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Original Article

Application of nursing based on the authorization theory in asthmatic children aged 7 to 14 years

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Abstract: Objective: To investigate the effect of a nursing model based on the authorization theory of asthma in children aged 7 to 14 years. Methods: In total, 200 children who were 7 to 14 years with asthma in remission were recruited in this study. These children were admitted to our hospital and were randomly divided into the control group (n=100) and the experimental group (n=100). Patients in the control group received routine nursing, while those in the experimental group received routine nursing and nursing based on the authorization theory. Treatment compliance, the time of disappearance of symptoms (like sputum, cough, wheeze, and wet rales), the length of hospitalization, lung function, including forced expiratory volume in 1 second (FEV_1), forced vital capacity (FVC), and FEV_1/FVC, general self-efficacy scale (GSES) score, MOS 36-item short form health survey (SF-36) score, and parents' satisfaction with nursing were compared between the two groups. Results: FEV_1, FVC, FEV_1/FVC, GSES score, and SF-36 scores in all aspects in the two groups after intervention were increased when compared with before intervention; in addition, FEV_1, FVC, FEV_1/FVC, GSES score, and SF-36 scores in all aspects in the experimental group after intervention were significantly higher than those in the control group (all $P<0.05$). The time of disappearance of symptoms (like sputum, cough, wheeze, and wet rales) and length of hospitalization in the experimental group were shorter than those in the control group (all $P<0.05$). Compared with the control group, treatment compliance and satisfaction in nursing in the experimental group were increased (both $P<0.05$). Conclusion: Nursing based on the authorization theory can effectively improve treatment compliance, lung function, SF-36 scores, and satisfaction in nursing, and shorten the length of hospitalization.

Keywords: Bronchial asthma, authorization theory, time of disappearance of clinical symptoms, lung function, quality of life

Introduction

Bronchial asthma is an idiosyncratic disease induced by chronic airway inflammation, which mainly involves cellular components and a variety of cells like airway epithelial cells, T lymphocytes, mast cells, and eosinophils [1, 2]. Recurrent asthma, cough, shortness of breath, and chest tightness are the main clinical manifestations. If the condition is not well controlled, patients will suffer from repeated acute attacks [3]. Accordingly, patients will have irreversible airflow limitations in the lungs and severe impairment of the lung function. Eventually, serious diseases like pulmonary heart disease, emphysema, and respiratory failure will be present [4]. Currently, there is no clinical cure for the treatment of asthma. Drug treatment is the only measure to control its development. In other words, most treatments are not effective, and reduce the quality of life [5]. Due to incomplete physical development, children can have poor self-management capabilities. They are thus prone to recurring attacks. In clinical practice, attention should be paid to these patients. In addition to the standard treatment, corresponding scientific nursing intervention should also be carried out to improve the therapeutic effect [6].

Authorization theory originates from the diabetes education theory existing in the American Diabetes Association (ADA). In the theory, patient-centered care is emphasized. The core content of the theory is that patients take full responsibility for self-management [7]. Patients'

living habits are mainly changed by the individual themselves, under the assistance of medical staff. In addition, they are finally responsible for their life after actively listening to the suggestions of medical staff [8]. It is believed in the theory that patients have the ability to identify diseases, make choices, and take corresponding actions [9]. The main role of medical staff is to stimulate the patients' subjective initiative in their own self-health care. With the cooperation between educators and patients, the cost and benefits of various treatment and management methods can be measured. In this way, patients can make good choices and perform self-management. In order to provoke patients' motivation of enhancing healthy behaviors and mobilize their sense of self-efficacy and subjective initiative, patients' choices are fully respected [10, 11]. At present, the theory has been gradually implemented in the treatment of diseases including hemodialysis and cancer. However, it has not been implemented in the treatment of asthma [12, 13]. In order to further control the development of asthma in children, we applied nursing based on the authorization theory in children with asthma in a remission period (7 to 14 years old), and explored the therapeutic effect.

Materials and methods

General information

This study was performed in 200 children with asthma in a remission period, who were admitted to Shanghai General Hospital, Shanghai Jiao Tong University Affiliated First People's Hospital from July 2019 to June 2020. According to a random number table, these children were assigned to the control group (n=100) and the experimental group (n=100). This study was approved by the Ethics Committee of Shanghai General Hospital, Shanghai Jiao Tong University Affiliated First People's Hospital.

