

Research on the behavioral impact path of family cluster management for school-aged children with asthma based on the COM-B model

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Abstract: Combining the COM-B model with family group management, we constructed a family group management program for school-age asthmatic children based on the COM-B model, explored the impact of the program on the self-management, asthma control, and quality of life of school-age asthmatic children, and provided an empirical basis for future clinical care intervention models. Ninety-six children who attended the pediatric asthma outpatient clinic of a tertiary hospital in Hangzhou from March 2023 to August 2023 were selected as the study subjects, and a computerized random number generator was used to generate random sequences, dividing the study subjects into 48 cases each in the control group and the experimental group. The control group of asthmatic children participated in routine care, while the experimental group applied the intervention program based on the COM-B model of family cluster management on the basis of routine care. The COM-B model-based intervention program of family group management for school-aged asthmatic children can improve the self-management ability of the children, thus effectively controlling asthma, improving the quality of life of asthmatic children, and providing a reference for more scientific and effective management of asthmatic children in the clinic.

Keywords: bronchial asthma, school-age children, cluster management, self-management

Introduction

Bronchial asthma (asthma) is a group of chronic heterogeneous respiratory diseases characterized by airway inflammation and airway hyperresponsiveness, often presenting with clinical manifestations such as recurrent cough and chest tightness, accompanied by reversible airflow limitation ^[1]. Asthma is one of the most common respiratory diseases in childhood and is listed as one of the four most persistent diseases by the World Health Organization ^[2]. According to the results of the WHO survey, the global prevalence of asthma in children is increasing year by year ^[3], the prevalence of asthma in children in the United States is about 53.7% ^[4], and the prevalence of asthma in children in Germany is about 5~10% ^[5]. The results of three surveys on the prevalence of asthma in children in China showed that the prevalence of asthma in children under 14 years of age was 0.91%, 1.97% and 3.02% in 1990, 2000 and 2010, respectively ^[6-9]. By 2025, it is predicted that about 100 million children worldwide will suffer from asthma,

and asthma has become one of the most urgent public health problems ^[10].

The Global Initiative for Asthma (GINA) ^[11] suggests that the goals of treatment for childhood asthma include controlling asthma symptoms, avoiding acute exacerbations, and reducing irreversible airway damage. Although the promotion and implementation of GINA has a certain degree of asthma control, the overall control effect is still unsatisfactory. On average, about 1/6 of children in the United States go to the emergency department for acute asthma attacks each year ^[12], the uncontrolled asthma rate in children in Western European countries is as high as 53.5% ^[13], and about 66% of children in China have frequent asthma attacks each year ^[14]. The effect of control is not only related to the excellent medical skills and care of healthcare professionals, but also closely related to the self-management behavior of children ^[15]. The long duration of asthma treatment and easy recurrence determine that children need to receive long-term standardized treatment and management, and treatment in the acute phase alone is not enough ^[16]. Therefore, it is urgent to carry out self-management education for school-age children with asthma.

School age is an important time for children to have independent thinking and judgment, when children's sense of self-responsibility is strengthened, and they are concerned about their own health problems and take the initiative to learn relevant knowledge and skills ^[17]. With the growth of age, school-age asthmatic children gradually take on the task of self-care, although the children have a certain degree of self-management ability, but still can not fully cope with the psychological and physical damage caused by the disease; at the same time, health care personnel focus on the education of parents, less education for children, resulting in the lack of awareness of the disease level, all of these reasons are not conducive to the cultivation of the self-management of behavior and development of the children. At present, the way to improve the self-management behavior of school-age asthmatic children has become a research hotspot, in which the intervention method based on group management has been gradually developed at home and abroad, and studies have shown that group management has a better efficacy in improving the self-management behavior of patients with chronic diseases, and has been vigorously promoted and supported by scholars at home and abroad ^[18-20].

At present, the research of domestic scholars on the patient-centered group management model is in the exploratory period, mostly focusing on patients with chronic diseases, atopic dermatitis, schizophrenia and other patients, and the above studies have shown that this model has unique advantages in improving patients' self-management behavior, improving patients' health and quality of life, etc. ^[21-25]. However, to date, there have been few studies applying cluster management to improve self-management behaviors in school-aged children with asthma. Therefore, this study applied the cluster management model to school-age asthmatic children to investigate the effects of cluster management on self-management behaviors of school-age asthmatic children and to establish an

intervention program that would help to improve the self-management behaviors of the children.

