nursing satisfaction. It possesses certain clinical-promotion value.

Keywords: Children's wheezing diseases; Family participation; Continuous nursing; Respiratory function training;

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1. Introduction

Children's wheezing diseases rank among the common chronic respiratory diseases in pediatrics, mainly manifested as repeated wheezing, cough, shortness of breath, dyspnea and other symptoms. They can be induced by multiple factors including respiratory-tract infection, allergen stimulation, environmental factors and airway hyperresponsiveness. Due to the relatively narrow airway lumen, immature development of respiratory muscles and imperfect immune-system function in children, problems such as airway obstruction, declined pulmonary-function and repeated disease attacks tend to occur during disease recovery. Researches indicate that recurrent wheezing in childhood not only affects normal growth-development and quality of life, but also may increase the risk of subsequent bronchial-asthma onset, bringing heavy economic burden and psychological pressure to children's families. At present, treatments for children's wheezing diseases mainly include pharmacotherapy such as anti-infection, anti-wheezing, expectorant therapy and atomization inhalation, as well as routine nursing care. Although the above-mentioned measures can effectively control acute symptoms, children after discharge often suffer from insufficient home-nursing knowledge, poor medication compliance, interrupted respiratory training and weak early-warning awareness of disease recurrence, which impair long-term disease-control effects. In recent years, with the development of chronic-disease-management concepts, nursing modes have gradually transformed from in-hospital nursing to continuous in-hospital and out-of-hospital management. Continuous nursing emphasizes improving disease-management capacity of patients and their family members and realizing long-term disease control through continuous post-discharge guidance, health education and follow-up management.

Family participation constitutes an important component of continuous nursing. For pediatric patients, parents are primary implementers of disease management. Their disease-cognition level, nursing skills and management capacity exert direct influences on therapeutic effects and disease prognosis. Studies hold that strengthening family participation can raise family members' disease-awareness level, enhance their capabilities in medication management, symptom monitoring and environmental control, so as to improve children's compliance and lower disease-recurrence risks. Meanwhile, as an important part of pulmonary rehabilitation, respiratory-function training features simple operation, high safety and good child acceptability. It can improve airway patency, strengthen respiratory-muscle function and promote sputum excretion. Combining respiratory-function training with family-participation-based continuous nursing is expected to further boost family-management capacity and disease-control outcomes.

2. Materials and methods

2.1. General data

A total of 96 children with wheezing diseases admitted to the Department of Pediatrics of Yancheng Maternity and Child-Health Hospital from January 2025 to March 2026 were enrolled. They were divided into control group and observation group via random-number-table method, with 48 cases in each group.

In the control group: 27 boys and 21 girls, aged 4–10 years, mean age (6.84 ± 1.42) years; disease course 2–6 days, mean (3.58 ± 0.91) days; 30 cases of mild wheezing, 18 cases of moderate wheezing; 14 cases with allergic history. In the observation group: 25 boys and 23 girls, aged 4–10 years, mean age (6.71 ± 1.36) years; disease course 2–6 days, mean (3.46 ± 0.87) days; 32 cases of mild wheezing, 16 cases of moderate wheezing; 16 cases with allergic history. There were no statistically-significant inter-group differences in general data including gender, age, disease course, wheezing severity and allergic history ($p > 0.05$), and the two groups were comparable.

2.1.1. Inclusion criteria

Conforming to relevant diagnostic criteria for children's wheezing diseases ^[1–5]; aged 4–10 years; relatively stable condition, capable of cooperating with intervention and follow-up; primary caregivers of children could receive follow-up via WeChat or telephone, and gave informed consent for participation in this study.

2.1.2. Exclusion criteria

Complicated with diseases impairing respiratory function such as congenital heart disease, foreign-body in airway, laryngomalacia and mediastinal neoplasm; complicated with severe nervous-system diseases, mental-behavioral disorders or cognitive impairment; condition deteriorated to require admission to intensive-care unit during treatment; incomplete data, case dropout or loss-to-follow-up.

