Original Article

Effectiveness of Asthma Knowledge in Nurses using Asthma Care Application Compared with Written Asthma Action Plan

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Background: Asthma education is crucial to prevent exacerbated symptoms and death. An Asthma Care Application (ACA) was developed to provide self-care knowledge to reduce the incidence of such.

Objective: The effectiveness, in terms of knowledge and satisfaction among nurses, with the ACA was compared to a traditional written asthma action plan (WAAP).

Materials and Methods: Nurses working at a university hospital attended workshops organized by our group. They were randomly divided into two groups, one using the ACA and the other a WAAP as educational instruments. Data about asthma knowledge and satisfaction were obtained by questionnaire before and after each group's workshop.

Results: Forty-four nurses were enrolled, half worked in the emergency department. The group using the ACA, 25 nurses (57% of the cohort), revealed a significant increase in post-test asthma knowledge scores (91%) compared to pre-test levels (75%) (p = 0.002). In contrast, the WAAP group showed less improvement: 89% post-test versus 80% pre-test (p = 0.135). The ACA group also reported higher satisfaction on ease of plan usage (p<0.001), a greater potential to reduce hospital admissions (p = 0.026), and portability/convenience (p = 0.026).

Conclusion: This ACA has good possibilities for improving patient asthma knowledge and satisfaction as compared to current WAAP; however, it needs to move past pilot testing on the nurse cohort to the actual end-users, i.e. asthma patients.

Keywords: Asthma, Action plans, Application, Asthma exacerbation

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Asthma is a serious and widely prevalent chronic non-communicable lung disease. According to the WHO 2018, 339 million people suffer from asthma worldwide and each year 383,000 people die from asthma exacerbation[1,2]. Childhood and university-age; familiar with smartphones/tablets, diagnosis is also increasing[3]. Common symptoms of asthma including wheezing, dyspnea, cough, and chest constriction[4,5], however, many patients underestimate their own symptoms[2]. The Global Initiative for Asthma (GINA) guidelines state effective self-management can dramatically reduce asthma mortality[2].

Three components are considered essential for asthma management: self-monitoring of symptoms, a written asthma action plan (WAAP) to recognize symptoms and how to respond, and a regular review of asthma control and treatment by health care providers[2]. Patient education without any take-home pamphlets is not very effective; furthermore, the absence of a WAAP is considered even less so[2,6]. Any asthma action plan should improve communication between health care providers and patients to help control symptoms[6].

Chronically-ill patients using devices such as smartphones/tablets have reported improved quality of life as this technology can provide clearer, visual explanations[7]. As a result, the "Asthma Care Application", the ACA, was invented by the Center of Excellence for Asthma, Allergy and Pulmonary Diseases at Thammasat University (TU-CAAP), Thailand. The main features in this application are an asthma action plan including videos demonstrating use of inhaler devices, emergency numbers for ambulances, basic asthma knowledge, the Asthma Control Test (ACT), a record of exacerbations, reminders for inhaler usage/medications, and future appointments.

In the present study, the authors attempted to measure the effectiveness of the ACA compared with the WAAP. However, out of concern for our asthmatic patients, the authors instead choose to pilot our new application on a

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group of nurses, who specialize in asthma care and education. Our rationale for this was that in Thailand, as in most of the world, patients derive most of their self-care knowledge from nurses[8].

Materials and Methods

Participants

All of the participants were nurses working at Thammasat University Hospital (TUH), attended asthma workshops organized by TU-CAAP. All of them involved in taking care of asthma patients, from the Emergency, Pediatric and Internal Medicine Departments.

Tools

The ACA, downloadable in both IOS and Android by searching for "Asthma care", and the WAAP were used. While the questionnaire being used in this study has been modified and administered to the group of health care workers in the Center of Excellence for Asthma, Allergy and Pulmonary disease at Thammasat Hospital. The questionnaire composed of demographic data, asthma knowledge 15 questions (yes/no), asthma action plan knowledge 15 questions (yes/no) and level of satisfaction and overall for 10 questions (scoring from 1 to 5).