Materials and Methods

Subjects

Children with asthma and their primary caregivers attending a pediatric asthma clinic of a tertiary hospital in Hangzhou from March 2023 to August 2023 were selected.

Inclusion criteria for Children with asthma

First-time diagnosis, meeting the diagnostic criteria of “Guidelines for the Diagnosis and Prevention of Bronchial Asthma (2016 edition)”. Diagnostic criteria are: repeated wheezing, cough, shortness of breath, chest tightness, often at night and/or in the early hours of the morning attack or exacerbation; exacerbation of both lungs can be detected scattered or diffuse, predominantly in the expiratory phase of the rales; anti-asthma treatment is effective.

School-age children aged 7 to 11 years old.

Children with asthma have certain reading comprehension and language communication ability, and voluntarily participate in the study and cooperate with the study.

Inclusion criteria for primary caregivers

Parents or grandparents of asthmatic children with home care time $\geq 4\text{h/d}$.

Possess certain reading comprehension and verbal communication skills.

Informed consent and voluntary participation in the study.

Exclusion Criteria for Children with asthma

Children with asthma have infections, cardiac, hepatic, renal insufficiency, or serious complications.

Children with asthma who have cognitive or mental disorders.

Children with asthma who are participating or have participated in asthma health education programs.

Exclusion Criteria for Primary Caregivers

Persons with cognitive or mental disorders.

Participating or having participated in asthma health education activities.

Detachment Criteria

Withdrawal from the study or failure to participate in the study.

Serious medical changes such as persistent asthma during the intervention should not be intervened.

Removal criteria

Children who did not follow the intervention program developed by the study.

Grouping

School-age children with asthma who met the inclusion criteria and volunteered to participate in the study were numbered according to the order of their

outpatient visits, and a computerized random number generator was used to generate a random sequence to randomly divide the study participants into the control and experimental groups in a 1:1 ratio.

Intervention method

Formation of the intervention team

The intervention team consisted of a pediatric asthma specialist, a child psychologist, a nurse practitioner, a charge nurse, and the researcher herself. One pediatric asthma specialist, an associate physician, was responsible for the diagnosis and treatment of childhood asthma. The researcher was responsible for hosting group activities, one-on-one counseling services, and creating and managing the WeChat group. The nurse manager was responsible for the coordination and management of the intervention process and supervision of the program implementation. Responsible nurses, 4 of them, were the main members of the team, with the title of competent nurse or above, assisting in the group activities. Professionals such as child psychologists participate in the group discussions flexibly in conjunction with health education topics.

Intervention program training

The training was completed by the researcher herself and the head nurse of the department. The researcher herself was mainly responsible for the coordination and harmonization of the training, and established a WeChat group to facilitate communication among team members. The researcher was responsible for explaining and demonstrating the knowledge and operation techniques related to childhood asthma, and the researcher trained the team members on the intervention program, including the content of the intervention program, implementation methods, and data collection methods. The training was conducted with the help of multimedia teaching tools such as PPT, and the head nurse was responsible for the quality control of the training. After the training, team members were assessed by questionnaire star test and skill operation to ensure that the team members fully mastered the content of this study. The researcher held regular team meetings to dynamically monitor the implementation of the intervention in the study team in real time to understand the implementation of the intervention program.

Implementation of the intervention program

Control group intervention method

Children with asthma in the control group participated in routine care. Asthma specialist clinic doctors conducted regular checkups, monitored lung function indicators, and adjusted drug dosages according to lung function results. Nurses in the asthma clinic played videos on the use of inhaler devices and provided face-to-face guidance on the use of medication inhaler devices; once a month,

they focused on explaining the triggers of asthma, dietary and exercise precautions, guidance on asthma medication, the use of peak flow rate meters, and the identification and management of acute asthma attacks to asthmatic children and their parents; distributing relevant written educational materials and guiding the recording of asthma diaries; and setting up a micro-telecommunication group to provide online Consultation, timely answer to the asthma children's questions; remind the follow-up visit, each time the follow-up visit to understand the asthma children's situation, check the use of drug inhalation device and asthma diary recording.

