

The implementation of pediatric asthma guidelines including self-assessment of the level of confidence and accessibility of medical supplies necessary for asthma management from the perspectives of multidisciplinary care teams

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Abstract

Background: Asthma control in Thai children is not yet satisfactory. Direct observation of the clinical practice for health care professionals (HCPs) in asthma clinic is essential.

Objective: To ascertain the implementation of asthma guidelines for Thai children, to assess the confidence level in general asthma management, and to determine the availability of medical supplies.

Methods: A cross-sectional study was conducted in which HCPs were surveyed by questionnaire. The selection of pediatric asthma guidelines and self-assessment of their confidence level of their own asthma practice were assessed by using a score range between 1 (the lowest) and 10 (the highest). Reasons for low confidence were identified. The necessity and availability of medical supplies for asthma and its comorbidities were investigated in government hospitals in Chachoengsao province.

Results: A total of 245 participants from 11 hospitals were enrolled. There were registered nurses (38.0%), medical and nursing students (31.4%), physicians (28.2%), and pharmacists (2.4%). The Global Initiative for Asthma has been the most frequently used guideline followed by the Thai Asthma Guideline for Children 2015-2016 (56.3% vs. 52.7%; $p = 0.45$). The pathway for assessment and stepwise approach for adjusting treatment was the most regularly applied (61.4%). The mean overall level of confidence was 5.72 ± 1.70 —a moderate level. Only 2 of 11 (18.2%) surveyed hospitals had nebulized corticosteroids, and less than half of them (45.5%) had an allergic rhinitis checklist.

Conclusion: To perfectly implement the national asthma guidelines, HCPs should be able to increase the level of confidence and procure necessary medical supplies.

Key words: pediatric, asthma guideline implementation, asthma exacerbations, health care professionals, medical supplies

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Abbreviations:

COPD	Chronic obstructive pulmonary disease
ED	Emergency department
GINA	The Global Initiative for Asthma
HCPs	Health care professionals
INCSS	Intranasal corticosteroids
LTRAs	Leukotriene receptor antagonists
RNs	Registered nurses

Introduction

The prevalence of asthma has been increasing among younger children by 10.7% in Thailand and 11.4% in other Asian countries, which have approximately aggravated by 0.18% per year from the International Study of Asthma and Allergies in Childhood phase III.¹ The recurrence during childhood of asthma exacerbations with improper treatments involving airway remodeling and declining lung functions may enhance the risk of COPD in early adulthood.²

There have been 3 standard guidelines widely used for the management of Thai pediatric patients with asthma: 1) GINA guideline³ 2) the Thai Asthma Guideline for Children 2015-2016,⁴ and 3) the Siriraj clinical asthma score guideline.⁵ Although national asthma guidelines have been published for the management of pediatric and adult patients in Thailand, asthma outcomes have not been as successful as they should be.⁶ A survey of asthmatic patients aged more than 12 years in Thailand found that 36% of the patients had developed asthma exacerbation in the past year, 17% had been admitted to a hospital, 35% had had unscheduled ED visits, and only 8% of patients had been able to control their symptoms.⁶ The finding was consistent with an Asia Pacific region survey of patients under 16 years of age in which only 2.5% of the patients achieved asthma control.⁷

Several factors contributed to uncontrolled asthma symptoms. These factors include as follows: the attitudes and perceptions of Thai patients, who tend to underestimate their symptoms; underdiagnoses of asthma comorbidities; and lack of knowledge of patients about how to avoid allergen exposure.^{6,7} Poor concordance by physicians with standard asthma guidelines is associated with higher risk of hospitalization.⁸ Lack of self-confidence and misunderstanding of procedures for applying guideline recommendations are also main reasons for failure in asthma outcome.^{9,10}

A few studies have investigated issues to understand the reasons for unfavorable asthma outcomes from the perspectives of multidisciplinary care teams working at local and provincial hospitals in Thailand.

In this study, we conducted questionnaire surveys and direct observations in asthma clinics to investigate guideline implementation; the level of confidence of general asthma management; the causes of lack of confidence in real-life practice; and the availabilities of some medical supplies and practical tools necessary for management of asthma and its comorbidities. The primary objective of this study was to ascertain the implementation of asthma guidelines for Thai children. Secondary objectives were to assess the confidence level in general asthma management of multidisciplinary care teams, and to determine the availability of medical supplies.

