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## **An Educational Intervention Regarding Asthma Management and an Asthma Clinical Pathway to Increase Knowledge of Nursing Staff in a Pediatric Emergency Department**

Kristina Valiente  
*Florida International University*

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An Educational Intervention Regarding Asthma Management and an Asthma Clinical Pathway  
to Increase Knowledge of Nursing Staff in a Pediatric Emergency Department

A Scholarly Project Presented to the Faculty of the  
Nicole Wertheim College of Nursing and Health Sciences

Florida International University

In partial fulfillment of the requirements  
For the Degree of Doctor of Nursing Practice

By

Kristina Valiente

Supervised By

Dr. Charles Buscemi

Approval Acknowledged: \_\_\_\_\_, DNP Program Director

Date: \_\_\_\_\_

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## **Abstract**

The treatment of asthma exacerbations in the emergency department can be very complex and involves a multidisciplinary approach that involves evaluation and reevaluation of the patient in order to make adjustments to the plan of care. Clinical pathways are increasingly being used to guide patient care and by incorporating clinical pathways in an emergency department it can lessen the variation in the delivery of care, reduce the use of unnecessary resources, and improve the overall quality of care for patients (Dexheimer, Abramo, Arnold, Johnson, Shyr, Ye, Fan, Patel, & Aronsky, 2013).

A systematic review was conducted to examine the impact of asthma clinical pathways on patient care and the impact of an educational intervention on clinical staff knowledge. The findings of the systematic review laid the foundation for a quality improvement project, which included the development of an educational intervention for the nursing staff in order to increase their knowledge of asthma management and the asthma clinical pathway currently being used in the Emergency Department. The findings from the quality improvement project were in line with the findings from the systematic review and support the project's aims that an educational intervention can improve the nursing staff's knowledge. A 15% improvement in overall knowledge was observed.

Keywords: Asthma, asthma clinical pathway, pediatrics, emergency department

## **Systematic Review**

### **INTRODUCTION**

#### **Background**

Asthma is a chronic inflammatory lung disorder that affects your airways. In the United States, there are approximately twenty million people diagnosed with asthma and nearly 9 million of them are children (Medline Plus, 2019). Children with asthma frequently report symptoms such as coughing that is constant or worsened by viral illnesses, wheezing, chest tightness or chest pain, and shortness of breath or difficulty breathing (Medline Plus, 2019). These symptoms can be caused by allergens such as mold, dust mites, viral infections, air pollution, and tobacco smoke (National Institute of Allergy and Infectious Diseases, 2019).

The primary goals for the management of asthma include patient education, trigger avoidance, and drug therapy regimens. Education for patients and their parents or caregivers should focus on the identification of triggers and how to avoid them. It should also focus on understanding the use of the medications prescribed and the importance of compliance (Kemp, 2001). Lack of compliance is a major issue in the management of pediatric asthma and there are several factors that play a significant role. Some of these include the frequency of dosing, the time it takes for the medications to take effect, and the possibility of side effects (Kemp, 2001). Asthma that is poorly controlled can lead to visits to the emergency department, hospital stays, and missed work and school days (American College of Allergy, Asthma, & Immunology, n.d.).

Asthma can be a life-threatening disease if it is not diagnosed and managed properly. Although it is rare, asthma can lead to numerous respiratory complications such as pneumonia, respiratory failure, and status asthmaticus, which is a condition where the exacerbation does not respond to medications (Healthdirect, 2018). Other long-term effects of asthma include

permanent narrowing of the bronchial tubes, which can affect how well you breathe on a day to day basis (Mayo Clinic, 2018). Lastly, according to the American Lung Association (2018), there were over 3,000 deaths in 2016 that were attributed to asthma.

Treatment of asthma exacerbations in the emergency department can be very complex. Asthma treatment and management usually includes a multidisciplinary approach and comprises of evaluation and reevaluation in order to adjust the patient's medications and determine the level of care that is required. Incorporating clinical pathways in an environment such as the emergency department could help health care providers in delivering consistent care for patients presenting with an asthma exacerbation (Dexheimer, Abramo, Arnold, Johnson, Shyr, Ye, Fan, Patel, & Aronsky, 2013).

### **Rationale**

Clinical pathways are increasingly being used to guide the care of patients. A pathway is a guideline that defines the timing and structure of care. Some of the goals of incorporating clinical pathways into practice include lessening the variation in the delivery of care, reducing the use of unnecessary resources, improving patient education and understanding of asthma, and improving the overall quality of care (Glauber, Harold, Homer, & Homer, 2001). Numerous studies of both emergency department and inpatient implementation of clinical pathways for asthma management in children have showed positive effects on the misuse of therapies, length of stay, and hospitalization & readmission rates (Simmons & Kotagal, 2008).

Clinical pathways are used to guide health care providers towards practicing up-to-date evidence-based medicine based off of the latest national guidelines. Pathways help standardize practice, which in turn promote patient safety and health system efficacy. Although studies have shown that the use of clinical pathways can lead to positive outcomes, the evidence-to-practice

gap still remains a challenge and there are still multiple barriers to adherence (Jabbour, Newton, Johnson, & Curran, 2018). Some barriers related to adherence include lack of awareness, unfamiliarity to institutional policies, and resistance to change. A main concern from practitioners regarding the use of clinical pathways for asthma management is that they believe that pathways limit the practitioner's critical thinking skills (Talib, Lax, & Reznik, 2018). Health care providers should realize that clinical pathways can help to reduce their mental effort, which in turn will allow them to focus on more complex issues (Jabbour, Newton, Johnson, & Curran, 2018). Practitioners should also see pathways as a way of enhancing education by presenting the latest evidence-based treatment options for their patients (Talib, Lax, & Reznik, 2018).

Working with the nursing staff is essential in successfully implementing clinical pathways in order to standardize the management of asthma (Calligaro, Miller, Dougherty, Raviola, & DeLaurentis, 1996). Nurses working in the emergency department are at the frontline of patient care and play a vital role in adhering to practice guidelines. This is why it is important for the nursing staff to have a clear understanding of asthma management and the use of an asthma clinical pathway in order to improve patient outcomes. At this time, little is known about the educational impact of pathways on nursing staff. The systematic review details the need for further research and quality improvement tools in order to increase nursing staff knowledge regarding asthma management and asthma clinical pathways. The findings of the systematic review can be used by nurses, advanced registered nurses, and other healthcare professionals.

