

Utilization of Written Asthma Action Plan In a Pediatric Primary Care Setting

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### Abstract

**Problem:** Asthma is a common and potentially serious chronic disease that affects over 20 million adults and 6 million children in the United States. Pediatric standard of care supports providing an asthma action plan to asthma patients/families. The use of asthma action plans (AAP) has been associated with improved asthma patient outcomes. Studies have shown poor utilization of AAP by healthcare providers for promoting self-management and self-efficacy.

**Purpose:** The purpose of this DNP quality improvement project was to implement and evaluate the use of personalized written asthma action plans by healthcare providers in a pediatric primary care setting.

**Methods:** The project was implemented over a 13-week period beginning in September of 2019. Participants were existing and newly diagnosed asthma patients less than or equal to 21 years old who were receiving care for sick visits or annual physical examination. The conceptual framework of the project was based on Kurt Lewin's change theory. In addition, a 4-hour education and training on asthma and the importance of the AAP was given to the healthcare providers (a physician and nurse practitioner), the office manager, and supporting members of staff. Healthcare providers and medical assistants were equally trained on how to complete an asthma action plan. The change process included the use of a colored paper asthma action plan and medical assistants provided the AAP sheet with a completed demographic section of the tool before the medical provider completed the other sections.

**Results:** During the implementation period, data were collected on the number of AAP's completed by the healthcare providers. This information was aggregated through a chart audit of de-identified copies of completed AAP's. Run charts were used for data analysis. The clinic achieved 90% of AAP utilization rate, which surpassed the 60% goal of the project.

**Conclusion:** The implementation and utilization of a written asthma action plan and in-service training in a pediatric outpatient setting improves patient accessibility to a treatment plan by primary care healthcare providers. The use of an evidence-based AAP can enhance patient management of asthma by giving patients and caregivers a roadmap to asthma care.

### **Introduction and Background**

Asthma is a common and potentially serious chronic disease that imposes considerable burden on patients, their families, and the community (Global Institute for Asthma [GINA], 2015). Asthma causes inflammation of the airways with resulting hyper-responsiveness, intermittent or acute airway narrowing, and presents with a recurrent period of wheezing, chest tightness, shortness of breath, and cough (National Heart, Lung and Blood Institute [NHLBI], 2014). Asthma is the leading chronic disease in children, and it affects about 6 million children. It imposes a growing burden on individuals, family, and society by causing impairment of health-related quality of life, missing school or workdays, mortality, and high cost of care (Asthma and Allergy Foundation of America [AAFA], 2019).

Evidence-based national and international guidelines have been developed for the diagnosis and effective management of asthma in children and adults. Included in the many asthma management guidelines is the use of an individualized written asthma action plan (WAAP) which is intended to help patients and their parents (caregivers) to recall self-management instructions given by the health care provider. It provides guidance on daily actions to control asthma and reinforces how to adjust medication in response to signs of worsening asthma (American Academy of Pediatricians [AAP], 2013). However, despite guidelines, WAAPs are poorly utilized by healthcare providers (NHLBI, 2014). Despite the recommendation, relatively few providers develop asthma action plans as part of asthma management, both in the adult and pediatric patient population. According to the Centers for Disease Control and Prevention (CDC) 2013, only about 48.6% of children were more likely to report having an AAP compared with 27.4% of adults.

The purpose of this quality improvement (QI) project was to implement and evaluate the use of written asthma action plans (WAAP) by healthcare providers in a pediatric primary care setting.

### **Literature Review**

Andrews, Jones and Mullan (2014) completed a systematic review of sixty-four articles to appraise available current evidence on asthma self-management and identify barriers or facilitators to effective self-management practices. The individualized asthma action plan was implemented as a tool to direct self-efficacy and self-management in all the articles reviewed, which included both pediatric and adult populations. The findings revealed that the use of AAP contributed to medication adherence, reduce mortality, and improved lung function.

Ducharme et al. (2011) conducted a single masked, randomized controlled design study in a pediatric emergency department (ED) to examine the efficacy of providing a written action plan together with a prescription (WAP-P) to improve adherence to medications among children. Children in the WAP-P group had a significant increase (68% vs. 50%) in the use of Fluticasone when compared to the control group of the 28 days. Children in the WAP-P group displayed significantly better asthma control, with 40% more patients were reporting less than two indicators of poor control. Compared with the control group, fewer patients in the WAP-P group stopped Fluticasone (51% vs. 72%; relative risk, 0.73; 95% CI, 0.58–0.92) which was evidence of good medication adherence (Ducharme et al., 2011).