Intervention Methods of the Trial Group

The trial group applied the intervention program based on the COM-B model of family cluster management model.

(1) Place of intervention: A classroom in the Asthma Clinic Center with a capacity of 25 people, equipped with computers, projectors, chairs, and teaching materials, and a rest area for asthmatic children and their parents to communicate with each other.

(2) Intervention time: The China Asthma Action Plan recommends a follow-up visit once every 2 to 4 weeks at the beginning of the control treatment, and once every 2 to 3 months when the disease is under control. Therefore, the total intervention time was set at 3 months, and the intervention sessions were held five times, respectively, in the first two weeks, the third four weeks, the fifth six weeks, the seventh eight weeks, and the ninth to twelfth weeks of the Sunday morning from 9:00 a.m. to 11:00 a.m., with a duration of 2 h.

(3) Intervention content: Each intervention was conducted from the three aspects of ability, opportunity and motivation in combination with the four intervention forms of warm-up, health education, Q&A interaction and individualized diagnosis and treatment of group management, and the specific time allocation was as follows: warm-up (20min), health education (45min), intermission (15min), Q&A interaction (20min), and individualized diagnosis and treatment (20min). ..

Competence refers to the knowledge and skills of asthma-related diseases. The lead person gives lectures in combination with the theme of the activity, organizes asthmatic children and their parents to discuss the theme of the activity and the doubts in self-monitoring, and conducts practical exercises and scenario simulations. Specific health education content is as follows: (1) Peak flow rate monitor guidance: the interventionist through props, practical exercises to explain the monitoring method of peak flow rate monitor, teach children to master the peak flow rate value, so that children and parents of self-monitoring to set up the correct knowledge, told children and parents home self-monitoring, if the PEF is 50% to 80% of the optimal value need to be vigilant; If the PEF is less than 50% of the optimal value, then timely consultation is needed. (2) Guidance on basic knowledge of asthma: In the process of health education, children and

parents were taught basic knowledge of asthma, including the concept of asthma, clinical manifestations, triggering factors, and treatment methods, in the form of PPTs and group lectures. The children and parents were given on-site answers to their questions. (3) Diet and exercise guidance: The interventionists took the form of videos, pictures, and cases to explain diet and exercise knowledge, explaining the importance of appropriate exercise to children and parents, detailing the frequency, intensity, and duration of exercise, and recommending walking, running, swimming, and other programs. (4) Medication guidance: The interveners informed the children and their parents of the necessity and importance of strict compliance with medication through group lectures and PPTs, and used examples to illustrate the dangers of non-standardized medication. Using props and practical exercises to explain the inhalation techniques and correct incorrect inhalation techniques in a timely manner. (5) Recognition and management of acute asthma attack: explain how to recognize acute asthma attack and its management through videos and cases, and use scenario simulation to strengthen the knowledge of children and parents. (6) Psychological guidance: Introduce the importance of maintaining a good state of mind and explain to children and parents techniques for regulating negative emotions.

Opportunities refer to external factors that promote behavioral change in children with asthma, such as access to social support from healthcare professionals, family, and peers. The intervention team provides professional knowledge and technical support to asthmatic children and parents through group activities, group WeChat and other services, and encourages children and parents to ask questions based on their own situation, and team members will provide individualized treatment. Parents were accompanied to participate in the group activities and were encouraged to participate in the main activities to enhance their knowledge of asthma and to strengthen the role of parental supervision. During the intervention process, the seats were distributed in a U-shape, which facilitated the children to communicate with each other and build up a sense of trust. Children with well-controlled asthma and their parents were invited to the site to share and pass on their experience; asthmatic children of similar age were gathered in the same group activity, and through sharing their asthma management experience and suggestions, they could obtain peer-to-peer information support, discuss and supervise each other, which would be more conducive to asthma management.

