

Management of Childhood Asthma and Role of Pharmacist

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Abstract

This study aimed to review model and activities of asthma management including role of pharmacist in asthma control. A systematic review was done during Jul-Aug 2010 from three major databases including Pubmed, the Cochrane Library, and Journals Ovid. Inclusion criteria included publication in English, enrollment of asthma children aged 0-18 years, with outcomes evaluation. Unpublished manuscripts, meeting abstracts, pharmacological articles, book chapters were not included. Information in each article was extracted regarding research design, study population, type of intervention, and setting. Seventeen articles were included in this study. Asthma management can be categorized into clinical-oriented model, service-management model, patient-centered model, and mixed model. Clinical-oriented model includes activities aimed to manage asthma attack and prevent persistent asthma, as follow, regular check-ups and evaluation for asthma severity, treatment of acute attacks and chronic asthma, and avoiding triggering factors. Service-management model aimed to educate patient or parents on how to manage acute attack, chronic asthma, and use of inhaler or spacer. The educational strategies used include information from booklet, computer-based simulation, school-based education program, and counseling. Patient-centered model includes perceptions of disease control, health educational model, and shared-decision making model. Mixed model includes knowledge translation model, self -management behaviors model, and asthma action plan which are categorized into 2 types: peak flow based written plans (PFWP) and symptom based written plans (SWP). An integration of pharmacist into health care team and patient treatment are an important role in primary care, disease management, and health promotion programs, thus, help promoting pharmacist role.

Keyword: Asthma management; Asthma care; Children.

INTRODUCTION

Asthma is a chronic inflammatory disorder of the airway, characterized by a pattern of episodic bronchial hyperresponsiveness (BHR) that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are reversible either spontaneously or with medication intervention^{1, 2}. A recent report of worldwide collaborative survey of asthma and allergic diseases and allergic diseases in children (ISAAC) has shown that asthma prevalence in Southeast Asia is still increasing³. In Singapore, 11.7% of

preschool children aged 4-6 years have been diagnosed with asthma⁴. The standard of asthma care in Asian countries is likely to be poorer than clinical guidelines such as Global Initiative for Asthma (GINA) guidelines¹, National Heart, Lung and Blood Institute (NHLBI), National Asthma Education and Prevention Program (NAEPP)⁵. In Thailand, results of two population surveys performed in Bangkok indicated a rise of prevalence of childhood asthma from 4 to 13% in less than ten years. More recently, an increasing asthma admission rates in Thailand has been reported, indicating that asthma severity in Thailand has become worse during the last decade⁶. Symptoms of poorly controlled

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asthma such as wheezing and night-time waking are likely to disrupt daily and nightly activities⁷. This indicates that there is a need for asthma intervention in early years, thus highlight on a good asthma management in children.

Asthma in children requires special attention because most asthma develops before children are 6 years. Symptoms of poorly controlled asthma such as wheezing and night-time waking are likely to disrupt daily and nightly activities⁷. This indicates that there is a need for asthma intervention in early years, thus highlight on a good asthma management in children. Asthma morbidity includes school absenteeism, hospitalizations, emergency visits for asthma². Many studies have identified significant care gaps in asthma care, for example, under and over diagnosis of asthma, inadequate assessment of control or severity of asthma, inappropriate use of medications, insufficient patient education, and others related to patients' lack of understanding of asthma and inappropriate behavior. Principles of treatment of children with asthma may differ from country to country because of differences in lifestyle, economic infrastructure, religion⁸. Asthma management can reduce emergency department (ED) visits, hospitalizations, missed school days, unscheduled office visits, and asthma-related healthcare cost. Clinical asthma management includes regular checkups, pharmacologic therapy, written plans, teaching children and caretakers about therapy and symptoms of an attack, and triggers of asthma^{9, 10}. These managements can play a role in controlling asthma and reducing asthma attack on patients, caretakers, and family members¹¹. Therefore, patients and families must move from simple adherence to treatment to therapy aimed at achieving full control of asthma¹¹⁻¹³.

The objective of this article is to review model and activities of asthma management among childhood including role of pharmacist in various countries. The

findings would be beneficial for healthcare facilities to select or modify an appropriate model for themselves.

MATERIALS AND METHODS

Three major databases on medical literature were searched, including Pubmed, the Cochrane Library, and Ovid. Numerous combinations keywords were used as follow: child, children, pediatric, asthma, care, and management. A systematic review was followed PRISMA statement¹⁴ and conducted during July-August 2010 with no restriction on date of publications. Inclusion criteria included publication in English, enrollment of children aged 0-18 years who had been diagnosed of asthma, evaluation of asthma outcomes such as hospitalization, emergency visit, lung function, etc., evaluation of asthma management such as knowledge, behavior, model, etc. References cited in the included articles were also reviewed. Unpublished manuscripts, meeting abstracts, pharmacological articles, book chapters were not included in this review. For each included articles, information was extracted regarding research design, study population, type of intervention, setting.

