FACILITATING THE USE OF ASTHMA ACTION PLANS IN PRIMARY CARE:

A QUALITY IMPROVEMENT PROJECT

by

Anne Kathryn Piper

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As members of the DNP Project Committee, we certify that we have read the DNP Project prepared by Anne Kathryn Piper entitled “Facilitating the Use of Asthma Action Plans in Primary Care: A Quality Improvement Project” and recommend that it be accepted as fulfilling the DNP Project requirement for the Degree of Doctor of Nursing Practice.

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Final approval and acceptance of this DNP Project is contingent upon the candidate’s submission of the final copies of the DNP Project to the Graduate College.

I hereby certify that I have read this DNP Project prepared under my direction and recommend that it be accepted as fulfilling the DNP Project requirement.

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SIGNED: Anne Kathryn Piper
ACKNOWLEDGMENTS

I want to express my gratitude to my committee chair, Dr. Marylyn McEwen, and committee members, Dr. Jane Carrington, and Dr. Laura McRee, for all your support and guidance through this project. There were so many ups and downs, but your guidance, encouragement, support, and commitment to learning were invaluable over the past year.

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Finally, and most importantly, I thank and praise God every day for sending me on this journey. For only He knows my path in life and has never given me more than I can handle. He is my Rock and Salvation.

“Trust in the LORD with all thine heart; and lean not unto thine own understanding.”
Proverbs 3:5
DEDICATION

This project is dedicated to my son, Elijah, may you know that you can aspire to be whatever your heart desires through Faith, Hope, and Love. And to my patients - past, present, and future - for you were my inspiration.
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ABSTRACT

Asthma is a chronic respiratory disease affecting over 300 million individuals worldwide (Akinbami et al., 2012; Brashers, 2010). Despite increased knowledge regarding the mechanisms and pathophysiology of asthma and increased treatment options, the prevalence of asthma in the United States continues to rise (Akinbami et al., 2012). Evidence-based guidelines on the treatment and management of asthma have been available for over 20 years and the use of Asthma Action Plans (AAP) has been consistently recommended to provide patients with the self-management skills to control asthma symptoms. However, research has consistently demonstrated underutilized AAPs as a method to decrease asthma exacerbations.

The purpose of this DNP project was to develop and implement a quality improvement (QI) initiative with Internal and Family Medicine in Mesa-Gilbert, Arizona that will improve asthma clinical management by providing the patient self-management skills needed to control the symptoms, prevent complications, and improve outcomes through the implementation of AAP standards for patients diagnosed with asthma.

Using the Plan-Do-Study-Act (PDSA) method to promote quality improvement (QI), a root cause analysis was conducted to evaluate the current processes within the clinic. The QI team agreed upon a process change, which was implemented to promote the identification of patients with asthma so that an AAP could be implemented. The low rates of patients identified during the time period in which this QI project was conducted presented a limitation as to whether the process change was truly effective.

This project discussed the process of QI using the PDSA Model for Improvement and need for evidence-based practice to promote improved patient outcomes. Further PDSA cycles
and additional time are required to fully incorporate process change and to determine the effectiveness of the intervention.
INTRODUCTION

Asthma is one of the most common airway diseases affecting individuals of all ages. It is frequently characterized by variable wheezing, shortness of breath, cough, and chest tightness that is reversible with proper treatment (Maslan & Mims, 2014; Zahran, Bailey & Garbe, 2011). Despite increased knowledge of the mechanisms of asthma and availability of treatment options, the prevalence of asthma diagnoses continues to rise across all demographics, with associated morbidity and mortality demonstrating a similar upward trend (Akinbami et al., 2012; Zahran, Bailey & Garbe, 2011). Guidelines published by the National Heart Lung and Blood Institute (NHLBI, 2007), and the joint work of NHLBI and the World Health Organization to develop the strategic Global Initiative for Asthma (GINA, 2015) advocate for the use of asthma action plans (AAP) for all individuals with an asthma diagnosis to provide the self-management skills needed to control the symptoms, prevent complications, and improve outcomes. AAPs are a written document developed between the patient and medical provider that outline a patient’s daily asthma management, as well as, short-term changes to asthma treatment in the event of worsening asthma severity and/or changes in peak expiratory flow (GINA, 2015). Despite these recommendations being in place for over 20 years, however, implementation and follow-up rates of action plans remain suboptimal at around 34% for all asthma patients (Ring et al., 2015; Zahran, Bailey & Garbe, 2011).

Project Purpose

The purpose of this DNP quality improvement (QI) project was to examine factors that contribute to underutilization of AAP standards for patients diagnosed with asthma and to
implement a change intervention to increase use of AAP standards for patients seeking treatment at the Internal Medicine and Family Practice Clinic in Mesa, Arizona.

**Project Aim**

The aim of this DNP project was to develop and implement a quality improvement (QI) initiative with Internal and Family Medicine in Mesa-Gilbert, Arizona that will improve use of AAP standards for patient diagnosed with asthma by 85% from baseline measures within four weeks of implementation. In addition, this project helped identify benefits and barriers of AAP use in the selected primary care setting. Implementation of AAP standards are intended to provide the patient self-management skills needed to control their symptoms, prevent complications, and improve outcomes through the implementation of AAP standards for patients diagnosed with asthma.

**Background Knowledge**

Simply defined, asthma is a state of hyper-responsiveness of the bronchial airways that contributes to airway obstruction and underlying chronic inflammation (Brashers, 2010; Maslan & Mims, 2014). Considered as a heterogeneous disease with various phenotypic presentations (GINA, 2015), asthma is also recognized to have a strong familial component with nearly 100 different genes implicated in the disease process (Brashers, 2010). In addition to genetic factors, repeated exposure to various allergens or irritants has been correlated with an increased risk of asthma development, as well as, affecting symptom severity and overall asthma control (Brashers, 2010; Follenweider & Lambertino, 2013). Dust mite infestations, tobacco smoke exposure, mold, cockroach allergen, and domesticated cats and dogs are the most common indoor risk factors, while air pollution, such as exhaust from vehicles and desert dust, are the
most common environmental irritants (Follenweider & Lambertino, 2013). Exposure to these various allergens triggers inflammatory mediators such as histamine, prostaglandins, and leukotrienes, which promotes hyper-responsiveness of the airways, pathological changes, and airway remodeling (Maslan & Mims, 2014). Non-allergic asthma may also be seen and is characterized by an absence of IgE antibodies in the presence of either indoor or environmental triggers (Maslan & Mims, 2014).

The prevalence of asthma in the United States has steadily increased since 2001, from 7.3% to 8.4%, with current estimates of 25.7 million individuals affected and further global burden of 300 million individuals worldwide (Akinbami et al., 2012; Brashers, 2010). Children under the age of 17 are more likely to have an asthma diagnosis compared to adults, with incidence more common in young boys and adult women within these subgroups (Maslan & Mims, 2014). Lower socioeconomic status, less educational background, and the presence of multiple comorbid health conditions also contribute to an increased rate of asthma (Maslan & Mims, 2014; Zahran, Bailey & Garbe, 2011). Further trends have been noted among blacks, American Indians, and Alaskan Natives as having an increased prevalence rate compared to Caucasians and Hispanics overall (Akinbami et al., 2012; Zahran, Bailey & Garbe, 2011).

Asthma is among the top five costliest health conditions in the United States, with medical expenditures exceeding $75.9 billion per year (Soni, 2015). It is estimated that the average cost of care is $3259 per person per year for an individual with asthma, with an additional $1680 for prescriptions alone (Maslan & Mims, 2014). According to the Centers for Disease Control and Prevention (CDC, 2015) there were 1.8 million emergency department visits and 439,000 inpatient hospitalizations in 2011, with asthma attributed as the primary diagnosis.
However, the total cost of asthma is not simply related to medical care, but also includes lost productivity, missed school days, and reported decreased quality of life. Maslan and Mims (2014) report that Americans miss nearly 14.41 million days of work and an additional 3.68 million school days per year.

Given the complexity and cost of treating asthma, various national and international organizations have advocated for the use of AAPs. In 1991, the National Heart Lung and Blood Institute (NHLBI, 2007) developed the first national guideline for the diagnosis and management of asthma, which advocated for the use of AAPs for all individuals with an asthma diagnosis to provide the self-management skills needed to control the symptoms, prevent complications, and improve outcomes. In 1993, NHLBI joined forces with the World Health Organization (WHO) to develop an international strategy for nations worldwide to initiate asthma care guidelines entitled the Global Initiative for Asthma (GINA, 2015), also supporting the use of AAPs in all patients with asthma. Over the past 20 years, both NHLBI Guidelines and the GINA Report have undergone yearly revisions to reflect the most recent evidence based practice and research. Further guidelines developed by the International Union Against Tuberculosis and Lung Diseases (2008) and the Institute for Clinical Systems Improvement (2012), based on GINA recommendations, provided additional national and international resources for the diagnosis and management of asthma in the United States, however individualized AAP use has remained a mainstay in all treatment recommendations (GINA, 2015; NHLBI, 2007). Applied in conjunction with education regarding the disease process and patient-provider collaboration, AAPs can be effective in improving patient outcomes, reducing urgent care or emergency visits, and reducing hospitalizations (NHLBI, 2007). However, given the increasing cost and morbidity, despite
improved treatment approaches, asthma care is suboptimal (GINA, 2015); one approach to improving asthma outcomes is to evaluate the current use of AAPs in primary care and develop processes to improve implementation and follow-up of AAPs.

**Local Problem**

In Arizona, over 600,000 individuals, or approximately 12% of the population, have been diagnosed with asthma (Arizona Asthma Coalition, 2016; Arizona Department of Health Services [ADHS], n.d.); the state also boasts the third highest asthma mortality rate in the United States, at 13.7 per 1 million persons (CDC, 2015). In Maricopa County alone, the asthma prevalence rate is at 13.8%, affecting 1 in every 8 persons (Schumacher et al., 2012). In 2013, Maricopa County had almost 103,000 asthma related inpatient discharges averaging 4 days per admission and $22,565 per hospital stay (ADHS, 2015; Arizona Asthma Coalition, 2016). Additionally, the Environmental Protection Agency (EPA) designated a grade of “F” for air quality within Maricopa County derived from the number of high ozone days and air particle counts obtained from 2011 to 2013, placing patients with asthma at an increased risk of developing exacerbations (American Lung Association, 2015).

