Practice Inquiry Project Final Manuscript:

Development of an Evidence-Based Pediatric Asthma Program for a Nonprofit Clinic Serving Underserved, Uninsured, and Underinsured Populations in Southern Nevada

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This practice inquiry project has been approved for meeting full requirements for the Doctor of Nursing Practice Degree at the University of Hawaii at Hilo School of Nursing

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Abstract

The purpose of this Practice Inquiry Project was to create a pediatric asthma management program for children age five and older, based on up-to-date evidence-based guidelines. The program was developed for the First Person Care Clinic, a free clinic that serves the underserved, uninsured, and underinsured population in Nevada. A microsystems analysis was performed to understand the clinic’s workflow and protocols for treating pediatric asthma patients. Analysis of current literature and vignette surveys helped in identifying topics included in the asthma management guide. Topics involved general asthma management and areas that needed to be improved in order to be consistent with current national asthma guidelines. An asthma management guide was developed and evaluated by an interdisciplinary team using the AGREE II methodology. Results from the evaluation indicated that providers recommended the management guide for use, but with an additional section that assists in the identification of comorbidities.
Practice Inquiry Project:
Development and Implementation of an Evidence-Based Pediatric Program for the Underserved, Uninsured, and Underinsured Population in Southern Nevada

Chapter 1: Statement of the Problem

The National Institutes of Health (2012) defines asthma as a chronic inflammatory lung disease that narrows the airways. It causes recurring periods of coughing, wheezing, chest tightness, and shortness of breath. In the United States, more than 25 million people have asthma. The rate of asthma per 1 thousand of the population has increased from 63.6 to 71.9 from 2001 to 2011, and appears to be increasing (American Lung Association, 2012). Of these people, nearly 7 million are children. Current asthma data suggests that the number of conditions and prevalence is increasing among all age groups. Sociocultural aspects are linked to asthma. According to a report by the United States Department of Health and Human Services and National Center for Health Statistics, demographic groups with higher rates of asthma include children aged 0-17 years, females, black persons, persons of multiple race, and persons with a family income level below poverty level (Centers for Disease Control and Prevention, 2012).

Asthma prevalence has been steadily increasing in the United States. According to the most recent data available from the CDC’s Behavioral Risk Factor Surveillance System (BRFSS), asthma prevalence for children in the state of Nevada was 11.8 percent in 2006 (CDC, 2012). A contributor to lack of proper pediatric asthma management in Nevada was underinsurance. According to a report by the Nevada legislature the percent of children not covered by health insurance was 17.5 percent compared to the national average of 9.8 percent, which made it the highest in the nation (Combs, 2012). In
addition, the state of Nevada ranked forty-eighth for number of physicians per 100,000 of the population, and last for the number of registered nurses per 100,00 of the population (Combs, 2012). Among the significant amount of uninsured children in Nevada, many sought care in nonprofit health care clinics such as the First Person Care Clinic (FPCC).

The FPCC is a non-profit organization that provided preventative and primary health care services to the Southern Nevada region, including the medically underserved, uninsured, and underinsured. It is considered a Safety Net Clinic or free clinic, which receive funding from diverse sources including private sector donations, civic groups, churches, foundations and corporations. In addition, funding was also received from federal, state or local grants (Association of State and Territorial Health Officials, 2011). Safety Net Clinics were approved to operate on four areas of focus. These include: 1) developing patient-centered medical homes as a way to increase preventative care, improve quality, and integrate and coordinate critically needed mental health and other services; 2) increase access to urgent care and same day services to ensure access to medical homes and reduce inappropriate emergency department use; 3) expand capacity to provide and coordinate complex care, particularly for the medically, socially, and psychologically complex patient, and 4) organize collaborative approaches to increase access on a geographic basis for high need populations and neighborhoods in the community (First Person Care Clinics, N.D.).

Despite serving all sectors regardless of their ability to pay, their mission is to provide efficient, quality, and affordable healthcare by maintaining continuity of care through a holistic, compassionate, and accessible approach. In addition, they take pride in providing care through evidence-based healthcare. Various services are available that
promote wellness through screening- and identification of chronic-illness, and dental, mental health, and pediatric programs (FPCC, N.D.).

Pediatric asthma patients receive care at the FPCC, however, the clinic did not have a process in place for asthma diagnosis and management. Majority of the pediatric asthma patients were treated symptomatically through the use of short-acting beta agonists such as nebulized albuterol. Children suspected of having asthma were referred out to other clinics for follow-up treatment.

**Problem Statement**

Asthma is a prevalent chronic childhood disorder that affects nearly 7.1 million children under the age of eighteen (ALA, 2014). The information presented above demonstrated the need for asthma care in the Southern Nevada population. The FPCC was a Safety Net Clinic that delivered free healthcare services to underserved, uninsured, and underinsured populations within Southern Nevada. The clinic did not have standard screening, treatment or long-term management processes for patients that presented with known asthma or asthma symptoms. With the vision of implementing evidence-based care and become a leader in providing patient care continuity, there were plans to expand services which included pediatric asthma. An evidence-based pediatric asthma program properly addressed the needs of the FPCC’s pediatric asthma patients.

**Purpose**

The purpose of this project was to create a pediatric asthma program for children age five and older, based on up-to-date evidence-based guidelines. The program was meant to guide the FPCC clinic’s providers and staff in proper asthma care, which included screening, diagnosis and management.
Three specific aims drove the project. Aims and objectives were as outlined:

**Specific Aim 1**
Evaluate the clinic’s current workflow and protocols for treating pediatric asthma patients.

**Objective 1.** Utilize microsystems analysis to gain knowledge and understanding of clinic functions in FPCC clinic for a pediatric asthma patient visit.

**Objective 2.** Evaluate current screening, diagnosis, and management plans used by the FPCC staff and providers for a pediatric asthma patient.

**Specific Aim 2**
Develop an evidence-based asthma program that meets the needs of the FPCC for pediatric asthma care.

**Objective 1.** Analyze existing treatment guidelines, current workflow processes and current asthma management plan flow for use in the FPCC.

**Objective 2.** Develop an evidence-based management algorithm based on the analysis of existing pediatric asthma guidelines and data analyzed from the FPCC.

**Specific Aim 3**
Perform an evaluation of the proposed pediatric asthma program using an interdisciplinary healthcare team.

**Objective 1.** Evaluate proposed pediatric asthma program by interdisciplinary team for adherence to evidence-based guidelines and suitability for the FPCC.
**Objective 2.** Apply changes to asthma management program as recommended.
Chapter 2: Review of Literature and Conceptual Framework

Chapter two provided a conceptual framework and comprehensive review of the literature that supported asthma in the pediatric population. The Human Ecology Theory explained applicability to the development and treatment of pediatric asthma. Further, a substantive review of literature specifically addressed definition of asthma, prevalence, cost, hospitalization, sociocultural factors, asthma in Nevada, pediatric asthma management guidelines, differences in asthma guidelines, diagnosis, current asthma management guidelines.

Conceptual Framework

The Human Ecology Theory, first introduced by Urie Bronfenbrenner in the 1970’s addressed an ecological development concept. Bronfenbrenner argued that the entire ecological system must be taken into consideration in order to understand human development (Bronfenbrenner, 1994, see Figure 1). The theory proposed that an individual’s environment is composed of five organized subsystems that supported and guided human growth. Subsystems consisted of microsystems, mesosystems, exosystems, macrosystems, and chronosystems (Bronfenbrenner, 1994).

Bronfenbrenner’s Human Ecological theory informed existing knowledge of the complex relationships among individuals and environments that were helpful in addressing the sociocultural, economic, and treatment management needs of children with asthma. The microsystem was the direct environment of an individual including family, friends, classmates, and neighbors. The mesosystem was the relationships between the microsystems in one’s life (Bronfenbrenner, 1994). For example, the mesosystem can be related to the relationship between home experience and an
individual’s health experience. A child may have increased asthma exacerbations because of poor living conditions at home. The exosystem was composed of linkages among settings, at least one of which the active person did not participate (Bronfenbrenner, 1994). For a child, an example would be the relationship between their home and their parent’s workplace. The child experienced living conditions based on the income earned at the parents’ or parent’s workplace. The macrosystem consisted of the overarching pattern of an individual’s micro-, meso-, and exosystems that formed an individual’s culture (Bronfenbrenner, 1994). The chronosystem included changes in an individual’s characteristics and environment over a passage of time (Bronfenbrenner, 1994). An example of this would have been a person’s experience of healthcare discrimination. Overtime, the experiences affected their compliance and their relationship with their provider. Figure 1 is a diagram of Bronfenbrenner’s Ecological Theory.

Figure 1. Bronfenbrenner’s Ecological Theory

(University of British Columbia, 2014)
The focus of the system in this project was the microsystem. Based on the Bronfenbrenner’s Ecological theory, the clinic in which the patient or family sought care was considered part of the microsystem. It was an important aspect of a child’s environment since it was a setting in which a child personally interacted, and the clinic direct influenced the child’s life. Any changes in the child’s microsystem affected other systems.

The goal of this asthma project was to implement effective, evidence-based techniques that contributed to positive outcomes in as many systems as possible. The extent to which other systems could be positively impacted was limited in systems where factors were non-modifiable or not immediately modifiable. Examples of non-modifiable or not immediately modifiable factors included the child’s gender, ethnicity, financial status, and living environment.

Overview of Asthma

Asthma is a chronic disease that affects the airways, or bronchial tubes, to the lungs. It is characterized by periods of airflow obstruction known as asthma attacks (CDC, 2012). Airways could become inflamed and swollen causing airway narrowing or bronchoconstriction, airway wall thickening, and increased mucus. Common symptoms of asthma included coughing, wheezing, shortness of breath and chest tightness. Asthma attacks occur in reaction to certain exposures, known as triggers. Triggers for asthma include exercise, infection, allergens, and environmental irritants (CDC, 2011; American Academy of Asthma and Immunology, 2014). Asthma is not curable, but asthma attacks are preventable and reversible. Asthma severity differs from person to person and, if not managed properly, could be life threatening (American Lung Association, 2014). Deaths
due to asthma are rare, but the number of deaths related to asthma increases as age increases (ALA, 2014).

**Prevalence**

From 2001 to 2010 the prevalence of asthma increased from 7.3 percent to 8.4 percent (CDC, 2012). In addition, asthma prevalence was higher among children than adults. Trends were seen in asthma prevalence across different populations. Asthma prevalence was higher among children, females, and those with family income below the poverty level, and those of multiple races. Asthma prevalence increased as poverty level increases. Asthma prevalence was 11.2 percent of those with income less than poverty level, 8.7 percent for those with incomes 100 percent to less than 200 percent of the poverty level, and 7.3 percent for those with incomes at least 200 percent of the poverty level. Asthma prevalence was highest in multiple race persons and lowest in Asian persons. Prevalence was 14.1 percent in multiple race persons, 11.2 in black persons, 9.4 percent in American Indian or Alaskan Native races, 7.7 percent in white persons, 6.3 percent in Hispanic persons, and 5.2 percent in Asian persons (CDC, 2012).

**Cost of Asthma**

According to the CDC (2011), asthma cost is about $3,300 per person each year. The annual direct health cost of asthma is approximately $56 billion, plus an additional $5.9 billion in indirect costs including lost revenue in productivity (CDC, 2011). Asthma was one of the leading causes of absenteeism among school-age children. In 2011, it was estimated that there were a total of 14.4 million school days in children lost (CDC, 2011). Medical expenses associated asthma increased from $48.6 billion to $50.1 billion from 2002 to 2007 and are expected to increase (CDC, 2011). This figure was of concern
especially since about two out of five and one out of nine insured people could not afford their prescription medications (CDC, 2011).

**Hospitalizations**

Asthma was the third leading cause of hospitalization among children under the age of fifteen (ALA, 2014). In 2010, there were a total of 640,000 emergency room visits due to asthma in children under fifteen (ALA, 2014). Rates of asthma among children were higher than other age groups. Compared to adults, children age zero to seventeen had a higher rate of asthma visits in primary care settings and emergency departments. Emergency department visits and hospitalizations per 100 persons were stable from 2001 to 2009, without improvement (CDC, 2012).

**Sociocultural Factors**

As previous prevalence data suggested, asthma was higher in minorities and those from low-income families. A population-based study by Gong, Lundholm, Rejno, Mood, Langstrom, & Almqvist (2014) found associations between parental socioeconomic status and childhood asthma occurrence. It was noted that children from families with lower income and education levels had higher incidence rates of asthma and increased risk of in-patient and outpatient asthma diagnosis and use of asthma medicine (Gong, et al., 2014). It was also found that lower amounts of asthma maintenance medications were dispensed for children from families with lower parental education (Gong, et al., 2014). This was a major concern especially since the use of asthma rescue inhalers as a primary means for asthma management was not the recommended treatment for uncontrolled asthma; maintenance medications were recommended (Institute for Safe Medicine Practices, 2010).
In addition to the physical environment contributing to asthma risk, being socially disadvantaged was shown to be another determinant. A study by Williams, Sternthal & Wright (2009) found that social inequalities such as residential segregation by race and socioeconomic status affected access to good quality healthcare. Segregation was also associated with increased exposure to physical and chemical risks, and social disorders (Gold & Wright, 2005).

Delivery of culturally congruent care was essential when caring for members of any population. Deficiencies in cultural competence were related to the delivery of effective asthma care. Cultural competence was defined as a set of congruent behaviors, attitudes, and policies that were respectful and responsive to health beliefs, practices and cultural and linguistic needs of diverse patients (NIH, 2014). According to a study by Seeleman, Stronks, van Aalderen, & Bot (2012), adherence was the main cause of poor outcomes in asthma care. As a result, providers were encouraged to recognize mechanisms that lead to culturally competent care. Some examples of providing culturally competent care included viewing differing cultural views as a strength, conducting a cultural self-assessment, understanding cultural dynamics, and adapting service delivery to reflect the understanding of cultural diversity (Sutton, 2000).

Asthma outcomes were worse in ethnic minority children compared to other children of the population. Various studies indicated that asthma disproportionately affected minorities such as Hispanics and Blacks. A study by Flores et al. (2009) examined urban minority children aged two to eighteen seen for asthma in four emergency departments. They found that on average, urban minority children experienced one asthma symptom daily, and one asthma exacerbation monthly, seven
missed school days, six missed parent work days, three emergency department visits, and one hospitalization yearly (Flores et al., 2009).

**Asthma in Nevada**

It is estimated that asthma affected a total of 34 million Nevadans. Estimated asthma prevalence rate was 11.8 percent for children and 13.4 percent (Moonie, 2012). In 2007, lifetime asthma and current asthma prevalence rates in Nevada were similar to the national average (Department of Health and Human Services, 2012). Data was limited on specific data related to asthma, but studies have examined asthma in Nevada. In 2011, the University of Nevada Las Vegas and the American Lung Association conducted a study that examined characteristics of children attending an asthma camp in Nevada. The study found that 14.5 percent of the participants had an asthma action plan (Shetty, Moonie, Beaulieu, & Aguino, 2011). In children diagnosed with asthma, having an asthma action plan was a recommendation of the National and Heart, Lung, and Blood Institute’s (NHLBI) National Asthma Education and Prevention Program Expert Panel 3 (NAEPP EP3) guidelines. Another study found a significant correlation between physician and patient assessments of asthma severity. A study by Moonie, et al. (2005), found that as asthma symptom severity increase, level of agreement between patients and physicians decreased. This could lead to poor asthma management since asthma national guidelines recommend that asthma management was severity-based.

**Pediatric Asthma Management Guidelines**

A number of asthma guidelines were published by interested groups and organizations. Similarities and differences existed in each of the guidelines. The
importance of guidelines was discussed, and the most often cited asthma guidelines were presented and subsequently compared.

There were four major guidelines for the management of asthma in children. The guidelines included 1) National Asthma Education and Prevention Program Expert Panel 3 (NAEPP EP3) published by the National Heart, Lung, and Blood (NHLBI); 2) PRACTALL Consensus Report published by the European Academy of Allergy and Immunology (EAACP) and American Academy of Allergy and Clinical Immunology (AAACP); 3) Evidence-Based Approach by the European Respiratory Society and American Thoracic Society; and 4) Global Initiative for Asthma (GINA) Report published by the (NHLBI), National Institute of Health (NIH) and World Health Organization (WHO). There were conflicting recommendations for children age four and under. This is likely due to underdeveloped lung functions, challenges to adequate deliver of inhaled drugs, safety issues, and ethical issues (Potter, 2010). On the other hand, management goals are similar among the different guidelines in children age 5 or older.

**Differences in Asthma Guidelines**

The Global Initiative for Asthma’s (GINA) and the National Asthma Education and Prevention Program’s Expert Panel Report 3 (EPR 3) provided similar asthma treatment guidelines for use in both children and adults. Both approaches are supported by Level A or the highest quality of evidence and build upon former guidelines that utilized evidence-based review of published literature to develop algorithms for asthma management. The similarities and differences in treatment approach were discussed in the following section.
A study by Bousquet & Busse (2010) examined the similarities and differences of EPR 3 and GINA asthma management guidelines. The study found that management recommendations had more similarities than differences, and differences that do exist are semantic in nature. Similarities identified included the definition of asthma control based on clinical manifestations and their responsiveness to therapy; the use of similar language with respect to exacerbations, and utilization of similar steps and medications in asthma management (Bousquet & Busse, 2010). In terms of differences, the GINA included response to therapy in assessments of asthma control, while the EPR 3 addressed resistance to treatment and effect of comorbid conditions. In addition, the EPR 3 assessment of asthma control was divided into domains of impairment and risk (Bousquet & Busse, 2010).