RESULTS

Five hundred and thirty-five articles were found from the searches using the selected keywords. Seventeen articles met criteria and were included in this review (Figure 1). A variety of interventions include school-based or clinic-based education program, self-monitoring, or asthma action plan are mentioned. Educational interventions are delivered through booklet, personnel communication, electronic devices, or simulation computer scenarios. Delivery of care also varies among physicians, nurses, parents, community social workers, and children themselves. The settings of the intervention include hospital, community education centre, home, school, outpatient

clinic, a combination of hospital/clinic and home. Many health models are adopted to improve asthma self-management. Outcomes assessed include lung functions, asthma morbidity, knowledge, self-management

behaviors, and prescribing practices. Thus, asthma management can be categorized into clinical-oriented model, service-management model, patient-centered model, and mixed model (Table 1).

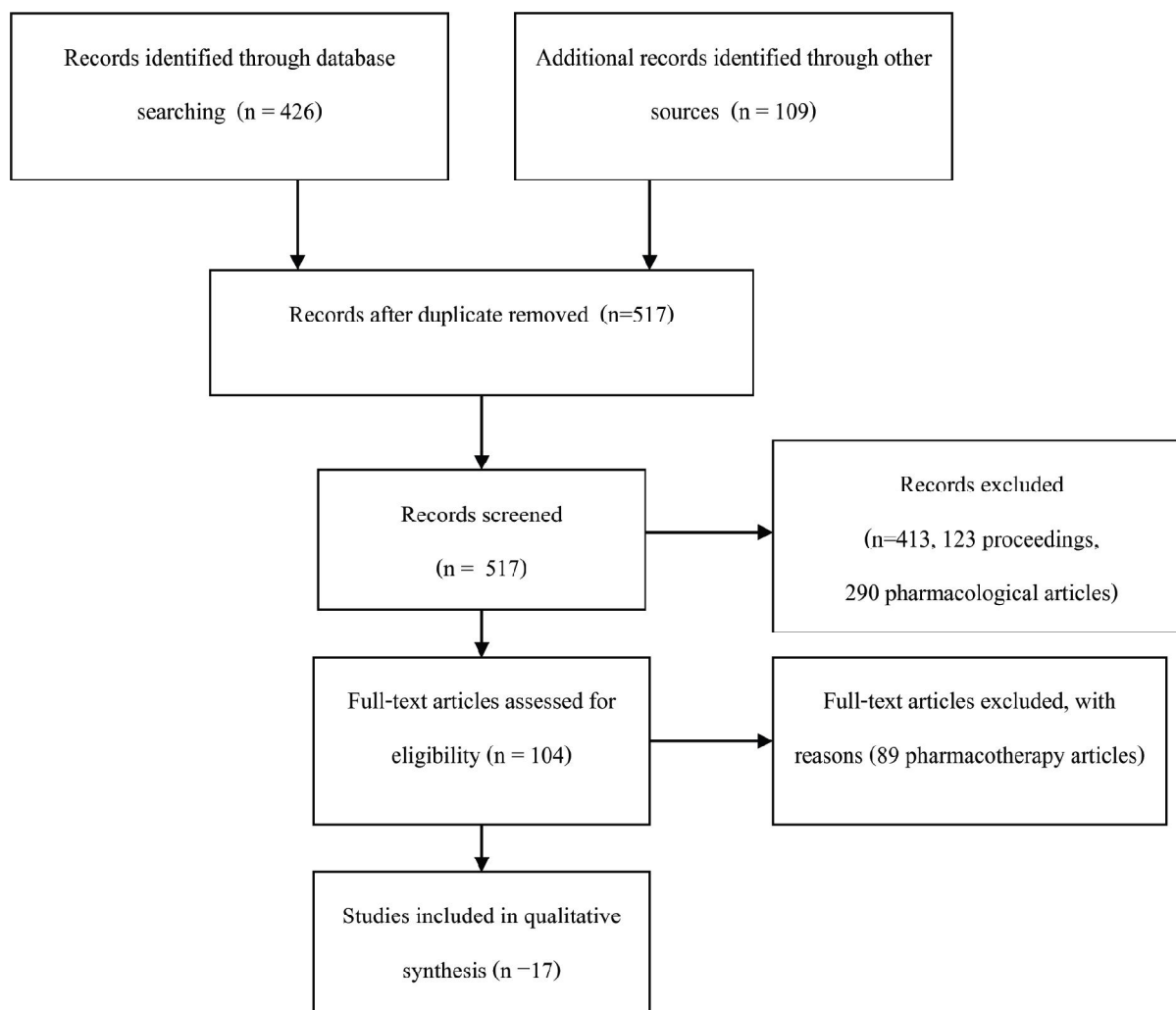


Figure 1. Search result.

