

# Implementation of a 12-week Disease Management Program Improved Clinical Outcomes and Quality of Life In Adults with Asthma in a Rural District Hospital: Pre- and Post-intervention Study

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**SUMMARY** Despite the availability of effective medical treatment and disease management guidelines, asthma remains a poorly controlled disease in developing countries. There is little evidence of the effectiveness of disease management guidelines in rural clinical practice. The effect of disease management guidelines on clinical outcomes and quality of life in asthmatic patients in a rural community hospital was examined. Fifty-seven patients aged  $\geq 16$  years with physician-diagnosed asthma from a hospital outpatient clinic in Ubon-ratchathani, Thailand, were recruited. Asthma diagnosis was confirmed by reviewing clinical records. We implemented a 12-week disease management program, including the use of written asthma treatment plan and asthma action plan tailored to individual patients. Using one-group pre- and post-intervention design, we compared the average number of emergency visits and hospitalizations from acute asthmatic attacks before and after the implementation of interventions using the Wilcoxon matched-pairs signed-rank test. We also compared patient's asthma quality of life (AQL) scores, measured using the 7-point scaled Mini Asthma Quality of Life Questionnaire. It was found that among the 57 patients, 38 (67%) were women, and the mean age (SD) of the patients was 47.6 (17.0) years. Sixteen patients (28%) had a family history of asthma. Emergency visits decreased from 0.48 (SD = 0.83) per patient before implementation of interventions to 0.11 (0.37) per patient after implementation of interventions ( $p = 0.003$ ). Hospitalizations with acute asthma attacks reduced from 0.14 (0.35) per patient to 0.04 (0.27) per patient ( $p = 0.034$ ). Overall AQL scores increased significantly from 3.7 to 5.4 ( $p < 0.001$ ), with most improvement observed in symptoms and emotions. It was concluded that implementation of a 12-week asthma disease management program could reduce emergency visits and hospitalizations, and improve patients' quality of life in a rural practice setting.

Asthma is a chronic respiratory disease which has a major socioeconomic impact on individuals, family and society. It is estimated that around 300 million people currently have asthma worldwide.<sup>1</sup> In Thailand, there has been a rise in the prevalence of asthma over the last decade with 11-15% of children aged 6-7 years<sup>2</sup> and 2-3% of adults affected by the disease in 2001.<sup>3</sup> Despite the availability of effective asthma medication and standard disease management guidelines, it remains

a poorly controlled disease.<sup>4,5</sup> Poor compliance with inhaled therapy, either intentional or unintentional, is a common cause of uncontrolled disease.<sup>6,7</sup> Inadequate use of long-term anti-inflammatory medication and high use of bronchodilators in

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patients with persistent asthma were observed in both developed and developing countries.<sup>5,8</sup> International and national disease management guidelines for asthma, albeit widely established, require sophisticated and expensive equipment and might be too complex to be used in clinical practice,<sup>4</sup> especially in a low-income practice setting. In clinical practice, specialists and general practitioners do not often follow the guidelines.<sup>9-11</sup> As part of most guidelines, individualized self-management and regular medical reviews have been shown to be effective at improving clinical outcomes and quality of life in patients with asthma.<sup>12</sup> However, this evidence is predominantly derived from randomized controlled trials in developed countries, which may not apply to “real world” clinical practice.

The Thoracic Society of Thailand has initiated a national asthma management guideline since 1997,<sup>13</sup> focusing on the assessment of disease severity, long-term medication to control airway inflammation, health education and environmental control, with a few detailed recommendations on patient self-management. A small proportion of Thai clinicians are nevertheless able to comply with the guideline, in part, due to sophisticated assessment of disease severity and pulmonary function.<sup>8</sup> Furthermore, there is little evidence that implementing such a guideline might lead to the improvement in clinical outcomes and quality of life in adults with asthma in a rural practice setting. An alternative approach might be to use a more pragmatic guideline which requires less sophisticated assessment and consider more patient perspectives. The present study examined the effectiveness of a patient-oriented asthma disease management program delivered by a multidisciplinary team in a rural district hospital in Thailand.