### **Objectives**

The purpose of this systematic review is to develop a quality improvement project in order to improve nursing staff knowledge regarding asthma management and the use of asthma clinical pathways in the emergency department.



The objectives of the systematic review are

1. To research the limited and unknown information regarding nurse's knowledge of asthma management and the impact of an educational intervention regarding asthma clinical pathways and management on nursing staff.
2. To critically examine literature that supports the implementation of asthma clinical pathways in the emergency department
3. To develop a quality improvement proposal from the findings of the current systematic review

## **METHODOLOGY**

### **Eligibility Criteria**

A literature review was conducted in order to find research articles related to the PICO (Population, Intervention, Comparison, Outcome) clinical question mentioned above. CINAHL (Cumulative Index to Nursing and Allied Health Literature) and MEDLINE (ProQuest) were the two databases used for this literature review. The following key terms were used: asthma\* AND "clinical pathway\*" AND (child\* or adolescen\* or youth\* or kid\*). The search included articles that were published as early as 1996, because that is around the time that clinical pathways were first introduced in the United States. From the initial search, there a total of 25 research articles retrieved from CINAHL and a total of 44 articles retrieved from MEDLINE (ProQuest), resulting in a total of 69 articles. After removing all of the duplicates, 49 articles were screened to see if they met the criteria for the PICO clinical question.

### **Information Sources**

The CINAHL database and the MEDLINE (ProQuest) database were both used to find primary sources for the systematic review. In addition, both databases were used to find articles that were relevant.

### **Search Strategy**

The searches through CINAHL and MEDLINE (ProQuest) began with the development of the keywords. The three unique keywords identified were: asthma, clinical pathway, and children. After identifying the main keywords, quotation marks and asterisks were then applied. Quotation marks were placed around the keyword “clinical pathway” since it is a word that must be kept together. In addition, asterisks were applied to the keyword’s “asthma” and “clinical pathway” in order to expand the search since those keywords could have different word endings. Lastly, related terms for the keyword “children” were identified and added, using asterisks as applicable, in order to expand the results. The final search terms that were developed were: asthma\* AND “clinical pathway\*” AND (child\* or adolescen\* or youth\* or kid\*).

The following search words were first entered into the CINAHL database: asthma\* AND “clinical pathway\*” AND (child\* or adolescen\* or youth\* or kid\*) and there was a total of 25 results. The same keywords were then entered into MEDLINE (ProQuest), which resulted in a total of 44 results. All 69 research articles were then placed into a folder in RefWorks and were screened for duplications by using the “find duplicates” tool. By using the “find duplicates” tool on RefWorks, there was a total of 8 duplicates found. The remaining 61 research articles were thoroughly screened again, and another 12 duplicates were found. This resulted in a total of 49 articles that were related to the search words used.

All 49 research articles were screened for relevance based off of their title and abstract. In order to be included in the systematic review, the articles had to focus on the use of a clinical

pathway for the management of asthma. In addition, the articles had to take place in an outpatient setting such as the emergency department. One study included in this systematic review takes place in the inpatient setting but was included for this review because it's focus relates directly to the PICO clinical question. Of the original 49 research articles screened, only 12 were relevant to the PICO clinical question. In addition, 7 of the articles were saved for potential background information. This left a total of 30 articles that were irrelevant to this systematic review.

The 12 research articles that were relevant to the research terms were fully screened to determine if they were still suitable for the systematic review. Of the 12 research articles, 2 were excluded from the systematic review due to inability to obtain access to the full-text versions to review them. In addition, 4 research articles were removed from the relevant to PICO clinical question file but saved for potential background information. This resulted in a total of 30 research articles that were irrelevant, 11 research articles that were saved for potential background information, and lastly 6 research articles that were found to be relevant to the PICO clinical question which will be included in the systematic review.