Inclusion criteria: Patients who met the diagnostic criteria for asthma in a remission period, which was defined in the Chinese Guidelines for Prevention and Treatment of Bronchial Asthma (2016 Edition) [14]. Patients who had normal intelligence and communication skills; family members signed the informed consent; follow-up could be performed during the whole period; patients had complete clinical data.

Exclusion criteria: Patients had diseases such as pulmonary tuberculosis, lung abscess, pneumoconiosis, chronic nasopharyngitis, bronchiectasis, and esophageal reflux syndrome; patients had cardiac insufficiency, immune function abnormality, or major infectious diseases; patients refused to cooperate or had extremely poor compliance to medical advice.

Methods

In the control group, children were routinely treated with budesonide aerosol (AstraZeneca, UK) and seretide (GlaxoWellcome, France). At the same time, they received routine nursing: (1) admission-education was conducted. Family members were informed to provide light food for children in daily life. Spicy and food that easily caused allergic reaction was prevented. In order to avoid choking, children stopped eating immediately when they coughed. In addition, they ate less food each time but more frequently. In this way, eating too much at one time was prevented and abnormal breathing was avoided; (2) temperature and humidity in the ward were adjusted to a suitable level. The temperature was 22°C-26°C, while the humidity was 55%-65%. These factors helped to maintain the humidity of the respiratory mucosa; (3) children were instructed to breathe correctly. Closed suction drainage was applied, if necessary. Firstly, a sputum tube was inserted into the airway. Secondly, sputum at the mouth of artificial airway tube was sucked. Thirdly, sputum at nasopharynx was sucked. Finally, the tube was slowly withdrawn. Suction time was below 15 s, with suction pressure within 100 mmHg. Atomization inhalation was also supplied. A proper amount of warm distilled water, which was freshly prepared, was poured into the humidification bottle. For patients with difficulty in expectoration, ambroxol (10-20 mg, Shanghai Boehringer Ingelheim Pharmaceutical Co., Ltd., China) dissolved in 20 mL of normal saline was provided. The inhalation was completed every 6 h, with 15-20 min/time; (4) children and their family members were instructed to take correct and standardized medication. Balanced nutrition was provided for children to enhance their physical fitness. Self-management care was provided after discharging from Shanghai General Hospital, Shanghai Jiao Tong University Affiliated First People's Hospital.

Patients in the experimental group received routine nursing and nursing based on the authorization theory, which was carried out successively, including clarification of problems, emotional expression, goal setting, plan formulation, and evaluation of results. (1) Health education courses were held. Educators were supported children and their family members with more information and confidence. During the process of communicating with the childrens' family members, a sympathetic response, open-ended questioning, reflective listening, timely encouragement, and so on, were the essential methods. (2) Clarification of problems: problems that children had in the process of self-management were clarified using a questionnaire. After mutual discussion, childrens' family members were made aware of the positive significance of self-management ability on the prognosis of the disease. Meanwhile, the awareness of the disease was deepened. (3) Emotional expression: reflective listening, which referred to simply repeating the feelings of children patients and querying reasons leading to those feelings, was applied. By sharing the unpleasant feelings with parents, injury and stress level in children were reduced. At the same time, the childrens' control over behavior was enhanced. (4) Goal setting and plan formulation: goals and plans were formulated in accordance with the present problems. Goals included short-term and long-term goals: avoiding exposure to allergens in daily life; avoiding exposure to second-hand smoke as much as possible; preventing the use of woolen cloth, carpets and other items indoors; ventilating the ward frequently; using a humidifier, which was adjusted based on air humidity, to improve the dry indoor environment. However, a humidifier was unsuitable to replace the atomizer. What's more, masks were prepared when the children went out. (5) Evaluation of results: after formulating goals and plans, the nursing staff consulted the childrens' family members whether they would like to accept these goals and plans. When they were accepted by the childrens' family members, these goals and plans were feasible. Evaluation of the effects of care was promptly carried out during the implementation process. The children were assisted to perform the self-evaluation of the completion of self-management goals. Reasons for failure and success were summarized. Children were encouraged and supported. In addition, they were inspired with confidence and motivation to complete the goals. A Wechat group was recommended to the childrens' family members. They were followed up by telephone, WeChat, and return visits. The intervention lasted for 3 months.

Outcome measures

Main outcome measures: Lung function before and 3 months after intervention: advanced lung function meter (CHESTAC-8800, Chest, Tokyo, Japan) was implemented to detect forced expiratory volume in the first second (FEV_1) and forced vital capacity (FVC). The ratio of FEV_1/FVC was then calculated.