The most significant difference between the GINA and EPR 3 guidelines was in the recommendation of preferred treatment of persistent asthma or “step 3” in children age five to eleven. In this step the GINA guidelines recommended a combination of low-dose inhaled corticosteroids (ICS) and long-acting beta-agonist (LABA) (Global Initiative for Asthma, 2014, See Appendix A for diagram). In comparison the EPR 3 recommended a more flexible approach that included the option of either combination therapy or increasing the dose of ICS (National Heart, Lung, and Blood Institute, 2014). The change in the EPR 3 was related to the increased risk of asthma-related mortality, and the increased likelihood of severe asthma exacerbations in higher doses of formoterol a LABA (Nelson, Weiss, Bleecker, Yancey, & Dorinsky, 2005; Mann, Chowdhury, Sullivan, Nicklas, Anthracite, & Meyer, 2003).
Acute Management of Asthma

Acute asthma exacerbation, when frequent, was a sign of poor asthma management (American Family Physicians, 2011). Asthma exacerbation could be classified as mild, moderate, severe, or life threatening. According to the NHLB’s (2011) EPR3 guidelines, degree of severity is based on signs and symptoms and initial peak expiratory flow (PEF) or forced expiratory volume in one second (FEV1), and can be used to determine the course of treatment. Mild exacerbation involved dyspnea only with activity and PEF or FEV1 greater than or equal to seventy percent of predicted or personal best; moderate exacerbation involves dyspnea that interferes with or limits usual activity and PEF forty to sixty-nine percent of predicted or personal best; severe exacerbation included dyspnea at rest that interfered with conversation and PEF less than forty percent of predicted or personal best; life-threatening asthma included perspiration, too dyspneic to speak, and PEF less than twenty-five percent of predicted personal best (NHLBI, 2011). Course of treatment ranged from home treatment with short-acting beta agonists for mild asthma to hospitalization that required frequent inhaled short-acting beta agonists (SABA) and intravenous corticosteroids (NHLBI, 2011).

Diagnosis

The NAEPP EP3 focused on three clinical activities used to establish the diagnosis of asthma. First, was the use of a detailed medical history and physical examination to determine symptoms of recurrent asthma episodes of airflow obstruction were present. Second, was the use of spirometry in patients five and older to determine that airway obstruction is at least reversible. Lastly, alternative causes of airway obstruction should be ruled using additional diagnostic tests, which included additional
pulmonary function studies, bronchoprovocation, chest x ray, and biomarkers of inflammation (NHLBI, 2007). See Appendix A for comparison of pediatric asthma guidelines.

**Current Asthma Management Guidelines**

Once diagnosis was established, critical steps needed included for proper management. The NAEPP EP3 emphasized four components of care in asthma management. Essential components include assessment and monitoring, education, control of environmental factors and comorbid conditions, and medications and stepwise approach.

**Assessment and Monitoring**

Assessment and monitoring involved assessing asthma severity to initiate therapy, assessing asthma control to monitor and adjust therapy, and scheduling follow-up care. Actions involved include using a severity classification chart to assess impairment and risk. Classification of severity is based on impairment and risk. Criteria used to classify impairment severity are based on presence of symptoms, nighttime awakenings, use of short-acting beta agonists (SABA), interference with normal activity and lung function. Criteria used to classify risk severity are based on exacerbation requiring oral corticosteroids (OCS). Asthma was classified as intermittent, mild persistent, moderate persistent, and severe persistent (NHLBI, 2011)

It was important to note that treatment was based on severity and age. Treatment algorithms exist for each of age the different age groups. The age groups for children include newborn to four years, age five to eleven, and age twelve and older and adults (NHLBI, 2011). See Appendix B for age groups severity classification charts.
Recommended lung function measurements by spirometry at least every one to two years or more frequently for less than optimally controlled asthma. Lung function measurement was also recommended during initial assessment, after treatment is initiated and symptoms and peak expiratory flow (PEF) have stabilized, or during periods of progressive or prolonged asthma control (NHLBI, 2011).

Intervals for follow-up visits were also mentioned in the guidelines. It was recommended that initial, step-up, regain control patients follow-up every two to six weeks. Patients who have stepped down in treatment are recommended to follow-up every three months. Additionally, patients who have achieved control are recommended to follow up every one to six months (NHLBI, 2011).

**Education**

Education was a component of asthma management that was emphasized in guideline recommendations. Major points to address in asthma education include providing self-management education, developing a written asthma plan with the patient, and integrating education into all points of care where health professionals interact with patients. Guidelines provided specific education topics that should be addressed during the initial visit, first follow-up visit, second follow-up visit, and all subsequent visits. Recommended actions during these visits included assessing for self-monitoring including peak flow monitoring, using a written asthma action plan to review medications, providing instructions for daily management and management of worsening asthma. An example of an asthma action plan is included in the Appendix. A table that summarized specific education topics at each visit is included in the appendix.
Control Environmental Factors and Comorbid Conditions

Guidelines advocate use of resources to control environmental exposure to eliminate asthma and treat comorbid conditions that can improve asthma control. Examples of comorbid conditions include obstructive sleep apnea, rhinitis and sinusitis, and stress or depression. A flu vaccine should also be considered for all patients over six months of age (NHLBI, 2011).

Medications and Stepwise Approach

Risk or impairment to the patient, their history of response to the medication, and the patient’s willingness and ability to use the medication should all be considered when a medication plan is created (NHLBI, 2011). In addition, the stepwise approach was recommended to guide asthma treatment. This included selection of medication and delivery devices to meet patients’ needs. See Appendix C for recommended stepwise approach to be used in identifying and treatment. Guidelines recommended the use of inhaled corticosteroids as the most effective long-term control therapy (NHLBI, 2011).

The stepwise approach consisted of six steps in treating the pediatric patient with asthma. Each step provided recommendations on referral, preferred medications, alternative medications, education, environmental control, and management of comorbidities. In each progressive step, a medication or medications are increased, added, or changed. Medications involved in the stepwise approach included inhaled corticosteroids (ICS), long-acting beta agonists (LABA), leukotriene receptor antagonist (LRA), mast cell stabilizers and oral corticosteroids (OCS). Figure 2 and Figure 3, from the NHLBI website, are used with permission to describe the stepwise approach in treating asthma (NHLBI, 2011; NHLBI, 2015). The American Academy of Allergy,
Asthma, and Immunology (AAAAI) follows the NAEPP EP3 guidelines. Figure 4 summarizes descriptions of medications used in stepwise approach (AAAAI, 2015).

Figure 2. Stepwise Approach for Managing Asthma in Children 5-11 Years of Age
Figure 3. Stepwise Approach for Managing Asthma in Children Age 12 and Older
Figure 4. Description of Medications Used in Stepwise Approach

<table>
<thead>
<tr>
<th>Classification</th>
<th>Medications</th>
<th>Actions</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-acting Beta Agonist (SABA)</td>
<td>Albuterol</td>
<td>Bronchodilation: Beta 2 bronchiolar smooth muscle relaxation</td>
<td>Rescue only</td>
</tr>
<tr>
<td></td>
<td>Proventil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhaled corticosteroid (ICS)</td>
<td>Fluticasone</td>
<td>Blocks inflammatory mediators</td>
<td>Long-acting for asthma prevention</td>
</tr>
<tr>
<td></td>
<td>Budesonide</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mometasone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-acting Beta Agonist (LABA)</td>
<td>Salmeterol (Serevent)</td>
<td>Bronchodilation: Beta 2 bronchiolar smooth muscle relaxation</td>
<td>Long-acting for asthma prevention</td>
</tr>
<tr>
<td></td>
<td>Formoterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined ICS &amp; LABA</td>
<td>Fluticasone/Salmeterol</td>
<td>Blocks inflammatory mediators/Bronchodilation: Beta 2 bronchiolar smooth muscle relaxation</td>
<td>Long-acting for asthma prevention</td>
</tr>
<tr>
<td></td>
<td>Budesonide/Formoterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mometasone/Formoterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholinergic Agonist</td>
<td>Ipratropium (Atrovent)</td>
<td>Bronchodilation by parasympathetic inhibition</td>
<td>Rescue and prevention</td>
</tr>
<tr>
<td>Immunomodulators</td>
<td>Omalizumab</td>
<td>Anti-IgE</td>
<td>Prevention</td>
</tr>
<tr>
<td>Cromolyn</td>
<td>Cromolyn</td>
<td>Mast cell stabilizer</td>
<td>Prevention</td>
</tr>
<tr>
<td>Methylxanthine</td>
<td>Theophylline</td>
<td>Caffeine-like, bronchodilation</td>
<td>Prevention</td>
</tr>
<tr>
<td>Oral/systemic Corticosteroid (OCS)</td>
<td>Prednisone</td>
<td>Blocks all inflammatory mediators</td>
<td>Rescue and prevention</td>
</tr>
</tbody>
</table>

(American Academy of Allergy, Asthma, & Immunology, 2015)

**Long-term Asthma Management**

Major goals in long-term asthma management involved reduction of impairment and risk. Impairment reduction is achieved through the prevention of chronic symptoms, not requiring frequent use of short-acting beta two agonist (SABA), and the maintenance of normal lung function and normal activity levels (NHLBI, 2011). Risk reduction is achieved through preventing exacerbations, minimizing need for emergency care or hospitalization, preventing reduced lung growth, and having minimal or no adverse effects on therapy (NHLBI, 2011).
**Exercise-induced bronchospasm (EIB)**

The goal in the treatment of EIB was prevention. Treatment strategies to prevent EIB included the use of long-term therapy, pretreatment before exercise using SABA, leukotriene receptor antagonists (LTRAs), cromolyn or nedocromil. Long-term use of LABA was not recommended as it may disguise poorly controlled persistent asthma. Non-pharmacological treatment recommendations included a warming up period, or mask or scarf for cold-induced EIB (NHLBI, 2011).

**Pregnancy**

The goal of asthma treatment during pregnancy was maintenance of asthma control throughout pregnancy. Monitoring asthma control was recommended during all prenatal visits because asthma either worsens or improves in one-third of women. The use of medications to treat asthma was important during pregnancy to ensure the fetus had adequate oxygenation during fetal development. Recommended medications for use during pregnancy included albuterol for episodic use and budesonide for long-term control. Budesonide was the preferred medication because more data on pregnancy was available (NHLBI, 2007).

**Surgery**

The goal of asthma treatment in surgery was to reduce risks for complications during and after the surgery. It was recommended to assess control prior to surgery. Guidelines recommend that medications should be provided to improve if lung function asthma was not controlled. Recommended medications included a short course of oral systemic corticosteroids and the use of intravenous hydrocortisone every eight hours
during the surgical period, and then rapidly reducing the dose within twenty-four hours after surgery (NHLBI, 2007).

**Management of Exacerbations**

**Home management**

Four components of care and a completed written asthma action plan were essential in home management. The four components included assessment and monitoring, patient education, environmental control, and medications. Patients should also be instructed in recognition of early signs, symptoms, and peak expiratory flow (PEF) that indicate worsening asthma. In addition, medication adjustments including increasing SABA and adding oral systemic corticosteroids should be considered if necessary. Nearby hospitals should be identified in the asthma action plan in the event of serious deterioration or lack of response to treatment (NHLBI, 2011).

**Management in the Urgent or Emergency Care Setting**

Key recommendations included assessing severity, treating to relieve hypoxemia and airflow obstruction or reducing airway inflammation, monitoring for response, and discharge with medication and patient education. Other interventions included use of supplemental oxygen, repetitive or continuous SABA, and/or oral systemic corticosteroids. Monitoring for response to treatment should be done by serial lung function measures, pulse oximetry, and symptoms. Adjunctive treatments with magnesium sulfate or combination helium/oxygen (Heliox) should be considered in severe exacerbations. Signs of severe exacerbation included forced expiratory volume in one second (FEV1) or PEF less than forty percent predicted, or was unresponsive to initial treatment. Upon discharge the patient should be provided medications including
SABA, oral corticosteroids, or possibly initiating ICS. A referral should be made for follow-up care. An emergency department discharge plan should also be provided along with proper inhaler techniques and measures to control environment (NHLBI, 2011).

**Hospital and Clinical Implementation of Evidence-Based Asthma Guidelines**

Many top pediatric pulmonology hospitals in the United States used the NAEPP EP3 guidelines as part of their treatment protocol for pediatric asthma patients. Notable hospitals that used these guidelines included Children’s Hospital Philadelphia, Cincinnati Children’s Hospital, Boston Children’s Hospital, Texas Children’s Hospital, and Children’s Hospital Colorado. These hospitals have been ranked as top-performing hospitals in pediatric pulmonology based on clinical processes and outcomes (U.S. News and World Report, 2015). See Appendix D for comparison of top US hospitals and use of guidelines.

A report by the Cincinnati Children’s Hospital demonstrated successful implementation of the NAEPP EP3 guidelines in their treatment protocol. The publication focused on children with a diagnosis of asthma that had one or more asthma-related hospital admission, two or more emergency department visits per year, or poorly controlled asthma. Data from the Greater Cincinnati Beacon Collaboration revealed promising results for the children with poorly controlled asthma. Over a six-year period, hospital admission decreased from 7.2 per ten thousand population to 5.0 per ten thousand population. In addition, emergency department visits decreased from 20.9 per ten thousand population to 13.7 per ten thousand population. It was emphasized that changes did not reflect breakthrough in medication prescribing, but rather delivery of interventions in an evidence-based manner (Cincinnati Children’s Hospital, 2014).
The Mayo Clinic’s Pediatric Asthma Program also demonstrated the effective use of evidence-based guidelines to improve patient outcomes. A study was conducted and included 477 children aged five to eighteen years in an integrated primary care practice. All children in the study had persistent asthma, a history of emergency department or hospital visits for asthma during the past twelve months, or uncontrolled asthma symptoms. Study results showed 71.6 percent of patients with follow-up were able to step-down or decrease in their classification in asthma severity using guideline-based treatments (Rank, Branda, & McWilliams, 2013).

Successful implementation has also been documented in the community outpatient setting. A Connecticut community study evaluated an asthma-management program based on NAEPP guidelines. The study included fifty-one pediatric practices, 297 health care providers, and 32,680 children. Primary interventions included inhaled corticosteroids and a written asthma action plan. The study found a significant decrease in the number of hospitalizations and emergency department encounters among children with persistent asthma was found. The study not only demonstrated the successful use of NHLBI guidelines by general pediatric providers, but also indicated that asthma care could be provided to a large population of children (Cloutier & Wakefield, 2011).

Summary

The conceptual framework tied asthma management in the microsystem level to health outcomes that arise from it. In addition, definition, prevalence, sociocultural factors, cost, and hospitalizations provided an overview of the asthma as a disease and demonstrated the severity of the impact of asthma on the pediatric population. Guidelines established aid in the screening, diagnosis and management of pediatric asthma. It was
evident that treatment of asthma could be applied in different settings and populations. In this project, management of asthma in the outpatient setting was closely examined to ensure applicability in the FPCC.
Chapter 3: Project Design and Evaluation Plan

Methodological Framework

The methodological framework used to accomplish the program was the four-step process Plan, Do, Study, Act or PDSA (PDSA), also known as the Deming Cycle. It was originally developed by statistician W. Edwards Deming to guide automakers in the manufacturing process. Initially, the framework was rejected by United States automakers, but welcomed and adopted by Japanese automakers. Its application in the automotive manufacturing process contributed to the success of the automaker Toyota, and was eventually acceptance by United States manufacturing (Austenfeld, 2001). The PDSA has been used in many healthcare quality improvement projects and was provided as a quality tool by the Agency for Healthcare Research and Quality. In healthcare, the PDSA provided a framework for developing, testing, and implementing changes. The PDSA framework was based on the scientific method and moderated the wisdom of careful study (AHRQ, 2008).

The PDSA is made up of four stages – Plan, Do, Study, and Act. It was used to test an idea by temporarily testing a change and assessing its impact (AHRQ, 2008). As its name suggested, the framework was made up of four stages. The first or ‘Plan’ stage defined the objective, questions, and predictions. This stage also addressed planning for data collection to answer questions. The second or ‘Do’ stage involved planning, collections, and initiating the analysis process. The third or ‘Study’ stage involved completing the analysis and comparing it to predictions. Finally, in the last or ‘Act’ stage planning of the next cycle guided the decision if change could be implemented. See Appendix E for PDSA diagram.
This project focused on the “plan” and “do” portions of the PDSA cycle. Since there was no clear asthma management process or plan, the clinic’s current method for asthma management was investigated. This aided in identifying areas of need and allowed planning from the clinical aspect. In addition, careful analysis of the review of literature assisted in development of an asthma management program from proven, evidence-based methods. The results from analysis of the clinic and review of literature provided a basis for creating an evidence-based pediatric asthma management program that was appropriate for the FPCC. Specific aims and objectives in the following section were used to complete the “plan” and “do” sections of the PDSA.

**Specific Aim 1**

Evaluate the clinic’s current workflow and protocols for treating pediatric asthma patients.

**Objective 1.** Utilize microsystems analysis to gain knowledge and understanding of clinic functions in FPCC clinic for a pediatric asthma patient visit.

The Dartmouth Hitchcock Clinic guided the microsystems analysis using the 5P Wall Model. The five “P’s” in the framework stood for purpose, patients, professionals, processes, and patterns. See Figure 4 for diagram. The framework contained process mapping as a means of gathering information about the clinic’s microsystem. Utilizing a microsystems analysis, the current resources and processes used in FPCC clinic for a pediatric asthma patient visit were examined. (The Dartmouth Institute, 2010).
Objective 2. Evaluate current screening, diagnosis, and management plans used by the FPCC staff and providers for a pediatric asthma patient.

An evaluation was completed to understand screening, diagnosis, and management plans used by the FPCC staff and providers for a pediatric asthma patient. A total of three vignettes were created to elicit what screening, diagnosis, and management plans were in place. The vignettes were developed by the project director based on NAEPP EP3 guidelines for mild, moderate, and severe asthma. The vignettes were then distributed to clinic staff. After a period of two weeks or fourteen days, they were collected for analysis. Figures 5 through 7 were vignettes used for evaluation.
Figure 6. Mild Asthma Vignette

Mild Asthma Vignette

Step 1

Wiley is a 5 year-old male child who was brought to the clinic with his mother Hanna. According to his mother he has been coughing, wheezing and a fever as high as 101.0 F for the past 2 weeks. He has been coughing more frequently, mostly at night. His mother states that he has had occasional coughs before, but did not think anything of it since it resolved on its own. She has given him Tylenol to help with his fever, with relief. He is up-to-date with his immunizations. His mother stated that his older sister had a “cold” three weeks ago.

1) Who sees Wiley first and what is done?
2) Are there any questionnaires used?
3) What items/tools are used?

Step 2

After Wiley is checked in, he is called in and is being seen by the provider.

1) What does the provider do with Wiley?
2) What questions does the provider ask?
3) What are some signs that might lead the provider to suspect that Wiley has asthma?
4) Are they any particular items/procedures/techniques done by the provider?

Step 3

Subsequently, questions are asked and tests are completed. Wiley is diagnosed with mild-persistent asthma.

1) Is Wiley treated in the clinic?
2) Is Wiley prescribed any medications? If so, please explain.
3) What else is done with Wiley and his mother?

Step 4

Wiley and his mother are given prescriptions and other paperwork. The provider is finishing up the visit.