## **RESULTS**

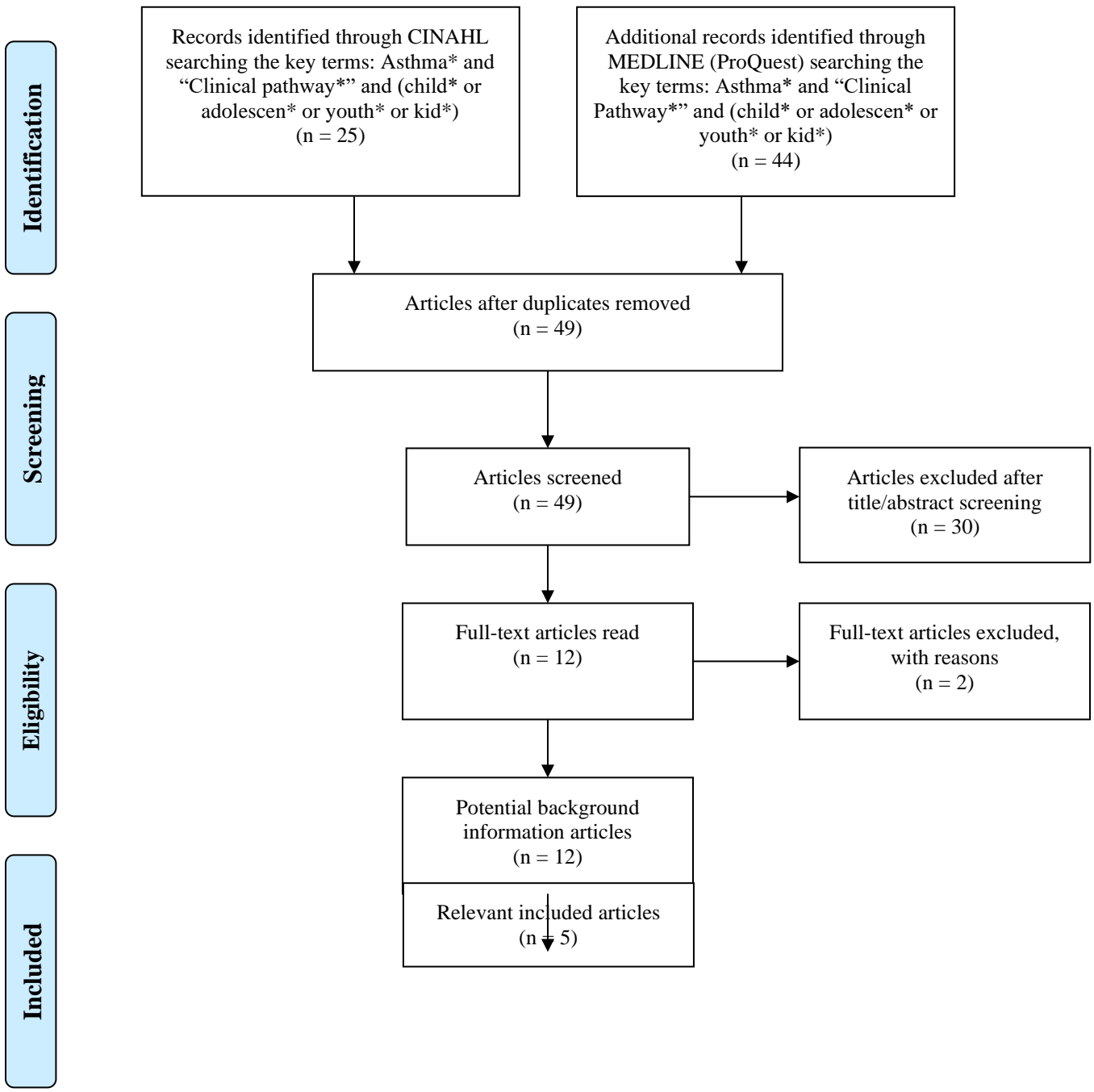
### **Study Selection**

The initial research results from CINAHL and MEDLINE (ProQuest) were first placed into a folder where they were screened for duplicates. After the duplicates were removed from the folder, the remaining research articles were screened for relevance to the PICO clinical question by screening through the titles and abstracts. After screening the titles and abstracts of the remaining articles, RefWorks was used to record relevant research articles, irrelevant research articles, and research articles that could potentially be used as background information for the research. The PRISMA flow chart developed by Moher, Liberati, Tetziaff, & Altman

(2009) was also used to depict the flow of information throughout the criteria selection process (See figure 1).

Numerous studies were eliminated while screening the title and abstract. The research articles that were eliminated during this phase were included in the irrelevant folder. Research articles that were found to have helpful background information were added to the potential background information folder. Lastly, the research articles that were placed in the relevant to PICO clinical question folder were read in their entirety. Articles whose full-text formats were unable to obtain were removed from the relevant to PICO question folder. In addition, those that were no longer found to be relevant to the PICO question but could be used as background information were added to the potential background information folder. A total of (30) research articles were placed into the irrelevant to PICO question folder, (12) in the potential background information folder, and (5) into the relevant to PICO clinical question folder with 1 article relating directly to the PICO clinical question.

Figure 1: PRISMA flowchart



## **Data Collection Process**

Data collected from the research studies included for the systematic review contained information such as the study methods, the participants, intervention groups, and the outcomes. The information collected was then compared by the researcher in order to assess the reliability of the studies.

## **Data Items**

The key data items obtained for the purpose of the systematic review were the materials and methods used, the setting of the studies, the studies' participants, the outcomes, and the potential bias. This information is outlined to describe the main data that was collected. This outline includes the purpose of the study, the methods used, the participant characteristics, and the studies' findings.

## **Study Characteristics**

The systematic review includes 4 cohort studies that focused primarily on the outcomes of incorporating an asthma clinical pathway in the emergency department setting. In addition, the final research article is a cohort study that focuses on the impact of an asthma clinical pathway on resident education and knowledge regarding asthma management. The final research study is closely related to the PICO clinical question.

## **Results of Individual Studies**

According to the Centers for Disease Control and Prevention (2018), about 1 in 12 children between the ages of 0 to 17 years are diagnosed with asthma. In addition, the CDC (2018) also found that more than half of all children diagnosed with asthma had one or more exacerbation in 2016. The Centers for Disease Control and Prevention (2018) also found that 1 in every 6 children with asthma visit the emergency department each year. Clinical pathways have

been proven to reduce unnecessary treatments and hospitalization, which in turn helps optimize the delivery of care (Norton, Pusic, Heathcote, and Carleton, 2007). Incorporating an asthma clinical pathway in the emergency department could help delay the delivery of care, which could result in shortened length of stays as well as decreased hospitalization rates (Touzin, Queyrens, Bussi eres, Langu erand, Bailey, & Laberage, 2008).

Bekmezian, Fee, and Weber (2016) conducted a cohort study to compare the outcomes of patients who were treated using a clinical pathway between September 2011 to September 2013. The researcher's objective was to determine the effect of implementing a clinical pathway on bronchodilator and corticosteroid administration in a timely manner, which in turn would help reduce hospital admissions. The setting of their study took place in a 33-bed tertiary care emergency department, who serves roughly 6,000 pediatric patients each year. Roughly 25% of their pediatric patients get admitted to the hospital, with approximately 5% of these patients being admitted into the intensive care unit (Bekmezian, Fee, and Weber, 2016).

The population for their study consisted of patients 21 years of age or younger, visiting the emergency department for a moderate to severe asthma exacerbation who have received 2 or more bronchodilator treatments. These treatments included inhaled albuterol, albuterol- ipratropium, or levalbuterol (Bekmezian, Fee, and Weber, 2016). Bekmezian, Fee, and Weber (2016) followed the National Institute of Health (NIH) Asthma Guidelines which recommend corticosteroid use on all patients with asthma exacerbations, except those who respond promptly to bronchodilator treatment. This is why the researchers excluded those patients who only received one bronchodilator treatment. In addition, Bekmezian, Fee, and Weber (2016) also excluded those patients who had received corticosteroids within 24 hours of their emergency department visit. Lastly, the researchers also focused on patients who were discharged with the

diagnosis of asthma in order to exclude those patients who were seen in the emergency department for bronchiolitis (Bekmezian, Fee, and Weber, 2016).

The one-page clinical pathway used in this study was formed using the National Institute of Health (NIH) Asthma Guidelines and was created by a multidisciplinary team which included attending physicians, pediatric and emergency medicine residents, and representatives from nursing, respiratory therapy, and pharmacy (Bekmezian, Fee, and Weber, 2016). The clinical pathway included tools to help with rapid evaluation of the severity of the asthma exacerbation, the response to the therapies administered, and the timing of interventions according to the severity of the exacerbation. The pathway was also used to remind practitioners that the National Institute of Health (NIH) Asthma Guidelines recommend chest X-rays in certain situations. In order to incorporate that Bekmezian, Fee, and Weber (2016) used the mnemonic of the four F's which include: focal exam findings, fever, failure to improve, and worry for foreign body.