Study design

This was prospective study from April to May 2017. Approval was obtained from the Ethics Committee of the Faculty of Medicine, Thammasat University, Thailand (IRB No. MTU-EC-IM-1-029/60), and the study was conducted according to the Declaration of Helsinki. The workshop participants were divided into two groups. All of them were given a pretest. There were three parts in the test; general asthma knowledge, asthma action plan knowledge and, for posttest only, user satisfaction. Then, they were provided the same information at a 3-hour workshop which discussed how to take care of asthma patients, asthma medication, and how to use either the ACA or WAAP. After this, there was a posttest.

Statistical analysis

Data are presented as mean (±SD; standard deviation), median (IQR; interquartile range) and proportion (%) when appropriate. The Fisher's exact test, when necessary, was used for comparisons among categorical variables between two groups. T-test and Mann-Whitney U test were utilized for continuous data. A two-tailed *p*-value of less than 0.05 was taken to indicate statistical significance. A standard statistical program was used.

Results

Of the 67 nurses attended the workshops, forty-four participated in this study; 25 used the ACA and 19 had the WAAP. The participant characteristics are shown in Table 1. Almost all of them were female, working at emergency and pediatric departments, and were using smartphones/tablets. The majority of nurses in both groups had worked less than 10 years; most of them had experience taking care of asthma patients before.

General asthma knowledge scores

As in Figure 1, the pretest scores of the two groups had no statistical difference. The basic asthma knowledge for both groups could be considered good with pretest scores being about 70 to 80%. Asthma knowledge in the ACA group improved significantly from pre to posttest (p = 0.002), although the WAAP showed less significant improvement in post-test scores (p = 0.135). ACA and WAAP posttest scores displayed no statistical difference.

Asthma action plan knowledge scores

There was no statistical difference between pretest and posttest scores for overall asthma action plan knowledge between ACA and WAAP, or within each group (Figure 2). Initially, the authors believed that providing even more knowledge on asthma action plans in the workshop would

Table 1. Participant characteristics

Characteristics, n (%)	All participant (n = 44)	Asthma care Application (n = 25)	Written asthma action plan (n = 19)
Female	41 (93)	22 (88)	19 (100)
Department			
Emergency	22 (50)	10 (40)	12 (63)
Pediatric	19 (43)	13 (52)	6 (32)
Others	3 (7)	2 (8)	1 (5)
Work experience			
<10 years	36 (82)	20 (80)	16 (84)
10 to 20 years	8 (18)	5 (20)	3 (16)
Have experience with asthma patients	42 (95)	24 (96)	18 (94)
Number of asthma patients treated in the past years			
<5	6 (14)	3 (12)	3 (18)
5 to 10	3 (7)	1 (4)	2 (12)
>10	35 (80)	21 (84)	14 (71)
Using a tablet or smartphone	42 (95)	24 (96)	18 (95)

improve the scores; nonetheless, the nurses already had a very good understanding of asthma as evidenced by their pretest results.

Satisfaction scores

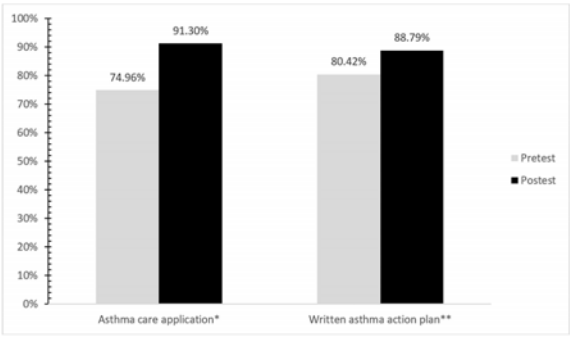
Overall, the satisfaction derived from using either the ACA or WAAP incurred no statistically significant difference (Table 2). However, there was a statistical significance in greater ACA satisfaction in three particular areas: ease of asthma action plan usage, reducing re-hospitalization, and convenience/portability ($p<0.001$, $p = 0.026$, $p = 0.026$, respectively).