The study by Lakupoch, Manuyakorn, Preutthipan, and Kamalporn (2018) utilized questionnaires, interviews, and data audits to collect data from the study participants. The prospective cohort study aimed at evaluating the effectiveness of a newly developed asthma action plan. The outcome was significantly reduced emergency room visits (P-value 0.005),

unscheduled of unscheduled doctors visit (P-value 0.046), admission days (P-value 0.026), and school absence days (P-value 0.022) compared to before the intervention (Lakupoch et al., 2018). Parent satisfaction- 85% were satisfied with the WAAP, and 95% felt more confident in asthma self-management of their children. The strength of the study was that experts validated the questionnaire and the WAAP tool that was developed before the investigation began. However, a larger sample size will be required to generalize the result.

A similar study conducted by Khan, Maharaj, Seerattan, and Babwah (2014) evaluated the effectiveness of adding a personalized WAAP in the treatment of children with partly controlled asthma in a pediatric clinic. The study was a well-designed RCT conducted in two different institutions and preceded by a pilot study, with sample size and power analysis calculated. The WAAPs group had fewer ER visits than the control group 36 vs. 52% ( $p = 0.141$ ), respectively.

An electronic AAP (eAAP) study conducted by Kuhn et al., 2015) utilized propensity score matching design to conduct a quantitative study to evaluate the implementation of eAAP in about 40 outpatient clinics caring for both pediatric and adult asthma patients. The result revealed a significant decline in exacerbation among the pediatric population at 3, 6, and 12 months using pre/post analyses.

The five articles acknowledged an asthma action plan as an essential component of patient education and self-management and that it is underused in asthma patient management. There were few differences in the content of the AAP implemented. Such variations included the use of color-coded zones and pictograms to simplify the content for easy understanding.

Similar patient outcomes were studied in the articles, and these include medication adherence, the number of ER visits, number of an unscheduled doctor visit, number of acute asthmatic attacks, and number of school or work absence days.

### **Theoretical Framework**

Kurt Lewin's change theory provided a model for understanding the approach to influence the human aspect of an organizational change. Lewin's change model was used as the conceptual framework to guide the implementation of the evidence-based quality improvement change in health providers' compliance in providing an individualized AAP to pediatrics in a local outpatient clinic. The three components of Lewin's change theory are the unfreezing stage, moving stage, and the refreezing stage and are related by three concepts which include the driving forces, restraining forces, and equilibrium (Nursing Theory, 2016).

Providing supporting national guidelines and evidence-based studies that inform on problems with the current practice, why it needs to change, the suggested change and its associated benefit served as the driving force towards practice change. The second phase of the Lewin's change theory was making the actual change, which was providing individualized WAAP to asthmatic patients in the clinic. It involved being able to overcome the barriers that mitigated against practice change, such as employee bias against the practice change. The final stage was the refreezing stage in which the implemented practice change will be sustained, and it becomes the new status quo of the organization (Hussain et al., 2018). The process of using the Lewin's change theory in the implementation of AAP included retrospective data review, adopting a collaborative approach between the project manager, providers, and staff of the project site to develop a structural change that will fit into the workflow to ensure support and sustainability of the project.

## **Methods**

### **Project Type, Population and Setting**

The quality improvement (QI) project was focused on the implementation of an asthma action plan among asthma patients in a pediatric outpatient clinic located in suburban Maryland. Participants were existing and newly diagnosed asthma patients less than or equal to 21 years old who were receiving care for sick visits or annual physical examination.

### **Change in Structures and Processes**

The strategic planning and pre-implementation phase began in June 2019 with a baseline assessment to determine the need, feasibility, knowledge base, and learning needs of the practice. The asthma population of the practice was identified as the group in most need of evidence-based practices that will improve patient's outcomes. After meetings and collaboration with the clinical site representative (who is the owner and medical director of the practice), the office manager, nurse practitioner, and other staff members, the AAP tool to be adopted for the project was decided (see Appendix A). The NHLBI color-coded AAP template was selected because the key components of AAP were clearly presented. Also, it was cost and readily available for use because authorization to use it was not required. In addition, a 4-hour education and training on asthma and the importance of the AAP was given to the healthcare providers (a physician and nurse practitioner), the office manager, and supporting members of staff on July 17, 2019 by the project facilitator. All members of staff were invited to the in-service to raise awareness of the intended practice change and to garner their support. To protect human subjects during the quality improvement project, an Institutional Review Board (IRB) approval for Non-Human Subjects Research (NHSR) was obtained from the University of Maryland Baltimore IRB and all patients' data were de-identified and kept securely in a locked file cabinet within the practice.

The process change to improve healthcare providers workflow required the medical assistants (MAs) to complete the non-medication aspect of the AAP tool: (a) name of the patient, (b) name of provider, (c) date, (d) healthcare provider's phone number and, (e) emergency department phone number. The MA's were equally trained to identify eligible asthma patients' and add an AAP template to the patients' chart during sick visits or during an annual physical examination. Also provided were copies of the National Asthma Education and Prevention Program Expert Panel Report 3 (EPR-3) guideline (NHLBI, 2018) and supporting evidence-based literature for referencing. On the other hand, the health providers, in collaboration with each patient made needed changes to the patient's medications and provided updated written AAP at each episodic visit and annual physical examination. The short-term goal was that sixty percent of eligible asthma patients would be provided with an individualized AAP to help improve self-management and achieve better asthma control.