This study was approved by the hospital ethics committee, and guardians of all children signed informed-consent forms.

2.2. Methods

2.2.1. Control group

The control group received routine nursing and discharge guidance. After admission, duty nurses assessed disease changes, closely monitored vital signs including body temperature, respiratory rate, heart rate, blood-oxygen saturation, as well as clinical symptoms such as cough and wheezing, and cooperated with physicians to complete anti-infection, anti-wheezing, expectorant, atomization-inhalation and other therapies. During nursing, children were guided to maintain comfortable body positions, encouraged to drink adequate water, and assisted with sputum excretion to keep respiratory tracts unobstructed. Meanwhile, health education was delivered to family members, explaining disease-related knowledge, medication administration methods, dietary management and daily-nursing precautions. Health-education pamphlets were distributed at discharge. Review-visit time and recurrence-prevention measures were informed, and family members were instructed to implement home-based nursing according to medical advice.

2.2.2. Observation group

On the basis of interventions for the control group, the observation group received family-participation-based continuous nursing combined with respiratory-function training. After enrolment, family-management files were established. Duty nurses recorded children's basic information, past medical history, allergic history, recurrence status, family-environment conditions and information of primary caregivers. One primary caregiver was designated as the person-in-charge of family management. Before discharge, duty nurses delivered systematic face-to-face training for primary caregivers, covering knowledge of wheezing diseases, identification of inducing factors, management of medication and atomization therapy,

respiratory-function-training methods, symptom monitoring and early-warning of recurrence, so that family members could master basic skills for long-term disease management.

In terms of respiratory-function training, duty nurses guided children and their family members to complete abdominal breathing, pursed-lip breathing, balloon-blowing training and effective-cough training together. For abdominal-breathing training, children maintained comfortable postures, inhaled slowly through nose to make abdomen bulge, then exhaled slowly through mouth to make abdomen fall back. For pursed-lip-breathing training, children inhaled through nose and then exhaled slowly with lips pursed as if whistling. Balloon-blowing training was performed progressively according to children's age and tolerance level. Effective-cough training required deep inspiration and brief breath-holding followed by active coughing to promote sputum discharge. The above-mentioned trainings were carried out twice a day, 15–20 minutes each time, lasting for 3 months. Duty nurses provided on-site guidance during hospitalization; after discharge, family members supervised training implementation.

2.3. Observation indicators

2.3.1. Family-management-ability score

Evaluated by self-developed evaluation scale for family-management ability of children with wheezing diseases of our hospital. It contained five dimensions: disease cognition, medication management, respiratory-training implementation, environmental management and symptom monitoring. Each dimension accounted for 20 points, with a total score of 100 points. Higher scores represented stronger family-management ability.

2.3.2. Training compliance

Evaluated according to the ratio of actual completed training times to planned training times. Completion rate $\geq 80\%$ was defined as good compliance; 60–79 % as fair; $< 60\%$ as poor.

2.3.3. Recurrence status

Children were followed-up for 3 months after discharge. Conditions of wheezing recurrence, emergency-department visits and readmission were recorded. Wheezing recurrence was defined as re-occurrence of obvious wheezing symptoms requiring pharmacotherapy or medical intervention.

2.4. Statistical methods

SPSS 26.0 statistical software was adopted for data analysis. Measurement data passing normality test were expressed as mean $\pm$ standard deviation ($\bar{x} \pm s$). Independent-sample *t*-test was used for inter-group comparison, and paired *t*-test was adopted for intra-group pre-post-intervention comparison. Enumeration data were expressed as case number and percentage, and Chi-square test or Fisher's exact test was used for inter-group comparison. $p < 0.05$ was regarded as the threshold for statistically-significant difference.

3. Results

3.1. Comparison of general data between two groups

No statistically-significant differences were found between the two groups in general data such as gender, age, disease course, wheezing severity and allergic history ($p > 0.05$). The two groups were comparable, as shown in Table 1.