Discussion

While there was no real overall difference in using either the WAAP or ACA in our study, the ACA will most likely have certain advantages in our population. According to the Thailand internet profile in 2018, Thais spend about 10 hours on average on internet use daily[9]. Increasing usage of mobiles and tablets might surge the benefit of ACA compare to WAAP. In the present study, the main benefit of the ACA was its convenience/portability to everywhere at any time as you download app into your smart devices and it's also available off-line. Furthermore, the ACA had the ability to be updated with new information such as attractive videos and other interactive features such as user experience surveys/polls.

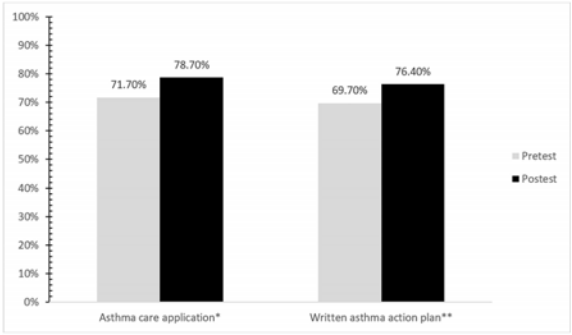
During asthma exacerbation, asthma action plan states the medication, how and when to access medical care[2]. A previous study found that patients using a digital asthma action plan had less number of urgent medical attendance and better adherence[10]. Besides, our study noted satisfaction level for emergency use, participants in ACA group consider using app could provide greater potential to reduce hospital admission. This ACA is considered more suitable for our current lifestyle help improving quality of life.

In some diseases such as diabetes mellitus, self-management is a crucial part of the treatment to prevent further complications. Educational app has been chosen to raise self-awareness with aims to introduce sustainable tools



* $p = 0.002$, ** $p = 0.135$

Figure 1. General asthma knowledge scores between asthma care application and written asthma action groups.



* $p = 0.097$, ** $p = 0.098$

Figure 2. General asthma action plan knowledge between asthma care application and written asthma action groups.

Table 2. Satisfaction Scores

Asthma care application	Written asthma	Action plan	*p*-value
For emergency use			
Ease of plan use	4.56	4.05	<0.001*
Reduction in mortality from exacerbation	4.36	4.32	0.78
Reduction in re-hospitalization	4.44	4.05	0.026*
Improvement in quality of life	4.36	4.21	0.69
Overview			
Creative/ease for use	4.46	4.53	0.69
Portability/convenience	4.71	4.37	0.026*
Descriptive images/text	4.44	4.47	0.76
Up-to-date information	4.46	4.53	0.67
Use as patient educational tool	4.54	4.63	0.56
Utility	4.58	4.53	0.72

* Statistically significant

and low-cost solution by providing the knowledge as well as maintaining long-term self-care management[11]. Parallel to that, to prevent asthma exacerbation and control the symptoms, patients need to understand the disease and the important of self-management in order to avoid allergens and other modifiable risk factors along with effective inhaler technique. All of that information has been given in ACA as graphics and easy understanding videos.

Study limitations

In the present study, our target is nurses at TUH; therefore, the sample size is small. Moreover, TUH does have the TU-CAAP which has been shown by high pretest scores. Increasing the sample size and the nurse specialty would be recommended in a future study, or they might focus on asthma patients as a target for the study.

Conclusion

This ACA has good possibilities for improving patient asthma knowledge and plan satisfaction as compared to current WAAP.

What is already known on this topic?

Asthma knowledges have immersed impact to self-management which is a key part in reducing exacerbation. According from guideline, asthma action plan is important for asthma education. WAAP have been introduced to all asthma patients aim to raise self-awareness and improve symptom control.

What this study adds?

Using ACA helps to improve asthma knowledge. ACA can be used in asthma patient as well as WAAP, by the way, ACA may be considered more suitable, accessible and satisficatory to most patients.

Acknowledgements

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Potential conflicts of interest

The authors declare no conflicts of interest.