## MATERIALS AND METHODS

### Setting and study population

This was a one-group pre- and post-intervention study without a control group, aimed to examine the impact of the implementation of a 12-week asthma disease management program on clinical outcomes and patients' quality of life in Srimuangmai Hospital, a 60-bed rural district hospital in Thailand. Rural district hospitals in

Thailand are responsible for primary and secondary health care, delivered by a team of health care professionals mostly led by general practitioners.

Patients with asthma were recruited through a hospital outpatient clinic, and a referral from 16 local health offices within Srimuangmai district. Asthma was defined as physician-diagnosed asthma and/or the use of asthma medication. The diagnosis was confirmed by reviewing hospital medical records. Following guidelines for diagnosis and management by the National Asthma Education and Prevention Program,<sup>14</sup> physicians used symptoms and signs, including clinical response to bronchodilators, to establish the diagnosis of asthma, without pulmonary function tested. We included patients aged 16 years or above. We excluded patients with other serious diseases that influence pulmonary function such as chronic obstructive pulmonary disease and heart failure. We also excluded those who were unable to use inhaled medication correctly or unlikely that this can be taught. We included a total of 57 patients with different disease severity for this intervention study. One patient died of respiratory failure before completing the 12-week program. Therefore, 56 patients contributed to analyses of the effectiveness of the program. The study was approved by the Srimuangmai Hospital ethical committee.

### Interventions

A summary of a 12-week asthma disease management program is shown in Table 1. A multidisciplinary disease management program was developed based on guidelines initiated by the Thai Thoracic Society<sup>13</sup> and the Global Initiative for Asthma (GINA).<sup>15</sup> This included treatment guidelines for long-term disease control and acute asthma exacerbation as well as self-management education using written asthma treatment and asthma action plans. In a first visit of the study, a physician examined patients and assessed their disease severity based on the GINA guidelines.<sup>15</sup> Pulmonary function tests were not performed. Patients were questioned about their personal and family history of disease, medication and lifestyle factors such as smoking habits. Height and weight were measured at the first clinic visit using standard procedures. Body mass index (BMI) was calculated as weight in kilogram

**Table 1** Summary of a 12-week asthma disease management program

Intervention/activities used in a hospital asthma clinic
1) Guidelines for long-term treatment and care of asthmatic patients (for 3 consecutive months)
a) Assessment of disease severity by a doctor using the GINA guidelines.
b) Recommendations for stepwise pharmacological management based on disease severity
c) 15-minute self-management education by trained nurses
d) Use of a written asthma treatment plan (treatment goal setting, medication, activity and environmental control, family involvement, follow-up)
e) Use of a written asthma action plan (three-coloured action plan in response to changes in symptoms)
f) drug counseling by pharmacists to ensure correct inhalation technique
g) Home visit for severe persistent cases
2) Guidelines on treatment of acute asthma exacerbation for a hospital emergency unit
3) Guidelines on treatment of patients hospitalised from acute asthma attacks

(kg) divided by the square of the height in meter ( $m^2$ ). Patients were prescribed with asthma medications appropriate to their disease severity, and then followed up every month for 3 months. They were also given a 15-minute comprehensive self-management education by trained nurses for every clinic visit. This included discussion with patients and their carers about an asthma treatment plan and asthma action plan tailored to individual patients taking into consideration their symptoms and social and physical environment. The asthma treatment plan is a patient-centered written guideline for long-term treatment and self care to help patients to justify personal goal setting and understand types and doses of asthmatic medication and how they should behave in order to control their symptoms. The asthma action plan is a written plan that helps patients recognize worsening asthma symptoms and know how to deal appropriately with acute changes in their symptoms. This action plan defines three categories of clinical symptoms (represented by three colours: green, yellow and red) that require different actions, ranging from increasing frequency of using an inhaled bronchodilator to urgently going to a hospital. In addition, drug counseling, including the assessment of inhalation technique according to a standard instruction checklist, was given by a pharmacist. We reviewed medical records of all participants three months before and after the implementation of the program in order to evaluate clinical outcomes. At the first clinic visit and at the end of the study, patients completed the Thai version