The time of disappearance of symptoms (like sputum, cough, wheezing, and rales) and the length of hospitalization were recorded.

Treatment compliance before and 3 months after intervention: a self-made questionnaire was applied to evaluate treatment compliance. Its content included aspects such as reasonable diet, standardized medication, living habits, attention to rest, psychological emotions, and regular follow-up visits. With the help of parents, the evaluation was completed. According to the childrens' executive ability, the results were divided into three levels: full compliance (above 80%), partial compliance (between 50% and 79%), and non-compliance (below 50%). Total compliance rate = (full compliance + partial compliance)/the total number of patients *100%.

Self-efficacy before and 3 months after intervention: the general self-efficacy scale (GSES) was used to assess self-efficacy. The scale was composed of 10 questions, with a total score of 4-40 points. The assessment was conducted with the help of the parents. The higher the score was, the better the self-efficacy.

Secondary outcome measures: Quality of life before and 3 months after intervention: MOS 36-item short form health survey (SF-36) was implemented to evaluate quality of life [15]. With the help of the parents, the evaluation was performed. The scale consisted of 8 dimensions, with a total of 36 items. The scale ranged from 0 to 10 points. The higher the score was, the better the quality of life.

Table 1. Baseline data ($\bar{x}$ ± sd, %)

Group	Control group (n=100)	Experimental group (n=100)	t/χ^2	P
Gender (male/female)	59/41	57/43	χ^2=0.082	0.774
Age (years)	11.0±1.1	11.1±1.1	t=0.643	0.521
Course of disease (years)	2.15±0.41	2.22±0.50	t=1.083	0.280
BMI (kg/m^2)	22.51±2.96	22.08±2.81	t=1.054	0.293

Note: BMI: body mass index.

Table 2. Lung function ($\bar{x}$ ± sd)

Group	Control group (n=100)	Experimental group (n=100)	t	P
FEV_1 (L)				
Before intervention	1.89±0.22	1.91±0.24	0.614	0.540
After intervention	2.01±0.24***	2.41±0.35***	9.425	<0.001
FVC (L)				
Before intervention	2.19±0.28	2.20±0.28	0.253	0.801
After intervention	2.42±0.35***	2.79±0.47***	6.314	<0.001
FEV_1/FVC (%)				
Before intervention	54.25±6.38	54.14±6.41	0.122	0.903
After intervention	57.78±7.57***	62.16±9.47***	3.613	<0.001

Note: Compared with before intervention, ***P<0.001. FEV_1: forced expiratory volume in 1 second; FVC: forced vital capacity.

Satisfaction in nursing: a self-made questionnaire, which included aspects like nursing attitudes, nursing skills, communication skills and health education, was applied to assess the childrens' satisfaction in nursing. The total score was 100 points. Using a 5 grade scoring method, the result was divided into 5 levels, including very satisfied (above 90 points), satisfied (between 80 and 89 points), basically satisfied (between 70 and 79 points), dissatisfied (between 60 and 69 points), and very dissatisfied (below 60 points). Satisfaction in nursing = (very satisfied + satisfied)/the total number of patients *100%.

Statistical methods

All data were analyzed using SPSS statistical software version 23.0. The 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 enumeration data were expressed as number/percentage (n/%); comparison was conducted with chi-square test. The difference was statistically significant when *P* value was less than 0.05.

Results

Baseline data

There were no significant differences in general information like gender, age, course of disease, and body mass index (BMI) between the two groups (**Table 1**, all P>0.05).

Lung function

As shown in **Table 2** and **Figure 1**, there was no significant difference in lung function before intervention between the two groups (all P>0.05); FEV_1, FVC and FEV_1/FVC in both groups after intervention were significantly increased when compared with before intervention (all P<0.05); FEV_1, FVC and FEV_1/FVC in the experimental group after intervention were higher than those in the control group (all P<0.05). These results denote that the nursing based on the authorization theory contributes to the improvement of lung function.