Methods

Study design and subjects

This is a cross-sectional study conducted in all 11 government hospitals in Chachoengsao province of Thailand. Survey questionnaires were distributed and direct observations

were carried out for HCPs aged 20 to 60 years who had responsibility in the treatment of pediatric patients with asthma. The data were collected from March 2019 to February 2021. A total of 245 HCPs (physicians, RNs, nursing and medical students, and pharmacists) replied to the questionnaires with a complete response. The written informed consent was obtained from all participants prior to the study, and this study was approved by the ethical committee of Buddhathorn Hospital (Approval No. BSH-IRB 019/2561). The study was registered at www.clinicaltrials.in.th (Study ID: TCTR 20210819005).

Questionnaires and administrations

The questionnaires inquired about 1) baseline characteristics, 2) selection of asthma guidelines for practice, 3) implementation the specific topics of Thai Asthma Guideline for Children 2015-2016,⁴ 4) self-assessment of level of confidence and description of the main reasons for lack of confidence in general asthma practice, 5) availability of medical supplies and tools for management of asthma and its comorbidities, including the accessibility of influenza vaccine and pneumococcal vaccine for high-risk groups.

The Thai Asthma Guideline for Children 2015-2016,⁴ a standard clinical practice guideline in Thailand, has been categorized into 5 topics as follows: 1) asthma diagnosis in pediatric patients younger than 5 years old 2) diagnosis in pediatric patients over 5 years old 3) asthma assessment and stepwise approach for adjusting treatment 4) asthma exacerbation management at the ED and 5) management in pediatric patients with severe asthma. Details of all of these topics were included in our questionnaires during the survey. We collected all data at the actual workplaces and conducted direct observations in the asthma clinics.

Evaluation the level of confidence of general asthma management

Before inviting the participants to complete the questionnaire, we clearly instructed each health care professional to evaluate himself or herself for the level of confidence in general asthma management related to their own responsibilities of routine clinical practice. In addition, we also grouped the participants into the three groups as doctor group (physicians and medical students), nurse group (registered nurses and nursing students) and pharmacists as shown in **Table 1**.

These data were also obtained by direct observation and from interviews with health care professionals while on duty in asthma clinics, emergency departments, and inpatient departments of the surveyed hospitals prior to the commencement of this research.

The levels of confidence were ranked using scores ranging from 1 to 10, which were classified into 3 groups as scores of 1 to 3, 4 to 6, and 7 to 10. These were defined as a low, moderate, and high level of confidence, respectively. All participants input these scores by themselves. The reasons for lack of confidence were obtained through a questionnaire of open-ended questions asking participants to express their various opinions to reveal the causes of the lack of confidence.

Table 1. Main responsibilities of each group of health care professional for asthma management

The main responsibilities of health care professionals	Doctor group (physicians and medical students)	Nurse group (registered nurses and nursing students)	Pharmacists
- Taking history and performing complete physical examinations for diagnosing asthma, including identifying and treating comorbid conditions	++	+	-
- Initiating stepwise approach to medication therapy	++	+	-
- Deciding to refer patients to a pediatric pulmonologist or an allergist in cases of severe and difficult-to-treat asthma	++	-	-
- Interpreting investigation results such as spirometry, allergy/immunology blood testing, and skin prick testing	+	-	-
- Measuring peak expiratory flow rate (PEFR) and spirometry	+	++	-
- Reviewing medical, social, and environmental history to determine exposure to allergens and to assess the level of asthma symptom control and co-morbidities	+	++	-
- Assessing the severity of exacerbation and starting treatment in the initial triage for patients with acute asthma	+	++	-
- Advising patients on discharge and follow-up care; writing an asthma action plan; recommending essential vaccinations and considering the need for home visits in cases of uncontrolled asthma symptoms	+	++	-
- Educating and developing good relationships with patients and their families for self-management, adherence to treatment for asthma, and allergen avoidance	+	++	+
- Training, assessing, and correcting inhaler technique of patients; providing information about medications and potential side effects	+	+	++

(-) no role, (+) some role, (++) strong role

Statistical analysis

The raw data were analyzed by using the SPSS software (version 21 for Windows; SPSS Inc., Chicago, IL, USA). Categorical variables are shown as numbers and percentages. The means (standard deviations) are given for the continuous variables. For parameter comparisons between groups, Pearson's chi-square test, or McNemar test were used for qualitative data. Linear regression analysis was performed to determine the means level of confidence between the group of medical career hierarchy. Comparisons between groups were calculated. $P < 0.05$ was indicated as a statistical significance outcome.