Internal and Family Medicine Clinic, the site for this DNP project, is located in Maricopa County and is situated on the border between the two Phoenix-Metro areas of Mesa and Gilbert. Mesa is the third most populated city in Arizona with over 464,000 people, covering approximately 136 square miles (City of Mesa, 2016; United States Census Bureau, 2015). Gilbert is the home to an additional 247,000 people and covers an area of approximately 47 square miles (Town of Gilbert, 2016). As of 2015, females comprised 50.8% of the population of both cities, while a majority were under the age of 18 or between the ages of 18 to 64 (Figure 1).
and primarily Caucasian (Figure 2) (United States Census Bureau, 2015). Additionally, 87.5% of Mesa residents and 95.5% of Gilbert residents have a high school degree or higher with 15.7% and 6.8% of the population living below the poverty level (United States Census Bureau, 2015). Compared to the county, Mesa-Gilbert has a representative sample of Maricopa County’s population demographics as a whole (United States Census Bureau, 2015). Interestingly, however, in 2011, 163 of every 100,000 hospitalizations within Mesa, and 73 of every 100,000 hospitalizations within Gilbert were attributed to a primary diagnosis of asthma, compared to the entire Maricopa County rate of 124 of every 100,000 hospitalizations (Prestanski, Stanley, Nohre & Sunenshine, 2013).

The Internal and Family Medicine Clinic currently has a census of 712 patients, with 10.8% of those patients having a current asthma diagnosis. Of those individuals with a diagnosis of asthma, 43 (55.8%) are between the age of 18 and 40; 12 patients (15.6%) are between 41 and 65 years of age; and 13 patients are under 18 years of age (16.9%). The remaining nine patients are over 65 years of age (11.7%) (S. Edmund, personal communication, August 26, 2016). GINA recommendations and NHLBI guidelines highlight the need for all patients with asthma to have a written AAP so that the patient may recognize and appropriately manage signs and symptoms of worsening asthma (GINA, 2015; NHLBI, 2007). Currently at Internal and Family Medicine Clinic, only 4 of the 77 patients diagnosed with asthma have had an AAP issued for patient self-management (5.2%) (S. Edmund, personal communication, August 26, 2016).
Despite guideline recommendation that Asthma Action Plans (AAP) can decrease severity of exacerbations, decrease morbidity and mortality related to asthma, and increase individual quality of life, initiation and use of AAPs for patients diagnosed with asthma remains sub-optimal (Kuhn et al., 2015; Ring et al., 2015; Sulaiman et al., 2011). To determine the factors related to AAP use, implementation of AAPs in practice, and perceived utility, a
literature search was conducted using Google Scholar, PubMed, and EbscoHost. Key words included combinations of the following terms: asthma, asthma action plan, primary care, initiation, and use. The search yielded 250 results, 12 of which were retained (see Table 1). Articles were excluded if they were in a language other than English, greater than 10 years old, or were not primary studies (i.e., systematic reviews).
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<th>Reference</th>
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<td>Ring, N., Booth, H., Wilson, C., Hoskins, G., Pinnock, H., Sheikh, A., &amp; Jepson, R. (2015). The ‘vicious cycle’ or personalized asthma action plan implementation in primary care: a qualitative study of patients and health professionals’ views. <em>BMC Family Practice, 16</em>, 145-157. doi: 10.1186/s12875-015-0352-4</td>
<td>To describe the views of both patients and health care professionals’ (specifically primary care providers) regarding the use and role of personalized asthma action plans in asthma management.</td>
<td>Qualitative Descriptive</td>
<td><strong>Sample:</strong> n=29</td>
<td><strong>Data Collection:</strong> A single one-on-one interview lasting 30-60 minutes using a topic guide developed by the interviewers. Both patients and providers were shown various Personal Asthma Action Plans (PAAP) to confirm if, and which, form they owned or had issued. Patients interviewed in their home, Providers interviewed in their practice. Questions focused on background information (length of asthma diagnosis/asthma-related hospital admissions or role in asthma management), whether they had/had issued a PAAP and if/how they use it, if PAAP has role in managing asthma, barriers/facilitators for PAAP use. Patients given £10 shopping voucher for participation. Providers given reimbursement towards “locum costs.” Digital recordings, field notes,</td>
<td>3 Emergent themes: 1) Patient’s do not see inherent value in the use of PAAPs 2) Professionals do not value the use of PAAP’s role in asthma management 3) There are multiple barriers reducing the use of/implementation of PAAPs.</td>
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- PAAPs are not easily available for use in practice or for the specific purpose desired by the patient
- Care processes are not conducive to issuing and reviewing PAAPs
- When plans become outdated for current patient situation, there is lack of review. Patients therefore do not bring them to their appointment and providers do not request them, perpetuating a cyclical view of the PAAP having little value.

Setting: 5 demographically various primary practices in one region of Scotland
<table>
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<tr>
<td>To determine if patients that have an active role in the management of their asthma through a shared decision making model, have better treatment adherence and clinical outcomes compared to individuals in clinician decision making model and usual care.</td>
</tr>
<tr>
<td><strong>Hypothesis:</strong> Patients that participate in shared decision making have an increased advantage in asthma care compared to patients receiving usual care.</td>
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<td><strong>Randomized Controlled Trial</strong></td>
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| **Sample:** n=612  
Patients who were identified to have “poor” or “very poorly” controlled asthma based on guidelines of the Global Initiative Male-266; Female-346  
Mean age- 45.9 years  
Patients divided in 3 groups: Shared Decision Making (SDM)-patients have an active role in decision making; Clinician Decision Making (CDM)-clinician makes decisions regarding care based on asthma control; Usual Care-Steped care approach with pharmacotherapy recommendations as per the National Asthma Education  
Data Collection: Data collected from the health center pharmacy for 3 values: 1)all asthma controllers, 2)ICS alone, and 3) for long-acting beta agonists (LABA)  
A second pharmacy measure was obtained: beclomethasone dipropionate canister equivalents. Each controller medication issued was assigned a weighted value using fractional/multiple beclomethasone 80µg based on previous studies.  
The third pharmacy measure was a weighted value assigned to SABAs dispensed. Calculate based on bronchodilator effectiveness in terms of canisters of albuterol.  
Data also extracted regarding health care utilization 1 year post study initiation to evaluated ED, hospital in-patient, urgent care, or out-patient using the ICD9 prefix 493  
Finally, clinical outcomes of asthma control were assessed 1 year post initiation to evaluate self-  
| After year 1, acquisition of controller medications was higher in the SDM group compared with CDM (P=0.029) and usual care (P<0.0001).  
ICS use alone was also higher in SDM compared to CDM (p=0.017) and usual care (p<0.0001).  
The SDM utilized more controller beclomethasone canister equivalents than the CDM group (10.9 vs. 9.1, p=0.005) and the usual group (10.9 vs. 5.2, p<0.0001).  
After year 1, SDM and CDM had higher scores on the asthma-related quality of life scales (mean 5.5 and 5.4, respectively) compared to the usual group (mean 5.1); however, the SDM and CDM scores were not significantly different.  
SDM and CDM groups had lower health care utilization after 1 year (1.0/yr. and 1.1/yr., respectively) compared to the usual group (1.4/yr.).  
Shared decision making (SDM) demonstrated higher adherence to |

**Setting:**
3 large health centers that are part of Kaiser Permanente: 1 in Oakland, CA, 1 in Portland, OR, and 1 in Honolulu, HI.

reported asthma control using the Asthma Therapy Assessment Questionnaire (ATAQ) and lung function measures (FEV1, FEV1:FEV6)

**Data Analysis:**
Multivariable generalized linear regression analysis was implemented to evaluate the individual intervention impact on each outcome.

Group data was subjected to either a $\chi^2$ or t tests to evaluate differences.

SAS software version 9.2 was used for all analyses.

---


**Sample:**

- **n=175**
- Patients with a diagnosis of asthma, confirmed by a provider or currently receiving asthma medication (excluding patients with COPD).
- Male-56
- Female-119
- Mean age-45.9

**Setting:**
Horizonte Health Unit, a family practice teaching clinic in Matosinhos, Portugal for medical asthma treatment, including ICS/controllers, and LABA therapy compared to the CDM and usual group. Clinical outcomes on all measures were also better compared to the usual group, but not significantly better than the CDM group.

Quality of life was inversely related to asthma severity ($\chi^2=64.257$, $p<0.001$).

Asthma control was most statistically significant in relation to male gender ($p<0.01$), younger age ($p<0.005$), and less use of medication, both controllers ($p<0.05$) and relief ($p<0.001$).

Patient enablement using mPEI demonstrated a mean score of 6.5, and a median score of 6 (score $>6$=clinically meaningful/beneficial enablement for disease management). No significant findings between mPEI and the following: mini-AQLQ, ACT, %FEV1, or asthma severity.
<table>
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<tr>
<td><strong>To determine how provider knowledge and attitude impacts adherence to national asthma guidelines based on self-reported implementation.</strong> Focus on 6 guidelines: 1) Spirometry 2) Peak flow meters 3) Patient self-assessments 4) Asthma Action plans 5) Severity assessment tools 6) Prescription of anti-inflammatory medications</td>
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<td><strong>Cross-sectional</strong></td>
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<td><strong>Sample:</strong> n=47 6 PAs/NPs, 20 residents, 21 attending physicians Male=25, Female=22; &gt;10yrs practice=18, &lt;10yrs=26</td>
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<td><strong>Setting:</strong> Academic Health Centers in Buffalo, New York</td>
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<tr>
<td><strong>Data Collection:</strong> Surveys mailed to 89 different providers Guideline knowledge assessed using multiple choice questions; 4-point scale (always, sometimes, rarely, never) used to assess provider attitude/implementation of guidelines <strong>Data Analysis:</strong> Attitude dichotomized to positive (always, sometimes) or negative (rarely, never) Implementation behaviors also dichotomized to regular use (always, sometimes) or irregular users (rarely, never) Fischer exact probability test to compare knowledge/attitudes with use. <em>p</em> value &lt;0.05 was statistically significant</td>
</tr>
<tr>
<td>EpilInfo Version 3.4 and PASW Statistics for Windows Version18.0 were utilized for statistical analysis</td>
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<td>Overall, there was strong positive correlation between asthma control and quality of life, but only weak positive correlation between asthma control and patient enablement. 70% of respondents had read the national guidelines 73% used tools to assess severity, versus regular use of patient self-assessment (36.2%) and asthma action plans (45.7%) Overall, positive attitude reported correlated with regular use of tools: Spirometry: 62% positive response were regular users; 22% negative response were irregular users (<em>p</em>=0.031) Peak flow: 100% positive response were regular users; 50% use with negative response (<em>p</em>≤0.001) Patient self-assessment: 45.7% positive response were regular users; 8.3% use with negative response (<em>p</em>=0.02) Asthma Action Plans: 55.6% positive response were regular users; 14.3% use with negative response (<em>p</em>=0.046) Anti-inflammatories: 100% positive response and use (<em>p</em>≤0.001) Severity assessment tools: 82.5% positive response were regular users</td>
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<tr>
<td><strong>To analyze the adherence of primary care providers to the 2007 US asthma guidelines.</strong></td>
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| **Sample:** n=1176  
Children age 5-11: 285  
Tweens age 12-18: 211  
Adults age 19-65: 680  
Patients with physician diagnosed persistent asthma between 3/16/09-5/1/14  
Female to male participation:  
Children-37.5% vs 62.5%  
Tweens-46.4% vs. 53.6%  
Adults-71.9% vs. 28.1%  
**Setting:**  
16 Family and 6 Pediatric Practices across the United States.  
No site had a certified asthma educator; none were federally qualified health centers |
| **Data Collection:**  
Medical records, including visit notes, medication lists, procedures/results, as well as, hospital/ER visit summaries  
Documents were copied at each site and mailed to the central study site via Federal Express to comply with HIPAA guidelines.  
Documents included the year before enrollment to the Asthma Tools Study.  
**Data Analysis:**  
Visit type, presence/absence of guideline adherence elements, and demographic data tabled and percentages calculated for group total and by sex and age categories  
Interrater reliability conducted at beginning and 2 additional times during data abstraction—testing repeated until data points for 4 visits from 4 different patients was at 95% or greater agreement  
S-Plus statistics package, version 7.0.6 was used  
22.2% of patients had no asthma-related visiting in the year before enrollment (across all age groups)  
Asthma control assessment completed in 15.0% of patients during 1-year study period  
Medication adherence-33.2% of documents contained assessment across all records  
Asthma triggers-documented in 32.5% of all patients, decreased frequency noted as age increased  
Inhaler technique-7.6% of all patients, again decreased frequency with age increase  
Asthma action plans-present in 3.1% of all documents, peak 8.9% in children aged 5-11 years  
Exposure to tobacco smoke-83.1% of adult records, 54.5% of tweens, and 34.0% of children’s records contained documentation of assessment  
Practices with EMR, in areas of 250,000 or less, and will <4 providers were more consistent with guidelines  
Tweens vs children and boys vs. girls were more likely to have no compared to negative response (p≤0.0001) |