The time of disappearance of symptoms and length of hospitalization

The time of disappearance of symptoms, such as sputum, cough, wheeze, and wet rales, and length of hospitalization in the experimental

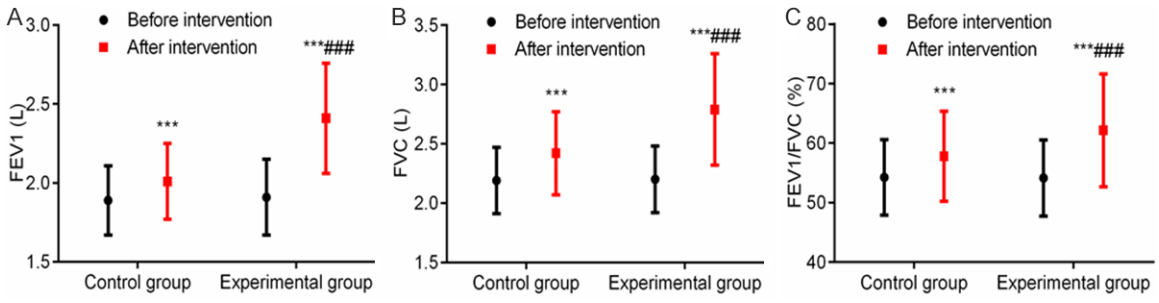

Figure 1. Lung function between the two groups. A: FEV_1; B: FVC; C: FEV_1/FVC. Compared with before intervention, ***P<0.001; compared with control group, ###P<0.001. FEV_1: forced expiratory volume in 1 second; FVC: forced vital capacity.

Table 3. The time of disappearance of symptoms and the length of hospitalization ($\bar{x}$ ± sd, d)

Group	Sputum	Cough	Wheeze	Wet rales	The length of hospitalization
Control group (n=100)	4.23±0.96	5.75±1.32	4.53±0.99	4.97±1.02	8.95±1.84
Experimental group (n=100)	3.31±0.78	4.32±0.92	3.64±0.86	4.05±0.89	6.56±1.63
t	7.438	8.888	6.787	6.796	9.723
P	<0.001	<0.001	<0.001	<0.001	<0.001

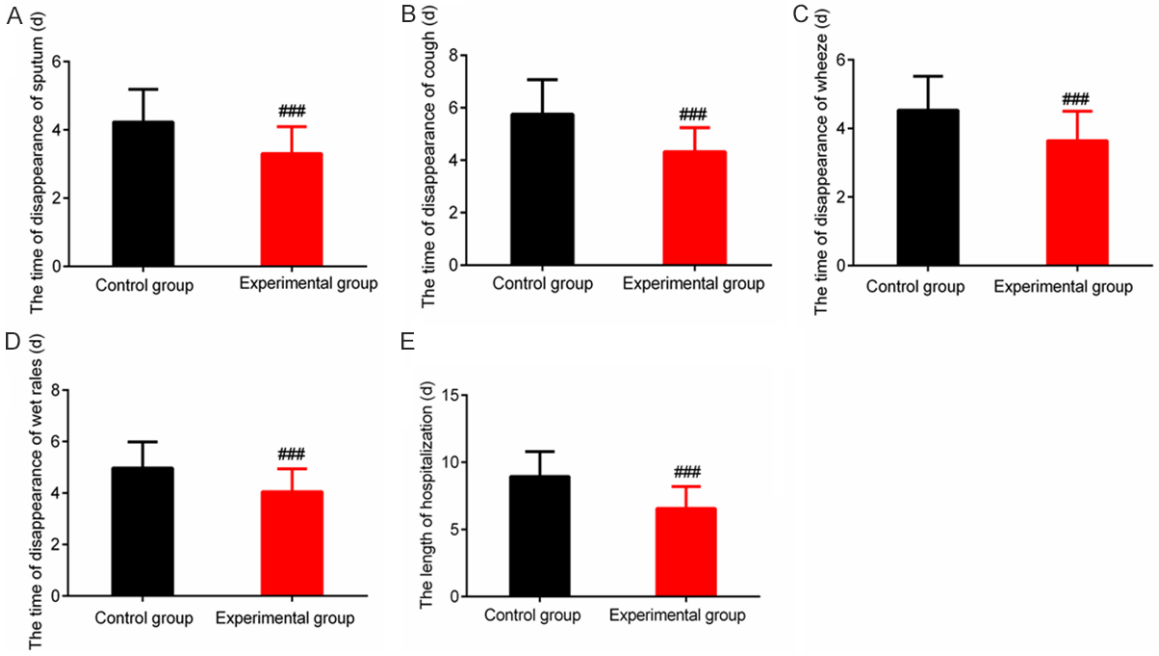

Figure 2. The time of disappearance of symptoms and length of hospitalization between the two groups. A: Sputum; B: Cough; C: Wheeze; D: Wet rales; E: The length of hospitalization. Compared with control group, ###P<0.001.

group were shorter than those in the control group (**Table 3** and **Figure 2**, all P<0.05), suggesting that nursing based on the authorization theory is beneficial for the improvement of clinical symptoms and shortening of length of hospitalization.