Prior to implementing the asthma clinical pathway in the emergency department, the attending physicians, pediatric and emergency medicine residents, nurses, and respiratory therapists had to attend one of several 20-minute educational sessions that reviewed the evidence base guidelines. These sessions were conducted during regular staff meetings and conferences in order to ensure that everyone obtained the required information (Bekmezian, Fee, and Weber, 2016). The guidelines were also distributed via email and were posted in the emergency department at triage and in the nurse and physician workstations. Lastly, monthly reminders were sent via email to practitioners who were not using the clinical pathway as advised (Bekmezian, Fee, and Weber, 2016).

Bekmezian, Fee, and Weber (2016) identified all patients with the diagnosis of asthma during the study period by searching through the electronic medical record and extracting data



such as the time of arrival, patient demographics, the mode of arrival, and the triage data. After extracting this data, a research assistant reviewed the charts and used a data abstraction tool in order to determine the outcome measures (Bekmezian, Fee, and Weber, 2016). For their study, Bekmezian's, Fee's, and Weber's primary outcome was the percentage of patients who received corticosteroids in sixty minutes or less. This information was calculated from the time of arrival to the emergency department to the time of administration of the first corticosteroid. The researchers also looked into the timing of bronchodilators, the use of chest X-Rays, and the emergency department length of stay disposition (Bekmezian, Fee, and Weber, 2016).

In order to obtain their results, Bekmezian, Fee, and Weber (2016) compared the pre and post intervention periods. The pre-intervention period took place from January 2006 to September 2011. The post-intervention period took place from September 2011 to September 2013. Over 1200 pediatric emergency department visits were included in this study. 870 were during the pre-intervention period and 379 were during the post-intervention period (Bekmezian, Fee, and Weber, 2016). Bekmezian, Fee, and Weber (2016) found that administration of corticosteroids within 1 hour of arrival to the emergency department increased from 18% in the pre-intervention group to 45% in the post-intervention group. In addition, the researchers also found that overall administration of corticosteroids occurred more frequently in the post-intervention group. Lastly, the researchers found that hospital admission rates were lower in the post-intervention group however ICU admission rates and emergency department length of stays were unchanged (Bekmezian, Fee, and Weber, 2016).

A limitation to this study is that it took place in an urban tertiary emergency department and its findings may not be generalizable to other settings such as a pediatric community emergency department (Bekmezian, Fee, and Weber, 2016). In addition, the study did not put a

lot of focus on the educational portion leading up to the implementation of the asthma clinical pathway in the emergency department. The attending physicians, residents, nurses, and respiratory therapists had to attend one of several 20-minute educational sessions that reviewed the evidence base guidelines (Bekmezian, Fee, and Weber, 2016). The results of this study could have been different if the clinical staff received a more focused educational training regarding asthma management and the clinical pathway.

In another study, McCoy et al. (2018) conducted a cohort study to develop an asthma clinical pathway in order to improve the time to treatment and reduce hospitalizations. This study was conducted at the Le Bonheur Children's Hospital, which is a 255-bed tertiary children's hospital with an average of 90,000 emergency department visits each year. Of those visits, roughly 3,000 are for asthma exacerbations (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018).

In order to develop the clinical pathway for their study, a multidisciplinary team which consisted of pediatric ED physicians, pediatric chief residents, pharmacists, nurses, respiratory therapists, and hospitalists met on a weekly then biweekly basis over the course of 3 months (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). Prior to the study, there was a respiratory severity assessment tool already in place which failed to convey the severity of the exacerbation accurately. After reviewing the latest evidence-based literature, the team developed the Respiratory Clinical Score (RCS) and incorporated it into the clinical pathway that would be used in triage. Based on the severity of the exacerbation, the emergency department nurse or respiratory therapist could assess and start treatment within minutes of arrival to the ED (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018).

In order to ensure that everyone was educated on the clinical pathway, McCoy et al. (2018) used a multipronged approach to provide the education necessary to all care providers. This included online training, trainings at staff meetings, pocket sized pathways, and “badge buddies” for all care providers. In addition, team members were provided with monthly progress updates and feedback (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018).

Data obtained for this study was extracted from the electronic medical records of patients admitted with the diagnosis of asthma exacerbation between the ages of 2 and 18 years old (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). McCoy et al. (2018) monitored the use of the computerized order entry system, the volumes of patients being seen for asthma, the admission rates and 72-hour readmission rates, the time of steroid administration from the time of arrival, and the time of first albuterol treatment from the time of arrival.

In their study, McCoy et al. (2018) found compliance with the use of the computerized order entry system increased from 20% to 90%. In addition, the researchers also found that administration of the first dose of steroids decreased to less than an hour. McCoy et al. (2018) also found that by using the clinical pathway to decrease the amount of time it takes to administer the first dose of steroids, hospital admission rates decreased from 24% to 17% over one year. This in turn led to a total savings of \$230,000 for the first 2 years following the implementation of the asthma clinical pathway (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018).

Limitations to this study include a lack of generalizability. In their study, McCoy et al. (2018) were given the advantage that children were allowed to be treated before being evaluated by a physician. The nursing staff and respiratory therapists were allowed to initiate the clinical pathway. This is a limitation to this study because not every institution is allowed to incorporate

a similar program. McCoy et al. (2018) also state that another limitation to this study is that their institution sees high volumes of patients with asthma exacerbations, which allowed for significant savings and a reduction in admission rates. The authors state that they had no conflict of interest to declare (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). Just like the study conducted by Bekmezian, Fee, and Weber (2016), this study found that the time for administration of corticosteroids decreased after the implementation of the asthma clinical pathway. In addition, both studies showed a decrease in hospital admission rates. These studies help support the idea that a clinical pathway for asthma management can improve the time to treatment and reduce hospitalization rates.