Results

Characteristics of the health care professionals

Overall, 339 HCPs were invited. 39 (11.5%) of them were excluded due to never having any experience of direct treatment for asthmatic patients, 24 (7.1%) were excluded because they were assigned to treatment for adult patients with asthma only, and 31 (9.1%) had an incomplete data set. Of these 245 participants were enrolled in this study and most of them were female 187 (76.3%) with 167 (68.1%) of HCPs aged between 20 to 30 years old. These consisted of 93 (38.0%) RNs, followed by medical students 71 (29.0%), physicians 69 (28.2%), nursing students 6 (2.4%) and pharmacists 6 (2.4%). About two-thirds 157 (64.1%) of HCPs had to treat both pediatric and adult patients with asthma. Most of them 83 (33.9%) treated approximately 4 to 19 patients per month (Table 2).

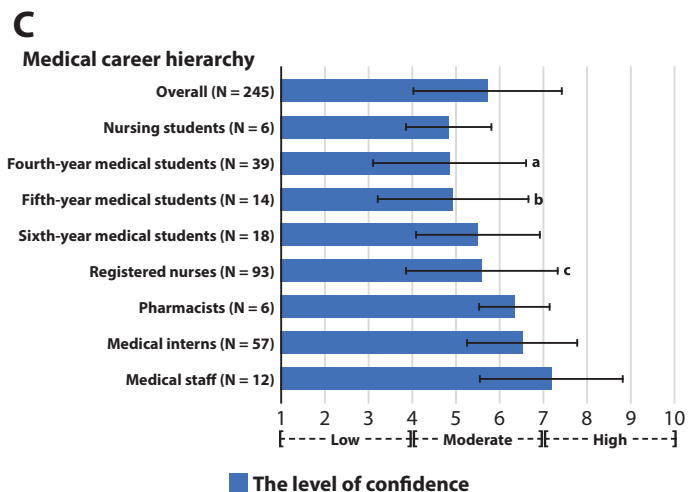
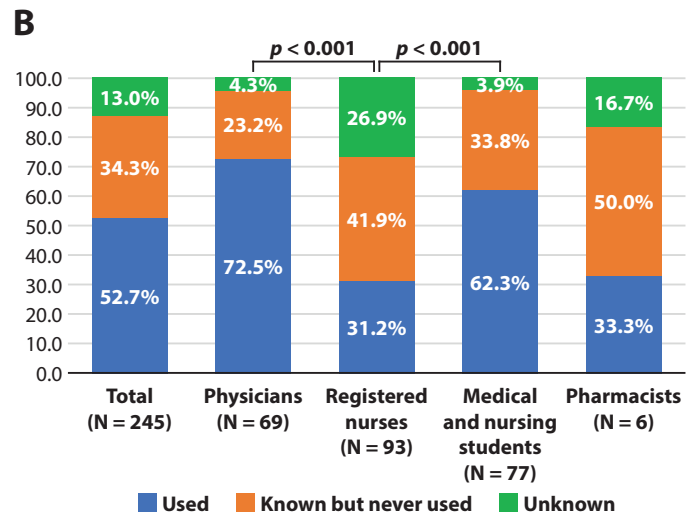
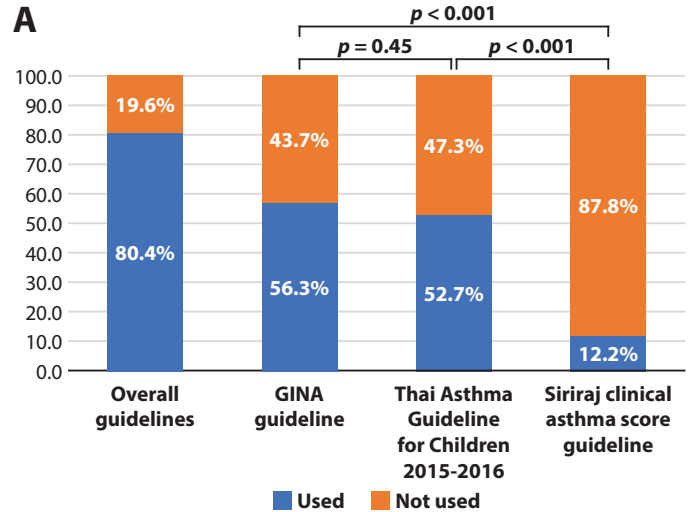
Selection of guidelines to follow and selection of topics in the Thai Asthma Guideline for Children 2015-2016 to apply