Table 1. Categories of management of childhood asthma.

Management of childhood asthma
1. Clinical-oriented model
Regular checkups and evaluation for asthma severity
Treatment of acute attacks and chronic asthma
Avoiding triggering factors
2. Service-management model
Asthma education on acute attack, chronic asthma, and use of inhaler or spacer
3. Patient-centered model
Perceptions of disease control
Health education model
Shared-decision making model
4. Mixed model
Knowledge translation model
Written asthma management plan
Self-management behaviors model

1. Clinical-oriented model

Regular checkups and evaluation for asthma severity

Proper diagnosis and regular assessment of asthma are key components of effective asthma management. Peak flows meter and/or spirometry are objective measures for evaluating acute and chronic asthma. Many guidelines used medication usage, activities limitation, and nighttime wake up as an indicator to evaluate asthma severity. There is another scoring system for asthma such as Wood's asthma score, pulmonary index score, but they are not widely used. However, thirty percent of asthma children did not have regular asthma checkups⁹. The frequency of monitoring asthma in Asian countries such as Sri Lanka, Indonesia, Singapore and Philippines, is noted to be exceeding low, as a large percentage of physicians indicated that they seldom or never use spirometry and peak

flow for monitoring¹⁵. In Canada and North America, only 27.2% of pediatric visits for children age over 7 years were documented objective measures of airflow rates¹⁶.

Treatment of acute attacks and chronic asthma

The drug of choice for treatment of acute asthma is nebulized salbutamol or terbutaline. Long term management of asthma involves a balance between the benefits of achieving symptom control as possible and the risks of adverse effects. Nebulized salbutamol is favored as treatment of choice in acute attacks in Asian countries. While long-acting β_2 -agonists, inhaled corticosteroids, or montelukast are favored as first-choice asthma maintenance¹⁵. Antileukotrienes and inhaled corticosteroids are used more frequently in Japan and in Europe, respectively, as the controller therapy 8. In Canada and North America, systemic steroids were used only 33% of children in ED and on discharge¹⁶.

Avoiding triggering factors

Asthma is a disease in which both genetic and environmental factors have important roles. Factors such as tobacco smoke, air pollution, and exposure to aeroallergens (e.g. dust mites, animal dander, mold, or cockroaches) were known to trigger asthma symptoms¹⁷⁻¹⁹. Most caretakers of asthma children said that they were aware of exposures that trigger asthma such as tobacco smoke. But tobacco smoke at home was still the third most common asthma trigger⁹. Other factors that can worsen asthma symptoms include exercise, viral infection, changes in weather, strong emotional expressions (e.g. laughing, crying hard)²⁰.

2. Service-management model

Asthma education on acute attack, chronic asthma, and use of inhaler or spacer

Asthma education programs have been implemented in many settings in order to augment education by primary care provider. The educational intervention may take place in the emergency room, the hospital, at home or in the community. The intervention could involve a nurse, **a pharmacist**, educator or health or medical practitioner associated with the hospital or referred to by the hospital. The intervention may include information administered in a range of formats, counseling, the use of home peak flow or symptom monitoring or a written action plan. School-based programs are attractive because they provide education to children in a setting in which they are accustomed to receive instruction and emphasize teaching how to manage asthma rather than relying on parents to do so. The educational strategies used include steps in the evaluation and intervention of asthma-related respiratory problems, sign and symptoms to evaluate the severity of acute asthma, asthma medication, asthma exacerbations action plan²¹. Following educational intervention delivered to children, their parents or both, there was a significantly reduced risk of subsequent emergency department visits (RR 0.73, 95% CI 0.65 to 0.81, N = 3008) and hospital admissions

(RR 0.79, 95% CI 0.69 to 0.92, N = 4019) compared with control. There were also fewer unscheduled doctor visits (RR 0.68, 95% CI 0.57 to 0.81, N = 1009). Very few data were available for other outcomes (FEV1, PEF, rescue medication use, quality of life or symptoms) and there was no statistically significant difference between education and control²².