Browne et al (2001) conducted a cohort study to examine patients presenting with asthma before and after the implementation of a clinical pathway. The study was conducted at the Children's Hospital at Westmead, a tertiary hospital who serves roughly 42,000 patients per year (Browne, Giles, McCaskill, Fasher, & Lam, 2001). This study was conducted over two 12-month period. The first one took place from January 1996 to December 1996 and that time was used to gather baseline data prior to the implementation of the clinical pathway. Information was gathered again from January 1999 to December 1999 after the clinical pathway was introduced (Browne, Giles, McCaskill, Fasher, & Lam, 2001). The researcher's primary outcomes for this study were to examine how many patients got admitted to the hospital for asthma, what was the average length of stay at the emergency department, and the readmission rates after discharge (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

The clinical pathway for this study was developed by three multidisciplinary teams, which incorporated the latest guidelines. These multidisciplinary teams were formed of medical experts, nursing staff, and emergency department practitioners (Browne, Giles, McCaskill,

Fasher, & Lam, 2001). The clinical pathways were initiated in triage and was carried out by the clinical nurse consultant (CNC). The CNC would perform a thorough assessment according to practice guidelines and would initiate the clinical pathway under the supervision of the on-call emergency department physician (Browne, Giles, McCaskill, Fasher, & Lam, 2001). In addition, Browne et al (2001) also ensured that discharge planning by the discharge nurse was initiated upon arrival into the unit. The discharge process of the clinical pathway incorporated a follow up, either by telephone contact by the discharge nurse or a scheduled visit to the pediatrician within 24 hours of being discharged from the emergency department (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

Data for this study was extracted from the Children's Hospital at Westmead's emergency department electronic medical records system. Over 2,500 patients presented to the emergency department for asthma between January 1999 and December 1999, however the disease was mild to moderate in severity in over 1,400 of these patients and the use of the clinical pathway was not warranted. This led to those patients being excluded from the study which resulted in a total of 1,123 patients to be included in the post-clinical pathway group (Browne, Giles, McCaskill, Fasher, & Lam, 2001). In addition, over 2,200 patients were seen in the emergency department for asthma between January 1996 and December 1996, but after examining the severity of the exacerbations and the inclusion criteria, only 1,210 were included in the pre-clinical pathway group (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

In their study, Browne et al (2001) found that hospital admission rates decreased from 32% to 10.3% after the implementation of an asthma clinical pathway in the emergency department. In addition, the researchers also found that the average length of stay in the emergency department decreased from 33.2 hours to 21.3 hours. Lastly, Browne et al (2001)

found that readmission rates for asthma after discharge from the emergency department slightly decreased from 8.4% to 4.2% after the implementation of the asthma clinical pathway (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

One thing that this study did not focus on was the education provided to the clinical staff prior to the implementation of the asthma clinical pathway in the emergency department. Browne et al (2001) suggest that written guidelines and focused educational interventions produced significant improvement in the delivery of patient care. In addition, they also found that it also helped reduced variability in how care is delivered (Browne, Giles, McCaskill, Fasher, & Lam, 2001). Browne et al (2001) believe that compliance could be attributed to the fact that they continue to educate their staff on the use of pathways, even after implementation. Just like the study conducted by Bekmezian, Fee, and Weber (2016) and the study conducted by McCoy et al (2018), this study also shows that an asthma clinical pathway can lead to decreased admission rates.

Rutman et al (2016) conducted a study to determine the impact of a modified asthma clinical pathway on the percentage of patients receiving care based off of the latest guidelines. This study took place in a tertiary 323-bed pediatric hospital, with a pediatric emergency department. Prior to beginning the study, this pediatric institution already had 67 clinical pathways implemented throughout their system (Rutman et al., 2016). Rutman et al (2016) and the clinical effectiveness team worked with a multidisciplinary group in order to update their clinical pathway for children presenting to the emergency department with asthma exacerbations. This multidisciplinary team consisted of nurses and physicians from the emergency department and inpatient units, respiratory therapists, pharmacists, and IT specialist (Rutman et al., 2016).

Modification of the asthma clinical pathway began with a literature review using the Embase and PubMed databases as well as national guidelines. Once the literature was conducted, modifications were approved during a series of meetings and were eventually built into the electronic medical records (Rutman et al., 2016). 2 weeks before implementing the pathway modifications, the updates were discussed at the emergency department and inpatient provider meetings. In addition, mandatory web-based training modules were distributed for all emergency department and inpatient providers. The training included a final knowledge assessment with a minimum passing score (Rutman et al., 2016). Rutman et al (2016) also ensured that laminated copies of the clinical pathway were placed in provider workstations and outside of patient's rooms.

Outcome measures for this study included the length of stay for both the emergency department and patients admitted to the floors. Length of stay was measured in order to determine the efficiency of the care provided to the patients (Rutman et al., 2016). Rutman et al (2016) also examined the overall amount of admissions for asthma due to a modification in the clinical pathway, which changed the admission criteria for the emergency department. Finally, cost data was obtained from the hospital administrative records to see if the modifications to the clinical pathway would help reduce the overall cost of care (Rutman et al., 2016).

Rutman et al (2016) analyzed the data for this study over a twenty-four-month period, before and after the modifications to the asthma clinical pathway. In order to be eligible for the study, children between the ages of 1 to 18 years old, had to present to the emergency department with an asthma exacerbation from September 2009 to October 2013. Exclusion criteria included patients who presented with other acute illnesses such as pneumonia, croup, or bronchiolitis; patients presenting with chronic illnesses such as cystic fibrosis and restrictive lung

disease; and those classified as having complex chronic disorders according to the Pediatric Medical Complexity Algorithm (Rutman et al., 2016).

Over 5,500 patients met the eligibility criteria for this study, 2,928 were included in the pre-modification group and 2,656 were included in the post-modification group. Adherence to the clinical pathway remained relatively high throughout the study period (Rutman et al., 2016). Rutman et al (2016) found that adherence to the asthma clinical pathway increased from 79% to 88%. In addition, the researchers also found a 30-minute decrease in the average emergency department length of stay for patients admitted to the floor after the modification of the asthma clinical pathway. The researchers believe that this decrease is a reflection of the admission criteria that was added to the clinical pathway (Rutman et al., 2016) Lastly, Rutman et al (2016) found a slight increase, less than 10%, in the costs of care for those patients who were discharged home from the emergency department.

A limitation to this study was that the patients were identified for analysis by using the International Classification of Diseases, Ninth Revision, Clinical Modification discharge codes (Rutman et al., 2016). Rutman et al (2016) believe that this could have led to misclassification, however they expect the bias to be similar in both the pre-modification group and the post-modification group. Another limitation identified by the researchers of this study was that they used the Respiratory Clinical Score instead of other widely used tools. The researchers believe that by using the Respiratory Clinical Score this limits the generalizability of their results (Rutman et al., 2016). Lastly, the researchers stated that their institution had infrastructure already in place to implement the use of clinical pathways. This in turn changed the culture, and providers were familiar with the use of pathways. The researchers believe that this may also limit



the generalizability of their results (Rutman et al., 2016). Unlike the previous studies, this study did not see any changes in the percentage of patients that got admitted for asthma exacerbations.