From a total of 245 HCPs, 197 (80.4%) reported implementing overall asthma guidelines for daily practice. There were significantly different proportions of use by HCPs between the three guidelines ($p < 0.001$). 138 (56.3%) regularly used GINA guideline and 129 (52.7%) used the Thai Asthma Guideline for Children 2015-2016 as practice parameters. There was no significant difference between the two guidelines of choice ($p = 0.45$). A statistically significant ($p < 0.001$) minority (30, 12.2%) of participants selected the Siriraj clinical asthma score guideline (Figure 1A).

In terms of the Thai Asthma Guideline for Children 2015-2016, 72.5% of physicians reported using this guideline followed by 62.3% of medical and nursing students. Only one-third of RNs (31.2%) and pharmacists (33.3%) routinely applied it in their practices. 41.9% of RNs knew about the guideline but never applied it and 26.9% of RNs declared not knowing about the existence of the guideline at all. Less than 5% of the physicians and students had never seen this Thai asthma guideline. There were significantly different proportions of implementation of Thai asthma guideline for children 2015-2016 between the four groups of HCPs ($p < 0.001$). Lower statistical significance was found between RNs and physicians ($p < 0.001$), and between RNs compared to students ($p < 0.001$) (Figure 1B).

Table 2. Characteristics of health care professionals

Characteristics	N = 245	%
Sex		
Female	187	76.3
Male	58	23.7
Age range (years)		
20 to 30	167	68.1
31 to 40	31	12.7
41 to 50	25	10.2
51 to 60	22	9.0
Positions		
Physicians		
Medical staff	12	4.9
Medical interns	57	23.3
Medical students		
Fourth year medical students	39	15.9
Fifth year medical students	14	5.7
Sixth year medical students	18	7.4
Registered nurses	93	38.0
Nursing students	6	2.4
Pharmacists	6	2.4
Patient care experience		
Children (< 15 years of age)	88	35.9
Older children and adults	157	64.1
The number of patients with asthma was treated in the past year		
At least 20 patients/month	44	18.0
4 to 19 patients/month	83	33.9
1 to 3 patients/month	74	30.2
1 to 11 patients/year	38	15.5
Unidentified	6	2.4



^a $p < 0.001$ when compared with medical staff and interns
^b $p < 0.05$ when compared with medical staff and interns
^c $p < 0.05$ when compared with medical staff and interns

Figure 1. Use of pediatric asthma guidelines (Figure 1A), Thai Asthma Guideline for Children 2015-2016 by occupation (Figure 1B), and Mean confidence level by medical career hierarchy (Figure 1C) (N = 245)

The topic of pathway for asthma assessment and stepwise approach for adjusting treatment and the topic of pathway for asthma diagnosis in pediatric patients younger than 5 years old were usually applied by 61.4% and 59.8% of all participants, respectively. Physicians were the majority group implementing all topics. In the registered nurse group, 41.4% of them mostly used the topic of pathway for asthma exacerbation management at the ED whereas most of the medical and nursing student group (72.9%) reported using the topic of pathway for asthma diagnosis in pediatric patients younger than 5 years old. The topic of pathway for management in pediatric patients with severe asthma had the lowest frequency of application, 13.4% of all participants. A group of pharmacists (2 participants) was excluded because they had no direct exposure to prescribed asthma treatments and medications. There were significant differences in the groups of HCPs for all topics (Table 3).