### **Data Collection**

The number of eligible patients was generated from the electronic health record. Each completed AAP was duplicated, de-identified and kept for data collection. The presence of written AAP serves as evidence of the health providers' use and provision of AAP to asthma patients. A unique patient identifier was generated for each patient when documenting in the audit sheet. The completed copies of the AAP were used to evaluate if providers completed all the required sections of the AAP tool given to the patients. An audit chart developed by the project facilitator was used to collect all the data and input in an excel spreadsheet (see Table 2 for the data audit sheet). On-site data collection was done weekly by manually reviewing the copies of the de-identified written AAP. The run chart was plotted from the data documented on

the chart audit sheet to identify the trend in the process measure. The process outcome measured were the frequency and percentages of the utilization of the AAP by the healthcare providers.

### **Data Analysis**

The data analysis plan consisted of quantitative analysis of de-identified subjects. Data collected in the asthma action plan audit sheet were manually entered into the excel spreadsheet for data analysis. The percentage of the utilization rate was calculated by dividing the summation of the number of completed AAP by the summation of the total eligible patients. The process outcome measure numerator was the number of asthma patients who received AAP during the implementation period. The denominator was the total number of eligible asthma patients cared for during the implementation period.

### **Results**

Prior to the start of the program, the clinic reported poor utilization of the electronic AAP. The structural changes made included a 4-hour education and training session for the medical assistants and the medical providers in practice. There was 100% compliance in attendance among all the healthcare providers and the implementation team. The implementation team completed samples of AAPs post staff training and they demonstrated the ability to complete correctly. By September 1st, the MAs, physician, and nurse practitioner began implementing the process change and completing the AAP accordingly. The implementation period lasted for 13 weeks and ended on December 1st (See Appendix B for timeline). A retrospective review of the electronic health records (EHR) shows that one hundred and twenty patients met inclusion criteria (N=120). At the end of the implementation phase, one hundred and eight AAPs were completed and given to asthma patients (n=108). Following educational intervention and system changes, ninety percent (90%) of pediatric asthma patients that visited

the clinic received written AAP during the intervention period, which surpassed the goal of 60%, as depicted in figure 1. In the last week of the project, a 100% utilization rate was recorded compared to a 50% utilization rate in the first week of the implementation.

The key facilitators for the QI project were the nurse practitioner, who joined mid-intervention and mobilized the team and one medical assistant project champion. The office manager who initially volunteered to be one of the project champions got busy with other assignments and could not offer the necessary support.

Barriers to the project were the amount of time it took to complete the AAP and the patient education component of the AAP. These barriers increased the time spent with each patient thereby slowing down the workflow. Healthcare providers also reported occasionally forgetting to complete the AAP, especially when the AAP tool was not made available by the MAs per to the QI project protocol.

### **Discussion**

Following educational intervention and system procedural changes to implement an evidence-based guideline on asthma management, the rate of utilization of written individualized asthma action plan increased among healthcare providers in the pediatric primary practice. Healthcare providers achieved 90% of the AAP utilization rate during the QI project. Tailoring interventions to the context and needs of the practice led to significantly more positive effects (Harvey & Lynch, 2017). The process data outcome reflected the progress the healthcare providers made in providing standard care for the patient's asthma population.

Other strategies utilized to improve adherence among the implementation team included sending email reminders to the project champions, weekly visits by the project director and meetings with the project champions and implementation team to get feedback on the progress of

the interventions. To enhance the project's progress, the project director utilized weekly run charts to display data and also gave monthly updates on the progress of the project during the clinic monthly meetings. A large AAP educational poster was made that contained the steps of the process change and the eligibility criteria of participants. This poster served as a reminder to the implementation team of the eligibility criteria of the intervention and reminded them of the ongoing QI intervention. A smaller version of the poster would have been beneficial if it was posted into each room as it could raise awareness among the patients of the need for an AAP while serving as reminders to the healthcare providers.

The outcome of the QI project was similar to other studies that found improved healthcare provider's use of AAP following education and procedure changes (Akhter, Monkman, Vang & Pfeiffer, 2017; Andrews, Jones & Mullan, 2014; Bundy & Murphy, 2014).

There was a notable decrease in number of AAPs completed during the third to fifth week. The feedback gathered from the implementation team was that the interventions were time-consuming, resulting in loss of interest and motivation among the medical assistants. Occasionally, identification of eligible patients was not done and providers did not complete AAP.

The strength of the project was the consistent participation of the health practitioners in the project. The organizational leaders elevated and prioritized the AAP as a standard of care that is required for optimizing asthma patients' outcomes. To encourage staff participation in this project, the project director would solicit feedback and input from the staff in ways to better the project and support the team. Providing consistent weekly reminders, visits and update of project data on the project poster board were also beneficial.