1) Are they any paperwork, given specifically to children with asthma?
2) Does the provider educate Wiley and his mother on particular topics? If so, please explain.
3) Is there a follow-up appointment scheduled? If so, when?
Figure 7. Moderate Asthma Vignette

Moderate Asthma Vignette

Step 1

Alicia is a 7 year-old female who is accompanied by her mother Heather. She was last seen at an urgent care clinic a month ago because her mother noticed that she was coughing and wheezing. At the urgent care clinic she was given nebulizer treatment and sent home with a prescription for rescue inhaler. Despite using her inhaler, she has been waking up at least twice a week for the past month. Her mother is concerned that the medication she was given is not helping. She has no known allergies and is up-to-date with her immunizations.

4) Who sees Alicia first and what is done?
5) Are there any questionnaires used?
6) What items/tools are used?

Step 2

Alicia is checked in and is now being seen by the provider.

5) What does the provider do with Alicia?
6) What questions does the provider ask?
7) What are some signs or symptoms that might lead the provider to suspect that Alicia’s asthma might have asthma?
8) Are they any particular items/procedures/techniques done by the provider?

Step 3

Subsequently, questions are asked and tests are completed. Alicia is diagnosed with moderate-persistent asthma.

4) Is Alicia treated in the clinic?
5) Does the provider give her new medications? If so, please explain.
6) What else is done with Alicia and her mother?

Step 4

Alicia and her mother are given prescriptions and other paperwork. The provider is finishing up the visit.

4) Are they any paperwork, given specifically to children with asthma?
5) Does the provider educate Alicia and his mother on particular topics? If so, please explain.
6) Is there a follow-up appointment scheduled? If so, when?
Koa is a 10 year-old male being seen in the clinic with his father Paul. He is an established patient who was diagnosed with asthma when he was 5 years old. Koa was last seen about two months ago. Today you notice that he is coughing, wheezing and is complaining of chest tightness. His father states that for everyday for the past three weeks he has been having asthma symptoms throughout the day. In addition, he has been using his rescue inhaler at least once per day. His father is concerned that his asthma is uncontrolled and is costing him too many absences from school. He currently uses a Pulmicort inhaler twice a day and albuterol inhaler as needed. He is allergic to cats and dogs.

Prior to bringing Koa to the clinic, Paul’s father is wondering if he should bring him to the clinic or to their local emergency department.

7) Who does Koa’s father talk to initially?
8) What questions are asked when considering whether he should come to the clinic or the emergency department?
9) Are there any tools or questionnaires used?

Koa comes to the clinic now being seen by the provider.

9) What does the provider do with Koa?
10) What are some signs or symptoms that might lead the provider to suspect that Koa’s asthma is uncontrolled?
11) Are they any particular items/procedures/techniques done by the provider?

Subsequently, questions are asked and tests are completed. Koa’s asthma is now classified as severe-persistent asthma.

7) Is Koa treated in the clinic?
8) Does the provider give her new medications? If so, please explain.
9) What else is done with Koa and his father?

Koa’s father is wondering if his son needs to be seen by a specialist to manage his asthma.

7) Do you feel that Koa could be treated in this clinic?
8) When would you consider referring Koa to a specialist? Please explain.
Vignette 1: Mild Asthma Vignette

Vignette questions and model answers included in the analysis was chosen based on criteria developed in NAEPP EP3 guidelines. Questions included for the analysis were scored using a point-based system. Questions that involved evidence-based criteria were assigned a point or number of points. The Nurse Practitioners of the clinic were referred to as providers.

Providers scored points if they matched or provided answers similar to the model answers. In the analysis portion, providers were scored as a group for each question. Group average was then calculated and provided in percent scale for easy interpretation. The following is a breakdown of points for each of the vignettes.

The first vignette involved a five-year-old child named Wiley. The patient was diagnosed with mild persistent asthma. The purpose of this vignette was to gain an understanding of how providers of the FPCC managed a child with mild persistent asthma.

Step one questions one, two, and three, were used to understand resources and processes. This included identification of first point of contact, the use of questionnaires in screening patients, and the type of questionnaire that was used. Since question one did not have evidence-based components it was not assigned points. Step one question three, determined whether the providers used asthma questionnaires in the clinic. Asthma questionnaires were used to evaluate control and adjust therapy (NHLBI, 2011). If providers indicated that they used an asthma questionnaire in the clinic they received one point. Providers could have received a total cumulative score of three if they answered correctly.
Step two involved the diagnostic process. Step two question one, involved clinical activities that established the diagnosis of asthma. Recommendations included identifications of signs and symptoms through a detailed history and physical, and spirometry (NHLBI, 2011). In step two question one, each provider received one point if they mentioned history and physical. Providers could have received a total cumulative score of three if they answered correctly.

The presence of key signs and symptoms or key symptom indicators increased the probability of asthma. Key symptom indicators included wheezing; cough; difficulty breathing; chest tightness; symptoms that occur or worsen in the presence of exercise, viral infection, allergens, weather changes, stress, menstruation; and nocturnal symptoms. In questions two and three, a provider received one point per key symptom indicator that was identified. Points for questions two and three were calculated separately. The maximum number of points each provider received was six. The maximum cumulative number of points the providers could have received was eighteen points.

The presence of multiple key symptom indicators increased the probability of the diagnosis of asthma, however, spirometry was needed to establish the diagnosis of asthma. This was addressed in step two question four. The expected answer for this question was Pulmonary Function Testing (PFT), which included spirometry. Spirometry demonstrated obstruction and assessed reversibility in those aged five and older. If a provider answered PFT or spirometry in step two question four, the provider received one point. The maximum cumulative number of points the providers could have received was three points.
Step three involved the asthma management process after diagnosis was established. In step three, Wiley was diagnosed with mild persistent asthma. After diagnosis and classification of asthma severity was established, treatment strategy was evaluated. Step two question one, determined if providers understood a five-year-old child with mild persistent asthma could be treated in the outpatient setting. NAEPP EP3 guidelines stated that a child, age five, with mild persistent asthma could be treated in the outpatient setting (NHLNI, 2011). As a result, in step three, question one, if the provider stated that Wiley could be treated in the clinic, the provider received one point. The maximum cumulative number of points the providers could receive was three points.

According the NAEPP EP3, children ages five to eleven diagnosed with mild-persistent asthma, are recommended to start therapy at step two in the stepwise approach. In addition, the recommended treatment regimen included the use of a short-acting beta agonist (SABA) as needed and low-dose inhaled corticosteroids (ICS). In Step three, question two, if the provider included a SABA in their treatment they received one point. If the provider included ICS in their plan they received another point. If the provider specified low-dose ICS in their plan they received an additional point. The maximum number of points each provider could have received was three points. The maximum cumulative number of points that the providers could have received was nine points.

Step four involved recommended clinical activities including the use of the asthma action plan (AAP), education, and scheduling follow-up visits. An AAP is a recommended clinical activity in the management of asthma that included instructions for daily management and actions used to manage worsening asthma. It is especially vital for managing patients with have moderate or severe persistent asthma, or those requiring
treatment at step four, five, or six (NHLBI, 2011). In Step four, Question one, if the provider included an AAP, they received one point. The maximum number of points each provider could have received is one point. The maximum cumulative number of points that the providers could have received was three points.

Providing proper education on specific topics is essential in management of asthma. The NAEPP EP3 recommends addressing specific education topics at the initial visit, first follow-up visit, second follow-up visit, and all subsequent visits. Recommended topics for the initial visit include expectations of visit, asthma control, patients’ goals of treatment, medications and quality of life (NHLBI, 2007). The provider received one point for each topic they were able to identify. In step four question two, the maximum number of points each provider could have received was five. The maximum cumulative number of points that the providers could have received was fifteen points.

Asthma guideline provided recommended intervals for scheduling for each visit. For the first follow-up visit an appropriate interval is between two to six weeks or sooner if needed (NHLBI, 2011). If the provider included a follow-up visit within this time span they received one point. The maximum cumulative number of points that the providers could have received was three points.

Vignette 2: Moderate Asthma Vignette

Formatting of mild and moderate asthma vignettes were similar, however, model answers were different. Asthma management varied based classification of asthma severity (NHLBI, 2011). The second vignette involved a seven-year-old child named Alicia. The patient was diagnosed with moderate persistent asthma.
The purpose of this vignette was to gain an understanding of how providers of the FPCC managed a child with moderate persistent asthma. Like question formatting in the mild asthma vignette, step one questions one, two, and three, were used to understand resources and processes. This included identification of the first point of contact, the use of questionnaires in screening patients, and the type of questionnaire that was used. Since question one did not have evidence-based components it was not assigned points. Step one question three, determined whether the providers used asthma questionnaires in the clinic. Asthma questionnaires were recommended to evaluate control and adjust therapy (NHLBI, 2011). If providers indicated that they used an asthma questionnaire in the clinic they received one point. Providers could have received a total cumulative score of three if they answered as the model answers suggested.

Step two involved the diagnostic process. The presence of key signs and symptoms or key symptom indicators increased the probability of asthma. Key symptom indicators included wheezing; cough; difficulty breathing; chest tightness; symptoms that occur or worsen in the presence of exercise, viral infection, allergens, weather changes, stress, menstruation; and nocturnal symptoms. In questions two and three, a provider received one point per key symptom indicator that was identified. Points to questions two and three were calculated separately. The maximum number of points each provider received was six. The maximum cumulative number of points the providers could have received was eighteen points.

The presence of multiple key symptom indicators increased the probability of the diagnosis of asthma, however, spirometry was needed to establish the diagnosis of asthma. This was addressed in step two question four. In addition, other causes of airway
obstruction should be considered if there was no clear response to initial therapy. Other diagnostic studies that would be useful when considering alternative diagnosis included bronchoprovocation, chest x ray, and biomarkers of inflammation (NHLBI, 2007). In Alicia’s case, she was not responding to the initial treatment regimen she started one month prior. Other tests should have been considered. In step two, question four, providers received one point for each test consistent with guidelines. The maximum number of points each provider received was four points. The maximum cumulative number of points the providers could have received was twelve points.

Step three involved the asthma management process after diagnosis was established. In step three, Alicia was diagnosed with moderate persistent asthma. After diagnosis and classification of asthma severity was established, treatment strategy was evaluated. Step two question one, determined if providers understood a seven-year-old child with moderate persistent asthma could be treated in the outpatient setting. NAEPP EP3 guidelines stated that a child, age seven, with moderate persistent asthma could be treated in the outpatient setting (NHLNI, 2011). As a result, in step three, question one, if the provider stated that Alicia could be treated in the clinic, the provider received one point. The maximum cumulative number of points the providers could receive was three points.

According the NAEPP EP3, in initiating therapy in children ages five to eleven who are diagnosed with moderate-persistent asthma are recommended to start therapy at step three in the Stepwise approach for managing asthma. The recommended treatment regimen included the use of short-acting beta agonist (SABA) as needed and medium-dose inhaled corticosteroids (ICS). In step three, question two, if the provider included a
SABA in their treatment they received one point. If the provider included ICS in their plan they received another point. If the provider specified medium-dose ICS in their plan they received an additional point. The maximum number of points each provider could have received is three points. The maximum cumulative number of points that the providers could have received was nine points.

Step four involved recommended clinical activities including the use asthma action plan (AAP), education, and scheduling follow-up visits. An AAP was a recommended clinical activity in the management of asthma that included instructions for daily management and actions used to manage worsening asthma. It was especially vital for managing patients with moderate or severe persistent asthma, or those requiring treatment at step four, five, or six (NHLBI, 2011). In Step four, question one, if the provider included an AAP, they received one point. The maximum number of points each provider could have received is one point. The maximum cumulative number of points that the providers could have received was three points.

Providing proper education on specific topics is essential in management of asthma. The NAEPP EP3 recommends addressing specific education topics at the initial visit, first follow-up visit, second follow-up visit, and all subsequent visits. Recommended topics for the initial visit include expectations of visit, asthma control, patients’ goals of treatment, medications and quality of life (NHLBI, 2007). The provider received one for topic they were able to identify. In step four question two, the maximum number of points each provider could have received was five. The maximum cumulative number of points that the providers could have received was fifteen points.
Asthma guidelines provided recommended intervals for scheduling for each visit. For the first follow-up visit an appropriate interval was between two to six weeks or sooner if needed (NHLBI, 2007). If the provider included a follow-up visit within this time span they received one point. The maximum cumulative number of points the providers could have received was three points.

Vignette 3: Severe Asthma Vignette

The third and final vignette involved a ten-year-old child named Koa. The patient was experiencing a moderate acute exacerbation. He was also diagnosed with severe persistent asthma. The purpose of this vignette was to gain an understanding of how providers of the FPCC manage a child with severe persistent asthma that was experiencing a moderate acute exacerbation.

Step one questions one and three, were used to understand resources and processes. This included identification of the first point of contact, the use of questionnaires in screening patients, and the type of questionnaire that was used. Since question one did not have evidence-based components it was not assigned points. Step one question three, determined whether the providers used asthma questionnaires in the clinic. Asthma questionnaires were used to evaluate control and adjust therapy (NHLBI, 2011). If providers indicated that they used an asthma questionnaire in the clinic they received one point. Providers could have received a total cumulative score of three if they answered as the model answers suggested.

Step one identified the providers’ ability to determine whether Koa’s asthma exacerbation was treatable in the clinic or a medical emergency. A severe asthma exacerbation usually required a visit to the emergency department and likely
hospitalization. According to guidelines, signs and symptoms of a severe acute exacerbation included dyspnea at rest, or signs and symptoms that interfered with conversation. The provider received one point if they provided either indication that the patient was experiencing a severe acute exacerbation. The maximum number of points each provider can receive was one. The maximum cumulative number of points the providers can receive was three points.

Step two involved diagnosis, identification of control, and management of acute exacerbation in the outpatient setting. Koa was experiencing an acute moderate exacerbation. According to the NAEPP EP3, an acute asthma exacerbation can be treated in the outpatient clinic setting. Recommended key clinical activities for diagnosis and management of acute asthma exacerbation includes assessing severity, treatment to relieving hypoxemia and obstruction; reduce airway inflammation (NHLBI, 2011). Treatment strategies included the use of supplemental oxygen, repetitive or continuous SABA, and oral system corticosteroids. The provider received one point per treatment strategy consistent with guideline recommendations. In step two question one, the maximum number of points each provider could have received was three. The maximum cumulative number of points the providers can receive was nine points.

Koa’s asthma was also uncontrolled despite being on his current asthma management regimen. Assessing and adjusting therapy in children aged five to eleven involved identifying seven components of control. Components included nighttime awakenings, interference with activity, SABA use for symptom control, lung function, exacerbations that required oral corticosteroids, reduced lung growth, and treatment-related adverse effects. The provider received one point per component of control they
identified. In step two, question two the maximum number of points each provider could have received was seven. The maximum cumulative number of points the providers could have received was twenty-one points.

In addition to establishing the diagnosis of asthma, diagnostic studies were used to assess asthma control and adjust therapy. Step three involved diagnostic tests useful included pulmonary function testing, bronchoprovocation, chest x ray, and biomarkers of inflammation (NHLBI, 2007). The providers scored one point for each diagnostic test identified. The maximum number of points each provider could have received was four points. The maximum cumulative number of points the providers could have received was twelve points.

Step three involved the asthma management process. Koa was diagnosed with severe persistent asthma. Step three question one involved the asthma management process after diagnosis was established. Koa was diagnosed with severe persistent asthma. Step three question one, determined if providers understood that ten-year-old child with severe persistent asthma could be managed in the outpatient setting. NAEPP EP3 guidelines stated that a child, age ten, with severe persistent asthma could be treated in the outpatient setting, but referral to an asthma specialist is required (NHLBI, 2011). As a result, if the provider stated that Alicia could be treated in the clinic, but with required referral, the provider received one point. In initiating therapy in children ages five to eleven who were diagnosed with severe-persistent asthma it was recommended to start therapy at step three in the stepwise approach. The recommended treatment regimen included the use of a short-acting beta agonist (SABA) as needed; low-dose ICS plus LABA or LTRA or low-dose ICS plus theophylline, or medium-dose inhaled
corticosteroids (ICS). A short course of oral systemic corticosteroids (OCS) should also be considered. If the provider included a SABA in their treatment they received one point. If the provider included ICS in their plan they received one point. If the provider specified low-dose ICS plus LABA, low-dose ICS plus LTRA, low-dose ICS plus theophylline, or medium-dose in their plan they received one point (NHLBI, 2011). If the provider included OCS in their plan they received one point. In Step three, question two the maximum number of points each provider could have received was four points. The maximum cumulative number of points the providers could have received was twelve points.

Step four addressed consultation or referral. According to the guidelines, consultation should be considered at step two. In addition, consultation with an asthma specialist was required at step three or higher. If the provider indicated that Koa should be referred to a specialist they received one point. In step four question two, the maximum number of points each provider could have received was one. The maximum cumulative number of points the providers could have received was three points.

Specific Aim 2

Develop an evidence-based asthma program that meets the needs of the FPCC for pediatric asthma care.

Objective 1. Analyzed existing treatment guidelines, current workflow processes and current asthma management plan flow for use in the FPCC.

Current asthma management guidelines as discussed in the Review of Literature, was analyzed. Evidence-based guidelines were thoroughly reviewed for inclusion in asthma program. The clinic’s current workflow protocols and processes from
microsystems analysis were reviewed and analyzed. In addition, the clinic’s current screening, diagnosis, and management plan gathered from the vignette surveys were analyzed as described in Specific Aim 1, Objective 2.

**Objective 2.** Develop an evidence-based management algorithm based on the analysis of existing pediatric asthma guidelines and analyzed data.

The FPCC asthma program guidelines was developed based on analysis of existing pediatric asthma guidelines. In addition, algorithm development was based on the results obtained from Specific Aim 2, Objective 1 above. Comparisons of pediatric asthma guidelines, review of reported outcomes from other pediatric asthma programs and analysis for fit was performed to assure the guideline were suitable for FPCC. The program was finalized and prepared for review by the interdisciplinary team.

Interdisciplinary team evaluators included two medical doctors that specialized in pulmonologly (MD), one family nurse practitioner (FNP), an FNP that specialized in pulmonary care, an acute care nurse practitioner (ACNP), and doctor of pharmacy (PharmD).

**Specific Aim 3**

Perform an evaluation of the proposed pediatric asthma program using an interdisciplinary healthcare team.

**Objective 1.** Evaluate proposed pediatric asthma program by interdisciplinary team for adherence to evidence-based guidelines and suitability for the FPCC.