Asthma practice confidence of HCPs in different professional positions

The mean overall level of confidence was 5.72 ± 1.70 , a moderate level. Classified by medical career hierarchy (Figure 1C), The mean confidence score of medical staff was the highest (7.17 ± 1.64) as the only high level of confidence, followed by medical interns (6.51 ± 1.27), pharmacists (6.33 ± 0.82), RNs (5.59 ± 1.74), sixth-year (5.50 ± 1.42), fifth-year (4.93 ± 1.73), fourth-year medical (4.85 ± 1.76) and nursing students (4.83 ± 0.98), all of which scored within the moderate range of confidence. The fourth-year medical students had a significantly lower level than the medical staff (mean difference, 2.32; 95%CI, 0.67-3.98; $p < 0.001$) and interns (mean difference, 1.66; 95%CI, 0.62-2.70; $p < 0.001$). Moreover, the fifth-year medical students also had a lower level of confidence compared to the medical staff (mean difference 2.24; 95%CI, 0.27-4.21; $p = 0.011$) and interns (mean difference 1.58; 95%CI, 0.08-3.08; $p = 0.027$).

Table 3. Use of specific topics of Thai Asthma Guideline for Children 2015-2016 by occupation

Topic of Thai Asthma Guideline for Children 2015-2016	Health care professionals								P-value
	Overall (N = 127)		Physicians (N = 50)		Registered nurses (N = 29)		Medical and nursing students (N = 48)		
	n	%	n	%	n	%	n	%	
Topic 1. The pathway for asthma diagnosis in pediatric patients younger than 5 years old	76	59.8	37	74.0	4	13.8	35	72.9	< 0.001
Topic 2. The pathway for asthma diagnosis in pediatric patients over 5 years old	66	52.0	37	74.0	6	20.7	23	47.9	< 0.001
Topic 3. The pathway for asthma assessment and stepwise approach for adjusting treatment	78	61.4	34	68.0	10	34.5	34	70.8	0.003
Topic 4. The pathway for asthma exacerbation management at emergency department	66	52.0	37	74.0	12	41.4	17	35.4	< 0.001
Topic 5. The pathway for management in pediatric patients with severe asthma	17	13.4	11	22.0	0	0	6	12.5	0.02

Table 4. Reasons for lack of confidence

Causes related with health care professionals	Doctor group (physicians and medical students)	Nurse group (registered nurses and nursing students)	Pharmacists
- Poor comprehension of pediatric asthma management guidelines	y	y	y
- Inadequate knowledge of inhalers techniques and allergen avoidance	y	y	y
- Too many patients of all ages to establish therapeutic relationships	y	y	y
- Insufficient asthma care team to monitor patients, especially home visits in patients with uncontrolled asthma symptoms	y	y	n
- Few specialists to consult about respiratory diseases	y	y	n
- Unable to monitor and interpret pulmonary function test	y	n	n

Abbreviations: n, no; y, yes

Table 5. Supplies and services available at each hospital

General information	Name of the hospitals										
	Provincial hospital	Community hospitals									
	H 1 Tertiary care	H 2 Secondary care	H 3 Secondary care	H 4 Secondary care	H 5 Secondary care	H 6 Secondary care	H 7 Secondary care	H 8 Secondary care	H 9 Secondary care	H 10 Secondary care	H 11 Secondary care
Bronchodilators											
Salbutamol (oral and inhaled)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Theophylline	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Terbutaline	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Magnesium sulfate injection	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Short-acting β2-agonists with short-acting muscarinic antagonists (pMDI)											
Short-acting β2-agonists with short-acting muscarinic antagonists (nebulization)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Long-acting inhaled muscarinic antagonist (tiotropium)	Y	n	n	n	n	n	n	n	n	n	n
Corticosteroids											
Systemic corticosteroids	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Inhaled corticosteroids (pMDI)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Inhaled corticosteroids with long-acting β2-agonists	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nebulized corticosteroids	Y	n	n	n	Y	n	n	n	n	n	n
Intranasal corticosteroids (INCSs)	Y	n	n	n	Y	Y	n	n	n	Y	n
Combination of INCSs and intranasal H1-antihistamine	n	n	n	n	n	n	n	n	n	n	n
Leukotriene receptor antagonists	Y	n	n	n	Y	n	n	n	n	n	n
Oral second-generation H1-antihistamines	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nasal decongestants	Y	n	n	Y	n	Y	Y	n	n	n	n

Table 5. (Continued)