GSES score

As displayed in **Table 4**, there was no significant difference in GSES score before intervention between the two groups (P>0.05); GSES scores in both groups after intervention were signifi-

Table 4. GSES score ($\bar{x}$ ± sd, score)

Group	Before intervention	After intervention
Control group (n=100)	18.36±3.45	24.25±3.81***
Experimental group (n=100)	18.54±3.62	30.18±4.03***
t	0.360	10.693
P	0.719	<0.001

Note: Compared with before intervention, ***P<0.001. GSES: general self-efficacy scale.

cantly increased when compared with before intervention (both P<0.001); GSES score in the experimental group after intervention was higher than that in the control group (P<0.001). These results indicate that nursing based on the authorization theory helps to improve GSES score.

Treatment compliance

Treatment compliance in the experimental group was increased when compared with the control group (**Table 5**, P<0.01), denoting that nursing based on the authorization theory is helpful for the improvement of treatment compliance.

SF-36 score

As shown in **Table 6**, there was no significant difference concerning SF-36 scores before intervention between the two groups (all P>0.05); SF-36 scores in role-emotional, bodily pain, physical functioning, role-physical, social functioning, mental health, vitality, and general health in both groups after intervention were significantly increased when compared with those before intervention (all P<0.05); SF-36 scores in the experimental group after intervention were higher than those in the control group (all P<0.05). These results indicate that nursing based on the authorization theory helps to improve the quality of life.

Satisfaction in nursing

Satisfaction in nursing in the experimental group was higher than that in the control group (**Table 7**, P<0.05), suggesting that the nursing based on authorization theory is beneficial for the improvement of satisfaction in nursing.

Discussion

Asthma is a chronic disease. If the condition is not well controlled, patients will suffer from repeated acute attacks. The onset of asthma is closely related to living habits and the environment. Therefore, in daily life, it is very important to improve self-management ability and take preventive measures against the disease [16]. In the past, most routine prognostic management is implemented to follow medical orders and passively complete certain tasks during admission. However, patients' pleasure is gradually decreased during the process of execution. When the execution ability is greatly declined, patients fail to persist in treatment compliance for a long time [17]. In other words, the intermediary processes such as patients' thinking, motivation, and physical and mental response have a direct influence on physical and mental health during the long-term treatment process [18, 19].

Nursing based on the authorization theory focuses more on patients' subjective initiatives in changing thier behaviors. During the treatment process, the stimulation of independent choice-making and decision-making power is emphasized. It effectively helps patients to have a correct understanding of their own strengths, living conditions, and needs. At the same time, it makes patients feel respected. Therefore, patients participate in self-management and this subjectively enhances the sense of life controlling. In this model, patients are instructed to express their opinions through mutual discussion, enabling them to know their problems more clearly. Based on these problems, goals and plans are formulated. In this way, patients can enjoy the sense of authorization, stimulating and enhancing their self-confidence in persistence. Meanwhile, self-esteem is encouraged, helping patients' mental state consciously change from dependence to initiative. Methods like sympathetic response and reflective listening are applied to instruct patients to express various thoughts related to the disease. Being a good listener is the primary role of nursing staff. Patients are guided to slowly release their negative emotions and pressures. In this way, they can think about problems more clearly and rationally. Zhao et al reported that clinical nursing based on the authorization theory can significantly improve patients' treatment compliance, shorten the

Table 5. Treatment compliance (n, %)

Group	Full compliance	Partial compliance	Non-compliance	Compliance rate
Control group (n=100)	64 (64.00)	22 (22.00)	14 (14.00)	86 (86.00)
Experimental group (n=100)	87 (87.00)	10 (10.00)	3 (3.00)	97 (97.00)
χ^2	12.867			7.779
P	<0.001			0.005

Table 6. SF-36 score ($\bar{x}$ ± sd, score)