A survey was conducted using the AGREE II methodology based questionnaire. The questionnaire used a 7-Point scale and addressed appropriate use of evidence-based guidelines, suitability of asthma program to the clinic’s needs, viability of program given
the clinic’s current staff and resources, and recommendations. See Figure 9 for Evaluation Tool.

Figure 9. Interdisciplinary Team Evaluation Questionnaire

<table>
<thead>
<tr>
<th>Evaluation of Proposed Pediatric Asthma Management Guide for Children Age Five and Older</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domain 1. Scope and Purpose</strong></td>
</tr>
<tr>
<td>A. The guideline addresses the prevention of (long-term) complications of pediatric patients with asthma</td>
</tr>
<tr>
<td><img src="image" alt="Rating Scale" /></td>
</tr>
<tr>
<td>B. The guideline lowers the risk of asthma exacerbations in patients with previous asthma exacerbations</td>
</tr>
<tr>
<td><img src="image" alt="Rating Scale" /></td>
</tr>
<tr>
<td>C. The guideline provides guidance on the most effective therapeutic treatment and management of pediatric patients with asthma</td>
</tr>
<tr>
<td><img src="image" alt="Rating Scale" /></td>
</tr>
<tr>
<td>D. The guideline addresses the target population including gender and age, severity of asthma, and comorbidities</td>
</tr>
<tr>
<td><img src="image" alt="Rating Scale" /></td>
</tr>
</tbody>
</table>

| **Domain 2. Stakeholder Involvement**                                                   |
| A. The asthma management guide development includes groups from relevant professional groups |
| ![Rating Scale](image)                                                                 |
| B. The views and preferences of the asthma management target users have been sought.    |
| ![Rating Scale](image)                                                                 |
| C. The target user(s) for the guideline are addressed.                                  |
| ![Rating Scale](image)                                                                 |
Domain 3. Rigor of Development

A. Health benefits, side effects, and risks have been considered in formulating the recommendations.

B. Guideline recommendations are evidence-based.

C. Guideline recommendations have been externally reviewed by experts prior to its publication.

Domain 4. Clarity of Presentation

A. The guideline recommendations are specific and unambiguous.

B. The different options for management of the condition or health issue are clearly presented.

C. Key recommendations are easily identifiable.

Domain 5. Applicability

A. Guideline recommendations provides advise and/or tools on how the recommendations can be put into practice.

B. The potential resource implications of applying the recommendations have been considered.

C. The guideline presents monitoring and/auditing criteria.
### Overall Assessment

A. Rate the overall quality of guideline recommendations.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>

B. I would recommend these guidelines for use.

<table>
<thead>
<tr>
<th>Yes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, with modifications</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

C. Recommended modifications to pediatric asthma guide.

The questionnaire evaluated six domains, which included overall assessment of the asthma program. These domains were scope and practice, stakeholder involvement, rigor of development, clarity of presentation, and applicability. Each domain contained three to four questions that rated the pediatric asthma guide on a scale from one to seven. A rating of one indicated that the surveyor strongly disagreed that the domain was addressed. A rating of seven indicated that the surveyor strongly agreed that the domain was addressed. In addition, the surveyor provided an overall assessment to recommend the guidelines for use, recommend the guidelines for use with modifications, or not recommend the guidelines for use. Finally, an area was provided to address recommended modifications. The surveys distributed the providers for evaluation. After a period of two weeks, or fourteen days, they were collected for analysis.

**Objective 2.** Apply changes to asthma management program as recommended.

Reviewed results of interdisciplinary team survey. Results of the interdisciplinary review questionnaire were analyzed for possible changes and recommendations.
Appropriate changes to asthma management program were applied as indicated by interdisciplinary team evaluation.
Chapter 4: Results

In this chapter the results of the project are presented. The aims and objectives of the project are reintroduced and guide the order of the presentation of results. As part of the ‘Plan’ stage of the PDSA methodological framework, analyses were performed to better understand the clinic’s processes, existing guidelines, current management used by the clinic, and protocols for treating asthma patients.

Specific Aim 1

Objective 1. Utilized microsystems analysis to gain knowledge and understanding of clinic functions in FPCC clinic for a pediatric asthma patient visit.

IRB approval was obtained on May 05, 2015. The microsystems analysis was performed on June 08, 2015. The Dartmouth Hitchcock Clinic’s 5P Wall Model was used to guide the microsystems analysis for the FPCC. The five areas of focus for microsystems analysis included purpose, patients, professionals, processes, and patterns. Figure 10 is the completed 5P Wall Model.

Microsystems analysis provided familiarity of tools, methods, and that engaged members of the FPCC. Awareness was raised in the opportunities for improvement. Improvement of the clinic practice changed application of assessing, diagnosing and treating the organization based on the smallest activities performed (The Dartmouth Institute, 2010). The following was the template used for evaluation.

Clinic purpose/aim was identified. This included the type of health services provided and form of payment. People with various health needs were also identified. Classifications included healthy, very high risk, and chronic. The number and types of
professionals were identified as specified by the microsystems diagram. Professionals were specified by their skill mix and included medical doctors (MD), nurse practitioners, medical assistants, and secretaries. Processes were distinguished based on the professional. Important performance patterns that were used in the microsystems analysis included days and specific clinic hours of operation.

Figure 10. Completed 5P Wall Model

Purpose

The microsystems analysis identified information about the clinic’s purpose, population, professionals, processes, and performance patterns. The purpose of the clinic
was to provide primary care services to the Southern Nevada region. The clinic was open to all Nevada residents, regardless of their ability to pay. This included underserved, uninsured, or underinsured populations.

Population

The patient population in the FPCC varied in health classification, health need, and age. The clinic served patients with varying health needs including those who were healthy, very high risk, and chronic. Patients were seen for various types of respiratory illnesses. Common respiratory diagnoses included asthma, chronic obstructive pulmonary disease (COPD), and bronchitis. Patients’ ages ranged from newborn to older adults.

Professionals

The professionals in the clinic were made up of ten staff members. This included one Doctor of Osteopathic Medicine (DO), three Family Nurse Practitioners (FNP), three Medical Assistants (MA), two clerks or secretaries, and one office manager. The primary care providers (PCP) of the clinic were the clinic’s FNPs.

Identification of the professionals assisted in determining the processes in the clinic. The professionals understood their role in patient care and functioned within their scope of practice. As a result, processes were identified based on their skill mix.

The secretary/clerk checked in patients and collected insurance information. The MA collected objective formation for providers. This included vital signs, pulmonary function testing, reason for visit, updates from previous visits and diagnostic studies. The providers then saw the patient. The providers performed objective and subjective assessments, educated patients, and created a management plan. The clinic had adequate professionals and resources to provide evidence-based interventions.
Patterns

In terms of performance patterns, two providers were normally present during business hours. The clinic was open for a total of forty hours per week. The clinic was open from eight o’clock a.m. to five o’clock p.m. on Mondays, Wednesdays, Thursdays, and Fridays. The clinic was open from twelve o’clock p.m. to eight o’clock p.m. on Tuesdays. The clinic offered later hours on Tuesdays to increase access for shift workers with schedules that limited clinic visits.

**Objective 2.** Evaluate current screening, diagnosis, and management plans used by the FPCC staff and PCPs for a pediatric asthma patient.

The vignettes with accompanied consents were delivered on Monday June 08, 2015. See Appendix for consent. One of the providers had unexpected circumstances and completed the vignette one week later than anticipated. The provider was not able to access the vignette until the following week. As a result, the provider completed the survey within two weeks of receipt. Completed consents and vignettes were retrieved on Monday, June 26, 2015. The providers that participated in the study included three nurse practitioners that were employed by the clinic. Providers were not restricted from using resources they normally had access to in the clinic. The doctor of osteopathic medicine (DO) did not participate in the study. His role in the clinic involved specialized procedures and he was not involved in the care of asthma patients.

A total of three providers participated in the vignette surveys. Providers were given a packet that contained the asthma vignette surveys. The vignettes involved three
scenarios of children with varying classifications of asthma that required treatment from the providers. Results of the vignettes are discussed in the following section.

**Specific Aim 2**

Develop an evidence-based asthma program that meets the needs of the FPCC for pediatric asthma care.

**Objective 1.** Analyze existing treatment guidelines, current workflow processes and current asthma management plan flow for use in the FPCC.

Existing treatment guidelines were analyzed as suggested in the review of literature. Information that was included in the asthma management guide was public domain and was able to be used without restriction from the NHLBI website. The stipulation was that change could not be made to the content and sources. Topics that were included as a result of the review of literature included diagnosis, initial management, long-term management, management of acute exacerbations, treatment of special situations, medications and dosages, delivery devices, and asthma questionnaires. Details on these particular topics are available in the review of literature section.

The proposed vignettes described in the methods portion were given to the providers. They included three scenarios of patients with varying classifications of asthma severity. The first vignette involved Wiley, a 5 year-old child with mild-persistent asthma. The second vignette concerned Alicia, a 7 year-old with moderate-persistent asthma. The final vignette associated Koa, a 10 year-old child with severe-persistent asthma and an acute moderate exacerbation.

The following section contains each vignette and responses that providers contributed. Vignettes are provided, followed by tables with providers’ responses. The
first column provides the scenario number and followed questions that corresponded to the scenarios. The second column provides evidence-based model answers. The third, fourth, and fifth columns contain providers’ answers. The sixth column displays the providers’ total cumulative average points received over the total possible points. Percentage equivalents are also included this column. To maintain anonymity of the providers, they are titled Provider A, Provider B, and Provider C. Asthma vignettes are presented in order of asthma severity. A summary of results was provided following each table.

*Mild Asthma Vignette*

Wiley is a 5 year-old male child who was brought to the clinic with his mother Hanna. According to his mother he has been coughing, wheezing and a fever as high as 101.0 F for the past 2 weeks. He has been coughing more frequently, mostly at night. His mother states that he has had occasional coughs before, but did not think anything of it since it resolved on its own. She has given him Tylenol to help with his fever, with relief. He is up-to-date with his immunizations. His mother stated that his older sister had a “cold” three weeks ago.
### Scenario 1

<table>
<thead>
<tr>
<th>Step</th>
<th>Q1. Who sees Wiley first and what is done?</th>
<th>Model Answer</th>
<th>Provider A</th>
<th>Provider B</th>
<th>Provider C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clerk or MA</td>
<td>Check in/ Front desk</td>
<td>Check in/ Front desk</td>
<td>MA</td>
<td>N/A</td>
<td>58</td>
</tr>
</tbody>
</table>

| Q2. Are there any questionnaires used? | ACT, ATAQ, or ACQ | Bright futures questionnaire | Bright futures questionnaire | No | 0/3 (0%) |

| Q3. What items/tools are used? | Screening questionnaire | Age appropriate | Age appropriate | None | N/A |

| Step 2 | Q1. What does the provider do with Wiley? | History and physical | SOAP | Interview, discuss, examine, and plan | SOAP | 3/3 (100%) |

| Q2. What questions does the provider ask? | Presence of: Wheezing; cough; difficulty breathing; chest tightness; symptoms that occur or worsen in the presence of exercise, viral infection, allergens, weather changes, stress, menstruation; nocturnal symptoms | Cough with activity, symptoms day/night | Cough with activity/rest, nocturnal signs and symptoms, hospitalizations, medication use | Cough, nocturnal symptoms | 6/18 (33%) |

| Q3. What are some signs that might lead the provider to suspect that Wiley has asthma? | Same as above | Cough and wheeze | Coughing, wheezing, nocturnal cough, worsening with illness | Coughing, wheezing | 8/18 (44%) |

| Q4. Are there any particular items/procedures/techniques done by the provider? | PFT/spirometry | PFT | PFT | PFT | 3/3 (100%) |

| Step 3 | Q1. Is Wiley treated in the clinic? | Yes | Yes | Yes | Yes | 3/3 (100%) |

| Q2. Is Wiley prescribed any medications? If so, please explain. | SABA, ICS, low-dose ICS | SABA, ICS | SABA, ICS, low-dose | SABA, ICS | 7/9 (77%) |

| Q3. What else is done with Wiley and his mother? | Patient education | Patient education | Patient education | Patient education | 3/3 (100%) |


| Q2. Does the provider educate Wiley and his mother on particular topics? If so, please explain. | Yes. Expectations of visit, asthma control, patients’ goals of treatment, medications, quality of life | Yes, asthma diagnosis, medications, trigger avoidance | Yes, asthma diagnosis, treatment, emergencies, allergies | Yes, asthma diagnosis, medications | 7/15 (46%) |

| Q3. Is there a follow-up appointment scheduled? If so, when? | Between 2 to 6 weeks or sooner as needed | 2 weeks | Yes, 2-4 weeks, sooner if needed | 2 weeks | 3/3 (100%) |
Moderate Asthma Vignette

Alicia is a 7 year-old female who is accompanied by her mother Heather. She was last seen at an urgent care clinic a month ago because her mother noticed that she was coughing and wheezing. At the urgent care clinic she was given nebulizer treatment and sent home with a prescription for rescue inhaler. Despite using her inhaler, she has been waking up at least twice a week for the past month. Her mother is concerned that the mediation she was given is not helping. She has no known allergies and is up-to-date with her immunizations.
<table>
<thead>
<tr>
<th>Scenario 2</th>
<th>Model Answer</th>
<th>Provider 1</th>
<th>Provider 2</th>
<th>Provider 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. Who sees Alicia first and what is done?</td>
<td>Clerk or MA</td>
<td>MA</td>
<td>MA</td>
<td>MA</td>
<td>N/A</td>
</tr>
<tr>
<td>Q2. Are there any questionnaires used?</td>
<td>ACT, ATAQ, or ACQ</td>
<td>Bright futures questionnaire</td>
<td>Bright futures questionnaire</td>
<td>None</td>
<td>0/3 (0%)</td>
</tr>
<tr>
<td>Q3. What items/tools are used?</td>
<td>Screening questionnaire</td>
<td>Age appropriate</td>
<td>Age appropriate</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. What does the provider do with Alicia?</td>
<td>Detailed H&amp;P</td>
<td>SOAP</td>
<td>SOAP</td>
<td>SOAP</td>
<td>3/3 (100%)</td>
</tr>
<tr>
<td>Q2. What questions does the provider ask?</td>
<td>Presence of: wheezing; cough; difficulty breathing; chest tightness; symptoms with activity, infection, allergies, irritants, weather, emotion, stress, menstruation; symptoms that occur or worsen at night, awakening patient</td>
<td>Asthma symptoms</td>
<td>Coughing, missing school days, hospitalizations, medication use, night symptoms</td>
<td>Asthma symptoms</td>
<td>4/18 (22%)</td>
</tr>
<tr>
<td>Q3. What are some signs that might lead the provider to suspect that Alicia might have asthma?</td>
<td>Same as above</td>
<td>Wheezing, coughing</td>
<td>Wheezing, coughing, waking up at night</td>
<td>Wheezing, coughing</td>
<td>7/18 (38%)</td>
</tr>
<tr>
<td>Q4. Are they any particular items/procedures/techniques done by the provider?</td>
<td>PFT Allergy testing</td>
<td>PFT</td>
<td>PFT’s pre and post, chest x-ray to rule out other concerns</td>
<td>PFT</td>
<td>3/12 (25%)</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. Is Alicia treated in the clinic?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3/3 (100%)</td>
</tr>
<tr>
<td>Q2. Is Alicia prescribed any medications? If so, please explain.</td>
<td>SABA, ICS, medium dose</td>
<td>Albuterol, ICS</td>
<td>Albuterol, ICS, medium dose-example Flovent HFA</td>
<td>Albuterol, ICS</td>
<td>7/9 (77%)</td>
</tr>
<tr>
<td>Q3. What else is done with Alicia and his mother?</td>
<td>Education</td>
<td>Education</td>
<td>Education</td>
<td>Education</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2. Does the provider educate Alicia and her mother on particular topics? If so, please explain.</td>
<td>Yes. Expectations of visit, asthma control, patients’ goals of treatment, medications, quality of life</td>
<td>Yes. Asthma diagnosis, medications, action plan</td>
<td>Yes. Asthma diagnosis, medications, emergency, action plan</td>
<td>Yes. Asthma diagnosis, medications, action plan</td>
<td>12/15 (80%)</td>
</tr>
<tr>
<td>Q3. Is there a follow-up appointment scheduled? If so, when?</td>
<td>Yes. Between 2 to 4 weeks or sooner as needed.</td>
<td>2-4 weeks</td>
<td>2 weeks to ensure understanding, improvement of symptoms, or concerns</td>
<td>2-4 weeks</td>
<td>3/3 (100%)</td>
</tr>
</tbody>
</table>
Severe Asthma Vignette

Koa is a 10 year-old male being seen in the clinic with his father Paul. He is an established patient who was diagnosed with asthma when he was 5 years old. Koa was last seen about two months ago. Today you notice that he is coughing, wheezing and is complaining of chest tightness. His father states that for everyday for the past three weeks he has been having asthma symptoms throughout the day. In addition, he has been using his rescue inhaler at least once per day. His father is concerned that his asthma is uncontrolled and is costing him too many absences from school. He currently uses a Pulmicort inhaler twice a day and albuterol inhaler as needed. He is allergic to cats and dogs.
<table>
<thead>
<tr>
<th>Scenario 3</th>
<th>Model Answer</th>
<th>Provider 1</th>
<th>Provider 2</th>
<th>Provider 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. Who does Koa’s father talk to initially?</td>
<td>Clerk or MA</td>
<td>MA</td>
<td>MA</td>
<td>MA</td>
<td>N/A</td>
</tr>
<tr>
<td>Q2. What questions are asked when considering whether he should come to the clinic or the emergency department?</td>
<td>Questions that address emergent versus non-emergent</td>
<td>Emergency or not</td>
<td>Color, ability to speak in full sentences, last treatment, spirometer reading</td>
<td>Emergency or not</td>
<td>N/A</td>
</tr>
<tr>
<td>Q3. Are there any tools or questionnaires used?</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. What does the provider do with Koa?</td>
<td>Oxygen PRN, nebulized SABA, OCS</td>
<td>Inhaled SABA</td>
<td>Inhaled SABA, OCS</td>
<td>Inhaled SABA</td>
<td>4/9 (44%)</td>
</tr>
<tr>
<td>Q2. What are some signs or symptoms that might lead the provider to suspect that Koa’s asthma is uncontrolled?</td>
<td>Nighttime awakenings, interference with activity, SABA use for symptom control, lung function, exacerbations requiring oral corticosteroids, reduced lung growth, treatment-related adverse effects</td>
<td>Missing school</td>
<td>Daily use of rescue inhaler, missing school days, allergies</td>
<td>Missing school</td>
<td>4/21 (19%)</td>
</tr>
<tr>
<td>Q3. Are they any particular items/procedures/techniques done by the provider?</td>
<td>PFT</td>
<td>Allergy testing</td>
<td>Chest x ray</td>
<td>Bronchoprovocation</td>
<td>PFT</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. Is Koa treated in the clinic?</td>
<td>Yes, but with referral to specialist</td>
<td>Yes</td>
<td>Yes, with referral to specialist</td>
<td>Yes</td>
<td>1/3 (33%)</td>
</tr>
<tr>
<td>Q2. Is Koa prescribed any medications? If so, please explain.</td>
<td>SABA; ICS; medium-dose, medium dose + LABA; course of OCS</td>
<td>SABA, ICS</td>
<td>SABA, high dose ICS (QVAR 2 puffs BID), short course of systemic corticosteroid</td>
<td>SABA, ICS</td>
<td>6/12 (50%)</td>
</tr>
<tr>
<td>Q3. What else is done with Koa and his father?</td>
<td>Education, AAP</td>
<td>Asthma action plan, when to go to ED</td>
<td>Asthma action plan, when to go to ED, allergies and irritants</td>
<td>Education</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. Do you feel that Koa could be treated in this clinic?</td>
<td>Yes</td>
<td>Yes</td>
<td>Possibly</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>Q2. When would you consider referring Koa to a specialist? Please explain.</td>
<td>Consultation should be considered when a child is at Step 2 of the Stepwise Approach. Consultation is required at Step 3 care or higher.</td>
<td>If his asthma is not improving</td>
<td>Now, since he has severe-persistent asthma</td>
<td>If not improving</td>
<td>1/3 (33%)</td>
</tr>
</tbody>
</table>
Areas Needed for Improvement

Table 11 displays areas that were less than one hundred percent and indicated a deviation from evidence-based model answers. These were areas that needed to be addressed in the pediatric asthma management guide, in order to provide evidence-based care. Areas include use of an asthma-screening questionnaire, proper identification signs and symptoms, use of proper diagnostic testing, use of recommended pharmacological interventions, including recommended education, and proper referral. The first column contains areas identified with scores less then one hundred percent. The second column shows percentage scores from the mild asthma vignette. The third column shows percentage score form the moderate asthma vignette. The fourth column shows scores from the severe asthma vignette.