General information	Name of the hospitals											
	Provincial hospital	Community hospitals										
	H 1	H 2	H 3	H 4	H 5	H 6	H 7	H 8	H 9	H 10	H 11	
Level of health services	Tertiary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care	Secondary care
Ophthalmic anti-allergic drugs												
Olopatadine hydrochloride	y	n	n	n	n	n	n	n	n	n	n	n
Ophthalmic corticosteroids	y	n	y	y	n	n	n	n	n	y	n	n
Allergen immunotherapy	n	n	n	n	n	n	n	n	n	n	n	n
Anti-immunoglobulin E therapy	n	n	n	n	n	n	n	n	n	n	n	n
Anti-interleukin-5 therapy	n	n	n	n	n	n	n	n	n	n	n	n
Phosphodiesterase (PDE)-4 inhibitors	n	n	n	n	n	n	n	n	n	n	n	n
Cone spacer devices or valved-holding chamber	y	y	y	y	y	y	y	y	n	y	y	y
Location for available peak flow meter	OPD, IPD, ED, asthma clinic	IPD, asthma clinic	OPD, IPD, ED, asthma clinic	asthma clinic	asthma clinic	asthma clinic	asthma clinic	asthma clinic	OPD, IPD	asthma clinic	asthma clinic	asthma clinic
Spirometer	y	y	y	y	y	n	y	y	n	y	y	y
High-flow nasal cannula oxygen therapy	y	n	n	n	y	n	n	n	n	n	y	n
Continuous nebulization therapy	n	n	n	n	n	n	n	n	n	n	n	n
Skin prick test or specific immunoglobulin E test for aeroallergen	y	n	n	n	n	n	n	n	n	n	n	n
Smoking exposure check list	y	y	y	y	y	y	y	y	y	y	y	y
Asthma comorbidities check lists	AR, OSA, BMI	AR	AR	BMI	BMI	BMI	AR	AR	BMI	BMI	BMI	BMI
Vaccines recommended for asthma patients												
Influenza vaccine	y	y	y	y	y	y	y	y	y	y	y	y
Invasive pneumococcal vaccine	n	n	n	n	n	n	n	n	n	n	n	n

Abbreviations: AR, allergic rhinitis; BMI, body mass index; H, hospital; IPD, inpatient department; n, no; OPD, outpatient department; OSA, obstructive sleep apnea; pMDI, pressurized metered dose inhaler; y, yes

Also, the medical staff and the interns had significantly higher levels of confidence than the RNs (mean difference 1.58; 95%CI, 0.04-3.11, $p = 0.039$) and (mean difference 0.92; 95%CI, 0.07-1.76; $p = 0.02$), respectively. In addition, the main reasons for lack of confidence related to responsibilities and the barriers to achieving asthma control from the perspective of HCPs were described in **Table 4**.

Availability of medical supplies

A total of 11 surveyed hospitals are shown in **Table 5**. Only one provincial hospital was categorized as a tertiary care hospital, while the others were at the secondary care level. Bronchodilators with or without short-acting muscarinic antagonists were found in all hospitals, while inhaled long-acting muscarinic antagonists (tiotropium bromide) were available at the provincial and at only one community hospital. The systemic and inhaled corticosteroids with or without long-acting β_2 -agonists were found to exist in all hospitals as well. Only 2/11 (18.2%) of surveyed hospitals had corticosteroid respules, which were used as a high dose treatment for severe asthma exacerbation.

For the management of allergic rhinitis and allergic eye diseases, 5/11 (45.5%) of the hospitals had INCSs, while 2/11 (18.2%) of them had LTRAs. The combination of INCSs and intranasal H1-antihistamines was not available in any settings. The ophthalmic anti-allergic medications, such as olopatadine hydrochloride and ophthalmic corticosteroids were found in only 1/13 (9.1%) and 4/11 (36.4%) of the surveyed hospitals, respectively.

Regarding the medical equipment, cone spacer devices or valved-holding chambers and peak flow meters were obtainable in all hospitals. Only 2/11 (18.2%) of them had peak flow meters placed at the ED. A spirometer and a high-flow nasal cannula were available in 9/11 (81.8%) and 3/11 (27.3%) of the hospitals, respectively. There was no procedure of continuous nebulization therapy observed. The skin prick test or specific immunoglobulin E test for aeroallergen was only available in the provincial hospital only. Less than half of the hospitals, 5/11 (45.5%), had documented symptoms of allergic rhinitis into practical check-lists as a common disease of asthma comorbidity. All hospitals provided influenza vaccine administration, while vaccine for the prevention of invasive pneumococcal diseases was not available in these government hospitals.