Motivation refers to the willingness and attitude to change the poor behavior of asthmatic children. The group discussion and question-and-answer interaction are adopted to guide asthmatic children and parents to reflect well and adhere to the health outcomes brought about by asthma management, so that the children and their parents can begin to realize the importance of asthma management. School-aged children with well-controlled asthma were sought as case models to motivate children with poorly controlled asthma to change undesirable behaviors and develop beliefs about healthy behaviors. Actively listen to the asthmatic child's feelings during the intervention, build a trusting relationship with each

other, correct misperceptions of the asthmatic child and parents, and give positive feedback.

Evaluation Indicators

Self-management ability

The Self-Management Scale for Asthmatic Children, developed by Ping Hu, was used for asthmatic children aged 7-17 years, with good reliability and validity, and an internal consistency Cronbach's α of 0.866. The Self-Management Scale for Children with Asthma has 34 items in 3 dimensions: (1) daily life management: 7 items from 1 to 7; (2) medical management of the disease: 18 items from 8 to 25; and (3) psychosocial management: 9 items from 26 to 34. A 5-point scale was used, and the five options of "always, often, sometimes, occasionally, and never" were scored as "5, 4, 3, 2, and 1", and the sum of the scores of each entry was the total score, which ranged from 34 to 170, with the higher scores indicating better self-management behaviors. The higher the score, the better the self-management behavior.

Asthma control

The Children's Asthma Control Test (C-ACT) scale was developed by Liu et al. in 2006, and then Chinese version of the questionnaire was completed in 2007 with the support of Prof. Y.C. Chen and the Center for Quality of Life in Lyon, France, and was evaluated during a 3-month observation period, with good reliability and validity, and a Cronbach's alpha of 0.855. The C-ACT scale is a scale that assesses asthma control based on the child's clinical symptoms of asthma in the last 4 weeks, and is applicable to children aged 4 to 11 years with asthma. The scale consists of 7 questions, the first 1-4 questions were completed by the children independently, the questions were: today's asthma, the effect of exercise on asthma, coughing due to asthma, whether waking up at night due to asthma, each question was scored 0-3 points; questions 5-7 were answered by the parents, evaluating the situation of the children in the past 4 weeks, each question was scored 5-0 points. The total score was 27 points, with a score of ≤ 19 as uncontrolled asthma, 20-22 as partially controlled, and ≥ 23 as completely controlled.

Quality of life of children

The Pediatric Asthma Quality of Life Questionnaire (PAQLQ) was used, which was developed by Prof. Juniper of McMaster University in Canada specifically for asthmatic children aged 7-17 years old, and can comprehensively reflect the physical and mental health of asthmatic children. The Cronbach's alpha of the questionnaire was 0.9 after more than 3 months of Chinese translation and reliability testing, and there were 3 dimensions and 23 items: (1) Activity limitation: A, 5 items; (2) Symptoms: S, 10 items; and (3) Emotional functioning: E, 8 items. The score was based on a 7-point scale, with 1 being the worst and 7 being

the best, and the total score was 23-161, with the higher the score, the better the quality of life.

Data collection

The children with asthma and their parents agreed to participate in this study and signed an informed consent form, and the questionnaires were distributed and collected by the group members of the subject group who were not involved in the implementation of the intervention program before the intervention and 3 months after the intervention, and a uniform guideline was used to explain the content of the data when the study subjects had questions about it. The questionnaires were checked item by item as soon as they were completed to ensure the completeness and validity of the data. After the data collection, the researcher herself was responsible for data organization and analysis.

Data processing and statistical analysis

SPSS 26.0 software was used for statistical analysis. Mean $\pm$ standard deviation was used to describe the measurement data that conformed to normal distribution and chi-square, and two independent samples t-test was used to compare between groups; median and quartile were used to describe the measurement data that did not conform to normal distribution and chi-square, and two independent samples rank-sum test was used to compare between groups; the counting data were described by cases and percentages, and chi-square was used to describe the counting data; the difference was considered statistically significant with $P < 0.05$.

Results

Comparison of general information of school-age asthmatic children in two groups

In this study, 96 cases of school-age asthmatic children attending the pediatric asthma specialist outpatient clinic of a tertiary hospital in Hangzhou were selected as the study subjects, 48 cases in the control group and 48 cases in the experimental group. During the intervention process, 5 cases dropped out, 1 case in the control group withdrew voluntarily, and 2 cases withdrew without participating in all activities; 1 case in the experimental group withdrew voluntarily, and 1 case withdrew without being able to participate in all activities. Therefore, a total of 91 asthmatic children completed the data collection, 45 in the control group and 46 in the experimental group. Comparison of the general data of asthmatic children in the two groups is shown in **Table 1**.