<table>
<thead>
<tr>
<th>Items scored less than 100 percent</th>
<th>Vignette 1 Mild Asthma</th>
<th>Vignette 2 Moderate Asthma</th>
<th>Vignette 3 Severe Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening Questionnaire</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Identification of signs and symptoms</td>
<td>33 – 44%</td>
<td>26 – 38%</td>
<td>19%</td>
</tr>
<tr>
<td>Diagnostic testing</td>
<td>100%</td>
<td>25%</td>
<td>66%</td>
</tr>
<tr>
<td>Recommended pharmacological interventions</td>
<td>77%</td>
<td>77%</td>
<td>50%</td>
</tr>
<tr>
<td>Recommended education topics</td>
<td>46%</td>
<td>80%</td>
<td>N/A</td>
</tr>
<tr>
<td>Referral</td>
<td>N/A</td>
<td>N/A</td>
<td>33%</td>
</tr>
</tbody>
</table>
Objective 2. Develop an evidence-based management algorithm based on the analysis of existing pediatric asthma guidelines and analyzed data from vignette surveys.

After current evidence-based literature and data from the clinic was analyzed, several topics were identified by the surveys that would ensure proper management of pediatric patients at the FPCC. These main topics included when the evidence-based pediatric asthma management guide was developed. This included foundational topics identified in the review of literature and the areas of improvements as indicated by the vignette surveys. Table 11 displays topics included in the pediatric asthma guide. Topics with an asterisk indicates it was an area of improvement identified by the vignette surveys. See Appendix for pediatric asthma management guide.

Table 11. Summary Identified Topics of Included in Asthma Management Guide

<table>
<thead>
<tr>
<th>Identified Topics Based on Analyzed Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma screening questionnaire*</td>
</tr>
<tr>
<td>Classification of asthma severity</td>
</tr>
<tr>
<td>Delivery devices</td>
</tr>
<tr>
<td>Diagnosis of asthma</td>
</tr>
<tr>
<td>Diagnostic testing*</td>
</tr>
<tr>
<td>Differential diagnosis</td>
</tr>
<tr>
<td>Detailed history</td>
</tr>
<tr>
<td>Identification of key signs and symptoms*</td>
</tr>
<tr>
<td>Management – initial</td>
</tr>
<tr>
<td>Management – long-term</td>
</tr>
<tr>
<td>Management – acute exacerbations</td>
</tr>
<tr>
<td>Medications – long-term</td>
</tr>
</tbody>
</table>
Use of Asthma Questionnaire

Step one in all three vignettes determined the need to include an asthma questionnaire into the pediatric asthma guide. Providers did not use an asthma-specific screening questionnaire. Providers stated they used the Bright Futures questionnaire, which was useful in gathering initial history including family history. This assisted in asthma diagnosis since children with parental histories of asthma are more likely to develop persistent asthma that children without parental histories. On the other hand, the use of an asthma-specific questionnaire is useful in monitoring effectiveness of therapy and asthma control, particularly in follow-up appointments. Results from this identified need for additional questionnaires therefore examples of the ACT asthma questionnaires for all age groups were included in the asthma management guide. ACT questionnaires are included in the references section, pages forty-nine to fifty-four of the asthma management guide.

Identification of Asthma Symptoms

Step two in established the need for a tool that was helpful in identifying asthma signs and symptoms. Guideline-based signs and symptoms or key symptom indicators were compared with providers’ answers. Providers were able to identify thirty-three to forty-four percent of key symptom indicators in the mild asthma scenario, twenty-six to thirty-eight percent of key symptom indicators in the moderate persistent asthma scenario and nineteen percent in the severe asthma vignette. To guide in identification key symptom indicators and assessing asthma control, tables were included in page five of the asthma management guide.

Diagnostic Testing

Needs in diagnostic testing were also identified in the vignettes. Results from the mild asthma vignette were acceptable. On the other hand, providers indicated that they would use
pulmonary function testing, as a method in diagnosing the patient, even as symptoms persisted. To address this, a table that summarized other recommended diagnostic studies were included in page nine of the asthma management guide.

Pharmacological Interventions

In step three, providers understood that in all three scenarios, with varying classifications of asthma could be treated in their clinic setting. In addition, providers were able to identify the proper medications, but only one provider was able to specify the correct dosage. Choosing the proper dosage can be difficult, especially since guidelines recommend specific dosages depending on the patient’s classification of asthma severity. As a result, the NAEPP EP3 recommended stepwise method was included in pages eleven and twelve of the asthma management guide.

The providers’ ability to treat acute asthma exacerbations also needed to be addressed in the asthma management guide. In the severe asthma vignette, providers treated the patient experiencing an exacerbation with a nebulizer treatment as a sole intervention. Only one provider indicated they would add oral corticosteroids.

Providers needed to be prepared to properly treat acute exacerbations resulted severe complications and even death. A section was included to address classification and management of acute asthma exacerbations.

Education

Proper education was important in managing asthma patients. The development of the asthma action plan was a crucial part of this education. All providers received the full scores for including an asthma action plan as part of patient and family education. The asthma action plan was important because it guided the patient and family in ways to reduce or prevent
exacerbations, and important information emergencies arose. To ensure that the provider and the patient and family co-developed an asthma action plan, a copy of the NAEPP EP3 asthma action plan was included in pages thirteen and fourteen in the asthma management guide.

Results from step four revealed the need to address additional education topics. On average, providers identified less than half of what is recommended by guidelines. Education topics providers chose incomplete education topics compared to NAEPP EP3 guidelines. To ensure that proper education topics were included in future patient education, recommended guideline topics were included in the asthma management guide. This includes specific topics for the initial visit, first follow-up visit, second follow-up visit, and all other subsequent visits.

Referral

Results on the decision of whether to refer or not to refer were conflicting among the providers. Two of the providers believed that referral was not necessary. Given the patient’s diagnosis of severe persistent asthma, the patient should have been referred. NAEPP EP3 guidelines recommended referral to an asthma specialist be considered at step two and required at step three. To address this a table was added to page ten to address when providers should consider referral to an asthma specialist.

Specific aim 3

Perform an evaluation of the proposed pediatric asthma program using an interdisciplinary healthcare team.

Objective 1. Evaluate proposed pediatric asthma program by interdisciplinary team for adherence to evidence-based guidelines and suitability for the FPCC.

The surveys with accompanied consents were delivered on Saturday September 19, 2015. The surveys were retrieved on October 5, 2015, two days later than planned. One of the
participants requested two additional days to complete the survey. There were a total of six providers that participated in the evaluation. Two of the providers were medical doctors (MDs) who specialized in pulmonary and critical care medicine. Three of the providers were nurse practitioners (NPs). One NP specialized in family practice, another specialized in acute pulmonary care, and the last specialized in outpatient pulmonary care. The final provider that participated in the survey was a doctor of pharmacy (PharmD).

A survey was conducted using AGREE II methodology based questionnaire. The questionnaire used a 7-point scale to evaluate six domains of the asthma management guide. For each domain, question for each of the domains were rated from one through seven. A rating of one indicated they strongly disagreed with the asthma management guide. A rating of seven indicated that they strongly agreed with the guide.

Table 13 summarizes responses from the six providers. Providers were assigned letters A through F maintain anonymity. The first column provided the domain to be evaluated. The following rows under the domain provided the questions pertaining to that domain. Each of the questions was lettered and corresponded to the survey. The second through seventh column provided assigned letters of the providers. The rows under of the columns corresponded to the answer for each of the providers. The eighth column provided the total number of points scored over the total possible points. The percentage equivalents were also provided in this column. Table 14 provides a summary of comments and recommended modifications to the pediatric asthma guide. The following figure contains tables that summarized responses from the providers. Discussion of results for each domain is addressed after Table 14.
Table 13. Evaluation of Asthma Management Guide by Providers

<table>
<thead>
<tr>
<th>Domain 1. Scope and Purpose</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The guideline addresses the prevention of (long-term) complications of pediatric patients with asthma.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
<tr>
<td>B. The guideline lowers the risk of asthma exacerbations in patients with previous asthma exacerbations.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
<tr>
<td>C. The guideline provides guidance on the most effective therapeutic treatment and management of pediatric patients with asthma.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
<tr>
<td>D. The guideline addresses the target population including gender and age, severity of asthma, and comorbidities.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>40/42 (95%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain 2. Stakeholder Involvement</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The asthma management guide development includes groups from relevant professional groups.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
<tr>
<td>B. The views and preferences of the asthma management target users have been sought.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
<tr>
<td>C. The target user(s) for the guideline are addressed.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain 3. Rigor of Development</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Health benefits, side effects, and risks have been considered in formulating the recommendations.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
<tr>
<td>B. Guideline recommendations are evidence-based.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
<tr>
<td>C. Guideline recommendations have been reviewed by experts prior to its publication.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain 4. Clarity of Presentation</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The guideline recommendations are specific and unambiguous.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
<tr>
<td>B. The different options for management of the condition or health issue are clearly presented.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
<tr>
<td>C. Key recommendations are easily identifiable.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain 5. Applicability</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Guideline recommendations provides advice and/or tools on how the recommendations can be put into practice.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
<tr>
<td>B. Implications of applying the recommendations have been considered.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
<tr>
<td>C. The guideline presents monitoring and/auditing criteria.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>42/42 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Assessment</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Rate the overall quality of guideline recommendations.</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>41/42 (97%)</td>
</tr>
<tr>
<td>B. I would recommend these guidelines for use. *indicates yes with modifications</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y*</td>
<td>Y</td>
<td>42/42 (100%)</td>
</tr>
</tbody>
</table>
Domain one involved questions regarding scope and purpose of this project. Domain one, question A stated the guideline addresses the prevention of long-term complications of pediatric patients with asthma. All of the providers strongly agreed the asthma management guide addressed prevention of long-term asthma. The total score received for this question is forty-two out of forty-two or one hundred percent.

Domain one, question B stated that the guideline lowers the risk of asthma exacerbations in patients with previous asthma exacerbations. All of the providers strongly agreed the pediatric the asthma management guide lowered risk of asthma exacerbation. The total score received for this question was forty-two out of forty-two or one hundred percent.

Domain one, question C stated the asthma management guide provided guidance on the most effective therapeutic treatment and management of pediatric patients with asthma. All seven of the providers strongly agreed the pediatric the asthma management guide provided guidance of the most therapeutic treatment and management of pediatric asthma. The total score received for this question was forty-two out of forty-two or one hundred percent.

Domain one, question D stated that the guideline addressed the target population including gender and age, severity of asthma, and comorbidities. Five out of six of the providers rated the pediatric asthma management guide as addressed the target population. Provider E, rated the pediatric asthma management guide as five out of seven. The total score received for this question was forty out of forty-two or ninety-five percent, strongly agreed.

In Domain two stakeholder involvement was addressed. Domain two, question A stated that the asthma management guide development included groups from relevant professional groups. All of the providers rated the pediatric asthma management guide as addressed impact
from all relevant groups. The total score received for question was forty-two out of forty two or one hundred percent. Providers strongly agreed.

Domain two, question B stated that the views and preferences of the asthma management target users had been sought. Five out of the six providers rated the pediatric asthma management guide as addressed views and preferences of asthma management target users. Provider E rated the pediatric asthma management guide as six out of seven. The total score received for this question was forty-one out of forty-two or ninety-seven percent. Providers strongly agreed, five percent agreed.

Domain two, question C stated that the target users for the guideline were addressed. All seven providers strongly agreed that the asthma management guide addressed targeted users. The total score received for question was forty-two out of forty-two or one hundred percent.

In domain three rigor of development was addressed. Domain three, question A stated that the health benefits, side effects, and risks had been considered in formulating recommendations. All seven of the providers rated the asthma management guide as meets rigorous. The total score received for question was forty-two out of forty-two or one hundred percent, strongly agreed.

Domain three, question B stated that guideline recommendations were evidence-based. All seven of the rated the pediatric asthma guide as evidence based. The total score received for question was forty-two out of forty-two or one hundred percent, strongly agreed.

Domain three, question C stated that experts prior to publication had reviewed guideline recommendations. All of the providers rated the pediatric asthma management guide as having been reviewed by experts prior to publication. The total score received for question was forty-two out of forty-two or one hundred percent, strongly agreed.
In domain four clarity of presentation was queried. Domain four, question A stated that the guideline recommendations were specific and unambiguous. Five out of the six providers rated the pediatric asthma management guide as specific and unambiguous. One provider, provider E, rated the pediatric asthma management guide as six out of seven. The total score received for this question was forty-one out of forty-two or ninety-seven percent. Providers strongly agreed and five percent agreed.

Domain four, question B stated the different options for management of the condition or health issue were clearly presented. Five out of the six providers rated the pediatric asthma management guide as clearly presented options for management of asthma. Provider E rated the pediatric asthma management guide as six out of seven. The total score received for this question was forty-one out of forty-two or ninety-seven percent. Providers strongly agreed, five percent agreed.

Domain four, question C stated that key recommendations were easily identifiable. Five out of the six providers rated the pediatric asthma management guide as easily identifiable. Provider E rated the pediatric asthma management guide as six out of seven. The total score received for this question was forty-one out of forty-two or ninety-seven percent. Providers strongly agreed, five percent agreed.

Domain five involved applicability. Domain five, question A stated that guideline recommendations provided advice and/or tools on how the recommendations could be put into practice. Five out of the six providers rated the pediatric asthma management guide as provided advice and/or tools on how recommendations be put into practice. Provider E rated the pediatric asthma management guide as six out of seven. The total score received for this question was
forty-one out of forty-two or ninety-seven percent. Providers strongly agreed, five percent agreed.

Domain five, question B stated that implications of applying the recommendations were considered. Five out of the six providers rated the pediatric asthma management guide as considered implications of applying the recommendations. Provider E, rated the pediatric asthma management guide as six out of seven. The total score received for this question was forty-one out of forty-two or ninety-seven percent. Providers strongly agreed, five percent agreed.

Domain five, question C stated that the guideline presents monitoring and auditing criteria. All of the providers rated the pediatric asthma management guide as presented monitoring and/or auditing criteria. The total score received for question was forty-two out of forty-two or one hundred percent. Providers strongly agreed.

The last section of the evaluation involved overall assessment of the pediatric asthma management guide. In the overall assessment, question A required participants to rate the overall quality of guideline recommendations. Five out of the six providers rated the pediatric asthma management guide as strongly agree or seven out of seven. Provider E, rated the pediatric asthma management guide as six out of seven. The total score received for this question was forty-one out of forty-two or ninety-seven percent. Providers strongly agreed, three percent agreed.

In the overall assessment, question B, all providers recommended the guidelines for use. Five out of six providers answered yes. Provider E, answered that they recommended the guidelines for use, but with modifications.
C. Comments and Recommended modifications to pediatric asthma guide.

Table 14. Comments and Recommendations of Interdisciplinary Team

<table>
<thead>
<tr>
<th>Provider</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider A</td>
<td>No comments or recommended modifications.</td>
</tr>
<tr>
<td>Provider B</td>
<td>No comments or recommended modifications.</td>
</tr>
<tr>
<td>Provider C</td>
<td>These recommended guidelines would be very helpful in clinical practice.</td>
</tr>
<tr>
<td>Provider D</td>
<td>No comments or recommended modifications.</td>
</tr>
<tr>
<td>Provider E</td>
<td>Treating common comorbidities such as GERD, COPD, and obesity should be more emphasized. Patients who do not respond or respond inconsistently to asthma treatment often have comorbidities. Identification of these comorbidities facilitates appropriate/effective therapy and/or reduces occurrences of potentially unnecessary and risky therapies. For example, the use of steroids in GERD can result in symptoms of cough and chest tightness like asthma. GERD itself could exacerbate asthma symptoms and subsequently have a significant influence on asthma management.</td>
</tr>
<tr>
<td>Provider F</td>
<td>Very complete and thorough. References and resources seemed very useful for patient education and staff resources. Good references - charts and questionnaires. Spanish references will be very helpful for patients. Overall, very comprehensive.</td>
</tr>
</tbody>
</table>

In the overall assessment, question C, space was provided to leave comments and recommended modifications to the pediatric asthma guide. Providers A, B, and D did not leave comments or recommended modifications. Provider C stated that the recommended guidelines would be very helpful in clinical practice. Provider F stated that the guide was complete and thorough. In addition, Provider F found references and resources useful for patient education and staff resources.