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Appendix.

Asthma knowledge and asthma action plan knowledge questionnaire (Pre/post-test)

Questionnarie explanation

1. To inform researcher the overall results, and improve the effectiveness of project in advancement.
2. Please " in the box and completely fill out the information?

Had you have a chance to look after the asthma patients recently? ☐ Yes ☐ No

The number of asthma patient you are in charge of? ☐ less than 5 ☐ 5-10 ☐ more than 10

Part 1 General information

1. Gender ☐ Male ☐ Female
2. Occupation ☐ Nurse ☐ Others
3. Workplace: Department…….. Hospital……..
4. Period of work time ☐ less than 10 years ☐ 10-20 years
5. Age ☐ 20-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ more than 61
6. Educational degree ☐ Lower ☐ Bachelor's degree ☐ Higher
7. Types of asthma action plan that you use
   ☐ Written asthma action plan ☐ Asthma care application
8. Do you use smartphone/tablet? ☐ yes ☐ no

Part 2 General asthma knowledge

1. Asthma is characterized by airway hyperresponsiveness responding to allergen lead to bronchospasm ☐ yes ☐ no
2. Asthma Patient normally have symptom during day time ☐ yes ☐ no
3. Asthma symptoms are dyspnea with wheezing, chronic cough and chest tightness ☐ yes ☐ no
4. Asthma patient should avoid allergens such as dust mite, cockroach and cigarette smoke. ☐ yes ☐ no
5. Asthma patient can stop medication or buy any medication by themselves. ☐ yes ☐ no
6. Asthma patient can moderately do exercise, for example, walking fast, swimming and aerobic dance. ☐ yes ☐ no
7. Controller is being used only when they have had asthma symptoms. ☐ yes ☐ no
8. Asthma patient have inflammatory airways. ☐ yes ☐ no
9. Avoiding cockroach by using the closure trash bin and insecticide. ☐ yes ☐ no
10. Asthma patient's room should have adequate airway flow without dolls, pet's fur and dust mite. ☐ yes ☐ no
11. Cigarette smoke is not the cause of asthma exacerbation. ☐ yes ☐ no
12. Air condition can filter dust mite. ☐ yes ☐ no
13. Air condition can filter pollen in the air ☐ yes ☐ no
14. Taking pet for showering can reduce pet's fur and dandruff. ☐ yes ☐ no
15. Asthma cannot lead to death. ☐ yes ☐ no

Part 3 Asthma action plan knowledge

1. When asthma patients don't have any symptoms, they don't have to use reliever (Ventolin/beradual) every day to preventing the symptoms. ☐ yes ☐ no
2. Beginning of asthma symptoms are coughing during wake up and at night. ☐ yes ☐ no
3. During severe asthma exacerbation, patients should immediately visit doctor. ☐ yes ☐ no
4. Steroid inhaler can help reduce asthma exacerbation within 20 minutes. ☐ yes ☐ no
5. Asthma patient should use quick-relief inhaler 15 minutes before doing exercise. ☐ yes ☐ no
6. When asthma patients have wheezing, chest tightness, and cough, they should use quick-relief inhaler for bronchodilator and if see no improvement they should go to visit doctor. ☐ yes ☐ no
7. Worsening of shortness of breath or wheezing, asthma patients should go to hospital instantly without using any medication ☐ yes ☐ no
8. Cyanosis of lip is categorized as one sign of severe exacerbation. ☐ yes ☐ no
9. When patients have severe asthma exacerbation, they should use quick-relief inhaler every 15 minutes for 3 times and got to visit doctor with use of quick-relief inhaler every 15 minutes along the way. ☐ yes ☐ no
10. Having any mild to severe asthma symptoms, patients should always visit doctor. ☐ yes ☐ no
11. In Asthma action plan, green color mean asthma symptoms have been managed well ☐ yes ☐ no
12. In Asthma action plan, yellow color means an asthma attack. ☐ yes no
13. When asthma patients have cold or flu induce cough using reliever every 4-6 hour until symptoms resolved. ☐ yes ☐ no
14. pMDI inhaler is bronchodilator that can be used for treat and prevent asthma symptoms and exacerbation by inhale at least 2 times a day. ☐ yes ☐ no
15. Only doctor who can manage with asthma exacerbation. ☐ yes ☐ no