Table 1. Comparison of the general data of school-age asthmatic children in the two groups.

Item	Control Group [n, (%)]	Experimental Group [n, (%)]	χ^2/t	P
Gender				
Male	25 (55.56)	20 (44.44)	0.105a	0.746
Female	34 (75.56)	8 (17.78)		
Residence				
Urban	24 (52.17)	22 (47.83)	1.224^a^	0.542
Town	39 (84.78)	5 (10.87)		
Rural	2 (4.35)			
Only Child				
Yes	24 (53.33)	21 (46.67)	0.528^a^	0.592
No	14 (31.11)	31 (68.89)		
Family History of Asthma				
Yes	33 (73.33)	12 (26.67)	1.141^a^	0.537
No	21 (46.67)	24 (53.33)		
History of Allergic Rhinitis				
Yes	27 (60)	28 (60.87)	0.007^a^	0.996
No	18 (39.13)	11 (23.91)		
Seasonality of Asthma Attacks				
Yes	35 (76.09)	38 (82.61)	0.468	0.442
No	8 (17.39)			
Primary Caregiver				
Parents	25 (54.35)	21 (45.65)	0.285	0.464
Grandparents	28 (60.87)	10 (21.74)		
Other Relatives	8 (17.39)			
Caregiver's Education Level				
Junior High or Below	10 (22.22)	8 (17.78)	2.018^a^	0.569
High School	12 (26.08)	11 (23.91)		
College	17 (36.97)			
Bachelor's Degree or Above	18 (40)			
Monthly Household Income per Capita				
<3000	10 (22.22)	13 (28.89)	0.335^a^	0.846
3000-5000	22 (48.89)	8 (17.39)		
>5000	14 (30.43)	24 (52.18)		
Age	8.63 $\pm$ 1.29	8.73 $\pm$ 1.45	-0.37^b^	0.712

Note: a indicates χ^2 test; b indicates independent samples t-test.

Comparison of self-management ability between two groups of school-age children with asthma

Compare the self-management abilities of the two groups of research subjects who will ultimately complete this study. The research results (**Table 2**) showed that there was no statistically significant difference ($P>0.05$) in the scores of self-management ability, daily life management, disease medical management, and social psychological management between the two groups of school-age children with asthma before intervention; After 3 months of intervention, the self-management ability, daily life management, disease medical management, and social psychological management scores of the experimental group were significantly higher than those of the control group, and the difference was statistically significant ($P<0.05$).

Table 2. Comparison of Self-Management Ability between Two Groups of School-Age Children with Asthma ($\bar{x} \pm s$)

Observation Indicator	Time	Control Group	Experimental Group	t	P
Self-Management Ability	Before Intervention	107.38 $\pm$ 5.21	123.04 $\pm$ 4.10	0.963	0.338
	After 3 Months of Intervention	106.22 $\pm$ 6.23	132.15 $\pm$ 7.26	-7.341	<0.001
Daily Life Management	Before Intervention	23.38 $\pm$ 2.71	26.13 $\pm$ 1.70	1.186	0.239
	After 3 Months of Intervention	22.67 $\pm$ 2.93	28.43 $\pm$ 3.23	-4.233	<0.001
Disease Medical Management	Before Intervention	55.13 $\pm$ 3.69	62.36 $\pm$ 3.51	-0.266	0.791
	After 3 Months of Intervention	55.35 $\pm$ 3.98	66.83 $\pm$ 4.17	-5.522	<0.001
Social Psychological Management	Before Intervention	28.87 $\pm$ 2.47	34.56 $\pm$ 1.92	1.253	0.213
	After 3 Months of Intervention	28.20 $\pm$ 2.63	37.11 $\pm$ 3.26	-4.535	<0.001

Comparison of asthma control in two groups of school-age children with asthma

Compare the asthma control status of the two groups of research subjects who will ultimately complete this study. The research results (**Table 3**) showed that the asthma control score of the control group of asthmatic children before intervention was (18.78 $\pm$ 1.39) points, while the experimental group was (18.63 $\pm$ 1.42) points. There was no statistically significant difference between the two groups ($P>0.05$). After 3 months of intervention, the asthma control score of the experimental group was (22.93 $\pm$ 1.63) points higher than that of the control group (21.84 $\pm$ 1.04) points, and the difference between the two groups was statistically significant ($P<0.05$).