Summary of Interdisciplinary Team Evaluation Results

Six members of the interdisciplinary team evaluated five domains and an overall assessment. The five domains included scope and practice, stakeholder involvement, rigor of development, clarity of presentation, and applicability. Five out of six of the providers strongly agreed that the pediatric asthma guide addressed the five domains appropriately. One of the providers agreed that the pediatric asthma management guide addressed four out of five domains.
appropriately, and strongly agreed that the asthma management guide addressed domain three appropriately. In addition, five out of six providers strongly agreed of the overall quality of the asthma management guide. All six of the providers agreed of the overall quality of the asthma management guide. All six providers strongly agreed to recommend the asthma management guide for use, but one provider made recommended modifications prior to finalizing.

**Objective 2.** Apply changes to asthma management program as recommended.

After analysis of the feedback provided by provider E, two recommendations were identified. The first recommendation was to place more emphasis on identification of comorbidities in asthma patients and treating common comorbidities such as GERD, COPD, and obesity. The final recommendation was to reduce the occurrence of potentially unnecessary and risky therapies. In order to address recommendations by provider E, a section titled “Detailed History” was added to the pediatric asthma management guide. This section included a table from the NAEPP EP3 titled “Suggested Items for Medical History.” See Appendix F for finalized version pediatric asthma guide.

**Summary of Results**

Five out of six providers strongly agreed the pediatric asthma management guide addressed all domains. One provider agreed that the pediatric asthma guide addressed all domains. In the overall assessment, five out of six providers strongly agreed with the overall quality of the pediatric asthma management guide. One provider agreed with the overall quality of the pediatric asthma management guide. Finally, all providers recommended the pediatric asthma management guide for use. One provider recommended modifications prior to finalizing the pediatric asthma management guide. The provider recommended placing more emphasis on
treating common comorbidities such as GERD, COPD, and obesity. Recommendations are addressed in the discussion.
Chapter 5: Discussion, Recommendations, Conclusions, and Implications for Practice

Discussion and Recommendations

Specific Aim 1

Evaluate the clinic’s current workflow and protocol for treating pediatric asthma patients.

Objective 1. Utilized microsystems analysis to gain knowledge and understanding of clinic functions in FPCC clinic for a pediatric asthma patient visit.

Human Ecology Theory

The Human Ecology theory by Bronfenbrenner (1994) poses that one’s entire ecological system must be taken into consideration in order to understand human development. The ecological system is composed of five organized subsystems, which include microsystem, mesosystem, exosystem, macrosystem, and chronosystem. Change in a subsystem affects other systems. The FPCC exists in the microsystem, which includes the clinic where the family or patient seeks care (Bronfenbrenner, 1994). The goal of developing the asthma management guide is to address the FPCC patients’ needs in a holistic manner. This contributes positive outcomes in as many systems as possible.

Asthma that is not properly managed in FPCC results in consequences in other parts of the microsystem and all other subsystems. On average urban minority children experienced one asthma symptom daily, one asthma exacerbation monthly, seven missed school days, six missed parent work days, three emergency department visits and one hospitalization yearly (Flores et al., 2009). The asthma management guide contains evidence-based guidelines that resulted positive outcomes in various patient settings including hospital and outpatient settings (Cincinnati Children’s Hospital, 2014; Rank, Branda, & McWilliams, 2013; Cloutier & Wakefield, 2011).
The asthma management guide addresses items that directly affects subsystems that support and guide human growth. These items are in the ‘history’ section of the asthma management guide. The microsystem was the direct environment of an individual including family, friends, classmates, and neighbors (Bronfenbrenner, 1994). Number eight of the history section involves the microsystem. Number eight addresses the impact of asthma on the patient and family (NHLBI, 2007).

The mesosystem was the relationships between the microsystems in one’s life. The exosystem was composed of linkages among settings, at least one of which the active person did not participate (Bronfenbrenner, 1994). Number six of the history section involves the mesosystem and exosystem. Items addressed in number six include social factors, and workplace or school characteristics that could interfere with asthma management (NHLBI, 2007).

The macrosystem consisted of the overarching pattern of an individual’s micro-, meso-, and exosystems that formed an individual’s culture (Bronfenbrenner, 1994). This is addressed in number 9 of the history section. Number nine involves perception and beliefs regarding use and long-term effects of medications, economic resources, and sociocultural beliefs (NHLBI, 2007).

The chronosystem included changes in an individual’s characteristics and environment over a passage of time (Bronfenbrenner, 1994). This is addressed in number four of the history section. Number four involves age of onset and diagnosis, history of early-life injury to airways, progression of disease, and present management and response (NHLBI, 2007). See page 6 of asthma management guide for history section.

The asthma management guide addresses the patient’s ecological system. Many of the items are included in the history section of the asthma management guide. Properly managed
Microsystems Analysis

The 5 P’s microsystems approach successfully determined the processes used in the FPCC clinic for a pediatric asthma visit. Processes under each of the five domains of the 5 P’s helped determine that the clinic had an infrastructure that was conducive to providing evidence-based care to the clinic’s population. This included adequate staffing, professionals’ roles in patient care, and patient access. Evidence-based processes can be carried out with these resources including obtaining detailed history, performing physical examination, diagnostic testing, and educating the patient.

The 5 P’s process used in the microsystems analysis was a powerful tool in obtaining process information about the clinic. Clearly defined titles and a sequential layout were especially helpful. This prevented error during data logging and ambiguous interpretation when performing the analysis. On the other hand, not all measures in the diagram were used.

Under performance patterns, many topics were not applicable since the focus in this section was quality. Measures included patient satisfaction, staff satisfaction, and access satisfaction. Measures in patient and access satisfaction would have required interaction with patients. It was decided the process, diagnosis, and treatment of pediatric asthma was the focus therefore patient issues of quality were not addressed.

Lastly, the 5 P’s process contributed to the organization of the asthma management guide. The sequential arrangement of the process diagram identified clinical activities performed by the staff and providers. This allowed for evaluation of the clinic’s management process without having interaction with patients. Management process is the next section.
**Objective 2.** Evaluate current screening, diagnosis, and management plans used by the FPCC staff and providers for a pediatric asthma patient.

**Vignette Surveys**

The review of literature and vignette surveys contributed the majority of information included in the asthma management guide. It revealed a plethora of evidence-based information. All of the evidence-based information could have been included, but the clinic needed an asthma management guide that was focused, concise and applicable. This was obtained in the vignette surveys. The vignette surveys identified current screening, diagnosis, and management plans used in the clinic. Methods used by the staff were compared with recommended evidence-based methods. This process highlighted items that needed to be added or changed in order for the clinic to provide evidence-based care. Outcomes from the analysis of the vignette surveys are discussed in the following section.

**Mild Asthma Vignette**

The first vignette involved a five-year-old child named Wiley diagnosed with mild persistent asthma. Step one questions one, two, and three, were used to understand resources and processes. This included identification of first point of contact, the use of questionnaires in screening patients, and the type of questionnaire that was used. The first point of contact for the clinic was either the clerk or medical assistant. Since question one did not have evidence-based components it was not assigned points. Step one question three, determined whether or not the providers used asthma questionnaires in the clinic. Zero out of three providers did not respond as the model answer suggested. Providers received zero percent.

Step two involved the diagnostic process. Step two question one, involved recommended activities that established diagnosis of asthma, which included detailed history and physical
examination. Providers answered subjective, objective, assessment, and plan (SOAP), which included history and physical. Three out of three of the providers responded as suggested in the model answer. Providers received a total cumulative average score of one hundred percent.

Probability of asthma is increased if presence of key signs and symptoms or key symptom indicators in increased. Key symptom indicators included wheezing; cough; difficulty breathing; chest tightness; symptoms that occur or worsen in the presence of exercise, viral infection, allergens, weather changes, stress, menstruation; and nocturnal symptoms. Points gained from step two question two and three had the same answers, but were calculated separately. Providers received one point per key symptom indicator identified. The maximum number of points each provider received was six. The maximum cumulative number of points the providers could have received was eighteen points. Providers were asked to identify key symptoms indicators on two separate questions. Providers identified two to four or thirty-three to forty-four percent of key symptoms indicators. These results indicated that providers were consistently unable to identify key asthma signs and symptoms in the patient with mild asthma.

The presence of multiple key symptom indicators increased the probability of the diagnosis of asthma, however, spirometry was needed to establish the diagnosis of asthma. This was addressed in step two question four. The expected answer for this question was Pulmonary Function Testing (PFT), which included spirometry. Spirometry demonstrated obstruction and assessed reversibility in those aged five and older. If a provider answered PFT or spirometry in step two question four, the provider received one point. Providers answered as suggested in the model answer. Providers received three out of three points or one hundred percent.

Step three involved the asthma management process after diagnosis was established. In step three, Wiley was diagnosed with mild persistent asthma. After diagnosis and classification
of asthma severity was established, treatment strategy was evaluated. Step two question one, determined if providers understood a five-year-old child with mild persistent asthma could be treated in the outpatient setting. NAEPP EP3 guidelines stated that a child, age five, with mild persistent asthma could be treated in the outpatient setting (NHLNI, 2011). As a result, in step three, question one, if the provider stated that Wiley could be treated in the clinic, the provider received one point. Providers answered as the model answer suggested. Providers received three out of three points or one hundred percent.

According the NAEPP EP3, children age five to eleven diagnosed with mild-persistent asthma, are recommended to start therapy at step two in the stepwise approach. In addition, the recommended treatment regimen included the use of a SABA as needed and low-dose ICS (NHLBI, 2011). In Step three, question two, if the provider included a SABA in their treatment they received one point. If the provided included ICS in their plan they received another point. If the provided specified low-dose ICS, they received an additional point. Providers received seven out of nine points or seven-seventy percent.

Step four involved recommended clinical activities including the use asthma action plan (AAP), education, and scheduling follow-up visits. An AAP is a recommended clinical activity in the management of asthma that included instructions for daily management and actions used to manage worsening asthma. It is especially vital for managing patients with have moderate or severe persistent asthma, or those requiring treatment at step four, five, or six (NHLBI, 2011). In Step four, question one, if the provider included an AAP, they received one point. Providers answered as suggested in the model answer. Providers received three out of three points or one hundred percent.
Providing proper education on specific topics is essential in management of asthma. The NAEPP EP3 recommends addressing specific education topics at the initial visit, first follow-up visit, second follow-up visit, and all subsequent visits. Recommended topics for the initial visit include expectations of visit, asthma control, patients’ goals of treatment, medications and quality of life (NHLBI, 2007). The provider received one for topic they were able to identify. Providers received seven out of fifteen topics and received a score of forty-six percent.

Asthma guidelines provided recommended intervals for scheduling for each visit. For the first follow-up visit an appropriate interval is between two to six weeks or sooner if needed (NHLBI, 2011). If the provider included a follow-up visit within this time span they received one point. Providers answered as suggested in the model answer and received one hundred percent.

Moderate Asthma Vignette

The second vignette involved a seven-year-old child named Alicia. The patient was diagnosed with moderate persistent asthma. This vignette provided an understanding of how providers of the FPCC managed a child with moderate persistent asthma. Step one questions one, two, and three, were used to understand resources and processes. This included identification of first point of contact, the use of questionnaires in screening patients, and the type of questionnaire that was used. Since question one did not have evidence-based components it was not assigned points.

Step one question three, determined whether or not providers used asthma questionnaires in the clinic. Asthma questionnaires were used to evaluate control and adjust therapy (NHLBI, 2011). If providers indicated that they used an asthma questionnaire in the clinic they received one point. All providers stated that an asthma questionnaire was not used in the clinic. Zero out
of three providers did not respond as the model answer suggested. Providers received zero percent.

Step two involved the diagnostic process. The presence of key signs and symptoms or key symptom indicators increased the probability of asthma. Key symptom indicators included wheezing; cough; difficulty breathing; chest tightness; symptoms that occur or worsen in the presence of exercise, viral infection, allergens, weather changes, stress, menstruation; and nocturnal symptoms. In questions two and three, a provider received one point per key symptom indicator that was identified. Providers were asked to identify key symptoms indicators on two separate questions in this vignette. Providers identified one to three out or twenty-six to thirty-eight percent of key symptom indicators. This indicated that providers were consistently unable to identify key symptom indicators in the patient with moderate asthma.

The presence of multiple key symptom indicators increased the probability of the diagnosis of asthma, however, spirometry was needed to establish the diagnosis of asthma. This was addressed in step two question four. In addition, other causes of airway obstruction should be considered if there was no clear response to initial therapy. Other diagnostic studies that would be useful when considering alternative diagnosis included bronchoprovocation, chest x ray, and biomarkers of inflammation (NHLBI, 2007). In Alicia’s case, she was not responding to the initial treatment regimen she started one month prior. Other tests should have been considered. In step two, question four, providers received one point for each test consistent with guidelines. Providers received three out of twelve points or twenty-five percent.

Step three involved the asthma management process after diagnosis was established. In step three, Alicia was diagnosed with moderate persistent asthma. After diagnosis and classification of asthma severity was established, treatment strategy was evaluated. Step two
question one, determined if providers understood a seven-year-old child with moderate persistent asthma could be treated in the outpatient setting. NAEPP EP3 guidelines stated that a child, age seven, with moderate persistent asthma could be treated in the outpatient setting (NHLNI, 2011). As a result, in step three, question one, if the provider stated that Alicia could be treated in the clinic, the provider received one point. Providers answered as suggested in the model answer and received one hundred percent.

According the NAEPP EP3, in initiating therapy in children ages five to eleven who are diagnosed with moderate-persistent asthma are recommended to start therapy at step three in the stepwise approach for managing asthma. The recommended treatment regimen included the use of SABA as needed and low-dose ICS plus either LABA, LTRA, or theophylline; or medium-dose ICS (NHLBI, 2011). In step three, question two, if the provider included a SABA in their treatment they received one point. If the provider included ICS in their plan they received another point. If the provided specified medium-dose ICS in their plan they received an additional point. On average providers received seven out of nine points or seventy seven percent.

Step four involved recommended clinical activities including the use asthma action plan (AAP), education, and scheduling follow-up visits. An AAP was a recommended clinical activity in the management of asthma that included instructions for daily management and actions used to manage worsening asthma. It was especially vital for managing patients with have moderate or severe persistent asthma, or those requiring treatment at step four, five, or six (NHLBI, 2011). In Step four, question one, if the provider included an AAP, they received one point. Providers answered as suggested in the model answer. Providers received three out of three points or one hundred percent.
Providing proper education on specific topics is essential in management of asthma. The NAEPP EP3 recommends addressing specific education topics at the initial visit, first follow-up visit, second follow-up visit, and all subsequent visits. Recommended topics for the initial visit include expectations of visit, asthma control, patients’ goals of treatment, medications and quality of life (NHLBI, 2007). The provider received one for topic they were able to identify. Providers received twelve out of fifteen points or eighty percent.

Asthma guideline provided recommended intervals for scheduling for each visit. For the first follow-up visit an appropriate interval was between two to six weeks or sooner if needed (NHLBI, 2011). If the provider included a follow-up visit within this time span they received one point. Providers answered as suggested by the model answer. Providers received three out of three points or one hundred percent.

Severe Asthma Discussion

The third and final vignette involved a ten-year old child named Koa. The patient is diagnosed with severe persistent asthma and was experiencing an acute moderate exacerbation. The purpose of this vignette was to gain an understanding of how providers of the FPCC manage a child with severe persistent asthma that was experiencing an acute moderate exacerbation.

Step one questions one and three, were used to understand resources and processes. This included identification of first point of contact, the use of questionnaires in screening patients, and the type of questionnaire that was used. Since question one did not have evidence-based components it was not assigned points. Step one question three, determined whether the providers used asthma questionnaires in the clinic. Asthma questionnaires were used to evaluate control and adjust therapy (NHLBI, 2011). If providers indicated that they used an asthma
questionnaire in the clinic they received one point. Zero out of three providers did not respond as
the model answer suggested. Providers received zero percent.

Step one question two, identified the providers’ ability to determine whether Koa’s
asthma exacerbation was treatable in the clinic or a medical emergency. A severe asthma
exacerbation usually required a visit to the emergency department and likely hospitalization.
According to guidelines, signs and symptoms of a severe acute exacerbation included dyspnea at
rest, or signs and symptoms that interfered with conversation (NHLBI, 2007). The provider
received one point if they answered by providing either indication that the patient was
experiencing a severe acute exacerbation. The maximum number of points each provider can
receive was one. The maximum cumulative number of points the providers can receive was three
points. Only one provider provided data for this question. Provider 2 stated signs or symptoms
that interfered with conversation as suggested in the model answer. Provider 1 and 3 replied
“emergency or not.”

Step two involved diagnosis, identification of control, and management of acute
exacerbation in the outpatient setting. Koa was experiencing an acute moderate exacerbation.
According to the NAEPP EP3, an acute asthma exacerbation can be treated in the outpatient
clinic setting (NHLBI, 2007). Recommended key clinical activities for diagnosis and
management of acute asthma exacerbation includes assessing severity, treatment to relieving
hypoxemia and obstruction; reduce airway inflammation (NHLBI, 2011). Treatment strategies
included the use of supplemental oxygen, repetitive or continuous SABA, and oral system
corticosteroids (NHLBI, 2011). The provider received one point per treatment strategy consistent
with guideline recommendations. In step two question one, providers received one point per
treatment recommendation properly identified. Providers received four out of nine points or forty-four percent.

Koa’s asthma was also uncontrolled despite being on his current asthma management regimen. Assessing and adjusting therapy in children aged five to eleven involved identifying seven components of control. Components included nighttime awakenings, interference with activity, SABA use for symptom control, lung function, exacerbations that required oral corticosteroids, reduced lung growth, and treatment-related adverse effects (NHLBI, 2011). In step two, question two the provider received one point per component of control they identified. Providers received four out of twenty one or nineteen percent.

In addition to establishing the diagnosis of asthma, diagnostic studies were used to assess asthma control and adjust therapy. Step three involved diagnostic tests useful included pulmonary function testing, bronchoprovocation, chest x ray, and biomarkers of inflammation (NHLBI, 2007). The providers scored one point for each diagnostic test identified. Provider 1 stated PFT. Provider 2 stated history, PFT, allergy testing, and chest x ray. Provider 3 stated PFT. Providers receive four out of twelve points or thirty-three percent.