การศึกษาประสิทธิผลของการให้ความรู้โรคหืดโดยใช้แอสท์ม่า แคร์แอพพลิเคชั่น เปรียบเทียบกับการใช้แผ่นพับให้ความรู้แบบกระดาษในพยาบาล

จิติมา หิรัญญนิธิวัฒนา, ภัทริน ภิรมย์พานิช, พัชรา บุญญอนุชิต, จิตินันท์ ไมตรี, อรพรรณ โพชนุกูล

ภูมิหลัง: โรคหืดเป็นโรคเรื้อรังทางระบบทางเดินหายใจ แอสท์ม่าแคร์แอพพลิเคชั่น จึงถูกพัฒนาขึ้นมาเพื่อเสริมความรู้เบื้องต้นเกี่ยวกับโรคหืด ที่มีความสำคัญในแง่ของการลดอัตราการเกิดหืดกำเริบ และลดอัตราการเสียชีวิต

วัตถุประสงค์: เพื่อศึกษาความรู้โรคหืดเบื้องต้น และความพึงพอใจระหว่างแอสท์ม่าแคร์แอพพลิเชชั่น กับแผ่นพับให้ความรู้แบบกระดาษในพยาบาล

วัสดุและวิธีการ: งานวิจัยนี้เป็นงานวิจัยเชิงทดลอง โดยผู้เข้าร่วมวิจัยเป็นพยาบาลที่ทำงานอยู่ในโรงพยาบาลธรรมศาสตร์ โดยมีการสุ่มเป็นสองกลุ่มเพื่อเข้ารับการอบรมให้ความรู้โรคหืดพร้อมกับแอสท์ม่าแคร์แอพพลิเคชั่น หรือแผ่นพับให้ความรู้แบบกระดาษ มีการเก็บข้อมูลโดยใช้แบบสอบถามก่อนและหลังเข้าร่วมโครงการ

ผลการศึกษา: งานวิจัยนี้มีผู้เข้าร่วมโครงการจำนวน 44 คน โดยแบ่งเป็นกลุ่มที่ใช้แอสท์ม่าแคร์แอพพลิเคชั่น 25 คน และกลุ่มใช้แผ่นพับให้ความรู้แบบกระดาษ 19 คน พบว่าในกลุ่มที่ใช้แอสท์ม่าแคร์แอพพลิเคชั่นมีคะแนนแบบสอบถามหลังเข้าร่วมโครงการสูงกว่าแบบสอบถามก่อนเข้าร่วมอย่างมีนัยสำคัญ (p = 0.002) ในขณะที่กลุ่มที่ใช้แผ่นพับให้ความรู้แบบกระดาษ มีคะแนนต่างกันเพียงเล็กน้อย นอกจากนี้ในกลุ่มแอสท์ม่าแคร์แอพพลิเคชั่น มีรายงานว่าได้รับความพึงพอใจเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติในด้านการใช้งานง่าย (p<0.001) ลดการมาโรงพยาบาล (p = 0.026) และความสะดวกในการใช้สื่อ (p = 0.026)

สรุป: การใช้แอสท์ม่า แคร์แอพพลิเคชั่น เป็นหนึ่งในแนวทางการยกระดับความรู้เบื้องต้นเกี่ยวกับโรคหืดในผู้ป่วย รวมถึงความพึงพอใจในการใช้เมื่อเทียบกับแผ่นพับให้ความรู้แบบกระดาษที่ใช้อยู่ในขณะนี้ อย่างไรก็ตามควรมีการนำไปศึกษาต่อยอดในผู้ใช้งานจริงอันได้แก่ ผู้ป่วยโรคหืดต่อไป