Discussion

This was the first study to report the insight data of multidisciplinary asthma care teams regarding asthma and management of its comorbidities for children from 11 government hospitals in Chachoengsao province, Thailand. The implementation rate of the asthma guidelines for management in daily practice was relatively high in our study (80%) like in Korea (85%).¹⁰ Furthermore, our study found that GINA guideline was the most frequently used guideline followed by the standard national guideline which is similar in Korea.¹⁰ This indicates that the international and national asthma guidelines should be developed in a similar direction.

We found wide implementation of national asthma guideline for children in the group of medical doctors and the group of medical and nursing students. About 96% reported that they knew the guideline existed and 60-70% used them in their practice. Similarly, a survey by Jo EJ, et al.¹⁰ found that 90% of physicians knew of the guideline and about 85% of them used an asthma management guideline, but only 11% of them implemented it almost every time. Surprisingly, 86% of Thai physicians tend to choose a treatment method for patients with concomitant asthma and allergic rhinitis by using GINA and Allergic Rhinitis and Its Impact on Asthma (ARIA) guidelines. This Thai implementation rate was higher than in India (82%), Malaysia (69%), Vietnam (53%), China (50%) and the Philippines (17%).¹¹

The Thai asthma guideline for children is divided into 5 topics. It is noteworthy that the 'pathway for asthma diagnosis in children' was used for children under 5 years of age more than it was for children over 5 years of age (about 60% vs. 52%). This result indicated that a higher proportion of young children might be diagnosed early with asthma. Similarly, a birth cohort conducted by Radhakrishnan DK,¹² following children born from 1993 to 2000, found the mean age at first diagnosis of asthma was significantly lower than 3 years of life (2.6 ± 2.0 years; $p < 0.0001$).

Most of the RNs selected the 'pathway for the management of asthma exacerbation in the ED' as well as 'asthma assessment and stepwise approach for adjusting treatment' for their usual practice as these were their responsibilities, while physicians relied more on 'asthma diagnosis and acute management' for their duties. Moreover, we found that RNs played an essential role in the asthma clinic because most of the community hospitals allowed them to prescribe treatment directly for their patients, especially during non-office hours, while medical interns were primarily accountable for treating asthmatic patients. A previous review in a primary care setting reported effective collaboration between practical nurses and general practitioners to be an important strategy. However, the practical nurses had more requirements on duty than the others concerning the process of care and specialized education for patients and their families.¹³

Similar to our results, Xue L, et al.¹⁴ reported that the primary role of registered nurses in the management of pediatric patients with asthma is assessing the level of asthma symptom control and co-morbidities, and educating patients and caregivers about self-management of asthma. This role is consistent with a nursing staff's recommendations on caring for pediatric patients with chronic respiratory diseases. In addition, RNs can diagnose, assess severity, and prescribe initial medications for treating pediatric patients with acute asthma in an emergency room before they receive treatment from medical teams.¹⁵ Pediatric patients with severe and difficult-to-treat asthma, which are not often found in clinical practice, will be referred directly to a pediatric pulmonologist or allergist by a general practitioner or a pediatrician. Therefore, this pathway for caring for these patients is not commonly used by registered nurses.

The medical staff and interns had a statistically higher level of confidence than the fourth- and fifth-year medical students and RNs. The reason could be that they have had more experience in the field of asthma education. Following Bunupuradah T, et al.¹⁶ reported 83% of pediatricians and 69% of general practitioners in Thailand constantly attempt to improve their asthma-related knowledge by attending conferences. Dubaybo BA¹⁷ also reported a similar majority reason for decreasing confidence in the management of asthmatic patients from the perspective of HCPs was lack of knowledge. In particular, the misunderstanding of some content for national asthma management guidelines led to non-strict concordance with these pathways. Besides, there were insufficient pharmacists in asthma clinics to routinely check and correct inhaler techniques and to advise methods of allergen avoidance. Although spirometry was available at most of the surveyed hospitals, there were not enough specialists to interpret the results, so not all patients were properly evaluated for lung function. Several studies have identified these same deficiencies in asthma management.^{9,10,18}

To control asthma and its comorbidities, there should be an appropriate allocation of necessary medical supplies as indicated by the national asthma guideline. Based on the current guideline,¹⁹ administration of nebulized high dose corticosteroids together with the systemic route of corticosteroids for patients with severe asthma within 1 hour from triage is beneficial to reduce disease severity and the rate of hospitalization through a non-genomic mechanism.^{19,20} However, most of the nebulized corticosteroids were not widely available in the community hospitals.