To assess patient ownership and patient/provider perceived usefulness of WAAPs in general practice.

**Sample:**
- Qualitative arm:
  - 26 patients with asthma or COPD
  - 13 general practice physicians/practice nurses (no demographic data provided for these groups)
- Quantitative arm: n=300
  - Adults=225 (age 18-70 yrs.)
  - Youth=27 (age 14-17yrs)
  - Children=49 (age 8-13yrs)

**Setting:**
31 General/Family Practices within Melbourne, Australia

**Data Collection:**
2 group focus session with Healthcare providers and 3 group focus sessions with patients—identify perceptions/experiences with use of spirometry and use of WAAPs in practice

Focus groups facilitated by 2 of the researchers

Questionnaire given to adults/parents of children as well as questionnaire regarding asthma control, and review of practice medical records to extract data

**Data Analysis:**
Content and thematic analysis of qualitative data

Logistic regression analysis used for quantitative data, use of Stata Version 11 software for data analysis

Of 225 adults, only 83 (37%) had a WAAP.

Patients that presented with an emergency presentation within the 12 months prior to the study, had poor medication adherence were more likely to have a WAAP (p<0.001, p=0.03. respectively)

Individuals who saw GP in last year for asthma attack were 3x more likely to have a WAAP

Themes identified:
1) WAAPs provide sense of security, even if not actually used
2) There are mixed perceptions on the usefulness/effectiveness of WAAPs
3) WAAPs are more useful for children than adults

Yin, H.S., Gupta, R.S., Tomopoulos, S., Wolf, M.S., Mendelsohn, A.L., Antler, L., …Dreyer, B.P. (2013). Readability, suitability, and ad characteristics contributing to asthma action plan use.

**Sample:**
30 asthma action plans: 27 endorsed by state Departments of Health, 3 National

**Data Collection:**
Action plans sought via internet search or phone call to each state Department of Health if unable to locate one on internet

Mean grade level among all action plans was 7.2 (Range 5.7-9.8).

Suitability factors among all plans:
1) Lack of state purpose: 73.3%
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<td>Action Plans</td>
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<td><strong>Setting:</strong> United States</td>
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<td><strong>Data Analysis:</strong> Readability formulas used included Readability Plus software, Flesch Reading Ease (FRE), Flesch-Kincaid (F-K), Gunning Fog (FOG), Simple Measure of Gobbledygook (SMOG), and Forecast to determine average reading level of action plan</td>
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<td>Action plan evaluated for each of the following characteristics: 1) symptom vs peak flow based, 2) fill by hand or electronically, 3) classification of severity, 4) patient-specific triggers list, 5) physician contact information, 6) physician signature</td>
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<td>2) Format does not encourage interactive learning-63.3%</td>
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<td>3) Headings suboptimal- 50%</td>
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<td>93.3% used green-yellow-red motif for visualization, 75% used illustrations</td>
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<td>None of the action plans were written at less than a 5th grade level, which is recommended for low-literate populations.</td>
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To pilot a team-based approach to improving Asthma Action Plan use in Family Medicine clinics. 

**Case Study**

| Setting: 5 Community-based family medicine clinics affiliated with the University of Michigan. |
| Set over 3-year time frame, from June 2007-December 2009 |
| **Intervention:** Team-based committee including a family medicine physician, outpatient pulmonary care RN, and family medicine outpatient RN. Both RNS’s were certified asthma educators |
| 2-hour educational program given to RNs, faculty, and residents regarding patient education and AAP use. |
| 98% of AAPs were written by RNs, based on self-report of RN and physicians |
| Range of 10,071 to 11686 patients included over the study period. |

14 RNs, 30 residents, and 56 faculty educated on patient education and AAP use. |

2) Format does not encourage interactive learning-63.3%
3) Headings suboptimal- 50%

29/30 plans were both symptom and peak-flow based
93.3% used green-yellow-red motif for visualization, 75% used illustrations
None of the action plans were written at less than a 5th grade level, which is recommended for low-literate populations.

| Sample: | n=5174 patients Children (0-17)=4259 Adults (≥18)=915 Mean age: Children (0-17y)=9.3 Adults (≥18) – 40 Gender: Male (0-17) - 62.3% (≥18) – 30.4% Female (0-17)– 37.7% (≥18) – 69.6% Setting: Carolinas HealthCare system-100 Primary Medicine practices | Data Collection: EHR queried monthly to identify patients with/without an eAAP. Patient was given unique identifier and then addressed outcomes using yes/no format: ED visits for asthma, hospitalizations related to asthma, and use of oral steroids for exacerbation. Outcomes of patients with/without eAAP were compared Controls selected from pool of patients in a health care system that did not have providers using eAAP (n=25,926) | Data Analysis: Propensity scoring using logistic regression | To develop and assess the utility of an electronic asthma action plan on asthma outcomes. Observational Design | 6484 eAAPs completed between 12/2012 and 9/2014 -82% were for children -Represents 10% of health system’s asthma population ED visits between eAAP recipients and control did not differ significantly at 3, 6, and 12 months; but children had 33% reduced chance of receiving an oral steroid Children had a significantly reduce risk of exacerbation compared to controls at the 12-month mark (p<0.001) For adults, at 3 months, there was a 41% decrease in oral steroids (p<0.001) and 34% decrease in exacerbation rates (p<0.05) |

To assess barriers self-identified by primary care providers that care for inner-city minority patients with asthma related to asthma guideline adherence

**Sample:**
- **n=202 primary care providers for adults**
- Female: n=100
- Caucasian: n=87
- Personal asthma history: n=19

**Setting:**
- 3 hospital-based general medicine clinics and 1 community-based medical clinic in East Harlem in New York, New York

**Data Collection:**
Self-administered questionnaire-assess demographics, clinical training, self-reported expertise in asthma care, personal/family history of asthma, asthma patient volume

**Data Analysis:**
Logistic regression analysis to identify predictors of provider adherence
Proportion of providers adherent to guidelines to components provided with 95% confidence intervals

SPSS statistical software utilized

70% of providers reported awareness of NHLBI guidelines—39% had read the guidelines, 46% had used the guidelines for asthma management

Self-reported adherence to key recommendations:
1) ICS use with symptoms >2x/week-62%
2) PF monitoring – 34%
3) Asthma Action plan use – 9%
4) Allergy testing referral – 10%
5) Influenza vaccination – 73%

Providers self-reported that patients were more likely to adhere to ICS use (58%) versus PF monitoring (19%) and asthma action plans (8%)

Lack of adherence to guidelines for AAPs associated with:
1) Lack of familiarity (p<0.001)
2) Lack of agreement (p=0.01)
3) Low patient volume (p=0.01)


To understand the perceptions of patients and providers regarding asthma diagnosis and care.

**Sample:**
- **n=200 patients and providers divided in 26 groups**
- 12 groups of patients with no exposure to

**Data Collection:**
1-hour focus groups conducted every 6 months for 3 years—total of 26 focus groups

Patients recruited based on

Three Themes:
1) Cost/economic barriers/process
   - provider unaware of cost of medications
   - insurance coverage/prior-approvals
| Goeman, D., Jenkins, C., Crane, M., Paul, E., Douglass, J. (2013). Educational intervention for older people with asthma: a randomized controlled trial. *Patient Education and Counseling, 93,* 586-595. doi: 10.1016/j.pec.2013.08.014 | To determine if tailored asthma education can improve asthma control in older people. | Single-blind parallel group randomized controlled trial | **Sample:** n=124 Patients ≥ 55 years with asthma Male-34 Female-89 **Setting:** Melbourne, Victoria, and Woolcock | **Data Collection:** Baseline respiratory function to confirm asthma diagnosis All participants took part in a 2-week “run-in” period using an electronic inhaler monitoring device to record time and number of actuations The intervention group demonstrated improved asthma control compared to baseline at 3 months (p=0.02) and at 12 months (p=0.001). The control group (usual care) demonstrated no change. The intervention group achieved goal of 80% adherence at 3 months, -time constraints for education during appointments 2) Self-governance/adherence -use of asthma action plans and effectiveness was variable, some found it very helpful whereas other patients had not heard of it -Lack of time for appropriate goal setting -patients not viewing asthma as a disease -patients are usually able to identify triggers 3) Education -communication with schools regarding treatment plan -controller versus rescue medications -effective inhaler use techniques |

Following initial 2 weeks, participants were provided education based on random assignment to 2 groups:
1) Face-to-face asthma education, education with inhaler technique, and patient concerns addressed; Education provided by 2 of the researchers, both of which are certified asthma educators (1 hour allocated)
2) “usual” care, brochure-only information (15 min. allocated)

Visits conducted in participant homes, or at a local hospital

Follow up completed at 3 months and 12 months for both groups and for repeat lung function measures

Brochure only participants were offered face-to-face education after completion of the study

**Data Analysis:**
SAS version 9.2 and SPSS version 15

Statistical significance was set at 2-sided p value of 0.05

continued to improve and maintained at 12 months. Adherence also improved in the control group, but did not reach goal of 80%. Group difference was not significant at 12 months (p=0.17).