3. Patient-centered model

Perceptions of disease control

Many patients overestimate their level of disease control, tolerate asthma symptom, and have low expectation about possible degree of disease control. Parents' concerns about long-term corticosteroids use (e.g. reduced children growth rate) may affect their adherence. Patients with poorly controlled may not receive a prescription for adequate controllers. On the other hand, physicians also tend to underestimate the prevalence of asthma and overestimate the degree of patient's asthma control²⁰.

Health education model

Asthma health model consist of three major factors, including background, process, and health outcomes factors. Background factors include asthma risk factors and family resources. Process factors include preventive and treatment strategies. Health outcomes are asthma morbidity. This model was explored to a longitudinal study and found that asthma severity is significant associated with parent asthma management, absenteeism, and hospitalization. As a result of analysis, boy and uninsured children were more likely to hospitalized².

Shared-decision making model

Successful management depends on patients' compliance to their prescribed asthma treatment regimen. The clinician and patient can negotiate an asthma management plan that works toward both clinician and patient goals. The clinician goals should be to optimize asthma control through minimizing symptoms, activity limitations, airway narrowing. The patient

goals are usually related to their ability to function normally in daily activities. Patients' perception of being involved in decision-making are significantly correlated with patient satisfaction, good relationship, and quality of life. Patients who interested in health problems show a good integration knowledge and better asthma control^{20, 23}.

4. Mixed model

Knowledge translation model

Care gaps were noted in many studies and may contribute to adverse outcomes such as hospitalization or repeated ED visits. There is evidence that asthma treatment in concordance with guidelines lead to a 46% reduction in hospitalization. Asthma management should move beyond published guidelines to guidelines implementation as a sequential process^{16, 19}, as follow;

- Identify, review and select the knowledge relevant to the problem.
- Adapt the knowledge to the local context.
- Select and implement methods to promote the knowledge.
- Monitor use of the knowledge.
- Evaluate the outcomes of using the knowledge.
- Sustain ongoing knowledge use.

Written asthma management plan

The need for active participation with asthma to prevent exacerbations has led to the universal recommendation by national and international asthma guidelines to provide written action plans (WAP). There are two types of written action plan: peak flow based written plans (PFWP) and symptom based written plans (SWP). Such action plans consist of a written set of instructions given to patients with asthma for the management of chronic symptoms as well as for the prevention and management of exacerbations. SWP identify patients into normal well-being, symptoms of asthma, and symptoms suggestive of severe respiratory distress. While PFWP establish zones based

on the personal best PEF reading of the patient. Symptom monitoring was preferred over peak flow monitoring by children (N = 2 studies; RR 1.21; 95% CI 1.00 to 1.46), but parents showed no preference (N = 2 studies; RR 0.96; 95% CI 0.18 to 2.11). Children assigned to PFWP reduced by 1/2 day the number of symptomatic days per week (N = 2 studies; mean difference: 0.45 days/week; 95% CI 0.04 to 0.26).

Self-management behaviors model

Asthma program refers to self-regulation or self-management model because asthma pattern makes it impossible to discuss every variation. Self-regulation includes self-monitoring, self-judgment, self-reaction, and self-evaluation. Self-monitoring includes monitoring asthma symptoms subjectively or through the use of a peak flow meter; monitoring efforts at managing asthma by taking medicines, keeping appointments, avoiding asthma triggers; and monitoring the presence of environment triggers. Self-judgment involves comparing the data from self-monitoring with healthy standards to determine if a problem exists. Self-reaction involves taking appropriate action. Self-evaluation involves assessing the success of the action taken and determined if an additional action is required. A study applies this model to design simulation scenarios in order to change children behaviors through simulated asthma management. The results suggested that this simulation design is motivational and educational. Children are able to describe behavioral strategies to prevent asthma episodes and to treat asthma symptoms, have confidence to carry out asthma-management behaviors, and have a perception of their own self-management autonomy¹².

Role of pharmacist in the asthma management model

There was no pharmacy-oriented or pharmacist initiative model for the asthma management. However, pharmacists have a role in healthcare team in a treatment and health education model²⁴⁻²⁷.

DISCUSSION

In this review, we have some limitations. There is no MeSH terms of “asthma management” in Pubmed and The Cochrane Library. Four categories of asthma management are set based on the characteristics of data from search results. There are various differences in management techniques and outcomes assessed, some studies are mix-up between theoretical model and clinical implication, and thus effectiveness assessment could not be done.