Step three involved the asthma management process. Step three question one involved the asthma management process after diagnosis was established. Koa was diagnosed with severe persistent asthma. Step three question one, determined if providers understood that ten-year-old child with severe persistent asthma could be managed in the outpatient setting. NAEPP EP3 guidelines stated that a child, age ten, with severe persistent asthma could be treated in the outpatient setting, but referral is required (NHLNI, 2011). As a result, in step three, question one, if the provider stated that Alicia could be treated in the clinic, but with required referral, the
provider received one point. On provider answered as suggested in the model answered.

Providers scored one out of three points or thirty three percent.

Koa was diagnosed with severe-persistent asthma. In initiating therapy in children ages five to eleven who were diagnosed with severe-persistent asthma it was recommended to start therapy at step three in the stepwise approach. The recommended treatment regimen included the use of SABA as needed; low-dose ICS plus LABA, or medium-dose ICS, or medium-dose ICS plus LABA (NHLBI, 2011). In step three, question two, if the provider included a SABA in their treatment they received one point. If the provider included ICS in their plan they received another point. If the provided specified low-dose ICS plus LABA, or medium-dose ICS, or medium-dose ICS plus LABA in their plan they received an additional point. Providers received six out of twelve points or fifty percent.

Step four addressed consultation or referral. According to guidelines, consultation should be considered at step two. In addition, consultation with an asthma specialist was required at step three or higher (NHLBI, 2011). If the provider indicated that Koa should be referred to a specialist they received one point. Providers received one out of three or thirty three percent.

Development of the vignette surveys did not come without its challenges. Information from the clinic had to be obtained in a manner that would simulate a patient visit, but without interaction with actual patients. The vignettes were built around processes and clinical activities that already took place in the clinic as determined by the microsystems analysis. Questions were asked in sequences that mimicked a pediatric asthma patient being treated in the FPCC.

Selection of content included in the questions was straightforward. Questions that were asked had model answers. Model answers created from evidence-based guidelines. This allowed for comparisons between providers’ answers and evidence-based answers in the analysis. Results
from the vignette surveys provided important information on areas that needed to be addressed in order for the clinic to provide evidence-based care. For example, in the severe persistent asthma vignette involving a treatment of a seven-year-old child, two providers indicated they would treat the patient with inhaled corticosteroids and a SABA as needed. NAEPP EP3 guidelines recommend treatment of this child with medium-dose or high-dose ICS, SABA as needed, and a course of OCS.

Applicability of the asthma management guide was limited to children in two age groups. The first group included children age five to eleven. The second group included children age twelve and older. Diagnosis of asthma in children can be made in children under the age five, but can be difficult since it is based on signs and symptoms rather than objective testing (NHLBI, 2007). Children under age five may not developmentally competent enough to complete pulmonary function testing.

**Specific Aim 2**

Developed an evidence-based asthma program that meets the needs of the FPCC for pediatric asthma care.

**Objective 1.** Analyzed existing treatment guidelines, current workflow processes and current asthma management plan flow for use in the FPCC.

Analysis of current asthma management guidelines revealed foundational topics that were included in the pediatric asthma management guide. The asthma management guide focused heavily on basic evidence-based topics in medical management including clinical presentation, diagnostic testing, differential diagnosis, treatment, and medications (NHLBI, 2007). Much of the information included in the asthma management guide was based on the National Heart, Lung, and Blood Institute’s Guidelines for the Diagnosis and Management of Asthma – Expert
Panel 3. These guidelines have been used with great success in the management of asthma in acute and outpatient settings (Rank, Branda, & McWilliams, 2013; Cloutier & Wakefield, 2011).

Analysis of vignette data successfully identified the clinic’s existing workflow processes and asthma management plan used in the FPCC. Results identified topics, also referred to as needs, that were emphasized in the asthma management guide. Topics that needed to be included were use of screening questionnaires, identification of signs and symptoms, diagnostic testing, recommended pharmacological interventions, recommended education, and referral.

During development of the asthma management guide, there was major debate on whether or not to include a ‘history’ section. This would guide the providers in history taking. It was not included in the preliminary version of the asthma guide because collecting patient history is standard practice during all routine initial visits. Also, providers in the clinic had stated that the Bright Futures questionnaire was used in initial history taking (American Academy of Pediatrics, 2015). Adding another section ran the risk providing too much information since it would be redundant to use two similar questionnaires to collect patient history. Results from evaluation by the interdisciplinary team suggested otherwise. This is examined in the discussion of Specific Aim 3.

Objective 2. Developed an evidence-based management algorithm based on the analysis of existing pediatric asthma guidelines and data analyzed from the FPCC.

The review of literature revealed foundational topics. These included general activities performed by a clinician during visits such as assessment, diagnosis, and planning (NHLBI, 2007). The vignette surveys identified existing asthma management plans used in the clinic. Existing management by FPCC providers were compared to NAEPP EP3 guidelines. This pointed out items that needed to be addressed to provide care in an evidence-based manner.
The next challenge in developing the guide involved efficient delivery of information. As a result, the asthma management guide was devised in the form of a manual. It contained approximately forty-eight pages and was divided into ten major categories.

The first category of the guide was diagnosis. This section was presented in the sequence a provider would take when diagnosing a patient. It consisted of seven subcategories. Subcategories included were diagnosis of asthma, key symptom indicators, history, physical examination, classification of severity, differential diagnosis and additional studies, and referral. If the diagnosis was made and classification was established, the provider referenced the second category for initial management.

Results from vignettes indicated that identification of signs and symptoms, diagnostic testing, and referral were particular items that needed to be emphasized. Providers struggled to identify key signs and symptoms in all vignettes. In addition, findings indicated that as asthma classification severity of the patient increased, physician identification of asthma signs and symptoms decreased. These findings are notable since a Nevada study by Moonie, et al. (2005) found decreasing levels of agreement between patients and physicians as asthma symptom severity increased.

Disagreement in the identification of asthma symptoms between the patients and physicians is concerning especially since presence of multiple key indicators increases the probability of asthma (NHLBI, 2007). Inability to properly identify asthma signs and symptoms can result in the incorrect severity or control classification. This can result in failure to treat based on evidence-based guidelines, since the stepwise approach is severity-based (NHLBI, 2011).
Providers indicated that their primary means of diagnosis was pulmonary function testing. This might be acceptable initially, however, additional diagnostic testing should be considered when other causes of airway obstruction leading to wheeze have been ruled out and there is no clear response to therapy. Diagnostic tests recommended by guidelines included bronchoprovocation, chest X ray, and biomarkers of inflammation (NHLBI, 2007).

Results from the severe asthma vignette indicated that guidance was needed in consideration of referral. Only one provider correctly answered referral was necessary in the patient with severe persistent asthma. National guidelines state that referral to an asthma specialist should be considered when there are difficulties in achieving or maintaining control or step four care or higher is required (NHLBI, 2011).

Once asthma classification is established, providers reference the second category for initial management. In this section the stepwise approach to asthma management is introduced. Steps correspond to evidence-based pharmacologic interventions. Additional topics that are addressed in this section included specific education topics, and recommended follow-up and diagnostic testing intervals. Use of rescue inhalers as primary means of treatment also indicated in the second category.

Results from the vignettes indicated that providers did not sufficiently address recommended education topics discussed in the NAEPP EP3 guidelines. In the mild asthma vignette, providers were able to identify only forty-six percent of recommended evidence-based education topics. This needed to be included in the asthma management guide since patient education was associated with adherence among the underprivileged and socially disadvantaged (Seeleman, Stronks, van Aalderen & Bot, 2012). To address education needs topics and techniques to properly educate patients were included.
The third category of the asthma management guide focused on long-term management. Category three was intended to guide providers in assessing control and adjusting therapy in children already diagnosed with asthma. In this section the stepwise approach was reintroduced, however, focus is aimed at reducing impairment and risk rather than initial diagnosis. Subcategories in this section included goals of treatment, assessing control and adjusting therapy, and the stepwise approach. The stepwise approach involves selecting appropriate treatment options based on the patient’s level of asthma severity (NHLBI, 2011). It addresses issues common in underprivileged populations including decreased use of maintenance medications and the use of rescue inhalers as primary means of asthma treatment (Gong et al., 2014; Institute for Safe Medicine Practices, 2010).

Results from the vignette surveys indicated that asthma-specific questionnaires were not used in the FPCC. Asthma questionnaires are considered reliable tools in verifying asthma control because there is a strong correlation between forced expiratory volume in one second (FEV1) and asthma specific health-related quality of life. In addition, asthma questionnaires have identified poor asthma control without spirometry with routine success (Ozoh, Okubadejo, Chukwu, Bandele & Irusen, 2012).

As a result, examples of three validated asthma questionnaires are also included. These questionnaires are used to assess control in children twelve and older. By design, scores from Asthma Therapy Assessment Questionnaire (ATAQ), Asthma Control Test (ACT), and Asthma Control Questionnaire (ACQ) are inputted in the management guide to classify asthma control. The ACT versions for children five to eleven, and twelve and older are included in English and Spanish in category ten.
The fourth category prioritized acute exacerbations. This section is used to guide providers in the management of acute asthma exacerbations. Categories covered in this section were goals of treatment, classification of severity, and prevention, assessment and interventions.

Results from the severe asthma vignette indicated providers needed guidance in managing acute exacerbations. Providers correctly identified that the patient experiencing an acute exacerbation could be treated in the FPCC, however they were not able to select guideline-based treatment that included oxygen, nebulized albuterol, and oral corticosteroids (NHLBI, 2011). Two providers stated they would only treat the patient with nebulized albuterol. Another stated they would treat with oral corticosteroids in addition to the albuterol.

Improper treatment of severe asthma is a serious problem for the FPCC. Failing to properly treat exacerbations can contribute to problems already experienced by those who are socially disadvantaged. Problems include increased incidence of asthma, decreased access to quality care, and increased number of missed school days (Williams, Sternthal & Wright, 2009; Flores et al., 2009).

The fifth category covered three special situations in asthma. These included exercise-induced bronchospasm (EIB), surgery and asthma, and pregnancy and asthma. A table was provided to aid in diagnosis and management of EIB. Another table was added to manage pregnancy and asthma. An additional table was provided to help providers understand recommended management strategies in the pre-surgery, intra-surgery, and post-surgery phases. Providers in this project were not queried on EIB, surgical, and pregnancy patients, however the asthma management guide provides insight into special situations providers might encounter in the primary care setting (NHLBI, 2007).
The sixth and seventh categories are focused on usual medication dosages. Subcategories are separated by age group and included specific dosages for long-term and quick-relief medications. The first age group was children age five to eleven. The second group was children aged twelve and older (NHLBI, 2011).

The eighth category provided a medication glossary. Information included in this section is similar to information found in a drug reference. It is comprised of drug names/products, indications, mechanisms, potential adverse effects, and therapeutic issues.

The ninth category included information on delivery devices used in asthma management. Types of devices are presented along with the recommended use in specific age populations. It also described optimal techniques, including the proper use of delivery devices, and therapeutic issues or barriers.

The tenth and final category contained reference documents. Clinic providers mentioned that an English Asthma Action Plan is the only version used. To address this English and Spanish language versions were included. English and Spanish versions of the Asthma Control Test (ACT) for each of the age groups are also included.

Data synthesized from the analyses facilitated the development of the asthma management guide. Information from each of the data sets contributed to organization and structure. The microsystems analysis guided organization. Categories were arranged sequentially and logically to provide a user-friendly experience for providers. Data gathered from the review of literature and vignette surveys directed structure. This ensured that data was ample yet succinct.
Specific Aim 3

Performed an evaluation of the proposed pediatric asthma program using an interdisciplinary healthcare team.

Objective 1. Evaluated proposed pediatric asthma program by interdisciplinary team for adherence to evidence-based guidelines and suitability for the FPCC.

The results from the asthma management guide evaluation by the interdisciplinary team indicated that the pediatric asthma guide was adherent to evidence-based guidelines and was suitable for use by the FPCC. There were a total of sixteen questions in five domains for evaluation. They included scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, and applicability. The total average score for the domains was ninety-eight percent. All providers recommended the guidelines for use, however, one provider recommended modifications prior to the guide being finalized.

The provider felt that a greater emphasis should have been placed on identification and treatment of common comorbidities including GERD, COPD, and obesity. The provider’s rationale was that patients that did not respond or responded inconsistently to asthma treatment often had comorbidities, which could result in potentially unnecessary and risky therapies.

During development of the guide there was conflict as to the usefulness of adding a section on detailed history taking. A history section was not included because information would have been too redundant, however, results indicated otherwise. As a result, a section to assist in history taking was added to the guide before it was finalized.

The recommendation by the provider to emphasize the identification and treatment of comorbidities is valid, however the comorbidities and rationale are not completely applicable to the patient population. GERD is a common comorbidity of asthma patients, but is not the case
for COPD and obesity. About half the children with asthma also have GERD (Mayo Clinic, 2015). COPD is more commonly seen in children with severe lung illnesses such as bronchiolitis (American Thoracic Society, 2015). In addition, epidemiological data has established obesity as a risk factor, but the mechanisms underlying the association between asthma and obesity are incompletely understood (Respiratory Medicine, 2013).

Since, the identification of comorbidities in pediatric asthma patients has been addressed, providers can use the history section to guide in the identification of comorbidities. Another focus of the provider is the concern of potentially unnecessary and risky therapies might be used if a patient did not respond to asthma treatment, particularly the use of steroids in a patient with GERD. The use of the stepwise approach avoids unnecessary and risky therapies since treatment begins with non-steroid medications like SABA for intermittent asthma (NHLBI, 2007). Medications and doses are added or changed as classification of asthma severity increases. As a result, ICS is added if asthma is persistent, however ICS is the most effective long-term control therapy and have significantly less potential than OCS for having adverse effects (NHLBI, 2007).

Use of oral systemic corticosteroids or OCS is recommended in the asthma management, but in cases when response is to treatment is poor and careful review of pulmonary conditions or comorbid conditions indicate that primary asthma diagnosis is severe (NHLBI, 2007). In addition, OCS is used to manage exacerbations or gain more rapid short-term control (NHLBI, 2007).

The asthma management guide was based on evidence-based guidelines. NAEPP EP3 guidelines recommend treatment based on asthma severity classification, and use of OCS in
severe cases or to gain short-term control (NHLBI, 2007). Following NAEPP EP3 guidelines avoids unnecessary and risky therapies in the treatment of pediatric asthma patients.

**Objective 2.** Applied changes to asthma management program as recommended.

Final changes were made to the asthma management guide based on the feedback from the evaluation. Results indicated that more emphasis should be placed on identification and treatment of common comorbidities of asthma. To address concerns mentioned by the provider, a section titled ‘history’ was added to the diagnosis section of the asthma management guide.

The history section included a table with recommended items that would guide the provider in identifying comorbidities. The table was extracted from NAEPP EP3 guidelines. It contained items that should be included when providers perform a history on a patient who is known or thought to have asthma. Items included in table were symptoms, patterns of symptoms, precipitating and/or aggravating factors, development of disease and treatment, family history, social history, history of exacerbations, impact of asthma on patient and family, and assessment of patient’s and family’s perceptions of disease. The precipitating and/or aggravating factors category specifically addresses concerns mentioned by the provider including comorbid conditions such as sinusitis, rhinitis, and gastroesophageal reflux disease (GERD).

**Implications for Practice and Conclusion**

This project addresses the needs in diagnosis and management of asthma the outpatient setting. Use of the asthma management guide may significantly improve care to reduce disparities in underserved, uninsured, and underinsured populations. The asthma management guide provides evidence-based care specific to the needs of the FPCC. This was achieved through use methods successful in identifying specific needs, analyzing clinic and guideline-based information, and validation by an interdisciplinary team of healthcare providers.
The developed asthma management guide offers evidence-based guidance to clinics in initial, long-term, and acute management of asthma in those aged five and older. In addition, it also provides insight into management of asthma in special situations including patients with exercise-induced bronchospasm, asthma patients who need surgery, and asthma patients that are pregnant.

The FPCC takes pride in providing evidence-based practice and hopes to expand in areas including pediatric asthma. This asthma management guide will be key in assisting providers. This project addresses the FPCC’s mission to provide efficient, quality, and affordable healthcare by maintaining continuity of care through a holistic, compassionate, and accessible approach.

The project suggests evaluation methods that can obtain critical information about a clinic that serves vulnerable populations, while maintaining ethical-legal standards. The methods used in the project allows researchers to study a provider or providers’ actions in a manner that simulates an actual patient scenario. Vignettes could easily be modified for other patient scenarios. Such modifications could aid in evaluation of other specialties by its application to future studies. These methods synthesize data for primary care use from data in specialties that can be vast and daunting.

The project provides insight into contributors of increased asthma rates in Nevada. Previous studies correlated decreased level of agreement between patients and physicians as asthma symptom severity increased (Moonie et al., 2005). Decreased level of agreement between patients and families, and providers could lead to a failure in management for two reasons. First, an asthma action plan co-developed by the patient/family and provider with conflicting levels of agreement could result in the patient not seeking timely or emergent care. Second, inaccurate
asthma severity classification could lead to incorrect use of the stepwise approach since it is severity-based.

Finally, the project is based on a four step methodological framework, the PDSA. The PDSA’s four steps include Plan, Do, Study, and Act. This project completes the ‘Plan’ and ‘Do’ steps. Further work would be needed to complete the Study and Act phases. The ‘Study’ would involve studying outcomes of the asthma management guide by completing analysis and comparing it to predictions. The ‘Act’ stage would involve planning another PDSA cycle if changes are applied to the asthma management guide.

Finally, this Practice Inquiry Project addresses practice issues affecting organizations that serve underserved, uninsured, and underinsured populations. Synthesis of theoretical knowledge and research knowledge provides crucial information to design an evidence-based pediatric asthma management guide that addresses specific needs of clinic patients. Projects of this nature require collaboration with multidisciplinary professionals from various health organizations. The study contributes to delivery of care that is validated and holistic.
References


National Heart, Lung and Blood Institute. (2007). *National asthma education and prevention program expert panel report. Guidelines for the diagnosis and management of asthma*


Appendix A: PDSA Model for Improvement

(NHS Institute for Innovation and Improvement, 2009)
## Appendix B: Asthma Action Plan

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

And, if a peak flow meter is used,

- **Peak Flow**: more than 80% of my best peak flow
- **My best peak flow**:
- **Before exercise**:
  - 2 or 4 puffs
  - 5 minutes before exercise

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

<table>
<thead>
<tr>
<th>Medicine</th>
<th>How much to take</th>
<th>When to take</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Asthma Is Getting Worse

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

- **Peak Flow**: to
  - 60 to 78% of my best peak flow

**GREEN ZONE**
- Add: quick-relief medicine—keep taking your GREEN ZONE medicine.
  - 2 or 4 puffs, every 20 minutes for up to 1 hour
  - Nasal sprays

If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:
- Continue monitoring to be sure you stay in the green zone.