Lastly, Talib, Lax, and Reznik (2017) conducted a study on pediatric residents' knowledge and attitudes regarding an asthma clinical pathway before and after the clinical pathway was implemented at the Children's Hospital at Montefiore. Children's Hospital at Montefiore is a low-income county hospital with asthma-related hospitalization rates and death rates about 5 and 3 times higher than the national average. According to the researchers, approximately 100 pediatric patients get admitted on a monthly basis for severe asthma exacerbations (Talib, Lax, & Reznik, 2017). For this study, a multidisciplinary committee consisting of physicians, nursing, pharmacy, respiratory therapists, and pediatric chief residents was developed in order to create an asthma pathway and care tools. These care tools included a respiratory scoring system, an action plan, and a patient and caregiver education video. In addition, an updated electronic asthma order set was also implemented (Talib, Lax, & Reznik, 2017).

Three months before the implementation of the asthma clinical pathway, residents were required to attend an educational conference which discussed the pathway and the developmental process, the inclusion and exclusion criteria for patients, the use of a respiratory score, and the latest practice guidelines. In addition, educational materials that outlined the pathway were distributed electronically, through posters and cars, as well as through a link in the electronic ordering system (Talib, Lax, and Reznik, 2017). A twenty-two-item survey was administered six months before and six months after the implementation of the asthma clinical pathway using Survey Monkey. The surveys were anonymous, and respondents were given an incentive to win 1 of 3 \$50 amazon gift cards using Survey Monkeys raffle feature (Talib, Lax, and Reznik,

2017). The survey assessed asthma management knowledge by using case scenarios. In addition, it also assessed the residents' attitudes and experiences with asthma management and preparedness to manage asthma by using a 5-point Likert-type scale. Lastly, the survey assessed perceived educational benefits and barriers to clinical pathways by using a check-all-that-apply type of questions (Talib, Lax, and Reznik, 2017).

Only 60% of the pediatric residents responded to the pre-survey. Additionally, only 53% of the pediatric residents responded to the post-survey. Out of the residents who responded to the post-survey, 53% reported that they attended one of the educational seminars that introduced the clinical pathway (Talib, Lax, and Reznik, 2017). Of the pediatric residents that responded to the surveys, 75% reported never having used a respiratory score in medical school. In addition, the average pathway knowledge score increased after the implementation of the asthma clinical pathway. Most importantly, the pediatric residents reported feeling more prepared to take care of patients with asthma without supervision after the implementation of the clinical pathway (91% vs. 60%). Fifty-four percent of the pediatric residents also reported being more satisfied with the management of asthma by using the pathway (Talib, Lax, and Reznik, 2017). Lastly, the top three educational benefits of the clinical pathway that were determined by the pediatric residents were: improved application of evidence-based medicine into practice (57%), improved ability to assess asthma exacerbations (52%), and improved skill at communicating respiratory status (47%) (Talib, Lax, and Reznik, 2017).

Talib, Lax, and Reznik (2017) reported several limitations to their study. First, their post-implementation survey was distributed six months after implementing the clinical pathway. It may take longer to completely institutionalize an asthma clinical pathway. In addition, the study was conducted in one children's hospital. Lastly, due to the fact that their study focused on

residents and that residents should have some knowledge regarding asthma management, the questions asked in the survey focused on clinical practice changes instead of general knowledge regarding asthma and its management (Talib, Lax, and Reznik, 2017). This study did not examine the outcomes on admission rates as the previous studies did, however, it examined the effect of a clinical pathway on residents' knowledge. In this study an asthma clinical pathway helped improve the residents' knowledge and could also potentially improve nursing staff knowledge, which in turn will improve patient outcomes.

### **Risk of Bias**

Primarily, the studies selected for this systematic review took place in different kinds of institutions, therefore generalizability was present. Each study selected for this review focused on the pediatric population, ranging from ages 0 to 21 years of age, and results may be varied when looking into other age groups. The five research studies included in this systematic review were cohort studies, which is an effective technique in establishing cause and effect (Barrett & Noble, 2019). Due to the fact that cohort studies are effective in examining cause at effect, it helps support one the objectives of this systematic review which was to examine literature regarding the implementation of asthma clinical pathways in the emergency department. By looking at the effects of implementing clinical pathways for the management of asthma, we could assess if the pathways have any potential benefits for the emergency department.

Figure 2: Results and Analysis of Individual Study Information

Author	Purpose	Research Methodology	Participant Characteristics	Results	Relevance
Bekmezian et al (2016)	To determine the effect of implementing an asthma clinical pathway in the emergency department on corticosteroid and bronchodilator administration and the subsequent effects on hospitalization rates.	Cohort Study	Patients, ages 21 years or younger presenting to the ED a with moderate to severe asthma exacerbation (n=1249). Some patients belonged to the pre-intervention (n=870) and some belonged to the post-intervention group(n=379)	Administration of corticosteroids within 1 hour of arrival to the emergency department increased in the post-intervention group (45% vs 18%). Overall administration of corticosteroids occurred more frequently in the post-intervention	The results could have been stronger if the clinical staff received more education regarding the clinical pathway

				group (96% vs 78%). Hospital admission rates decreased in the post-intervention group (13% vs. 21%)	
McCoy et al (2018)	To develop an asthma clinical pathway in order to improve the time to treatment and reduce hospitalizations.	Cohort Study	Patients admitted with the diagnosis of asthma exacerbation between the ages of 2 and 18 years old.	Compliance with the use of the computerized order entry system increased from 20% to 90%. that Administration of the first dose of steroids decreased to less than an hour. Hospital	Compliance with the computerized order entry system could be attributed to the educational tools provided to the clinical staff.