Providing education on asthma management promotes self-efficacy and effective monitoring and management of asthma symptoms (Global Initiative for Asthma, 2018). A limitation to this project was that more emphasis was given to completion of an AAP rather than using the AAP to provide patient education. There was also no plan to evaluate the learning needs of the patient before and after completing the AAP. Another limitation in this project revolves around retrieving of data from the practice EHR; therefore, pre-intervention electronic AAP data could not be collected for more reliable, in-depth data analysis. The data from the project could not be generalized because there was no geographical variability of samples. In addition, this project design was also not a quantitative research, but a quality improvement project with outcomes intended for the understudied institution and not for generalizable knowledge.

### **Conclusion**

The QI project was useful in implementing an evidence-based practice in an outpatient setting. The strategy planned to enhance the sustainability of AAP optimization would be to permanently add a reminder/prompt into the EHR for healthcare providers when reviewing the electronic records of asthma patients.

Improving organization readiness and practice culture of medical providers and staff is crucial to AAP optimization. Having an updated written AAP gives an asthma patient a concrete guide to the identification of asthma symptoms and appropriate management. This project emphasized the role of a Doctor of Nursing Practice (DNP) leader in the dissemination and implementation of guidelines and evidence-based practices or protocols.

Recommended future research activities should focus on two areas. First, more studies should consider evaluating AAP utilization by patients and their caregivers. Second, the

effectiveness of AAP in improving asthma outcomes such as ER visits, missed school days, low quality of health, and medication non-adherence should be evaluated.

In summary, through education and collaboration among the healthcare providers and staff, the team implemented the utilization of a written individualized asthma action plan for pediatric asthma patients in this suburban outpatient pediatric clinic.

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## Tables

Table 1. *Evidence Review Table**Using the Melnyk – Fineout-Overholt Evidence Rating Criteria and Newhouse Rating Scale for Quality of Evidence*

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
Andrews, Jones & Mullan, 2014.	To review the current literature on asthma self-management programs in adult and children. Also, to determine barriers or facilitators to effective self-management outcomes.	Systematic reviews	N=64 systematic reviews which included qualitative analysis and randomizes clinical trials on WAAP, symptoms monitoring, patient education, and regular medical review	To find proponents of WAAP measured as reported by patients or caregivers  To find the relationship between self-efficacy and self-management measured by the verbal report of the participants	Increased evidence found that WAAP contributed to improved asthma medication adherence.  WAAP is not being used by patients because the health care provider does not consistently provide them  Self-efficacy was identified as a facilitator to behavior modification	1 C
Ducharme, Zemek, Chalut, McGillivray, Noya,	To evaluate the efficacy of a written asthma action plan coupled with a	Single-masked Randomized Controlled Trial	N=219 children aged 1-17 years. Intervention group n=109, control group n= 110.	Patient adherence to the use of Fluticasone inhalers	The intervention group had more than a twofold higher median adherence rate in days	2 B

<p>Resendes, Khomenko, Rouleau, Zhang, 2015</p>	<p>prescription (WAP-P) to improve adherence to medications and asthma control</p>			<p>(controller) 28 days after discharge, measured by using electronic dose counters.</p> <p>The effectiveness of using WAP measured by the number of unscheduled acute care visits from hospital record.</p>	<p>15–28 compared with placebo ( control) group, with a mean group difference of 16.13% (95% CI, 2.09–29.91).</p> <p>Children in the WAP-P group had a significant increase (68% vs. 50%) in the use of Fluticasone than the control group of the 28 days</p> <p>Children in the WAP-P group displayed significantly better asthma control, with 40% more patients were reporting less than two indicators of poor control.</p> <p>There was no significant difference in the use of rescue albuterol, acute-care visits, or quality-of-life scores for the child or caregiver.</p>	
<p>Khan, Maharaj, Seerattan, &amp; Babwah, 2014)</p>	<p>To evaluate the effectiveness of adding a personalized written asthma action plan (WAAP) in the treatment of</p>	<p>Blinded Randomized controlled trial</p>	<p>N= 91, intervention group= 45, control group= 46 Children with partly controlled asthma were randomized to receive a personalized</p>	<p>(i)the number of ER visit(s); (ii) number of asthmatic attacks; (iii) number of unscheduled doctor visit(s);</p>	<p>Both interventional and control groups experienced a statistically significant reduced number of ER visits ( <math>p = 0.005</math> and <math>0.0002</math>) and number of asthmatic attacks and acute asthmatic attacks ( <math>p = 0.0064</math> and <math>0.0006</math>).</p>	<p>2B</p>