Allergic rhinitis is one of the major risk factors which was found in about one-fourth of pediatric patients with uncontrollable asthma. Therefore, the appropriate treatment of allergic rhinitis in these patients can effectively control the progression of asthma symptoms.²¹ In the present study, we found about 46% of surveyed hospitals had INCSSs and about 18% of them had LTRAs; thus, to improve cost-effectiveness,²² we suggest that each hospital should have these medications available to manage moderate to severe or persistent allergic rhinitis.²³

In our case, a low number of peak flow meters were found at ED. This indicated that peak flow meters were rarely used in surveyed hospitals. In Japan, 57% of hospitals had peak flow meters, but they were used for only 9% of asthmatic assessments.⁸ Therefore, all HCPs should be advised to use peak flow meters according to the asthma guideline recommendations.^{24,25}

Allergic rhinitis, vocal cord dysfunction, gastroesophageal reflux disease, depression and anxiety, obesity, obstructive sleep apnea, and rhinosinusitis are comorbidities of asthma that are often under-diagnosed by physicians.²⁶ We found that less than half of our surveyed hospitals had an allergic rhinitis checklist within the medical record. Furthermore, a study conducted on general practitioners and pediatricians in Thailand reported that only 60% and 69% of them regularly screen for allergic rhinitis, respectively.¹⁶ We recommend that each asthma clinic have check-lists for all comorbidities in their medical records to remind the HCPs to screen and determine the prevalence of such diseases to facilitate early treatments.

Finally, the pneumococcal vaccine has not been covered in the Expanded Program on Immunization (EPI) of Thailand. However, there was no available report on any proportion of patients with asthma or COPD who had been vaccinated with the invasive pneumococcal disease vaccine in Thailand.

The limitations of our study are 1) most participants were positioned in community hospitals and we collected data of one province only, 2) private hospitals or clinics were not included, so our results may not be representative of those who attend asthma clinics in other settings of Thailand, 3) we do not describe the specific topics of the GINA guideline that was implemented, 4) there was no assessment of the benefits of using asthma guidelines or the availability of medical supplies that could impact on asthma outcomes differently. In future studies, we should aim to increase the number of other hospitals, especially those located in the same health region. Furthermore, it is necessary to conduct an insight study to investigate the proportion of perfect adherence to the national asthma guideline for children and its correlation to the availability of necessary medical supplies, which will be likely to affect the extent of asthma control in a resource-limited area.

Conclusion

This survey of HCPs treating pediatric asthma in Chachoengsao, Thailand found that the majority of HCPs do implement national asthma guidelines, and are moderately confident about their practice, but that satisfactory medical supplies are not always available. We recommend that the guidelines could be updated to provide additional, relevant, practical information for HCPs and that the provision of medical supplies could be improved.

Acknowledgements

We would like to thank Prof. Orathai Jirapongsananuruk from the Division of Allergy and Immunology, Department of Pediatrics, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand and would also like to thank Dr. Charuwan Manmee, and Ms. Krissana Arsayot from the Department of Research & Technology Assessment, Rajavithi Hospital for comments that greatly improved the manuscript. We acknowledge Miss Julaporn Pooliam from the Division of Clinical Epidemiology, Department of Research and Development, Faculty of Medicine Siriraj Hospital for statistical analyses. We would like to express special thanks to Mr. Michael Jan Everts from the Clinical Research Center, Faculty of Medicine, Thammasat University for editing the English language in this manuscript.

Conflict of interest to declaration

The authors report no conflict of interest to declare. The authors are the solely responsible for the content and writing of the article.

Funding disclosure

The authors received no financial support for the research or authorship of this article.

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