There was a significant difference in action plan ownership in the intervention group (pre-18%, post-61%) versus the control group (pre-32%, post 37%) at 12 months. Fischer’s exact p=0.015
Patient and provider knowledge, behaviors, and attitudes towards asthma action plans has been assessed by multiple authors (Ring et al., 2015, Tumiel-Berhalter & Watkins, 2006, Wisnivesky et al., 2008, Sulaiman et al., 2011, Mowrer et al., 2015, & Yawn, Rank, Cabana, Wollan & Juhn, 2016). Primary care providers were generally aware of the national guidelines, but adherence remained low (Tumiel-Berhalter & Watkins, 2006; Yawn et al., 2016). Providers noted that care processes, such as lack of patient contact time during appointments or lack of available documents, inhibited the ability to provide adequate education implementation, or review of action plans (Ring et al., 2015; Mowrer et al., 2015). Provider self-perceived lack of familiarity with the process increased the rates of non-adherence (Wisnivesky et al., 2008) and Ring et al. (2015) further noted that if patients do not bring the plan and providers do not request them, each perpetuates a continued cycle of the action plan having little value in asthma management.

Involving patients in the decision-making and personal control of asthma has variable results. Wilson et al. (2010) examined patients in a shared decision making model and found that patients had higher asthma-related quality of life scores, decreased health care utilization, and higher adherence to regimens compared to the usual care. However, using a standardized assessment for patient enablement, Correia de Sousa et al. (2013) noted that there was only a weak positive correlation between asthma control and patient empowerment, meaning that patients that were encouraged to take control of their symptoms did not necessarily have better control. Sulaiman et al. (2011) provides some insight into this phenomenon, noting that patients view asthma action plans as providing a sense of security over purpose, even if they are not routinely used.
Shared decision-making models can be timely (Wilson et al., 2010). Additionally, perceived lack of time and familiarity with AAPs by providers can impact overall patient asthma education (Mowrer et al. 2015, Wisnivesky et al., 2008) leading patients to interpret the plan as they understand, but not necessarily how they are intended. Yin et al. (2013) conducted a readability and usability study on 30 different action plans and noted that the mean grade level was 7.2, well above the recommended 3rd-5th grade reading level for health education. Between the lack of perceived time for appropriate asthma education and high mean grade level of educational materials, these factors support the view that action plans are ineffective, especially if patients are unable to interpret the instructions.

Finally, several studies focused on the implementation process to improve adherence to the guidelines. Electronic health record (EHR) reminders, embedded electronic asthma action plans, and face-to-face education (in addition to action plan use) significantly increased use of asthma action plans, decreased risk of exacerbations, and increased rates of asthma control and adherence to regimens (Kaferle & Wimsatt, 2012; Kuhn et al., 2015; Goeman, Jenkins, Crane, Paul & Douglass, 2013).

Strengths of this literature review demonstrated the utility of asthma action plans in increasing asthma control and decreasing exacerbations. Additionally, barriers to implementation were identified on the part of both providers and patients. One weakness that was identified focuses on the idea that many of the studies either were targeted towards pediatrics, with limited quantitative data on the effectiveness of action plans specifically in the adult population. Only one study (Kuhn et al., 2015) was noted to have quantitative data that demonstrated action plans were not nearly as effective in reducing exacerbations among adults when compared to children,
while the remainder of the articles reviewed focused only on qualitative assessment of the perceptions and knowledge of providers and/or adult patients. Wilson et al. (2010) noted improved asthma control in adults with a shared decision making model, but the authors did not mention the use of asthma action plans specifically. Taking a shared-decision making model and applying this towards the concepts of asthma action plans in primary care could demonstrate additional utility and improved adherence towards the recommended guidelines for asthma management.

Summary

This section presented the purpose and aim of the quality improvement project. The prevalence and incidence of asthma, as well as, the costs associated with treatment of asthma were discussed. National and international guidelines and the strategic GINA report were discussed, with emphasis on the use of AAPs to help patients to self-manage symptoms and exacerbations. This section also discussed the current evidence in literature regarding the use of AAPs in practice.

METHODS

Ethical Considerations

The purpose of this DNP project was to develop and implement a QI initiative that will improve asthma clinical management by providing the patient self-management skills needed to control the symptoms, prevent complications, and improve outcomes through the implementation of AAP standards for patients diagnosed with asthma. The aim of the QI project was to improve the use of AAP standards for patient diagnosed with asthma by 85% from baseline measure within four weeks of implementation. The DNP student was not compensated for monetary gain
with completion of this project and had no personal or professional conflicts of interest. In terms of respect for persons, the data abstracted for purposes of this project was completed by the NP at Internal and Family Medicine from the electronic health records (EHR) database and was de-identified in accordance with the federal Health Insurance Portability and Accountability Act (HIPAA) of 1996. Since data will be de-identified and this project did not meet criteria for human research, informed consent was not required. Individual-level data were not abstracted for this project; instead pre- and post-intervention statistics related to AAP use were run on de-identified data to promote beneficence and justice. The stakeholders were essential in identifying and helping to minimize risk to patients through project implementation to ensure individuals were not subjected to harm.

Setting

Initially, this project was to be conducted at Edmund Primary Care in Mesa, Arizona. The clinic relocated prior to conducting this project, merging with another clinic in the community. However, due to provider changes and scheduling issues, the new clinic was no longer conducive to conducting this project. Due to these changes, stakeholders at Internal and Family Medicine clinic were approached and were open to implementation of this QI initiative. Internal and Family Medicine is a physician owned and operated practice in Mesa-Gilbert, Arizona that provides primary care and internal medicine services with a focus on comprehensive wellness, prevention, and evidence-based care. Dr. Ana Sierra De Aragon operates the site for this project with the assistance of Dr. Sara Edmund, DNP.

The current patient census at Internal and Family Medicine is 712 patients, of which 77 patients (11%) have a diagnosis of asthma and only 4 (5.1%) had an AAP in place before
implementation of this QI project. The clinic serves patients of all ages and payer services consist of a diverse mixture of Medicare, Medicaid, private insurance, and self-pay.

**Design**

The growth of research, knowledge, and technologies within the healthcare system is profound, yet in current practice, the provision of healthcare has considerable variability and frequent shortcomings in the application of knowledge (Institute of Medicine [IOM], 2001). Implementing change is significantly more challenging than developing the idea; however, change is a requirement for successful improvement efforts (Langley et al., 2009). Additionally, all changes do not equate to improvement, but refining the skills to develop, test, and implement change in healthcare is essential to continuously improve (Institute of Healthcare Improvement, 2016).

**The Model for Improvement**

The Institute for Healthcare Improvement (IHI) Model for Improvement is a guide for quality initiatives that uses three fundamental questions followed by the Plan-Do-Study-Act (PDSA) model (Figure 3). Developed by Walter Shewhart and Edward Denning, this method originated for the purpose of improvement in industrial settings but has been embraced within healthcare because of the ability to achieve efficient and accelerated results with small tests of change (Reed & Card, 2015). Akin to the scientific method, the Model for Improvement focuses on formulating a research question or hypothesis, developing and carrying out methods to collect data, analyzing the results, and utilizing the results in practice to continue or change processes (Taylor et al., 2014).
The IOM (2001) endorses six key aims of any improvement initiative:

1) Safe: initiatives should not pose an increased risk of injury when the intention is to improve.
2) Effective: improvement strategies should have evidence to support their use for all individuals whom will benefit.
3) Patient-centered: healthcare should be respectful and clinical decisions must take into consideration individual preference, needs, and values.
4) Timely: delays in care should be minimized for both those receiving and giving care when considering improvement.
5) Efficient: waste should be minimized with regards to both human and non-human resources (i.e., supplies, equipment, ideas, time).
6) Equitable: care provision should not vary with regards to gender, ethnicity, socioeconomic status, etc., but rather have equality among all intended recipients.
Setting aims, establishing measures and selecting changes. The initial step of the Model for Improvement involves setting aims, or the purpose of, the quality improvement project. The aim should identify the system or process to be improved, the setting or population of patients to be targeted, timeframe, goals or predictions for the improved process, and a guide for how the intervention will progress (i.e., project boundaries, initial activities/needs to promote the change, or potential change cycles) (Langley et al., 2009). Aims should be agreed upon among all involved with the proposed change to allow individuals to understand their own
standards of care, as well as, have a true understanding of their role in practice improvement (Batalden & Davidoff, 2009). Additionally, using a team approach ensures that the necessary individuals and resources are available for the duration of the process improvement (IHI, 2016). The aims should also take into consideration the IOMs six key aims for improvement as discussed previously and are in line with the purpose of this DNP project in describing the factors that contribute to the implementation of AAPs in patients diagnosed with asthma who seek care in a primary care practice.

Establishing measures is critical to understanding whether the implemented change is effective and contributing to an improved process. Measurement for process improvement differs from that for research in that research brings light to new knowledge by harnessing as much data as possible, whereas process improvement brings new knowledge into practice, controls for established biases from test to test, and involves enough information to learn from and inform a new cycle to test additional changes (IHI, 2016). Quality improvement involves three types of measures: outcome measures, which evaluate performance related to the process and is often directly linked to the aim or purpose of the study; process measures, which determine whether the activity was completed, and balancing measures, which evaluate whether improvement in certain measures negatively or positively affects related measures (Langley et al., 2009). From this initial step, changes are identified to support the initial PDSA cycle.

The goal of this project, as discussed previously, is to identify and evaluate a process improvement plan to facilitate the use of AAPs in a primary care clinic. The development of a QI initiative is multifaceted to promote the involvement of individuals at the point of care. In order to foster buy-in of the clinic, QI team meetings with the key stakeholders were conducted. The
American Academy of Pediatrics (AAP, 2011) suggests that meetings focused on quality improvement be as efficient and short as possible, while still ensuring that all members have a clear understanding of what is to be accomplished and by when. Additionally, it is recommended that frequent focused “huddles,” or short meetings that are 20 minutes or less, occur throughout the intervention to review details of the PDSA cycle, clarify details, or address unexpected observations (AAP, 2012).