Various treatment guidelines were used including GINA¹ and NHLBI⁵. These guidelines classify asthma severity due to asthma symptoms, medication usage or activities limitations. There is a widely variation of practice among physicians despite many practice guidelines are available. Adherence to guidelines remains less than ideal among asthmatic children. Gaps between evidence-based guidelines and management of asthma were noted²¹. Thus, childhood asthma is still an uncontrolled chronic condition because of many factors such as patient’s or caretaker’s perception of disease, self-management behaviors, cost of treatment. Also environmental exposures, access to care, different cultures, and ethnicities could affect various beliefs and concerns about disease. Most information from included articles relies on parents or caretakers as the informant of children through questionnaire or interview. The information that provided on children’s symptoms, medication usage and technique, activity restriction may be quite different from the children’s own experiences. However, base on the cognitive and emotional development of children, young children are not able to report their symptoms or functioning, then parent reports or recall may be the only available information.

We categorize asthma management into four categories based on the characteristics of data. Synthesized findings among asthma management are difficult because there are heterogeneity in management interventions and outcomes assessed. The settings are also various include hospital, clinic, home, and school. Some studies are mix-up between theoretical model and clinical implication,

while some studies are review articles with no intervention. Some studies focused on asthmatic children, whereas others focused on parents or health care providers such as pediatricians, school nurses. In terms of effectiveness, there were various types of outcome measures. Although when the same outcomes are assessed, they are still not comparable because of different time intervals, age groups, or instruments. Some studies conflate all age group without any subgroup analysis despite there are marked difference of asthma prevalence between age groups (0-4 years, 5-11 years, and ≥ 12 years)²⁸. Otherwise, conflating of medications into relievers and controllers may lead to missing of changes within categories, such as increases antileukotriene and decreases aminophylline use. Some interventions^{22, 28, 29} compare standard or usual care with new asthma management model while others are not. Also the results of some studies^{22, 29} do not have statistical power to show differences between intervention and control group. Thus, the data may not strongly recommend implementing a new asthma management model.

In 2007, the National Heart, Lung, and Blood Institute had released guidelines for the Diagnosis and Management of Asthma⁵ which focused on asthma self-management education that should be integrated into all aspects of asthma care, and it requires repetition and reinforcement²⁴. Co-operation between different health professionals are able to help asthmatic patients to develop self management skills including adherence to treatment. Although there is particular model for pharmacist, pharmacists can extend their role in clinical outcomes monitoring and be a part of health care team. According to the basic concept of pharmaceutical care, pharmacist-managed asthma programs could identify and solve or prevent drug-related problems if the pharmacist is therapy-oriented and motivated to take responsibility³⁰. An integration of pharmacist into health care team and patient treatment are an important role in primary care, disease management, and health promotion programs, thus, help promoting pharmacist role²⁷. Nevertheless, patients’ attitudes and subjective norms are

predictors of intention which in part determine patient behavior toward drug therapy. In Thailand, both hospital and community pharmacists can play an active role not only counseling and education but also encouraging patient to self monitoring, judgment, and management for asthma symptoms.

Generalizability was considered after the model categorization. We found limitations according to large variations in implementation of asthma management, health care professionals together with patients or caretakers may adopt the practice and self-management to local needs. Attitudes and social norms at school, home, or works may influence patients' perception to asthma management and yield a different rate of success in controlling disease among different communities were also barriers. However, basic methodology and evaluation methods could be applied to fit local setting in individual country.

We proposed Thailand as a case study of generalization particularly role of pharmacist. In Thailand, self-management advice for asthma is not recommended for patients in any settings; also asthma action plan and pulmonary function measures are not available for patients. Indeed, particular difficulties for asthma management are acceptability of pharmacist to patients and other health care professionals, as well as clinical skill of pharmacist to do so. However, community pharmacists have expanded their role in recent year as part of good practice community pharmacy, accredited by Pharmacy Council, to improve services for patients with acute and chronic illness. It is established that a community pharmacist with basic training in asthma care who act as a part of multidisciplinary intervention can improve asthma outcomes²⁵. Community pharmacist can address patients' basic knowledge of asthma, triggering agents, medication technique, smoking status, and action in response for worsening symptoms. Most community pharmacies have inadequate facilities including privacy area and advising tools to advice patients. Inconsistency of asthma self-management advice for both patients and pharmacists are also the major barriers to improve asthma outcomes²⁵.

CONCLUSION

Disease management programs have various activities, thus strategies should be optimized in accordance to health context, sociology, or culture of each country. Asthma management should move beyond published guidelines to guidelines implementation. Therefore, patients and families must move from simple adherence to treatment to therapy aimed at achieving full control of asthma. Management models of asthma in children can be categorized into 4 major groups. Application in various countries needs modification due to difference in context.

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