	children with partly controlled asthma.		WAAP or no plan, in addition to standard care including education (the issuance and explanation of asthma education material and scheduled clinic reviews).	(iv) number of night-time awakenings and (v) number of school days missed. Outcomes were measured by reported data from parents or caregiver during the 6months of the study	However, the WAAPs group had fewer ER visits than the control group 36 vs. 52% ( $p = 0.141$ ) respectively. Although statistically insignificant, the mean number of other outcomes were better in the WAAP intervention group than the control group i.e unscheduled doctor visit, night-time awakening and number of missed school days.	
Kuhn, Reeves., Taylor, Tapp, Mcwillia, Gunter, Cleveland & Dulin. (2015)	To develop an electronic AAP decision support tool (eAAP) within the electronic health record (EHR) that will enhance provision of AAP by providers, while also creating an individualized instructional handout for patients to use as	Propensity score matching design. Propensity matching macro based on the nearest neighbor algorithm. <sup>22</sup> Controls were selected from a pool of 25,926 patients who attended a health care system practice where no providers	N= 10,348 participants (children and adults) Intervention group=5174 , matched with control group=5174 From 40 outpatient practices.	Number of asthma exacerbation measured by 1)frequency of asthma related ED visits 2) oral steroid use 3)frequency of asthma related hospitalization	1.Children with eAAP had 33% lower odds of receiving an oral steroid for asthma 2. Asthma-related ED visits declined after 3, 6, and 12 months compared with patients not receiving an eAAP. 3.There was decline in hospitalization although insignificant due to low incidences of hospitalization. 4.Among the adult population at 3 months, there was a decrease in outpatient oral steroids and reduction in any	2A

	<p>their self-management plan. Also, to evaluate the effectiveness of the eAAP's in reducing asthma exacerbation.</p>	<p>had used the eAAP tool.</p>			<p>exacerbation after receiving an eAAP. 5. Equivalent measures for adults were not statistically significant at 6 and 12 month most likely due to smaller sample size.</p>	
<p>Lakupoch, Manuyakorn, Preutthipan, &amp; Kamalaporin, 2018</p>	<p>To evaluate the effectiveness of a newly developed asthma action plan in the management of children with asthma</p>	<p>A prospective cohort study that followed up participants for six months after intervention</p>	<p>N= 52 children between the ages of 5-18 years. 2 participants were lost in follow up and 1 was treated with immunotherapy. 49 participants were included in the analysis.</p>	<p>1)the number of ER visits 2)number of unscheduled doctors visit 3)number of acute asthmatic attack 4)number of school absence days 5) parent satisfaction with the newly developed WAAP, measured by the use of pre and post-study questionnaire</p>	<p>Significantly reduced emergency room visit (P-value 0.005), unscheduled of unscheduled doctors visit (P-value 0.046), admission days (P-value 0.026) and school absence days (P-value 0.022).  Parent satisfaction- 85% were satisfied with the WAAP and 95% felt more confidence in asthma self-management of their children.</p>	<p>3A</p>

Table 2: Asthma Action Plan (AAP) Data Audit Sheet

<b>Date of Visit</b>	<b>Date of Review</b>	<b>Patient Study ID</b>	<b>Diagnosed with Asthma Yes=1 No= 0</b>	<b>Had AAP Prior to Intervention: Yes=1 No= 0</b>	<b>AAP Completed: Partially=0 Fully=1</b>	<b>Total # of Eligible Patients</b>
<b>Week 1</b>						

Appendix A

**Asthma Action Plan**

For: \_\_\_\_\_ Doctor: \_\_\_\_\_ Date: \_\_\_\_\_  
 Doctor's Phone Number \_\_\_\_\_ Hospital/Emergency Department Phone Number \_\_\_\_\_

**GREEN ZONE**

**Doing Well**

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

**And, if a peak flow meter is used,**

**Peak flow:** more than \_\_\_\_\_  
 (80 percent or more of my best peak flow)

My best peak flow is: \_\_\_\_\_

Take these long-term control medicines each day (include an anti-inflammatory).

Medicine	How much to take	When to take it
_____	_____	_____
_____	_____	_____
_____	_____	_____
Before exercise	<input type="checkbox"/> _____ <input type="checkbox"/> 2 or <input type="checkbox"/> 4 puffs	5 minutes before exercise

**YELLOW ZONE**

**Asthma Is Getting Worse**

- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all, usual activities

**-Or-**

**Peak flow:** \_\_\_\_\_ to \_\_\_\_\_  
 (50 to 79 percent of my best peak flow)

**First** Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.

\_\_\_\_\_  2 or  4 puffs, every 20 minutes for up to 1 hour  
(short-acting beta<sub>2</sub>-agonist)  Nebulizer, once

**Second** **If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:**

Continue monitoring to be sure you stay in the green zone.

**-Or-**

**If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:**

Take: \_\_\_\_\_  2 or  4 puffs or  Nebulizer  
(short-acting beta<sub>2</sub>-agonist)

Add: \_\_\_\_\_ mg per day For \_\_\_\_\_ (3–10) days  
(oral steroid)

Call the doctor  before/  within \_\_\_\_\_ hours after taking the oral steroid.