Table 3. Comparison of Asthma Control between Two Groups of School-Age Children with Asthma ($\bar{x} \pm s$)

Observation Indicator	Time	Control Group	Experimental Group	t	P
Asthma Control Test	Before Intervention	18.78 $\pm$ 1.39	18.63 $\pm$ 1.42	0.499	0.619
	After 3 Months of Intervention	21.84 $\pm$ 1.04	22.93 $\pm$ 1.63	-3.777	<0.001

Comparison of Quality of Life Scores between Two Groups of School Age Asthma Children

The quality of life of the two groups of research subjects who completed this study before and after intervention was compared. The research results showed (**Table 4**): the quality of life score of the control group of school-age asthmatic children before intervention was (106.87 ± 7.97) points, and the score of the experimental group was (107.50 ± 8.45) points. There was no statistically significant difference between the two groups ($P > 0.05$); After 3 months of intervention, the score of the experimental group was (126.02 ± 8.51) higher than that of the control group (115.04 ± 7.48) , and the difference between the two groups was statistically significant ($P < 0.05$).

Table 4. Comparison of Quality of Life Scores between Two Groups of School-Age Children with Asthma ($\bar{x} \pm s$)

Observation Indicator	Time	Control Group	Experimental Group	t	P
Total Quality of Life Score	Before Intervention	106.87 ± 7.97	115.04 ± 7.48	-0.367	0.714
	After 3 Months of Intervention	107.50 ± 8.45	126.02 ± 8.51	-6.530	<0.001
Activity Dimension	Before Intervention	27.64 ± 2.98	29.60 ± 4.07	-0.047	0.963
	After 3 Months of Intervention	28.67 ± 2.79	33.57 ± 3.54	-4.960	<0.001
Symptom Dimension	Before Intervention	47.44 ± 4.99	48.80 ± 5.62	-0.757	0.451
	After 3 Months of Intervention	46.63 ± 5.26	53.65 ± 5.28	4.245	<0.001
Emotional Dimension	Before Intervention	31.78 ± 3.58	36.64 ± 5.05	-1.678	0.097
	After 3 Months of Intervention	33.20 ± 4.43	38.81 ± 4.69	2.115	0.037

Discussion

Bronchial asthma is a respiratory disease characterized by chronic airway inflammation and airway hyperresponsiveness, and its prevalence is increasing year by year, becoming a serious global health problem [26]. According to the Global Initiative for the Prevention and Treatment of Asthma (GINA) in 2020 and the Diagnosis and Treatment Guidelines for Childhood Asthma in China, the most important aspect of controlling asthma is self-management and prevention education. However, there is currently no unified, standardized, and systematic health education program that can improve the self-management ability of school-age children with asthma. Therefore, this study aims to explore the application effect of family group management scheme based on COM-B model in improving the self-management ability of school-age children with asthma.

Improving self-management ability of school-age children with asthma through family group management scheme based on COM-B model

The results of this study showed that after 3 months of intervention, the self-management ability and scores in various dimensions of the experimental group were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.05$), indicating that the family group management plan based on the COM-B model can improve the self-management ability of school-age asthmatic children, which is similar to the results of Yang Huai-

hong et al.^[27]. The possible reason for the analysis is that the construction of this plan is based on the abilities, opportunities, and motivations of the COM-B model. Only by possessing the physical and psychological abilities related to asthma management, obtaining the opportunity to ensure self-management, and stimulating the belief of behavioral change in children with asthma can the implementation of the plan be promoted. In terms of ability, targeted and individualized health education is mainly provided to children and parents with asthma through training and education methods, such as group lectures, videos, pictures, props, scenario simulations, etc. The knowledge related to asthma is repeatedly instilled in children with asthma, and guidance is provided on medication inhalation techniques, thereby improving children's cognitive level and self-management ability towards the disease; Through education, persuasion, and modeling, school aged children and parents with asthma are made aware of the health outcomes brought about by adhering to asthma management, stimulating their reflective motivation and correcting their erroneous perception that asthma only needs to be treated after wheezing. This forms the correct motivation for healthy behavior and promotes the formation of healthy behavior; Through modeling, environmental reconstruction, and other forms, asthmatic children are encouraged to actively participate in communication and interaction with peers, gaining opportunities for support from their families and peers.