Key-stakeholders at the site were recruited to participate in three sessions to review the evidence regarding the use of asthma action plans, the clinic’s current process of identifying patients with asthma, the use or non-use of asthma action plans, root causes affecting AAP use, and decide on the targeted factors of process change to be implemented. The target population for the intervention was also determined. QI is most effective utilizing a team approach to “[harness] the knowledge, skills, experience, and perspectives of different individuals….to make lasting improvements” (U.S. Department of Health and Human Services Health Resources and Services Administration [HRSA], 2011, p. 3). The QI team included the physician and the NP of the clinic, the office manager, three medical assistants, and the DNP student facilitating the QI project. Dunphy, Winland-Brown, Porter, and Thomas (2011) note that the decisions made at the point of care are critical to the overall quality of care but these decisions must take into consideration the evidence of benefit, potential harm, and the overall cost, in addition to patient preferences and needs. For evidence-based practice to be accepted and successful, the triangulation of these factors must occur as demonstrated in Figure 4. By involving various individuals, team effectiveness is enhanced as each person brings knowledge regarding how the
current system operates, the clinic’s day-to-day processes, and the insight regarding the needs and established relationships with the patient (IHI, 2016).

**FIGURE 4. Triangulation of Evidence-Based Practice.**

During the initial discussion, the purpose of the project and evidence and guidelines regarding asthma action plan use were discussed; in addition, the QI team evaluated the process of identifying patients with asthma and the use or non-use of asthma action plans in the clinic. The second discussion focused on identifying the root causes impacting the current AAP process. An Ishikawa, or fishbone, diagram (Figure 5) was utilized to assist the team in brainstorming to focus on the causes rather than specific solutions that may not be achievable individually, or may not be sustainable in practice. According to the American Society of Quality (n.d.), Ishikawa diagrams are helpful in identifying the forces that contribute to the current outcomes within a system, including the materials, methods or processes, people, equipment, environment, or management, and how these factors interact.
FIGURE 5. Ishikawa (Fishbone) Diagram.

**Plan-Do-Study Act (PDSA) cycle.** PDSA is an iterative process in which cycle repetition promotes action-oriented learning, promotes continued development or process improvements, and informs the action of futures cycles (IHI, 2016). Reed and Card (2015) note, however, that although the PDSA process may be successful, this does not always equate to the success of the overall quality improvement project. Rather, each PDSA should be considered a learning platform that helps understand the complexities of the healthcare environment and allows for the researcher to understand natural variations and additional factors that ultimately impact outcomes of the project (Taylor et al., 2014).

**Plan.** The “plan” phase utilizes the information identified from setting aims, establishing measures, and selecting changes to outline the initial test or observation. This phase includes a specific objective, or aim, of the test, hypotheses of what will happen, and the plan for carrying out the test, such as who, what, when, where, and data needed (IHI, 2016). This aim must be
agreed upon by the entire team and was determined within the QI team meetings, as each of the key stakeholders has a significant role in the quality improvement intervention. The purpose of this project was to facilitate the use of asthma action plans; one example of an aim considered for this project was that 85% of patients with asthma that are evaluated during the 4 weeks will have an asthma action plan in place.

The plan phase was a culmination of the initial discussions and involved the final discussion to select the process change or changes that were implemented for the first PDSA cycle. Evaluation of the Ishikawa diagram was conducted, which allowed the QI team to identify sequential cause and effect relationships and areas of improvement that are within the control of QI team members. From this evaluation, the objective for the first test of change was chosen and predictions regarding the outcome were identified (IHI, 2016). Finally, the plan assigned roles of the QI team members in carrying out the intervention, the timeframe to test the intervention, and the data to be collected. Provost (2015) notes that one of the most important aspects of this phase is to identify the “end date” of the intervention, whether it be after a certain number of patients or a specified calendar date. PDSA cycles are meant to be rapid tests of change, so by establishing a timeframe, having an end date helps to keep the QI intervention moving forward towards modification as necessary and future tests of change (Provost, 2015). For this test of change, a timeframe of four weeks post intervention was used to evaluate the test of change. Four weeks of pre-intervention data were collected to compare the effectiveness of the test of change. Input from the QI team was essential to determine an appropriate period of time to evaluate the change.
**Do.** The “do” phase involves the implementation of the test of change with beginning analysis of data, as well as, documentation of observations, including the unexpected (IHI, 2016; Langley et al., 2009). This phase of the Model for Improvement involved carrying out the chosen intervention. Essential to the implementation was evaluation of problems or unexpected observations during the test (IHI, 2016; Taylor et al., 2014), for which the DNP student was available throughout the intervention period to provide support to the providers and clinic staff. In addition, data collection and analysis began during this phase.

**Study.** The “study” phase allowed for analysis of the data with comparison of the results to the predictions made in the “plan” phase (IHI, 2016; Langley et al., 2009). Following a four-week trial of the selected change or changes, complete data analysis was performed. Data analysis included pre- and post- evaluation of the medical record, specifically a chart review from the Internal and Family Medicine Clinic EHR, to assess for the presence of AAPs for patients diagnosed with asthma. The charts reviewed included patients that were evaluated at the clinic with a diagnosis of asthma during the 4-week period of the QI intervention. Additional data that were abstracted included the following: age; gender; ethnicity; type of insurance; grade level; asthma severity classification; the number of asthma exacerbations in the past 12 months; the number of clinic visits related to asthma in the past 12 months; the number of asthma related hospitalizations within the past 12 months; and whether the patient smokes tobacco products. The data were de-identified and obtained through weekly EHR queries performed by the NP. Results were analyzed using descriptive statistics measures and run charts were planned to provide a simple summary of the data over the intervention period, in addition to identifying barriers that may impact asthma action plan use. Run charts provide a visual representation of the
effectiveness of an intervention over time through a graphic display, including prior to the start of the intervention (IHI, 2016). The study period allowed for comparison of predictions to the data obtained and reflection on the information attained (Taylor et al., 2014).

**Act.** Finally, the “act” phase provides an opportunity to make changes based on the data and prepare for future PDSA cycles (IHI, 2016). In this final stage of the PDSA cycle, the QI team reflected on the data and the effectiveness of the implemented changes to determine if they were sustainable or necessitated modifications. This discussion also informed the plan for the next test of change and future PDSA cycles with focus on two key questions: what changes should be made, and what will the next PDSA cycle require (IHI, 2016; Taylor et al., 2014).

Each phase of PDSA is essential to the overall success of the project, even if the overall result is abandonment of the change. Reed and Card (2015) note that “planning paralysis” and attempting to perfect change can delay implementation and is not an effective or efficient use of resources; however, underinvestment in the actual planning process makes implementation and evaluation of the results less effective (p. 3). Effective management of the PDSA cycle and informed learning is rarely linear in this model, but rather characterized as loop learning that may result in goal revision or even changes to the intervention (Reed & Card, 2015; Langley et al., 2009).

**SQUIRE Guidelines**

The Standards for Quality Improvement Reporting Excellence, or SQUIRE guidelines, were used for the reporting format for this DNP project. The SQUIRE guidelines were developed in response to the advances in quality improvement sciences in healthcare and the wide variety of content and quality being reported in the literature (Ogrinc et al., 2015). The guidelines thus
provide a framework to report new knowledge obtained through quality improvement initiatives and to describe the work at a system level and the result the intervention has on quality, safety, and value of healthcare (Ogrinc et al., 2015). SQUIRE guidelines establish a framework with 19 individual sections to guide the project from beginning to end, as well as, bridge the gap between project completion and dissemination of the findings (Ogrinc et al., 2015).

**Concepts**

The identification of the problem of interest, AAPs in primary care, and use of a quality improvement framework to implement change, begs for clarification and definition of the concepts inherent in this project.

In 2001, the IOM brought the concept of quality to the forefront of healthcare with the publication of *Crossing the Quality Chasm: A New Health System for the 21st Century*. This publication identified quality in relation to provision of care noting three significant problems within the healthcare system: overuse, underuse, and misuse (IOM, 2001). Merriam-Webster defines quality as “how good or bad something is,” and alternatively, “a high level of value or excellence” (“Quality,” para. 1). In relation to healthcare, quality has been defined as the extent to which health services promote the optimal health outcomes that are consistent with current and professional knowledge (Gillam & Siriwardena, 2013). Utilizing this definition supports the key idea for this project to promote and improve health outcomes for patients with asthma.

Improvement is defined as “the act of improving something: the act or process of making something better” (“Improvement,” 2015, para. 1). Langley et al. (2009) suggests that improvement is defined by the criteria being studied, such as faster, more effective, more efficient, etc. However, improvement in and of itself is a type of change and these ideas are
frequently linked (Langley et al., 2009). Any improvement in healthcare is a change in process that may have predictable or unpredictable effects on care provided (Taylor et al., 2014).

Taken together, the concepts of quality and improvement demonstrate the basis for this project: to provide value in the process of making something better, specifically, to improve the process of AAP utilization and health outcomes for patients with asthma. While the basis for this project specifically focused on the processes for AAP utilization, the value obtained may be seen in future studies regarding decreased emergency room visits or hospitalizations related to asthma.

Asthma is a state of hyper-responsiveness of the bronchial airways with variable wheezing, shortness of breath, cough, or changes in peak expiratory flow measures (GINA, 2015; Maslan & Mims, 2014). Asthma is diagnosed by a medical provider and may be classified by severity, such as intermittent, mild persistent, moderate persistent, and severe persistent which helps to guide the treatment course and development of the AAP (GINA, 2015). The NHLBI Asthma Classification table guides diagnosis with treatment initiated in a step-wise approach based on asthma severity (Appendix B).

For the purposes of this study, AAPs are defined as a written document developed between the patient and medical provider that outline a patient’s daily asthma management, as well as, short-term changes to asthma treatment in the event of worsening asthma severity and/or changes in peak expiratory flow (GINA, 2015). Some action plans will also have a visual reminder of an individual’s asthma triggers and recommendations on how to prevent an asthma exacerbation. In addition, the action plan should also outline guidance on when the patient should notify his or her healthcare provider or go to the Emergency Room should symptoms
continue to worsen despite the outlined management (American Lung Association, 2016). Some examples of an asthma action plan are provided in Appendix C.

Summary

This section discussed the ethical considerations, setting, and organizing framework for this DNP project, focusing on the three essential questions and the PDSA cycle of the Model for Improvement. In addition, this chapter discussed the six key factors identified by the IOM as important for quality improvement, the SQUIRE guidelines for report QI projects, and defined the concepts inherent to this project.