**RED ZONE**

**Medical Alert!**

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

**-Or-**

**Peak flow:** less than \_\_\_\_\_  
 (50 percent of my best peak flow)

**Take this medicine:**

\_\_\_\_\_  4 or  6 puffs or  Nebulizer  
(short-acting beta<sub>2</sub>-agonist)

\_\_\_\_\_ mg  
(oral steroid)

**Then call your doctor NOW.** Go to the hospital or call an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

**DANGER SIGNS**

- **Trouble walking and talking due to shortness of breath**
- **Lips or fingernails are blue**

➔

- **Take  4 or  6 puffs of your quick-relief medicine AND**
- **Go to the hospital or call for an ambulance \_\_\_\_\_ NOW!**  
(phone)

See the reverse side for things you can do to avoid your asthma triggers.

Note: *NIH Asthma Action Plan*

### How To Control Things That Make Your Asthma Worse

This guide suggests things you can do to avoid your asthma triggers. Put a check next to the triggers that you know make your asthma worse and ask your doctor to help you find out if you have other triggers as well. Then decide with your doctor what steps you will take.

#### Allergens

##### Animal Dander

Some people are allergic to the flakes of skin or dried saliva from animals with fur or feathers.

The best thing to do:

- Keep furred or feathered pets out of your home.
- If you can't keep the pet outdoors, then:
  - Keep the pet out of your bedroom and other sleeping areas at all times, and keep the door closed.
  - Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet away from fabric-covered furniture and carpets.

##### Dust Mites

Many people with asthma are allergic to dust mites. Dust mites are tiny bugs that are found in every home—in mattresses, pillows, carpets, upholstered furniture, bedcovers, clothes, stuffed toys, and fabric or other fabric-covered items.

Things that can help:

- Encase your mattress in a special dust-proof cover.
- Encase your pillow in a special dust-proof cover or wash the pillow each week in hot water. Water must be hotter than 130°F to kill the mites. Cold or warm water used with detergent and bleach can also be effective.
- Wash the sheets and blankets on your bed each week in hot water.
- Reduce indoor humidity to below 60 percent (ideally between 30–50 percent). Dehumidifiers or central air conditioners can do this.
- Try not to sleep or lie on cloth-covered cushions.
- Remove carpets from your bedroom and those laid on concrete, if you can.
- Keep stuffed toys out of the bed or wash the toys weekly in hot water or cooler water with detergent and bleach.

##### Cockroaches

Many people with asthma are allergic to the dried droppings and remains of cockroaches.

The best thing to do:

- Keep food and garbage in closed containers. Never leave food out.
- Use poison baits, powders, gels, or paste (for example, boric acid). You can also use traps.
- If a spray is used to kill roaches, stay out of the room until the odor goes away.

##### Indoor Mold

- Fix leaky faucets, pipes, or other sources of water that have mold around them.
- Clean moldy surfaces with a cleaner that has bleach in it.

##### Pollen and Outdoor Mold

What to do during your allergy season (when pollen or mold spore counts are high):

- Try to keep your windows closed.
- Stay indoors with windows closed from late morning to afternoon, if you can. Pollen and some mold spore counts are highest at that time.
- Ask your doctor whether you need to take or increase anti-inflammatory medicine before your allergy season starts.

#### Irritants

##### Tobacco Smoke

- If you smoke, ask your doctor for ways to help you quit. Ask family members to quit smoking, too.
- Do not allow smoking in your home or car.

##### Smoke, Strong Odors, and Sprays

- If possible, do not use a wood-burning stove, kerosene heater, or fireplace.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, and paints.

#### Other things that bring on asthma symptoms in some people include:

##### Vacuum Cleaning

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you vacuum, use a dust mask (from a hardware store), a double-layered or microfilter vacuum cleaner bag, or a vacuum cleaner with a HEPA filter.

##### Other Things That Can Make Asthma Worse

- Sulfites in foods and beverages: Do not drink beer or wine or eat dried fruit, processed potatoes, or shrimp if they cause asthma symptoms.
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.
- Other medicines: Tell your doctor about all the medicines you take. Include cold medicines, aspirin, vitamins and other supplements, and nonselective beta-blockers (including those in eye drops).