Table 1. Comparison of general data between two groups of children

Items	Control group (n = 48)	Observation group (n = 48)	<i>t</i> / χ^2 value	<i>p</i> value
Male/Female (cases)	27/21	25/23	0.168	0.682
Age (years)	6.84 ± 1.42	6.71 ± 1.36	0.458	0.648
Disease course (d)	3.58 ± 0.91	3.46 ± 0.87	0.660	0.511
Mild/Moderate wheezing (cases)	30/18	32/16	0.177	0.674
Allergic history (cases)	14 (29.17 %)	16 (33.33 %)	0.190	0.663

3.2. Comparison of family-management-ability scores between two groups

Before intervention, there existed no statistically-significant differences in dimensional scores and total scores of family-management-ability between the two groups ($p > 0.05$). After 3-month intervention, family-management-ability scores of both groups increased compared with pre-intervention levels. Scores of the observation group in disease cognition, medication management, respiratory-training implementation, environmental management, symptom monitoring and total score were obviously higher than those of the control group, with statistically-significant differences ($p < 0.001$), as shown in Table 2.

Table 2. Comparison of family-management-ability scores of two groups before and after intervention

Indicators	Time	Control group(n = 48)	Observation group(n = 48)	<i>t</i> value	<i>p</i> value
Disease cognition	Before intervention	11.42 ± 2.16	11.56 ± 2.21	0.314	0.754
	After intervention	14.83 ± 2.35	17.46 ± 2.08	5.799	< 0.001
Medication management	Before intervention	10.91 ± 2.24	11.13 ± 2.19	0.487	0.628
	After intervention	14.25 ± 2.31	17.21 ± 2.03	6.661	< 0.001
Respiratory-training implementation	Before intervention	9.78 ± 2.05	9.86 ± 2.12	0.188	0.851
	After intervention	13.58 ± 2.42	17.38 ± 2.06	8.283	< 0.001
Environmental management	Before intervention	12.04 ± 2.28	11.92 ± 2.25	0.260	0.795
	After intervention	15.12 ± 2.34	17.63 ± 2.01	5.634	< 0.001
Symptom monitoring	Before intervention	10.69 ± 2.17	10.81 ± 2.20	0.269	0.788
	After intervention	14.56 ± 2.39	17.25 ± 2.11	5.845	< 0.001
Total score	Before intervention	54.84 ± 7.26	55.28 ± 7.39	0.294	0.769
	After intervention	72.34 ± 8.18	86.93 ± 7.41	9.153	< 0.001

3.3. Comparison of training compliance between two groups

The excellent-compliance rate of training in the observation group was 91.67 %, markedly higher than 66.67 % in the control group ($\chi^2 = 9.560$, $p = 0.002$), as shown in Table 3.

Table 3. Comparison of training compliance between two groups

Group	Cases	Good	Fair	Poor	Excellent-compliance rate	χ^2 value	<i>p</i> value
Control group	48	32	11	5	32 (66.67 %)	-	-
Observation group	48	44	3	1	44 (91.67 %)	9.560	0.002

3.4. Comparison of risks of major follow-up outcomes between two groups within 3 months

After 3-month follow-up, risks of wheezing recurrence, emergency-department visits and readmission in the

observation group were all lower than those in the control group. Statistically-significant differences were observed in wheezing recurrence and emergency-department visits ($p < 0.05$), while no statistical difference was found in readmission rate ($p > 0.05$), as shown in Table 4.

Table 4. Comparison of risks of major follow-up outcomes of two groups within 3 months

Follow-up outcome	Control group (n = 48)	Observation group (n = 48)	RR (95 %CI)	p value
Wheezing recurrence	15/48 (31.25 %)	5/48 (10.42 %)	0.33 (0.13–0.84)	0.011
Emergency-department visit	12/48 (25.00 %)	4/48 (8.33 %)	0.33 (0.12–0.96)	0.028
Readmission	7/48 (14.58 %)	2/48 (4.17 %)	0.29 (0.06–1.31)	0.076

Note: RR means relative risk of observation group compared with control group; 95 % CI stands for 95 % confidence interval.