RESULTS

This QI project was developed and implemented in partnership with the stakeholders of Internal and Family Medicine Clinic to support the purpose and aim of this project in developing and implementing a QI initiative to improve the use of AAP standards for patient diagnosed with asthma by 85% from baseline measure within four weeks of implementation. Consent to conduct this project was provided by the NP of the clinic (Appendix C) and the proposal for this plan was reviewed and approved by the University of Arizona Internal Review Board (Appendix D).

Plan-Do-Study-Act (PDSA)

Plan

Two planning sessions were conducted with the stakeholders at Internal and Family Medicine during October 2016. The DNP student facilitated the meetings to develop interventions that would provide the first test of change to improve the use of AAPs. These are organized by the meeting dates below.
October 5, 2016. This was the date of the first QI team meeting. Ideally, this would have involved all key stakeholders, but due to schedule constraints, the NP was the only attendee with the DNP student. Because of the NP’s knowledge base, this was a brief meeting that outlined the basics of asthma pathophysiology, current national and local prevalence statistics, and the NHLBI guideline recommendations for AAPs, as well as, the current AAP use in the clinic.

Next, the DNP student and NP reviewed the factors that may contribute to low rates of AAP implementation and/or review. An Ishikawa diagram was utilized to allow for root-cause analysis and to guide the session (Figure 6). It was identified that one of the primary causes impacting AAP use was the lack of a defined process to identify patients with asthma upon visiting the clinic for appointments. In addition, the lack of available action plans, either written or electronic, also impacted implementation or review by the provider. Since the NP and the DNP student were the only attendees at the first meeting, the decision regarding which process changes to be trialed was deferred to the second meeting with the additional stakeholders. The NP was agreeable with the implementation of AAPs, as was the MD by phone discussion, but it was determined that the office staff would be essential in the process to help ensure that patients with asthma were identified.
October 13, 2016. The second QI meeting was held just over a week after the first meeting. This meeting was to involve the office manager, as well as the additional three MA’s in the clinic. However, because the clinic remained open during the meeting, the office manager was the only attendee for this meeting. The NP was also involved via phone conversation. The DNP student provided a short review of asthma, prevalence rates, current population of patients within the clinic with an asthma diagnosis, as well as guideline recommendations for the office manager. The Ishikawa diagram from the initial meeting was reviewed. The office manager agreed that a process change was needed to identify patients with asthma. The current office
process from pre-visit to check out after the patient’s visit with the provider is outlined in Figure 7.

The office manager noted that currently, all chart prep and documentation is completed via the electronic medical record (EMR). When a patient checks in, he or she is initially given a Superbill with a notation at the top that declares the reason for the visit, such as a sick visit, annual physical, or follow-up for a chronic condition. The Superbill provides a physical paper trail of the patient’s visit with the Current Procedural Terminology, or CPT coding, that outlines the type of visit and/or services rendered during the visit. This information is then entered in the EHR at the end of the visit for proper billing.

The DNP student and the office manager discussed when during the patient process changes could be implemented to improve the rate of AAP implementation. It was identified that upon scheduling a patient, a “flag” would be added to the chart that indicated that the patient has a diagnosis of asthma. The “flag” was a notation on the chart that became visible within a separate dialogue box in the EHR upon opening a patient chart. The notation would need to be acknowledged by the medical staff and closed prior to documenting within the patient’s chart. When the patient checks in, the front-office MA would review the reason for the visit and the “flag” would display in the EHR upon opening the chart. The MA would then make a notation at the top of the Superbill that stated simply “Asthma” or “AAP needed.” Once the patient was taken to the exam room, the back-office MA would be responsible for reviewing the notations on the Superbill that outline the patient’s reason for the visit. If “Asthma” or “AAP needed” was noted, the back-office MA would then provide an AAP for the provider to complete during the patient visit. Once completed, the provider would provide the scheduling MA the document to be
scanned in to the patient’s chart and the patient would receive the original for home reference.

The new process change is outlined in Figure 8.

**FIGURE 7. Pre-Intervention Process of Internal and Family Medicine**

**FIGURE 8. Proposed Process Changes for Internal and Family Medicine**

At the time of this QI project, the providers had not been regularly using AAPs in practice. It was identified during the development of the Ishikawa that the clinic would be changing EHR platforms during the third week of data collection, so implementing an electronic action plan would not be feasible or practical at the time of this project. The DNP student therefore provided several options of AAPs for use, including a pediatric and a Spanish version.
(Appendix C). Each AAP has slightly different components, allowing the provider to determine which version would be most appropriate for clinical use and for the patient’s needs.

It was agreed upon by the DNP student and the office manager that the changes would be implemented and trialed beginning October 17, 2016 and be conducted for a four-week timeframe to evaluate the effectiveness of the process changes. Data for the four weeks prior to the process change were also requested for comparison of the effectiveness of the tests of change implemented during this phase. Additionally, the overall aim of the PDSA cycle of this project was clarified: 85% of patients with asthma that are evaluated in the clinic over the next 4 weeks will have an active AAP in place.

Do

Preparation and notation on patient charts began the Friday prior to the implementation of the process changes. New appointments and next day appointments were reviewed for a diagnosis of asthma and the notation “Asthma” or “AAP needed” was made. Copies of the various AAPs listed in Appendix C were provided to the clinic staff by the DNP student to assist in the process of ensuring the provider would receive a copy to complete with the patient, as well as provide different options so that the provider may determine which was best for the patient and clinical use. The process changes were implemented from October 17 thru November 11, 2016. The DNP student was available throughout the course of the intervention and conducted brief weekly meetings with the staff to discuss the progress, provide support, and help clarify and assess the process improvement. The process changes were implemented without difficulty throughout the intervention period.
Study

Over the four-week intervention period, only one patient was identified with a diagnosis of asthma and an AAP was implemented at the time of the patient visit. Given the low numbers during the intervention period, comparison to the pre-intervention data was not performed as it would be difficult to determine if the one AAP implemented was truly related to the process change.

Act

A final meeting following the four-week intervention was conducted and facilitated by the DNP student to evaluate the results of the QI project. The stakeholders felt that the process changes were effective and easy to implement, but agreed that the low subset of patients with asthma was a limitation in determining whether the process change was effective. The MAs noted that the implemented process changes went smooth. The stakeholders noted that the EHR change in the middle of the study period created an increased stressor. Despite the stressor, they were able to transition the process into the new system without much difficulty. The providers were encouraged that this is a process that could continue, but true benefit would need to be evaluated over a longer period and with more patients.

Summary

This section discussed the process of conducting a PDSA cycle to implement a process change to improve the use of AAPs in clinical practice. A root cause analysis was conducted utilizing the Ishikawa diagram to determine current clinical processes for patients with asthma. Process changes were discussed to support improving implementation and use of AAPs in the
clinical practice. The planning meetings, implementation process, and results of the PDSA cycle were reviewed, as well as, the resulting actions moving forward.

**DISCUSSION**

**Summary**

This QI project was conducted at Internal and Family Medicine Clinic in Mesa-Gilbert, Arizona. The purpose of this project was to improve asthma clinical management by providing the patient self-management skills needed to control the symptoms, prevent complications, and improve outcomes through the implementation of AAP standards for patients diagnosed with asthma. A QI team was developed that consisted of the DNP student, the physician and nurse practitioner, and the four MAs within the clinic.

A review of current asthma management within the clinic revealed underutilized AAPs for all patients with asthma, noting that only 4 of the 77 patients with a diagnosis of asthma within the clinic had an active plan. While conducting a root-cause analysis, it was determined that there was no process in place to identify patients with asthma to ensure implementation or follow up on recommended guidelines for management. The QI team developed a process improvement plan to identify patients with asthma and provide an AAP to the provider for completion with the patient.

The process changes were implemented without difficulty during the intervention however, only one patient with asthma was identified during the 4-week period. The QI team expressed that while they were able to identify this patient, it is unclear if this was a result of the process changes. During the post-intervention meeting it was discussed that a longer intervention period and more patients would be needed to determine if the process change was truly effective.
Interpretations

Asthma is a chronic, inflammatory and obstructive disease of the respiratory system with variable presentations among patients (Dunphy, Winland-Brown, Porter & Thomas, 2011). The management of asthma is not a “one-size-fits-all” approach; rather, it requires a collaborative approach between the healthcare team and the patient. Additionally, individual asthma care is not a static process and continuous evaluation of patient management is essential to promote optimal physiological functioning, manage variable symptom presentations, and improve individual wellbeing (Shen, Johnston & Hays, 2011). Analyzing current approaches and applying quality improvement processes is beneficial to support essential clinical processes and, ultimately, improve overall health outcomes of decreased morbidity and mortality for patients with asthma (Health Resources and Services Administration, 2011).

The foremost asthma treatment guidelines have consistently emphasized the need for patients to receive self-management techniques and education in order to fully understand all aspects of their asthma care (Shen, Johnston & Hays, 2011). Research on the use of asthma action plans for self-management has demonstrated efficacy by providing problem-solving behaviors to individuals to manage asthma symptoms over time (GINA, 2015; NHLBI, 2007; Shen, Johnston & Hays, 2011), especially for patients that “have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma” (NHLBI, 2007, p. 115).

This QI project implemented a process change within Internal and Family Medicine to support and promote the use of AAPs in clinical practice. Based on the results of this project, it was difficult to determine if a process change was effective in identifying patients with asthma. Studies have found that while providers are overall aware of the guidelines, adherence remains
low due to time constraints during patient appointments, lack of familiarity or availability of documents and even low patient volume have been noted to be factors impacting the implementation or review of AAPs (Goeman, et al., 2013; Mowrer et al., 2015; Ring et al., 2015). This was apparent in this QI project as low overall patient volume was a likely limiting factor, in addition to time constraints during the actual appointment.

Research has shown that the use of electronic AAPs (eAAP) and EHR reminders greatly improves the use of AAPs in practice, decreases exacerbations and oral steroid use, and increases continuity of care and adherence to prescribed regimens (Goeman et al., 2013; Kuhn et al., 2015). The use of notations on the chart to remind staff of a patient with asthma was utilized for this QI project. Examining the results of this project, it appeared that this helped to increase the rate of AAP implementation by providing a new paper AAP to the provider, however, it did not necessarily improve the rate of AAP review. This may, in part, be related to the already low rates of AAP use in the clinic. The clinic serves approximately 712 patients, of which 77 have a diagnosis of asthma and only four had an active AAP in use prior to this project. Unfortunately, the use of an electronic AAP was not feasible for this QI project due to the transition to a new EHR program during the project timeframe. Expanding the project timeframe and/or implementing the QI project in a larger healthcare center with an increased number of patients with asthma may allow for the development and implementation of an electronic plan in future PDSA cycles.