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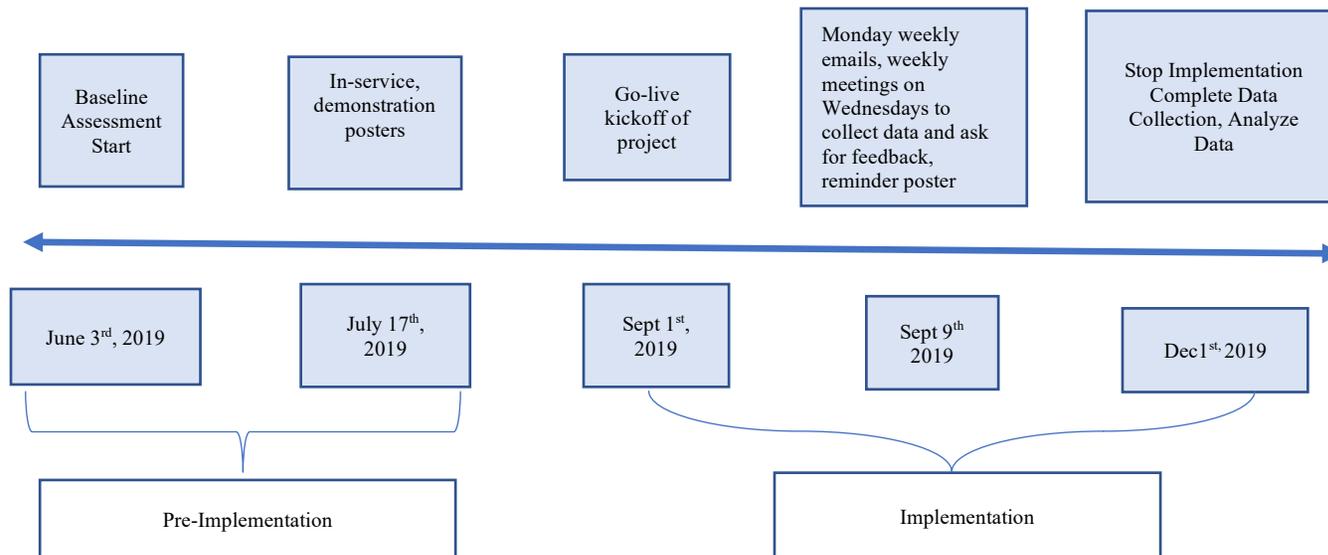
National Heart  
Lung and Blood Institute

For More Information, go to: [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov)

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Note: *NIH Asthma Action Plan*