At present, the health education for children with asthma in China mainly relies on face-to-face education by medical personnel in hospitals, with routine distribution of health education manuals; The content of propaganda is often fragmented and lacks specificity, mainly in the form of preaching education; The participation of asthmatic children and parents is not high; At the same time, the unique phenomenon of "forgetting curve" in health education also leads to poor effectiveness of conventional health education. In order to address the shortcomings of current health education, this study adopted family group management. Compared with traditional education models, this model is guided by the disease knowledge and skill needs of asthmatic children and parents, and involves asthmatic children and parents together. It can better meet the different health knowledge needs of children and parents, strengthen the supervision and support role of families in the treatment of patients' diseases, and help promote positive changes in self-management behavior of children. Before each intervention activity, nurses guide asthmatic children to self monitor and record peak flow velocity, and provide targeted guidance at the activity site and in the family group WeChat group, which helps promote children's active participation in the decision-making process of asthma management and improve self-efficacy. Asthma children and parents can contact medical staff for technical guidance at any time through online groups, and provide timely answers to questions from asthma children and parents. School aged asthma children who perform well will be praised, and those who do not do well will be criticized and corrected, so that asthma children can maintain good self-management behavior. At the same time, family group ac-

tivities provide a platform for children and parents to communicate and interact with each other. Everyone encourages and learns from each other, which helps to alleviate doubts about asthma and stimulate self-management enthusiasm; On the other hand, inviting peers who have effective asthma control and experience in asthma management to share their experiences can help children supervise and encourage each other, actively learn asthma knowledge and skills, promote changes in bad behavior, and form healthy behavior. This study combines the COM-B model with the family group management model and places it in a “closed loop” of behavior change in children with asthma. By promoting and interacting step by step, it can achieve a spiral increase in behavior change ^[28].

Improving asthma control in school-age children through family group management scheme based on COM-B model

Although asthma cannot be cured at present, effective asthma prevention and treatment education and management can achieve clinical control of asthma. Poor medication adherence and incorrect medication inhalation techniques are the main reasons affecting effective asthma control. When investigating the use of inhaled corticosteroids in children with asthma, Zhong Tianshu ^[29] found that due to concerns about the safety of corticosteroids and other reasons, the long-term regular use rate of corticosteroids was low, only 26%, which in turn affected the control of asthma. Liao Yaoji ^[30] pointed out in her research that the current level of inhalation technology in children with asthma is not ideal, mostly at a moderate or below level. It is necessary to combine multimedia teaching and training tools, and strengthen the guidance and supervision of medical personnel to improve drug inhalation technology. Due to incomplete mental development, school-age children may not follow medical advice, which can affect their asthma control. This study implemented a family group management plan based on the COM-B model. The results showed that after 3 months of intervention, the asthma control score of the experimental group was (22.93 ± 1.63) points, while that of the control group was (21.84 ± 1.04) points. The asthma control situation of the experimental group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$), indicating that the family group management plan based on the COM-B model can improve the asthma control situation of school-age children with asthma, which is consistent with the research results of Shi Lei ^[31]. The reason for this may be the implementation of a family group management model based on the COM-B model, which illustrates the harm of non-standard medication through examples, repeatedly informs asthmatic children and parents of the necessity and importance of strictly following medical treatment, and uses a teaching model of theory, Q&A interaction, and practical operation to explain medication inhalation techniques, correct incorrect inhalation techniques in a timely manner, and improve medication compliance in asthmatic children. At the same time, during the intervention process, non-compliance behavior in asthmatic children is detected through mandatory and supervised methods, and timely and correct guidance is provided to ensure