Readability and usability must also be evaluated for the purposes of this project. Ring et al. (2015) conducted a qualitative study to describe the views of patients and health care professionals regarding the use of personalized AAPs. The authors noted that current care
processes in the primary care setting were not conducive to implementing or reviewing AAPs. Mowrer et al (2015) reinforced this finding that providers and patients noted time constraints for appropriate education and goal setting for asthma care and self-management. These findings create a concern for patients when they are provided an AAP without fully understanding the value or how to apply it when asthma symptoms change.

Yin et al (2013) analyzed 30 different AAPs for readability and usability: 27 that were endorsed by state health departments, and three from national departments, such as NHLBI. It was found that the mean reading grade level for the AAPs was approximately 7.2, with a range of 5.7 to 9.8. Prior to this QI project, Internal and Family Medicine did not have a designated AAP for use. Various forms were provided to help “jumpstart” the project (Appendix C). These AAPs were analyzed for readability using computer-calculated scoring algorithms provided via software from readability-score.com. The software calculates an average grade level score based on the following algorithms: Flesch Reading Ease, Gunning-Fog, Flesch-Kincaid grade level, Coleman-Liau Index, SMOG Index, and Automated Readability Index. Each of these algorithms, except for the Flesch Reading Ease, evaluates the reading level of the selected text (Wang, Miller, Schmitt, & Wen, 2013). The Flesch Reading Ease evaluates how easy the reading passage is to understand in English and scores the text on a 100-point scale; the closer the score is to 100, the easier the text is to understand (Wang, Miller, Schmitt & Wen, 2013). The results of the AAPs used for this QI project are provided in Table 2. Two of the action plans considered for this project were at the maximum 5th-grade recommended reading level for health education materials (Yin et al., 2013). Evaluating readability and usability of AAPs used in clinical practice
should be done to ensure that they are appropriate for the health system, ensure access to available treatment options, and consider the local cultural and literacy context (GINA, 2015).

### TABLE 2. Readability Tests of AAPs Used in QI Process

<table>
<thead>
<tr>
<th>Readability Algorithm</th>
<th>NHLBI</th>
<th>American Lung Association</th>
<th>District of Columbia</th>
<th>AAFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flesch Reading Ease</td>
<td>92.6</td>
<td>97.5</td>
<td>80.6</td>
<td>93.4</td>
</tr>
<tr>
<td>Gunning Fog</td>
<td>5.2</td>
<td>5.1</td>
<td>5.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Flesch-Kincaid Grade level</td>
<td>2.1</td>
<td>0.9</td>
<td>3.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Coleman-Liau Index</td>
<td>10.6</td>
<td>14.1</td>
<td>15.1</td>
<td>11.4</td>
</tr>
<tr>
<td>SMOG index</td>
<td>7</td>
<td>6.8</td>
<td>7.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Automated Readability Index</td>
<td>3.3</td>
<td>5</td>
<td>5.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Avg. Grade Level</td>
<td>5.6</td>
<td>6.4</td>
<td>7.4</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Finally, reimbursement for asthma-related care may also be a barrier to effective management. Currently, asthma education and AAP development is coded under the Evaluation & Management code (E&M), however, capitation rates on services for diagnoses such as asthma are often set too low to be financially feasible, especially for small clinics or healthcare centers (CDC, 2013). Additionally, there is no reimbursement for patients to receive services from an asthma educator in many states, including Arizona. To evaluate reimbursement efforts and fund programs in an effort to improve reimbursement, the CDC established a work group from the National Asthma Control Program (NACP. The program found that it was often difficult to engage third-party payers to change reimbursement policies due to the increased need for resources to support asthma education; additionally, state-funded public health insurance varied widely in regards to the services, procedures, and supplies that would be reimbursed, outlining the need for both state and federal changes (CDC, 2013). It is difficult to determine if
reimbursement policies impacted this QI project with the low rate of patients with asthma, however, evaluation over time with more patients would be beneficial to determine the impact on clinical practice.

**Project Limitations**

The small census of patients that received care related to asthma at Internal and Family Medicine Clinic was a significant limitation to this QI project. Consideration must be extended as to whether this project may have a greater impact in a clinic with a larger census of patients with asthma. Application of the process changes in a larger clinic or health center would be essential to determining if the process changes are truly effective in improving the rate of asthma action plan implementation and use. In addition, the implementation of a new EMR during this QI project posed a challenge to the clinic staff in applying the process changes at the same time as trying to learn a new system. Finally, this project only consisted of a single PDSA cycle over a four-week period with a primary focus on process change to improve the rate of asthma action plan utilization. This limited time frame also did not allow for further exploration as to whether the process changes ultimately help to improve patient outcomes.

A second limitation of this project were the organizational changes that precluded conducting the QI project at two clinical sites after the project was initiated at each site. The time and effort required of the DNP student to develop the partnerships and then secure a new site ultimately contributed to the inability to evaluate the project change. Fortunately, one of the major stakeholders, Dr. Sara Edmund, facilitated securing the third and final clinical site to conduct the project.
Project Strengths

There were several strengths of this QI project. The providers at Internal and Family Medicine were engaged in the process and supported the idea of improving patient care through evidence-based practice. This was essential to the development and implementation of the process changes, as well as the overall goal and aims of this project. Additionally, there is significant research available that demonstrates the efficacy of AAPs in clinical practice. Providing this evidence to the stakeholders helped to cement the importance of applying evidence-based practice guidelines in practice to ensure optimal patient outcomes.

Significance to Nursing and Practice

This QI project is significant to advance practice nursing because it reflects the importance of utilizing guideline recommendations to improve patient care and the role of the DNP prepared clinician in a complex and evolving healthcare system. Guidelines have increasingly become an essential part of health-care delivery to ensure the application of evidence-based practice in the clinical setting (Dunphy, Winland-Brown, Porter & Thomas, 2011). Wide variation exists among practitioners in relation to diagnostic and treatment approaches; however, with the increasing costs of healthcare, providers must find care approaches that provide high value that fully supports healthcare outcomes, patient safety, and patient satisfaction at a feasible cost (Anderson et al., 2014). The utilization of AAPs is one example of providing high value, low cost intervention to improve patient outcomes that is supported by evidence-based research.

Multiple research studies have documented the ability of Nurse Practitioners to provide safe, effective and quality care. In a systematic review conducted by Stanik-Hutt et al. (2013),
published literature from 1990-2009 was analyzed to determine quality of care in relation to patient satisfaction, self-report of perceived health status and functional status, hospitalizations, numbers of unexpected ED visits, hospital length of stay, duration of ventilation, mortality outcomes, and effectiveness. In all areas of care, apart from duration of ventilation, a moderate to high strength of evidence was found among the 37 studies that demonstrated patient outcomes of Nurse Practitioners similar to that of physicians.

With the passage of the Affordable Care Act (ACA), insurance access and coverage was expanded to nearly 32 million uninsured Americans, with an estimated 24 million individuals gaining health insurance by 2019, creating an influx of patients and demand for clinicians to meet increasingly complex needs (Lathrop & Hodnicki, 2014). As of October 2016, an estimated 222,000 nurse practitioners are licensed in the United States, with 83.4% certified in some area of primary care (American Association of Nurse Practitioners, 2016). Nurse practitioners are helping to fill the gap to provide primary care services and are taking on increasing responsibilities in the healthcare arena (Stanik-Hutt et al., 2013). As part of the Healthy People 2020 objectives to increase access to health services, nurse practitioners are in a position to improve healthcare access, provide quality care, and improve health outcomes (United States Department of Health and Human Services, 2014). Understanding and applying guidelines to care for chronic conditions, such as asthma, allows for nurse practitioners to translate research into practice and provide the opportunity to decrease morbidity and mortality related to chronic disease (NHLBI, 2007). Even more so, the DNP prepared clinician is in an optimal position to apply clinical practice expertise and demonstrate clinical leadership in the ever changing and increasingly complex healthcare field (Lathrop & Hodnicki, 2014).
By following the process of developing and implementing a QI initiative, the DNP student developed skills to promote and strengthen systems leadership skills. Quality improvement is an ongoing process. Applying this knowledge to daily practice will be a starting point to improving patient care and promoting optimal patient outcomes. One way that this may occur is by identifying process changes in daily practice that will support the use of AAPs. While the DNP student currently practices in urgent care, initiating and advocating for AAP use when patients present for asthma-related concerns in the urgent care setting may help to open communication and discussions with patients and primary care providers to implement and subsequently, review AAPs to prevent complications and improve patient outcomes. Quality improvement strategies are needed throughout healthcare and by applying the skills acquired throughout the DNP program, the DNP student is prepared to support continued changes and evidence-based practice to improve patient care.

**Conclusion**

This QI project was developed in conjunction with the stakeholders of Internal and Family Medicine in Mesa/Gilbert, Arizona to improve the care delivered to patients with asthma. While research has shown that the use of AAPs are an effective method to provide patients with the self-management skills to control the symptoms, prevent complications, and improve outcomes, underutilization has been a concern. While this project attempted to improve the processes to support the use of AAPs, the low number of patients was a barrier in determining the true effectiveness of the interventions. Future PDSA cycles will be of benefit in further supporting the process change, determining the effect of AAPs on patients with asthma within the clinic, and promoting the use of evidence-based guidelines within clinical care.
APPENDIX A:

INTERNAL AND FAMILY MEDICINE CLINIC PERMISSION TO CONDUCT QUALITY IMPROVEMENT (QI) PROJECT
September 12, 2016

To Whom It May Concern:

DNP student Anne Piper has permission to conduct a QI project in my office and utilize data from charts within my patient panel. This data was/will be extracted from my EHR and no private information was or will be included within the data.

Please let me know if you have any questions.