- **OR**
- If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:
  - Take: 
    - 2 or 4 puffs of a inhaler
    - 2 or 4 puffs of an inhaler
    - Nasal sprays
    - Oral steroids
  - Call the doctor 1 before or within hours after taking the oral steroid.

### Medical Alert!

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

- **Peak Flow**: too poor to
  - 60% of my best peak flow

**YELLOW ZONE**
- Take this medicine:
  - 2 or 4 puffs of an inhaled steroid

Then call your doctor NOW. Go to the hospital or call an ambulance if:
- You are still in the red zone after 15 minutes
- You have not reached your doctor

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

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

(NHLBI, 2007)
### Appendix C: Comparison of Pediatric Asthma Management Guidelines

<table>
<thead>
<tr>
<th>Name of Guideline</th>
<th>Diagnosis</th>
<th>Management</th>
<th>Education</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAEPP EP3 (NHLBI, 2007)</td>
<td>Use of severity classification chart. Assesses domains of impairment and risk to determine initial treatment. Severity is classified as intermittent, mild persistent, moderate persistent, and severe persistent.</td>
<td>Four components of care include assessment and monitoring, education, control of environment, and medications. Treatment involves stepwise approach.</td>
<td>Education focuses on self-management education, patient-provider developed asthma action plan, and integration of education into all points of care where health professionals interact with patients.</td>
<td>Inhaled corticosteroids (ICS) Cromolyn sodium and nedocromil Immunomodulators Leukotriene modifiers Long-acting beta agonist (LABA) Methylxanthines Anticholinergics Short-acting beta agonist Systemic corticosteroids</td>
</tr>
<tr>
<td>PRACTALL Concensus</td>
<td>Use of standardized diagnostic questionnaire with spirometry.</td>
<td>Care components include avoidance of airborne allergens and irritant triggers, appropriate pharmacotherapy, and asthma education programs for</td>
<td>Education focuses on avoidance measures including allergens, house-dust mites, food allergens, triggers, and</td>
<td>SABAs ICS Leukotriene Receptor Antagonist (LTRA) LABA (only in combination with</td>
</tr>
</tbody>
</table>
| ERS & ATS | Uses previously established diagnosis of asthma.  
Used to diagnose and treat severe asthma and not to be used as standard of care. Severe asthma is classified as asthma requiring treatment with high dose inhaled corticosteroids plus another controller medication.  
Do not use FeNO to guide therapy in adults or children with severe asthma. In children with severe allergic asthma, therapeutic trial of omalizumab.  
Do not use methotrexate in children with severe asthma.  
Do not include macrolide antibiotics as part of asthma treatment regimen in children with severe asthma. Do not use antifungal agents in asthma treatment regimen in children with severe asthma without positive sensitization to fungus. | Do not use FeNO to guide therapy in adults or children with severe asthma. In children with severe allergic asthma, therapeutic trial of omalizumab.  
Do not use methotrexate in children with severe asthma.  
Do not include macrolide antibiotics as part of asthma treatment regimen in children with severe asthma. Do not use antifungal agents in asthma treatment regimen in children with severe asthma without positive sensitization to fungus. | No education specified in guidelines. | ICS  
Sustained release theophylline  
Anti-IgE antibodies  
Cromolyn sodium  
Oral steroids |
| GINA | Use of diagnostic flow-chart in diagnosis. | Components of care include symptom control, | Education focuses on definition, | ICS  
LABA |
Diagnosis flowchart includes history of respiratory symptoms and evidence of variable expiratory airflow limitation. Key symptoms include wheezing, shortness of breath, chest tightness, and cough. No classification is specified. Once treatment is initiated, asthma control is classified as well-controlled, partially controlled, and uncontrolled.

<table>
<thead>
<tr>
<th>LTRA</th>
<th>Chromones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-IgE</td>
<td>Systemic</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td></td>
</tr>
<tr>
<td>SABA</td>
<td>Short-acting anticholinergics</td>
</tr>
</tbody>
</table>
Appendix D: U.S. News and World Report Best hospitals for Pediatric Pulmonology

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Guideline/Guidelines Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children’s Hospital of Philadelphia</td>
<td>NAEPP EP3</td>
</tr>
<tr>
<td>Cincinnati Children’s Hospital Medical Ctr</td>
<td>NAEPP EP3, ERS/ATS</td>
</tr>
<tr>
<td>Boston Children’s Hospital</td>
<td>NAEPP EP3</td>
</tr>
<tr>
<td>Texas Children’s Hospital</td>
<td>NAEPP EP3</td>
</tr>
<tr>
<td>Children’s Hospital Colorado</td>
<td>NAEPP EP3, PRACTALL, GINA</td>
</tr>
<tr>
<td>Children’s Hospital of Pittsburgh of UPMC</td>
<td>NAEPP EP3</td>
</tr>
<tr>
<td>Nationwide Children’s Hospital</td>
<td>PRACTALL</td>
</tr>
<tr>
<td>St. Louis Children’s Hospital</td>
<td>NAEPP EP3</td>
</tr>
<tr>
<td>John’s Hopkins Children’s Hospital</td>
<td>NAEPP EP3, PRACTALL</td>
</tr>
<tr>
<td>Stanford Children’s Hospital</td>
<td>NAEPP EP3, PRACTALL</td>
</tr>
</tbody>
</table>

(Potter, 2010)
Appendix E: Classification of Asthma Severity, 5-11 Years of Age

### NAEPP EPR-3 Classification of Asthma Severity & Control in Children 5-11 Years of Age

<table>
<thead>
<tr>
<th>Component</th>
<th>Intermittent</th>
<th>Persistent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week</td>
<td>&gt; 2 days/week but not daily</td>
<td>Daily</td>
<td>Throughout the day</td>
<td>Often 7x/week</td>
</tr>
<tr>
<td>Nighttime Awakenings</td>
<td>≤ 2x/month</td>
<td>3-4x/month</td>
<td>&gt; 1x/week but not nightly</td>
<td>Often 7x/week</td>
<td></td>
</tr>
<tr>
<td>SABA Use (other than for EIB)</td>
<td>≤ 2 days/week</td>
<td>&gt; 2 days/week but not daily</td>
<td>Daily</td>
<td>Several times/day</td>
<td></td>
</tr>
<tr>
<td>Interference with Normal Activity</td>
<td>None</td>
<td>Minor limitation</td>
<td>Some limitation</td>
<td>Extremely limited</td>
<td></td>
</tr>
<tr>
<td>Lung Function</td>
<td>Normal FEV&lt;sub&gt;1&lt;/sub&gt;, between exacerbations</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt; &gt; 80% predicted</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt;/FVC &gt; 85%</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt; = 60-80% predicted</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt;/FVC = 75-80%</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbation requiring OSC</td>
<td>≥ 2 exacerbations in 6 months requiring OSC, or ≥ 4 wheezing episodes/1 year lasting &gt; 1 day</td>
<td>AND risk factors for persistent asthma</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time. Exacerbations of any severity may occur in patients in any severity category. Relative annual risk of exacerbations may be related to FEV<sub>1</sub>.

### Recommended Step for Initiating Therapy

- **Step 1**: Use Standard-dose ICS andConsider OSC
- **Step 2**: Medium-dose ICS, or Step 4 and Consider OSC
- **Step 3**: Medium-dose ICS option and Consider OSC

In 2-6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4-6 weeks, consider adjusting therapy or alternative diagnoses.

(NHLBI, 2011)
Appendix F: Classification of Asthma Severity, Age 12 and older and Adults

### NAEPP EPR-3 Classification of Asthma Severity & Control in Youths ≥12 Years and Adults

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td></td>
<td>Mild</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Nighttime觉醒es</td>
<td>≤ 2 times/month</td>
</tr>
<tr>
<td>SABA Use (other than for EIB)</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Interference with Normal Activity</td>
<td>None</td>
</tr>
<tr>
<td>Lung Function</td>
<td>Normal FEV_{1}, between exacerbations</td>
</tr>
<tr>
<td></td>
<td>normal</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbation requiring OSC</td>
</tr>
</tbody>
</table>

**Recommended Step for Initiating Therapy**

The stepwise approach is meant to assist, not replace, the clinical decision making required to meet individual patient needs.

- **Step 1**: In 2-6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.
- **Step 2**: Step 3 AND Consider OSC
- **Step 4 or 5 AND Consider OSC**

(NHLBI, 2011)
Appendix G. Copyright Use of NHLBI Website Information

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Most of the information on the NHLBI website is in the public domain and can be used without restriction. Users are asked not to make any changes in the content and source the content as:

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### Appendix H. Recommended Education Topics by Visit

#### Recommendations for Initial Visit

**Focus on:**
- Expectations of visit
- Asthma control
- Patient's goals of treatment
- Medications
- Quality of life

**Ask relevant questions:**
- What worries you most about your asthma?
- What do you want to accomplish at this visit?
- What do you expect from treatment?
- What medications have you tried?
- What other questions do you have for me today?
- Are there things in your environment that make your asthma worse?

**Teach in simple language:**
- What is asthma? Asthma is a chronic lung disease. The airways are very sensitive. They become inflamed and narrow; breathing becomes difficult.
- The definition of asthma control: few daytime symptoms, no nighttime awakenings due to asthma, able to engage in normal activities, normal lung function.
- Asthma treatments: two types of medicines are needed:
  - Long-term control: medications that prevent symptoms, often by reducing inflammation.
  - Quick-relief: short-acting bronchodilator relaxes muscles around airways.
- Bring all medications to every appointment.
- When to seek medical advice: Provide appropriate telephone number.

**Teach or review and demonstrate:**
- Inhale and spacer or valved holding chamber (VHC): use. Check performance.
- Self-monitoring skills that are tied to a written asthma action plan:
  - Recognize intensity and frequency of asthma symptoms.
  - Review the signs of deterioration and the need to reevaluate therapy:
    - Waking at night or early morning with asthma
    - Increased medication use
    - Decreased activity tolerance
- Use of a written asthma action plan (See figures 5 and 6) that includes instructions for daily management and for recognizing and handling worsening asthma.

#### Recommendations for First Followup Visit (2 to 4 Weeks or Sooner as Needed)

**Focus on:**
- Expectations of visit
- Asthma control
- Patient's goals of treatment
- Medications
- Patient's treatment preferences
- Quality of life

**Ask relevant questions from previous visit and also ask:**
- What medications are you taking?
- How and when are you taking them?
- What problems have you had using your medications?
- Please show me how you use your inhaled medications.

**Teach in simple language:**
- Use of two types of medications.
- Remind patient to bring all medications and the peak flow meter, if using, to every appointment for review.
- Self-assessment of asthma control using symptoms and/or peak flow as a guide.

**Teach or review and demonstrate:**
- Use of written asthma action plan. Review and adjust as needed.
- Peak flow monitoring if indicated.
- Correct inhaler and spacer or VHC technique.
### Appendix I. Recommended Education Topics by Visit cont.

#### Recommendations for Second Followup Visit

<table>
<thead>
<tr>
<th>Focus on:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Expectations of visit</td>
</tr>
<tr>
<td>- Asthma control</td>
</tr>
<tr>
<td>- Patients’ goals of treatment</td>
</tr>
<tr>
<td>- Medications</td>
</tr>
<tr>
<td>- Quality of life</td>
</tr>
</tbody>
</table>

**Ask relevant questions from previous visits and also ask:**

- Have you noticed anything in your home, work, or school that makes your asthma worse?
- Describe for me how you know when to call your doctor or go to the hospital for asthma care.
- What questions do you have about the asthma action plan?
- Can we make it easier?
- Are your medications causing you any problems?
- Have you noticed anything in your environment that makes your asthma worse?
- Have you missed any of your medications?

**Teach in simple language:**

- Self-assessment of asthma control, using symptoms and/or peak flow as a guide
- Relevant environmental control avoidance strategies:
  - How to identify home, work, or school exposures that can cause or worsen asthma
  - How to control house-dust mites, animal exposure, if applicable
  - How to avoid cigarette smoke (active and passive)
- Review all medications.

**Teach or review and demonstrate:**

- Inhaler/spacer or HHC technique
- Peak flow monitoring technique
- Use of written asthma action plan. Review and adjust as needed.
- Confirm that patient knows what to do if asthma gets worse.

#### Recommendations for All Subsequent Visits

<table>
<thead>
<tr>
<th>Focus on:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Expectations of visit</td>
</tr>
<tr>
<td>- Asthma control</td>
</tr>
<tr>
<td>- Patients’ goals of treatment</td>
</tr>
<tr>
<td>- Medications</td>
</tr>
<tr>
<td>- Quality of life</td>
</tr>
</tbody>
</table>

**Ask relevant questions from previous visits and also ask:**

- How have you tried to control things that make your asthma worse?
- Please show me how you use your inhaled medication.

**Teach in simple language:**

- Review and reinforce all:
  - Educational messages
  - Environmental control strategies at home, work, or school
  - Medications
  - Self-assessment of asthma control, using symptoms and/or peak flow as a guide

**Teach or review and demonstrate:**

- Inhaler/spacer or HHC technique
- Peak flow monitoring technique, if appropriate
- Use of written asthma action plan. Review and adjust as needed
- Confirm that patient knows what to do if asthma gets worse.
Appendix J. Consent to Participate in Study

University of Hawai'i at Hilo

Consent to Participate in Research Project:

Development of an Evidence-Based Pediatric Asthma Program for a Nonprofit Clinic Serving Underserved, Uninsured, and Underinsured Populations in Southern Nevada

My name is Armando Sarmiento. I am a graduate student at the University of Hawaii at Hilo in the School of Nursing. As part of the requirements for earning my graduate degree, I am doing a research project as a requirement for earning my graduate degree. The purpose of my project to create a pediatric asthma program for children ages five to seventeen. The program will guide the First Person Care Clinic’s providers and staff in proper asthma care including screening, diagnosis and management. I am asking you to participate because your clinic sees pediatric asthma patients.

Activities and Time Commitment: If you participate in this project, I will distribute the survey at this office. The survey will be delivered to the office on a weekday and will be collected on the same weekday the following week. The survey consists of a total of three vignettes. Survey questions will include questions like, “What are some signs and symptoms that might lead the provider to suspect that a child’s asthma is uncontrolled?” “Are there any particular items/procedures/techniques done be the provider?” Each survey will take 30 to 45 minutes each. You will be one of about 12 people whom I will survey for this study.

Benefits and Risks: There will be no direct benefit to you for participating in this interview. The results of this project may help improve pediatric asthma management at the First Person Care Clinic to benefit future patients. If you feel stressed or uncomfortable answering any of the survey questions you can skip the question. You can also stop the survey or you can withdraw from the project altogether.

Privacy and Confidentiality: I will keep all information in a safe place. Only my University of Hawaii advisor and I will have access to the information. Other agencies that have legal permission have the right to review research records. The University of Hawaii Human Studies Program has the right to review research records for this study. When I report the results of my research project, I will not use your name. I will not use any other personal identifying information that can identify you. I will use pseudonyms (fake names) and report my findings in a way that protects your privacy and confidentiality to the extent allowed by law.

Voluntary Participation: Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you. Your choice to participate or not participate will not affect your rights to services at the First Person Care Clinic.

Questions: If you have any questions about this study, please call me at 808.430.3300 or email me at armandoc@hawaii.edu. You may also contact my adviser, Dr. Alice Davis at
808.932.7073 or aedavis@hawaii.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at 808.956.5007 or uhirb@hawaii.edu.

If you agree to participate in this project, please sign and date this signature page and return it to me, Armando Sarmiento.

Please keep the section above for your records.
If you consent to be in this project, please sign the signature section below and return it to me, Armando Sarmiento.

-----------------------------------------------------------------------------------------------------------------
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| Tear or cut here                                                                                                  |
|                                                                                                                  |
|                                                                                                                  |
-----------------------------------------------------------------------------------------------------------------

Signature(s) for Consent:

I give permission to join the research project entitled, Development of an Evidence-Based Pediatric Asthma Program for a Nonprofit Clinic Serving Underserved, Uninsured, and Underinsured Populations in Southern Nevada

Please initial next to either “Yes” or “No” to the following:

_____ Yes  _____ No  I consent to be surveyed for the interview portion of this research.

_____ Yes  _____ No  I give permission to allow the investigator to use my real name to be used for the publication of this research

Name of Participant (Print): __________________________________________

Participant's Signature: __________________________________________

Signature of the Person Obtaining Consent: _________________________

Date: ________________________
Appendix K. Institutional Review Board Approval

May 4, 2015

TO: Armando Sarmiento
   Principal Investigator
   UH Hilo – School of Nursing, DNP Program

FROM: Denise A. Lin-DeShetler, MPH, MA
       Director

SUBJECT: CHS #23041 - “Development of an Evidence-Based Pediatric Asthma Program for a
          Nonprofit Clinic Serving Underserved, Uninsured, and Underinsured
          Populations in Southern Nevada”

This letter is your record of the Human Studies Program approval of this study as exempt.

On May 4, 2015, the University of Hawai‘i (UH) Human Studies Program approved this study as
exempt from federal regulations pertaining to the protection of human research participants. The
authority for the exemption applicable to your study is documented in the Code of Federal Regulations
at 45 CFR 46.101(b) (Category 2).

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at

Exempt studies do not require regular continuing review by the Human Studies Program. However, if
you propose to modify your study, you must receive approval from the Human Studies Program prior to
implementing any changes. You can submit your proposed changes via email at uhirb@hawaii.edu. (The
subject line should read: Exempt Study Modification.) The Human Studies Program may review the
exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private
information which can be linked to the identities of individuals as soon as it is reasonable to do so.
Signed consent forms, as applicable to your study, should be maintained for at least the duration of your
project.

This approval does not expire. However, please notify the Human Studies Program when your study is
complete. Upon notification, we will close our files pertaining to your study.

If you have any questions relating to the protection of human research participants, please contact the
Human Studies Program at 956-5007 or uhirb@hawaii.edu. We wish you success in carrying out your
research project.