medication adherence. By filling out the Children's Asthma Control Test (C-ACT) scale, it was found that school-age children with asthma and their parents have a misconception of "treating asthma only after wheezing" in asthma management. Through education, persuasion, and modeling, the misconceptions of children and parents can be corrected, thus forming a correct motivation for managing asthma and effectively controlling asthma. Asthma is the most common chronic respiratory disease in children, characterized by a long course and easy recurrence, requiring long-term standardized management. Through various forms and dimensions of health education such as multimedia, peer education, role-playing, and the distribution of health education manuals, asthma related knowledge is instilled in children and parents with asthma. The supervision of treatment compliance in school-age children with asthma is strengthened by writing asthma diaries, WeChat interactions, and setting up inhalation treatment punch lists. Children and parents are encouraged to raise questions based on their own situation, provide personalized diagnosis and treatment, and urge children to use peak flow velocity meters for self-monitoring, constantly understand changes in their own condition, detect signs of acute asthma attacks as early as possible, intervene in advance, which is conducive to asthma control.

Improving the Quality of Life of School aged Asthma Children through Family Group Management Scheme Based on COM-B Model

Asthma, as the most common chronic respiratory disease in children, has the characteristics of long course and easy recurrence. Asthma not only brings physiological discomfort to children with typical symptoms such as wheezing, shortness of breath, and difficulty breathing, but also leads to anxiety, sensitivity, and inability to participate in normal social activities, resulting in a lack of social and emotional role function. Conventional health education is difficult to provide sufficient support for asthmatic children and their parents due to factors such as time and manpower. The family group management model can make up for this deficiency by building a platform for communication between school-age asthmatic children and their parents, and obtaining diverse social support from medical personnel, peers, families, etc. Quality of life can comprehensively evaluate the impact of asthma on the psychological, physiological, and social functions of children. By assessing the quality of life of children, medical staff can better understand the impact of the disease on them and take targeted measures to improve their quality of life. From the research results, there was no statistically significant difference in the quality of life between the two groups of asthmatic children before intervention ($P>0.05$). However, after 3 months of intervention, there was a statistically significant difference in the quality of life between the two groups of asthmatic children ($P<0.05$), indicating that the family group management plan based on the COM-B model can improve the quality of life of school-age asthmatic children. In this study, the family group management model was implemented on a group by group basis for a 3-month intervention activity. During the intervention process, a combination of offline and online methods were used

to provide health education and skill training to school-age children with asthma and their parents, and individualized diagnosis and treatment were given based on each child's condition. At the same time, timely promotion of asthma related knowledge and skills through WeChat, as well as interaction with asthmatic children and parents through the WeChat platform, helps to enhance trust between doctors and patients through continuous and personalized support. At the same time, asthma children of similar age are gathered in the same group activity, with similar needs and common goals. Through communication, mutual understanding, and sharing of their asthma management experiences and suggestions, information and emotional support from peers are obtained, thus gaining a sense of collective belonging. To a large extent, it can reduce the anxiety of children and enhance their self-management as a positive factor. Through various forms such as lectures, videos, and pictures, we aim to deepen the understanding of asthma among children with asthma, raise awareness of the importance of asthma management among both the children and their parents, and stimulate spontaneous reflection. Through group interactive discussions, we encourage children and parents with asthma to express their confusion, and have medical staff answer and clarify their questions. This interactive process corrects the misconceptions of children with asthma and stimulates their enthusiasm to participate in asthma management. Inviting peers who have effective asthma control and experience in asthma management to share their experiences can help increase children's beliefs in managing asthma, enrich their social behavior, alleviate the physiological and psychological discomfort caused by asthma, improve the self-efficacy of asthmatic children, and thus enhance their quality of life. Medical staff should guide children and parents to face the psychological and physiological problems caused by the disease correctly, correct their misconceptions about the disease in a timely manner, avoid the adverse effects of asthma on children, and promote their healthy and active life.

Conclusions

The intervention plan for family group management of school-age children with asthma based on the COM-B model can improve their self-management ability, effectively control asthma, improve the quality of life of asthmatic children, and provide reference for more scientific and effective management of asthmatic children in clinical practice.

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