Sincerely,

Dr. Sara J. Edmund, DNP, FNP-C
Family Nurse Practitioner
Internal & Family Medicine
APPENDIX B:

ASTHMA SEVERITY CLASSIFICATION TABLE AND STEP-WISE TREATMENT RECOMMENDATIONS
The Pediatrician’s Ready Reference Guide
Current NHLBI guidelines on assessing and monitoring asthma control

<table>
<thead>
<tr>
<th>COMPONENTS OF SEVERITY</th>
<th>INTERMITTENT</th>
<th>PERSISTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MILD</td>
<td>MODERATE</td>
</tr>
<tr>
<td>AGE IN YEARS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>5-11</td>
<td>&gt;12</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nocturnal symptoms</td>
<td>0</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>SABA use</td>
<td>≤2 days/week</td>
<td>≥2 days/week</td>
</tr>
<tr>
<td>Interferes with normal activity</td>
<td>None</td>
<td>Minor</td>
</tr>
<tr>
<td>PFT</td>
<td>n/a</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>FEV, FEV/FVC</td>
<td>n/a</td>
<td>&gt;85%</td>
</tr>
<tr>
<td>Risk</td>
<td>0-1x/year</td>
<td>&gt;2x/6 months or &gt;4x/year + risk factors</td>
</tr>
</tbody>
</table>

RECOMMENDED STEP FOR INITIATING TREATMENT

<table>
<thead>
<tr>
<th>STEP 1</th>
<th>STEP 2</th>
<th>STEP 3</th>
<th>STEP 3</th>
<th>STEP 4</th>
</tr>
</thead>
</table>

Abbreviation: FEV, forced expiratory volume; FVC, forced vital capacity; PFT, pulmonary function test; NHLBI, National Heart, Lung, and Blood Institute; SABA, short-acting beta agonist.
From Reddy AP, et al. 1

### 2007 NHLBI Stepwise Treatment Recommendations by Age

<table>
<thead>
<tr>
<th>Step</th>
<th>Intermittent</th>
<th>Persistent: Daily Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0-4 Years of Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>SABA as needed</td>
<td>Low-dose ICS</td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td>Cromolyn or montelukast</td>
</tr>
<tr>
<td><strong>5-11 Years of Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>SABA as needed</td>
<td>Low-dose ICS + LABA, LTRA, theophylline or medium-dose ICS</td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td>Cromolyn, LTRA, nedocromil, or theophylline</td>
</tr>
<tr>
<td><strong>&gt;12 Years of Age - Adults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred</td>
<td>SABA as needed</td>
<td>Low-dose ICS + LABA or medium-dose ICS</td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td>Cromolyn, LTRA, nedocromil, or theophylline</td>
</tr>
</tbody>
</table>

For all ages at each step: patient education, environmental control, management of comorbidities

For 5-11 years of age and >12 years of age-adult groups:
Consider subcutaneous immunotherapy for patients with persistent allergic asthma

Abbreviations: ICS, inhaled corticosteroids; LABA, long-acting beta agonist; LTRA, leukotriene receptor antagonist; SABA, short-acting beta agonist; NHLBI, National Heart, Lung, and Blood Institute.

From Reddy AP, et al.1

APPENDIX C:

EXAMPLES OF AN ASTHMA ACTION PLAN
### Asthma Action Plan

**District of Columbia Asthma Program**, Retrieved from [http://dcasthma.org/asthma_action_plans.htm](http://dcasthma.org/asthma_action_plans.htm)

<table>
<thead>
<tr>
<th>Name</th>
<th>Date of Birth</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Care Provider</td>
<td>Provider’s Phone</td>
<td></td>
</tr>
<tr>
<td>Parent/Responsible Person</td>
<td>Parent’s Phone</td>
<td>School</td>
</tr>
<tr>
<td>Additional Emergency Contact</td>
<td>Contact Phone</td>
<td>Last 4 Digits of SS#</td>
</tr>
</tbody>
</table>

#### Asthma Severity
- Intermittent or Persistent: □ Mild □ Moderate □ Severe
- Asthma Control: □ Well-controlled □ Needs better control

#### Asthma Triggers Identified (Things that make your asthma worse):
- Colds □ Smoke (tobacco, incense) □ Pollen □ Dust □ Animals □ Strong odors □ Mold/moisture □ Pets (rodents, cockroaches) □ Stress/emootions □ Gastroesophageal reflux □ Exercising □ Seasons: Fall, Winter, Spring, Summer □ Other: __________

#### Date of Last Flu Shot:
- / / 

### Green Zone: Go! — Take these CONTROL (PREVENTION) Medicines EVERY Day

- You have ALL of these:
  - Breathing is easy
  - No cough or wheeze
  - Can work and play
  - Can sleep all night

- **Peak flow in this area:** ______
  - (More than 90% of Personal Best)

- **Personal best peak flow:** ______

#### Asthma Triggers Identified (Things that make your asthma worse):
- Colds □ Smoke (tobacco, incense) □ Pollen □ Dust □ Animals □ Strong odors □ Mold/moisture □ Pets (rodents, cockroaches) □ Stress/emootions □ Gastroesophageal reflux □ Exercising □ Seasons: Fall, Winter, Spring, Summer □ Other: __________

#### Date of Last Flu Shot:
- / / 

### Yellow Zone: Caution! - Continue CONTROL Medicines and ADD RESCUE Medicines

- You have ANY of these:
  - First sign of a cold
  - Cough or wheeze
  - Tight chest
  - Problems sleeping, working, or playing

- **Peak flow in this area:** ______
  - (50%-90% of Personal Best)

- **Call your DOCTOR if you have these signs more than two times a week or if your rescue medicine doesn’t work!**

### Red Zone: EMERGENCY! — Continue CONTROL & RESCUE Medicines and GET HELP!

- You have ANY of these:
  - Can’t talk, eat, or walk well
  - Medicine is not helping
  - Breathing hard and fast
  - Blue lips and fingernails
  - Tired or lethargic
  - Ribs show

- **Peak flow in this area:** ______
  - (Less than 50% of Personal Best)

#### REQUIRED Healthcare Provider Signature:

- Name: __________
- Date: __________

#### REQUIRED Responsible Person Signature:

- Name: __________
- Date: __________

- Follow up with primary doctor in 1 week or:

  - Phone: __________

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**District of Columbia Asthma Program**, Retrieved from [http://dcasthma.org/asthma_action_plans.htm](http://dcasthma.org/asthma_action_plans.htm)
(National Heart, Lung, & Blood Institute, retrieved from http://catalog.nhlbi.nih.gov/catalog/product/Asthma-Action-Plan/07-5251)
Asthma Action Plan

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
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<table>
<thead>
<tr>
<th>Doctor</th>
<th>Medical Record #</th>
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<table>
<thead>
<tr>
<th>Doctor’s Office Phone #: Day</th>
<th>Night/Weekend</th>
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<thead>
<tr>
<th>Emergency Contact</th>
<th>Doctor’s Signature</th>
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The Colors of a traffic light will help you use your asthma medicines.

Green means Go Zone!
Use preventive medicine.

Yellow Means Caution Zone!
Add quick-relief medicine.

Red means Danger Zone!
Get help from a doctor.

Personal Best Peak Flow ________________

GO

You have all of these:
• Breathing is good
• No cough or wheeze
• Sleep through the night
• Can work and play

Peak flow from _______ to _______

Use these daily preventive anti-inflammatory medicines:

<table>
<thead>
<tr>
<th>MEDICINE</th>
<th>HOW MUCH</th>
<th>HOW OFTEN/WHEN</th>
</tr>
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For asthma with exercise, take:

<table>
<thead>
<tr>
<th>MEDICINE</th>
<th>HOW MUCH</th>
<th>HOW OFTEN/WHEN</th>
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Continue with green zone medicine and add:

<table>
<thead>
<tr>
<th>MEDICINE</th>
<th>HOW MUCH</th>
<th>HOW OFTEN/WHEN</th>
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</table>

CAUTION

You have any of these:
• First signs of a cold
• Exposure to known trigger
• Cough
• Tight chest
• Mid wheeze
• Coughing at night

Peak flow from _______ to _______

<table>
<thead>
<tr>
<th>MEDICINE</th>
<th>HOW MUCH</th>
<th>HOW OFTEN/WHEN</th>
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CALL YOUR PRIMARY CARE PROVIDER.

DANGER

Your asthma is getting worse fast:
• Medicine is not helping
• Breathing is hard and fast
• Nose open wide
• Ribs show
• Can’t talk well

Peak flow reading below

<table>
<thead>
<tr>
<th>MEDICINE</th>
<th>HOW MUCH</th>
<th>HOW OFTEN/WHEN</th>
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GET HELP FROM A DOCTOR NOW! Do not be afraid of causing a fuss. Your doctor will want to see you right away. It’s important! If you cannot contact your doctor, go directly to the emergency room. DO NOT WAIT.

Make an appointment with your primary care provider within two days of an ER visit or hospitalization.

(Retrieved from http://www.aafa.org/page/asthma-treatment-action-plan.aspx)
## Asthma Action Plan

### General Information:
- **Name:**
- **Emergency contact:**
- **Phone numbers:**
- **Physician/hospital information:**
- **Phone numbers:**
- **Physician signature:**
- **Date:**

### Severity: Class/Stage:
- **Intermittent**
- **Mild Persistent**
- **Severe Persistent**

### Plan:
- **Medications:**
  - **Control Medications:**
    - **Medicine:**
    - **How Much to Take:**
    - **When to take it:**
- **Pre-medication:**
  - How much and when:
  - Exercise modifications:

### Green Zone: Doing Well

### Peak Flow Meter Personal Best =

### Symptoms:
- Breathing is good
- No cough or wheeze
- Can work and play
- Sleeps well at night

### Yellow Zone: Getting Worse

### Peak Flow Meter Personal Best =

### Symptoms:
- Some problems breathing
- Cough, wheezing, or chest tight
- Problems working or playing
- Wake up at night

### Red Zone: Medical Alert

### Peak Flow Meter Personal Best =

### Symptoms:
- Lots of problems breathing
- Cannot work or play
- Getting worse instead of better
- Medicine is not helping

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APPENDIX D:

UNIVERSITY OF ARIZONA INTERNAL REVIEW BOARD APPROVAL-HUMAN

SUBJECTS REVIEW NOT REQUIRED
Date: September 30, 2016

Principal Investigator: Anne Kathryn Piper

Protocol Number: 1609889607

Protocol Title: FACILITATING THE USE OF ASTHMA ACTION PLANS IN PRIMARY CARE: A QUALITY IMPROVEMENT PROJECT

Determination: Human Subjects Review not Required

The project listed above does not require oversight by the University of Arizona because the project does not meet the definition of 'research' and/or 'human subject'.

- **Not Research as defined by 45 CFR 46.102(d):** As presented, the activities described above do not meet the definition of research as cited in the regulations issued by the U.S. Department of Health and Human Services which state that "research means a systematic investigation, including research development, testing and evaluation, designed to contribute to generalizable knowledge".

- **Not Human Subjects Research as defined by 45 CFR 46.102(f):** As presented, the activities described above do not meet the definition of research involving human subjects as cited in the regulations issued by the U.S. Department of Health and Human Services which state that "human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains data through intervention or interaction with the individual, or identifiable private information".

Note: Modifications to projects not requiring human subjects review that change the nature of the project should be submitted to the Human Subjects Protection Program (HSPP) for a new determination (e.g. addition of research with children, specimen collection, participant observation, prospective collection of data when the study was previously retrospective in nature, and broadening the scope or nature of the research question). Please contact the HSPP to consult on whether the proposed changes need further review.

The University of Arizona maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00004218).
REFERENCES