### Appendix B Project Timeline



**Pediatric Patients ( $\leq 21$ years old) with Completed Asthma Action Plan**

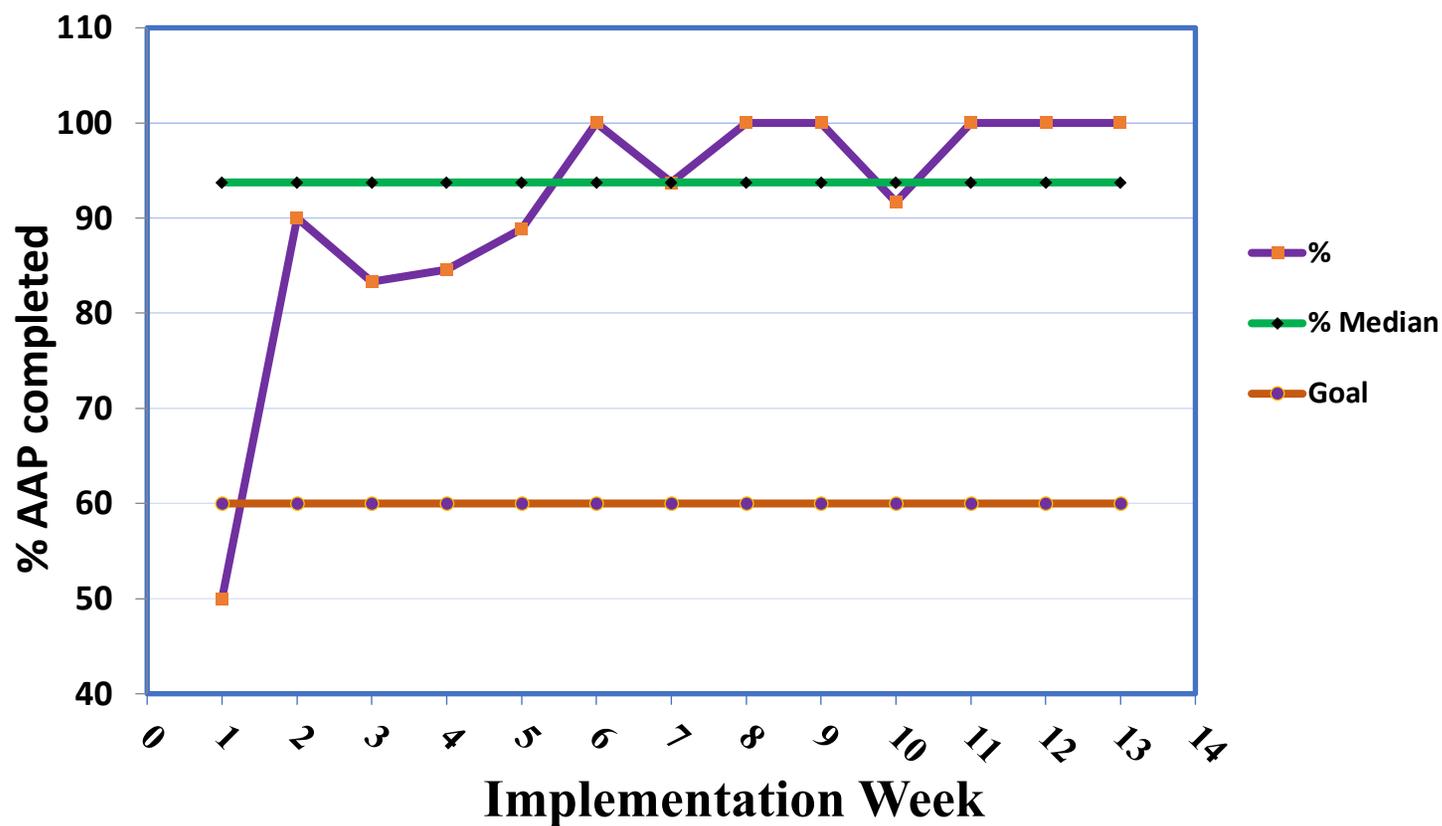


Figure 1: Asthma Action Plan given During Project (n=103)

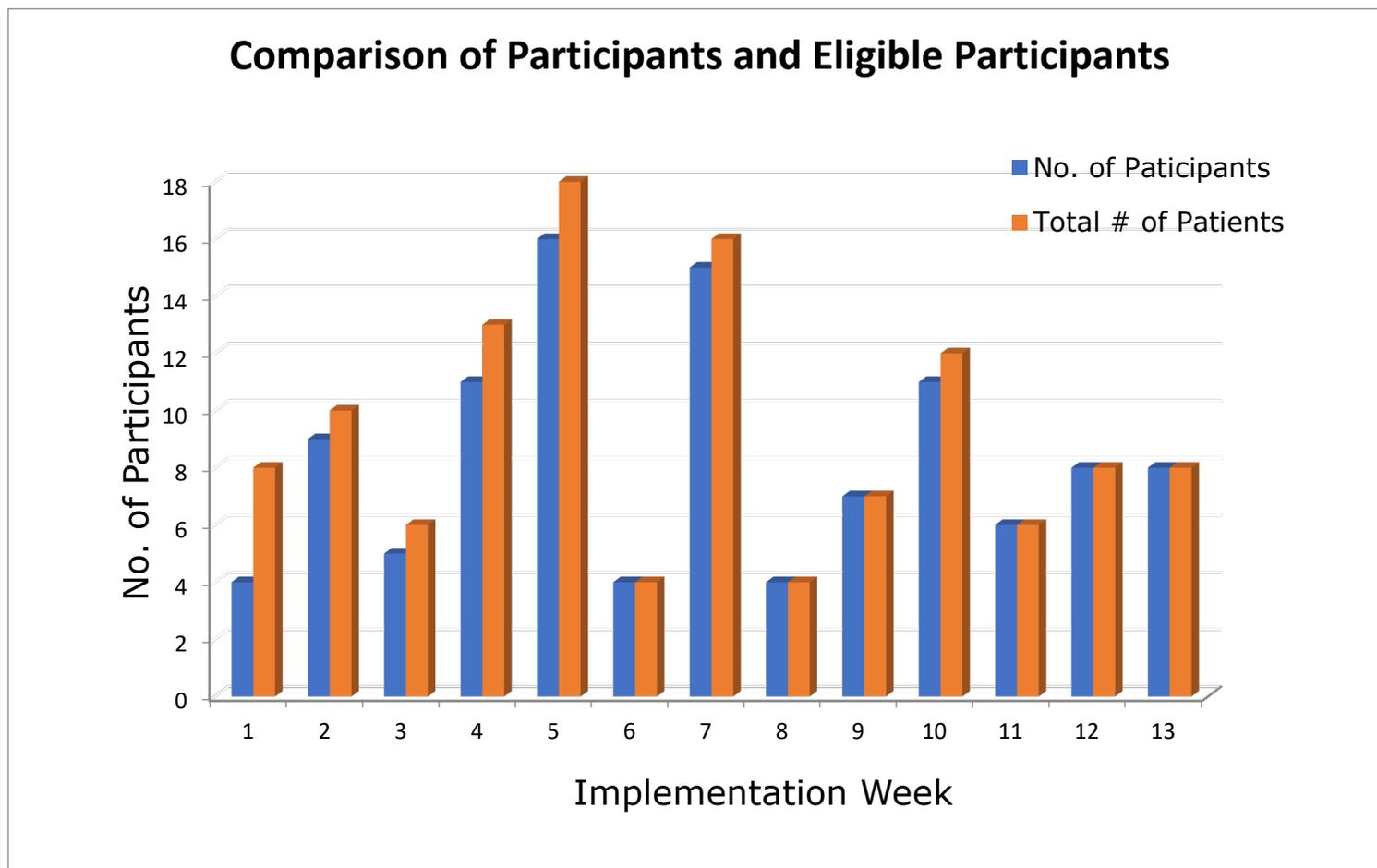


Figure 2: Comparison of participants and eligible patients in the project (n=108, N= 120)