of the Mini Asthma Quality of Life Questionnaire (AQLQ).<sup>16</sup> The questionnaire was culturally adapted and linguistically validated by the MAPI Research Institute and Prof Elizabeth Juniper, the questionnaire developer (<http://www.qoltech.co.uk/index.htm>). The questionnaire consists of 15 seven-point scaled questions on four different domains: symptoms, activities, emotions and environment. The higher AQLQ score for each question, domain or overall questionnaire reflects better quality of life. A difference in the scores of  $> 0.5$  is considered a clinically significant change in quality of life.

### Outcomes and analyses

We compared the average number per patient of emergency visits and hospitalizations from acute asthmatic attacks over 3-month periods before and after the implementation of the intervention program. We also compared patient's AQLQ scores before and after receiving interventions. Data were compared using the Wilcoxon matched-pairs signed-rank test as differences between pre- and post-intervention outcomes were skewed. All analyses were performed using STATA 10.0SE (StataCorp LP).

## RESULTS

A total of 57 patients with asthma participated in this study. Baseline characteristics of patients are summarized separately for men and

women in Table 2. The mean age (SD) of patients was 47.6 (17.0), and 38 patients (67%) were female. Sixteen patients (28%) had a family history of asthma, and 7 (12%) were current smokers. The mean BMI (SD) was 21.3 (3.7) kg/m<sup>2</sup>. At the first clinic visit, around half of the patients had moderate to severe persistent asthma, and only 26% received inhaled corticosteroids. Men and women were similar with regards to age, a family history of asthma, smoking habits and BMI. They were also comparable regarding disease severity and

prescribed inhaled corticosteroids. Data from drug counseling sessions and asthma treatment plan suggested that the majority of patients had good compliance and medication adherence throughout the study period (up to 90% compliance).

Table 3 demonstrates the average number of emergency visits and hospitalizations from acute asthma exacerbations before and after receiving the disease management program. Emergency visits decreased from 0.48 (SD = 0.83) per patient

**Table 2** Characteristics of 57 patients with asthma at the first visit

	Total	Men	Women
<b>Number (%)</b>	57 (100.0)	19 (33.3)	38 (66.7)
<b>Age, years, mean (SD)</b>	47.6 (17.0)	43.4 (14.0)	49.7 (18.2)
<b>Family history of asthma, No. (%)</b>	16 (28.1)	5 (26.3)	11 (28.9)
<b>Current smoker, No. (%)</b>	7 (12.3)	2 (10.5)	5 (13.2)
<b>Body mass index, kg/m<sup>2</sup>, mean (SD)</b>	21.3 (3.7)	21.1 (2.0)	21.4 (4.3)
<b>Disease severity, No. (%)</b>			
<b>Mild intermittent</b>	18 (31.6)	5 (26.3)	13 (34.2)
<b>Mild persistent</b>	9 (15.8)	1 (5.3)	8 (21.1)
<b>Moderate persistent</b>	25 (43.9)	12 (63.2)	13 (34.2)
<b>Severe persistent</b>	5 (8.8)	1 (5.3)	4 (10.5)
<b>Use of inhaled corticosteroids, No. (%)</b>	15 (26.3)	4 (21.1)	11 (28.9)

SD, standard deviation.