Group	Control group (n=100)	Experimental group (n=100)	t	P
Role-emotional				
Before intervention	51.95±5.12	52.17±5.09	0.305	0.761
After intervention	71.45±7.46[a]	80.45±8.21[a]	8.113	<0.001
Bodily pain				
Before intervention	71.75±7.47	71.06±7.38	0.657	0.512
After intervention	76.68±8.66[a]	86.14±8.84[a]	7.644	<0.001
Physical functioning				
Before intervention	65.79±6.56	64.53±6.47	1.368	0.173
After intervention	74.17±7.67[a]	81.87±8.28[a]	6.822	<0.001
Role-physical				
Before intervention	62.45±6.63	62.34±6.76	0.116	0.908
After intervention	74.21±77.33[a]	81.54±8.21[a]	6.660	<0.001
Social functioning				
Before intervention	54.34±5.53	53.77±5.51	0.730	0.466
After intervention	72.36±7.51[a]	81.65±8.30[a]	8.300	<0.001
Mental health				
Before intervention	70.59±7.18	69.06±7.08	1.517	0.131
After intervention	80.84±8.19[a]	86.37±8.45[a]	4.699	<0.001
Vitality				
Before intervention	53.48±5.56	52.32±5.71	1.455	0.147
After intervention	76.41±7.24[a]	83.53±8.76[a]	6.265	<0.001
General health				
Before intervention	52.59±5.47	51.44±5.36	1.502	0.135
After intervention	73.49±7.14[a]	82.33±8.19[a]	8.136	<0.001

Note: Compared with before intervention, [a]P<0.01. SF-36: MOS 36-item short form health survey.

Table 7. Satisfaction in nursing (n, %)

Group	Control group (n=100)	Experimental group (n=100)	χ^2	P
Very	56 (56.00)	77 (77.00)	9.898	0.002
Satisfied	29 (29.00)	17 (17.00)		
Basically satisfied	12 (12.00)	4 (4.00)		
Dissatisfied	2 (2.00)	1 (1.00)		
Very dissatisfied	1 (1.00)	1 (1.00)		
Satisfaction in nursing	85 (85.00)	94 (94.00)	4.310	0.038

length of hospitalization, and increase satisfaction in nursing [20]. In our study, our results showed that the improvement of lung function in the experimental group after intervention was increased when compared with the control group, while the time of disappearance of

symptoms and the length of hospitalization were decreased. In addition, treatment compliance in the experimental group after intervention was higher than that in the control group. These results suggest that nursing based on the authorization theory is beneficial for the improvement of lung function, the time of disappearance of symptoms, and treatment compliance, promoting early discharge. These were consistent with the results reported previously.

Living environment is an important factor inducing asthma. Dust mites and dander are the most common and detrimental indoor allergens. In daily life, it is critical to minimize the exposure to irritating conditions and keep a clean environment [20]. High humidity is helpful for the spreading and breeding of germs. During the atomization process, some humidifiers release a large amount of negative oxygen ions, which not only effectively increase the indoor humidity and moisturize dry air, but also combine with the floating smoke and dust in the air. Paint, must, smoke and odor are effectively removed, making the air fresher [21, 22]. However, it is worth noting that a humidifier is a double-edged sword. Excessive humidification may aggravate the conditions. So, it is not suitable to humidify for a long time. Humidity is advised to be maintained at 55%-65%. In the external environment, mask wearing can prevent the inhalation of pollen or dust. Accordingly, stimulation of exogenous substances is avoided and recurrence of asthma is prevented [23]. These suggest that the management of daily life after discharge is also very important besides good care in diet, environment, and expectoration during admission. In daily life, however, most family members seldom pay attention to these details. Clear goals and plans can help to make patients clearly know what they should do to achieve their goals. During the intervention process, patients are assisted to perform self-evaluation. The source of errors is found, while coping methods are analyzed. Through reflective practice, self-cultivation of patients is strengthened. Management efficiency is increased, and quality of life is effectively improved [24]. In our study, GSES score and SF-36 score in the experimental group after intervention were higher than those in the control group. In addition, satisfaction in nursing in the experimental group was also significantly increased when compared with the control group. Liu and Yun reported that nursing based on the authorization theory can effectively improve the quality of life in patients with deep vein thrombosis at the lower extremities, increasing satisfaction in nursing. This was consistent with the results we reported here [25]. In another word, this indicates that nursing based on the authorization theory can effectively improve self-efficacy and quality of life. Additionally, it is easier for family members to accept care through the change of autonomous behavior, promoting family members' satisfaction in nursing.

However, the application of the theory in asthma is relatively rare. In addition, the sample size of this study is small. In other words, the effectiveness of this nursing model cannot be accurately predicted. A long-term study will be performed in an amplified number of patients to collect more evidence.

In summary, the application of nursing based on the authorization theory in children aged 7 to 14 years with asthma can effectively improve treatment compliance, lung function, SF-36 score, and satisfaction in nursing, and shorten the length of hospitalization.

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Disclosure of conflict of interest

None.

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