				admission rates decreased from 24% to 17% over one year. \$230,000 for the first 2 years following the implementation of the asthma clinical pathway.	
Browne et al (2001)	To evaluate the effectiveness of clinical pathways for common pediatric conditions in an emergency department.	Cohort Study	Patients presenting to the CHW-ED between January and December 1999 with the diagnosis of asthma (n=1123). Patients seen in the emergency	Hospital admission rates decreased from 32% to 10.3% after the implementation of an asthma clinical pathway in the ED. Average length of stay in the ED	Continuous educational sessions for staff could attribute to increase compliance rates of the use of clinical pathways for the

			department for asthma between January 1996 and December 1996 (n=1210)	decreased from 33.2 hours to 21.3 hours. Readmission rates after discharge from the ED decreased from 8.4% to 4.2%	management of asthma.
Rutman et al (2016)	To determine the impact of the modified asthma pathway on adherence, percentage of patients being treated according to the pathway, length of stay, and cost	Cohort Study	A total of 5,584 patients between the ages of 1 and 18 years old were included. Pre-modification (n=2,928) and post-modification (n=2,656)	Adherence to the clinical pathway increased from 79% to 88% throughout the study. Patients receiving care through the pathway improved. There was a 10% decrease	Clinical staff received training 2 weeks prior to the modification of the clinical pathways. In addition, ED and inpatient staff were required to complete an online

				in the ED length of stay.	teaching module with a minimum passing score. A more thorough and hands on training could have led to better outcomes.
Talib et al (2017)	To assess the use of pathways and resident's knowledge of clinical pathways. Assess attitudes and experiences with asthma management.  Assess perceived educational benefits.	Cohort Study	Pediatric residents at a children's hospital (n=114) completed an anonymous survey 6 months before and 6 months after the	Mean pathway knowledge score increased after the implementation of the asthma clinical pathway as did the preparedness to manage asthma	This study found that implementing a clinical pathway for the management of asthma improved the pediatric residents'



			implementation of an asthma clinical pathway	(61% vs. 91%). Electronic order set use also increased (28% to 80%). The top three educational benefits of clinical pathways determined by the residents included: application of evidence-based medicine (57%), ability to assess asthma exacerbations (52%), and skill at communicating	knowledge and comfort with treating patients. It is possible that similar results could be found when focusing on nursing staff.
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				respiratory status (47%)	
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## DISCUSSION

### Summary of the Evidence

Five cohort studies were thoroughly examined to identify evidence-based practices that support the implementation of an asthma clinical pathway in the emergency department for pediatric patients. Asthma is the most common chronic illness in children, and each year, one in six children with asthma visit the emergency department (CDC, 2018). The literature was examined to see if the implementation of an asthma clinical pathway had positive outcomes on patient care and on staff knowledge regarding asthma management.

Bekmezian, Fee, and Weber (2015) stated that poor compliance to the National Institute of Health (NIH) Asthma Guidelines may lead to unnecessary hospitalizations for children with asthma presenting to the emergency department with an exacerbation. Corticosteroids are one of the most important therapies for asthma exacerbations and because of this, the NIH Asthma Guidelines recommend timely administration of corticosteroids for children who do not respond to up to three doses of bronchodilators within the first hour (Bekmezian, Fee, & Weber, 2015). Bekmezian, Fee, and Weber (2015) continue to state that several recent studies have proven that timely administration of corticosteroids leads to a decrease in hospital admission however, despite the evidence, corticosteroids are often unprescribed. Due to this, Bekmezian, Fee, and Weber (2015) conducted a cohort study to see if the implementation of an asthma clinical pathway will help improve the amount of time it takes for corticosteroids to be administered and to examine its subsequent effects on hospitalization rates for children with asthma exacerbations.

Bekmezian's, Fee's, and Weber's (2015) cohort study took place in a tertiary care emergency department that sees an average of 6,000 pediatric patients per year. The population for this study consisted of patients, ages 21 years and younger, visiting the emergency

department with moderate to severe asthma exacerbations. The clinical pathway used in this study was developed using the National Institute of Health (NIH) Asthma Guidelines by pediatric and emergency medicine attendings and residents, respiratory therapists, pharmacists, and nursing staff. The pathway included support tools for rapid assessment and a sequence of interventions according to the severity of the asthma exacerbation (Bekmezian, Fee, & Weber, 2015).

Prior to implementing their asthma clinical pathway, clinical staff members such as nurses, attendings, residents, and respiratory therapists had to attend a 20-minute educational session to review the pathway material. These educational sessions were held during regular mandatory staff meetings and teaching conferences in order to ensure that everyone participated (Bekmezian, Fee, & Weber, 2015). In addition to the educational sessions, the asthma clinical pathway and guidelines were also sent out via email. Lastly, the clinical pathway was posted in the emergency department triage area, at the nurses and physician workstations, and in the resident clinical handbook (Bekmezian, Fee, & Weber, 2015).

Bekmezian, Fee, and Weber (2015) studied a total of 1,249 patients who presented to the emergency department with moderate to severe asthma exacerbations. 870 of these patients were studied before the implementation of the asthma clinical pathway and 379 were studied after the pathway was implemented in the emergency department (Bekmezian, Fee, & Weber, 2015). Bekmezian, Fee, and Weber (2015) found that administration of corticosteroids within the first hour increased from 18% to 45% after the implementation of the asthma clinical pathway. The researchers also found that overall administration of corticosteroids increased from 78% to 96%. Lastly, they found that after implementing the asthma clinical pathway in the emergency department hospital admissions decreased from 21% to 13% (Bekmezian, Fee, & Weber, 2015).

A limitation to this study is that it took place in a single tertiary pediatric emergency department, which means that their findings may not be generalizable to other settings. In addition, the study was not randomized, which means that the results may be biased due to unmeasured confounding (Bekmezian, Fee, & Weber, 2015). Although there are some limitations to their study, Bekmezian, Fee, and Weber (2015) found that incorporating an asthma clinical pathway in a pediatric emergency department can lead to administration of corticosteroids in a more timely manner which in turn, helps decrease the hospitalization rates for patients with moderate to severe asthma exacerbations.

McCoy et al (2018) state that the time to evaluation is critical for pediatric patients presenting to the emergency department with an asthma exacerbation. This delay in treatment could lead to poor patient outcomes and unnecessary hospitalizations. Despite the evidence-based guidelines in place, the researchers found that there was still variation among providers regarding asthma management, which leads to inconsistent patient outcomes and costs (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). Due to the variation in care, McCoy et al (2018) conducted a cohort study in order to standardize care by implementing an asthma clinical pathway in the emergency department to improve the time it takes for corticosteroids to be administered and to ultimately reduce hospital admission rates.

This study took place in a tertiary children's hospital which sees an average of 3,000 patients in the emergency department each year for asthma exacerbations, with 23% of them being admitted (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). The clinical pathway used in this study was developed by pediatric emergency department physicians, hospitalists, nurses, respiratory therapists, information technology specialist, and chief residents. The members of the team were responsible for educating their colleagues by conducting lectures,

online trainings, and presentations at mandatory staff meetings. In addition, the team members developed pocket-sized pathways and “badge buddies” for all care providers (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018).