**Table 3** Comparisons of clinical outcomes and asthma quality of life scores (AQLQ score) before and after a 12-week disease management program in 56 patients with asthma

	Before interventions <sup>‡</sup>	After interventions <sup>‡</sup>	Mean difference <sup>†</sup>	p-value <sup>‡</sup>
<b>Number of emergency visit (per patient)</b>	0.48 (0.83)	0.11 (0.37)	-0.38 (0.95), 0 (-1 to 0)	0.003
<b>Number of hospitalization from asthma (per patient)</b>	0.14 (0.35)	0.04 (0.27)	-0.11 (0.37), 0 (0 to 0)	0.034
<b>AQLQ Score</b>				
<b>Overall</b>	3.7 (0.8)	5.4 (0.7)	1.7 (0.4), 1.8 (1.5 – 2.0)	< 0.001
<b>Symptoms</b>	3.4 (0.9)	5.4 (0.9)	2.1 (0.7), 1.9 (1.6 – 2.6)	< 0.001
<b>Activities</b>	4.7 (0.9)	6.3 (0.8)	1.6 (0.6), 1.6 (1.3 – 2.0)	< 0.001
<b>Emotions</b>	2.8 (1.0)	4.5 (1.1)	1.6 (0.5), 1.7 (1.2 – 2.0)	< 0.001
<b>Environment</b>	3.7 (1.0)	5.1 (1.0)	1.5 (0.7), 1.7 (1.0 – 2.0)	< 0.001

\*data are presented as mean with standard deviation (SD), and clinical outcomes were derived from medical records.

†difference between post- and pre-intervention mean values, expressed as mean (SD) and median (interquartile range)

‡p-value using the Wilcoxon matched-pairs signed-rank test

before implementation of interventions to 0.11 (SD = 0.37) per patient after implementation of interventions ( $p = 0.003$ ). Hospitalizations from acute asthma exacerbations declined from 0.14 (SD = 0.35) per patient to 0.04 (SD = 0.27) per patient ( $p = 0.034$ ). Overall AQLQ scores increased from 3.7 to 5.4 ( $p < 0.001$ ). Significant improvement in all domains of quality of life was observed, with the most improvement in symptoms and emotions.

## DISCUSSION

The present study has shown that a 12-week asthma disease management program integrating treatment guidelines and self-management education could reduce emergency visits and hospitalizations from acute asthma exacerbations in a rural community hospital. The program could also improve patient's quality of life measured by the AQLQ scores. These findings underline the importance of incorporating a patient-oriented approach into disease management guidelines in clinical practice.

Our study demonstrates that effective treatment and care for asthmatic patients in a resource-scarce health care setting is feasible. Although asthma treatment guidelines and asthma self-management education have been demonstrated to improve clinical outcomes in patients with asthma in clinical trials,<sup>12</sup> such interventions might not be effective in clinical practice, particularly in a rural setting, where patients are unselected and monitored less intensively. Our study shows that using asthma treatment guidelines and self-management education in a rural setting with limited resources and technologies might be effective at reducing emergency visits and hospitalizations as well as improving patients' quality of life. This might help reduce both direct and indirect economical costs associated with asthma treatment. This improvement might be a result from several components in the disease management program. These include careful consultation visits which incorporate accurate assessment of asthma severity and appropriate medication according to disease severity. Correct inhalation technique enhanced by regular individual drug counseling might also be one of potential explanations for the improvement. Good patient compliance and medication adherence in our study

might also help improve outcomes. In addition, self-management education concerning patients' treatment goal, preference, compliance and environment might help patients understand their individualized treatment plan, better assess and deal with their asthma symptoms more appropriately.

To our knowledge, this study is the first in Thailand to use the AQLQ to evaluate the effect of asthma treatment and educational program on quality of life in adults with asthma. Similar to previous studies in western countries,<sup>12, 17-19</sup> our study found that asthma treatment guidelines and self-management education could improve patient's quality of life. The statistically significant change in AQLQ scores observed in our study also represents clinically significant improvement as shown by an increase in AQLQ scores of more than 0.5 in all domains. The positive changes in AQLQ scores observed in our study were relatively higher than those in previous studies in Western populations.<sup>18, 19</sup> Notably, before receiving interventions the patients in our study were more severe or less well-controlled as shown by lower AQLQ scores (total and individual domains) and a high proportion of moderately to severely persistent asthma with a relatively small proportion of patients receiving inhaled corticosteroids at baseline. They might therefore have a wider potential gap to improve than those with better quality of life at baseline. This might suggest that patients with more severe asthma are more likely to benefit more from treatments.