3.5. Comparison of family-member nursing satisfaction between two groups

Total nursing-satisfaction rate of family members in the observation group was 95.83 %, higher than 79.17 % of the control group ($\chi^2 = 6.095$, $p = 0.014$), as shown in Table 5.

Table 5. Comparison of family-member satisfaction between two groups

Group	Cases	Very satisfied	Satisfied	Dissatisfied	Total satisfaction rate	χ^2 value	p value
Control group	48	20	18	10	38 (79.17 %)	-	-
Observation group	48	31	15	2	46 (95.83 %)	6.095	0.014

4. Discussion

The results of this study indicated that there existed no statistically-significant differences in dimensional scores and total scores of family-management-ability between the two groups before intervention ($p > 0.05$), which suggested comparability of baseline data. After 3-month intervention, scores of the observation group in disease cognition, medication management, respiratory-training implementation, environmental management, symptom monitoring and total score were obviously higher than those of the control group ($p < 0.001$). The total score of the observation group reached (86.93 ± 7.41) points versus (72.34 ± 8.18) points of the control group, showing statistically-significant difference. It demonstrated that family-participation-based continuous nursing combined with respiratory-function training could effectively improve children's family-management ability. Possible reasons may lie in that the family-participation mode highlights family-members' principal role in disease management. Through establishment of family-management files, individualized health education and skill training, family members can systematically master disease-related knowledge and nursing skills. Meanwhile, continuous guidance and supervision via WeChat platforms and telephone follow-up further strengthen family members' comprehension and application of disease-management contents, so as to improve family-management ability.

Compliance serves as a vital factor affecting long-term management outcomes of chronic diseases. As an important component of rehabilitation management for wheezing diseases, respiratory-function training requires long-term standardized implementation to exert effects. Nevertheless, young children lack the initiative to persist in training, and ideal outcomes can hardly be achieved merely relying on children themselves. This study showed that the excellent-compliance rate of training in the observation group was 91.67 %, significantly higher than 66.67 % in the control group ($P=0.002$), which was basically consistent

with findings of previous researches on family management and rehabilitation training. It indicated that the family-participation mode helped improve children's training compliance. The underlying reason may be that the family-participation mode clarifies primary caregivers' responsibilities and makes parents direct participants in training execution and supervision.

Disease recurrence is an important indicator for evaluating long-term management outcomes of children's wheezing diseases. Three-month follow-up in this study found that the wheezing-recurrence rate and emergency-visit rate of the observation group were 10.42 % and 8.33 % respectively, both lower than 31.25 % and 25.00 % of the control group, with statistically-significant differences ($p < 0.05$). It suggested that family-participation-based continuous nursing combined with respiratory-function training contributed to lowering disease-recurrence risks. Possible explanations are as follows: firstly, improved disease-cognition level of family members enables standardized implementation of medication and respiratory training; secondly, guidance on family-environment management reduces exposure to allergens and other inducing factors; thirdly, symptom-monitoring and recurrence-early-warning education allow family members to detect disease changes timely and take corresponding measures to prevent further deterioration. In addition, although the readmission rate of the observation group was lower, no statistical significance was obtained ($p = 0.076$). This may result from relatively small sample size, short follow-up duration and low incidence of readmission events. Further researches with expanded sample size are required for subsequent verification.

5. Conclusion

Family-participation-based continuous nursing combined with respiratory function training can improve family-management ability and training compliance in children with wheezing diseases, reduce wheezing recurrence and emergency visits, and increase family-member nursing satisfaction, showing certain clinical-promotion value.

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Disclosure statement

The authors declare no conflict of interest.

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