Quality of life assessed by the AQLQ has previously been found to associate weakly or moderately with clinical outcomes of asthma treatment. Indeed, the assessment of health-related quality of life captures distinct components of health status, functional impairments that are important to patients in their day-to-day lives such as physical, emotional and social dysfunction, and it therefore needs to be assessed directly.<sup>20</sup> The assessment of this disease-specific quality of life alongside clinical outcomes in the present study might help health care professionals to obtain a complete picture of a patient's health status. This might be useful for the evaluation of the effectiveness of asthma management programs. Moreover, as AQLQ scores are closely related to patients' daily life and health, it can be used as part of strategies to encourage

patients to adhere to long-term asthma treatment, or to change their behavior and environment.

Clinical practice guidelines are generally disease-oriented, but not patient-oriented. In other words, they appear not to consider the heterogeneity of disease, differences in practice setting, the availability of asthma medication, and variations in individual patients' preference, compliance and response to treatments.<sup>9</sup> Our findings show that the utilization of patient-oriented disease management guidelines incorporating individualized written asthma treatment and action plans was effective at improving clinical outcomes and quality of life in adult patients in a rural practice setting. This suggests that local guidelines are needed to achieve benefits of asthma treatment,<sup>21</sup> and it also highlights the implications of professional-patient communication and patient involvement in disease management for optimal asthma control,<sup>22,23</sup>

We used a one-group pre- and post-intervention study design to investigate the impact of the implementation of asthma treatment guidelines and self-management education on robust clinical outcomes such as recorded emergency visits and hospitalizations as well as distinct components of health status, asthma-specific quality of life. This quasi-experimental study design is usually used in a hospital or clinical setting where it might be unethical or logistically unfeasible to randomize the interventions with known efficacy to individual patients or groups.<sup>24, 25</sup> This study design allows for the use of each study participant as self control,<sup>24</sup> which eliminates some innate confounding. Nevertheless, such an approach may not be able to eliminate time-dependent confounding factors such as season and changes in clinical practice over time. However, the study participants were recruited over different seasons throughout the year and treated by the same physicians and multidisciplinary team throughout the study period. Furthermore, a patient care team strictly followed the treatment guidelines and educational program. Taking these together, the effects of seasons and changes in clinical practice over time on outcomes might be limited.

Without randomized controls and blinding, our findings should be interpreted with

caution. Our study was subjected to some biases such as interviewer bias. Nurses who reviewed clinical records to determine clinical outcomes and administered AQLQ were not blinded of pre- and post-intervention status of patients. This might have had an effect on the way that interviewers questioned about patients' quality of life. Data on emergency visits and hospitalizations were based on hospital medical records. It might be possible that some patients with acute asthmatic attacks received treatment in other hospitals, or even did not come to the hospital for treatment. However, this is unlikely because our hospital is the only hospital in the district, and under Thailand universal coverage health care system, patients are required to be treated in a hospital to which they have registered. As asthma diagnosis was based on clinical symptoms and signs without spirometry, there might be a possibility of misclassification. It is also noteworthy that our findings solely represent short-term effects of the disease management program, but we hope to report the results for analyses at one year after the implementation of the program soon. Provided hard workload in Thai rural district hospitals, further research into the costs and benefits of optimal, perhaps less intensive, asthma disease management programs or guidelines in a rural practice setting is needed.

In conclusion, the implementation of a 12-week asthma disease management program including self-management education could reduce the number of emergency visits and hospitalizations and improve quality of life in adult patients with asthma in a rural practice setting. This suggests that disease management guidelines should be patient-oriented, and adapted to a clinical setting to which they are applied.

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