The data for this study was extracted from the electronic medical records of patients between the ages of 2 years old and 18 years old, who were admitted for asthma exacerbations (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). McCoy et al (2018) also examined the average time from arrival to administration of corticosteroids, the average time from arrival to administration of the first albuterol treatments, and the hospital admission rates. The researchers found that compliance with the clinical pathway and order entry plan increased from 20% to 90%. In addition, the researchers also found that the time from arrival to the administration of corticosteroids decreased to less than 60 minutes (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). Lastly, McCoy et al (2018) found that the implementation of the asthma clinical pathway in the emergency department decreased hospital admission rates from 24% to 17%.

A limitation to this study is the lack of generalizability. The hospital in which this study was conducted allows for the use of nurse and respiratory therapist-initiated pathways, however this may not be the case for every organization (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). Another limitation to this study is that the hospital in which this study took place sees high volumes of patients with asthma, which allowed for considerable cost savings by decreasing the amount of hospital admission. Other organizations may not see the same result of cost savings (McCoy, Kink, Harrold, Longjohn, Meredith, and Pishko, 2018). Although there are some limitations to this study, McCoy et al (2018) found that implementing an asthma clinical

pathway in a pediatric emergency department can lead to administration of corticosteroids within 60 minutes of arrival, which in turn helps decrease the amount of hospital admissions.

Browne et al (2001) state that clinical pathways are a good way to ensure that the best standards of practice are being used in order for patients to receive the best possible care in the emergency department. The researchers continue to state that clinical pathways are becoming the cornerstone of successful care because they provide clear expectations for both the clinicals and the parents or caregivers. In addition, clinical pathways provide a consistent approach to care which in turn helps improve patient outcomes (Browne, Giles, McCaskill, Fasher, & Lam, 2001). The purpose of their study was to evaluate the overall efficacy of using clinical pathways for common pediatric illnesses in the emergency department (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

Browne et al (2001) conducted their study in a tertiary children's hospital, which treats roughly 42,000 pediatric patients each year. The researchers examined their patients over two twelve-month periods, before and after the implementation of the clinical pathway in the emergency department. For the purpose of this study, the researchers closely examined the number of patients that got admitted to the hospital, the average length of stay in the emergency department, and re-presentation of symptoms after discharge (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

Browne et al (2001) assembled a team consisting of medical experts, nurses, and emergency department practitioners in order to develop their clinical pathway. The clinical pathway used in their study started at triage. The clinical nurse consultant in triage would perform clinical assessments and simple procedures according to the guidelines set out in the clinical pathway, under the supervision of the on-call emergency department physician. In

addition, the discharge nurse in the emergency department would ensure that discharge planning started upon arrival to the ED (Browne, Giles, McCaskill, Fasher, & Lam, 2001). The parents or caregivers would be given a discharge plan to follow after discharge. The parents or caregivers would also receive a follow-up via telephone by the discharge nurse or a scheduled visit to the pediatrician within 24 hours of being discharged from the emergency department (Browne, Giles, McCaskill, Fasher, & Lam, 2001).

After implementing their asthma clinical pathway in the emergency department, Browne et al (2001) found that hospital admission rates decreased from 32% to 10.3%. In addition, the researchers also found that the length of stay decreased from an average of 33.2 hours to 21.3 hours. Lastly, the readmission rates for asthma exacerbations decreased from 8.4% to 4.2% (Browne, Giles, McCaskill, Fasher, & Lam, 2001). A limitation to this study is that the hospital in which the study was conducted allowed for nurse-initiated interventions during triage, other organization may not allow similar interventions. Although there are limitations to their study, Browne et al (2001) found that implementing a clinical pathway for asthma management can lead to a decrease in length of stay, hospital admission, and readmission rates.

Rutman et al (2016) state that asthma is the most common chronic disease in children and accounts for over 600,000 emergency department visits each year. In addition, the researchers also state that hospitalization rates for children treated in the emergency department for asthma are as high as 53% (Rutman et al., 2016). The institution in which Rutman et al (2016) conducted their study, originally introduced an asthma clinical pathway back in 2002. In 2010, a quality metrics review revealed that there was opportunity for improvement in their emergency department asthma clinical pathway. The purpose of their study was to examine the impact of



modifications to their asthma clinical pathway on the efficacy of care provided (Rutman et al., 2016).

The study conducted by Rutman et al (2016) took place in a tertiary pediatric hospital that sees an average of 43,000 patients per year in the emergency department. For the purpose of this study, the clinical effectiveness team worked with emergency department physicians and nurses as well as pharmacists, respiratory therapists and information technology specialists to update their asthma clinical pathway (Rutman et al., 2016). The modification of the current asthma clinical pathway began with a literature review of Embase, PubMed, and national guidelines. The team then used the contents from the literature review to update the clinical pathway and electronic order sets (Rutman et al., 2016). In order to inform clinical staff about the new clinical pathway, the changes were discussed at emergency department meetings two weeks prior to implementation. In addition, email notifications were sent out to clinical staff members with the information regarding the new asthma clinical pathway. Clinical staff members also had to take a mandatory web-based training module with a required minimum passing score. Lastly, laminated copies of the asthma clinical pathway were posted outside of patient rooms and in the nurses and physician workstations (Rutman et al., 2016).

In their study, Rutman et al (2016) found that adherence to the clinical pathway increased from 79% to 88%. The researchers also found that the length of stay in the emergency department decreased by 30 minutes for patients who were admitted with asthma. The researchers believe that this decrease may be attributed to the admission criteria that was added to the clinical pathway (Rutman et al., 2016). Lastly, Rutman et al (2016) found no significant change in the percentage of patients admitted with asthma.

A limitation to this study is that Rutman et al (2016) used the International Classification of Diseases, Ninth Revision, Clinical Modification discharge diagnosis codes which could have led to misclassification. In addition, the researchers also used the Respiratory Clinical Score, instead of other more commonly used tools (Rutman et al., 2016). Lastly, the organization in which the study was conducted already had clinical pathways in place and providers already had an understanding of how to use them so this may limit the generalizability of their study (Rutman et al., 2016). Although there are limitations to their study, the modifications to their clinical pathway led to some improvements to the care provided to pediatric patients presenting to the emergency department for asthma exacerbations.

Talib, Lax, and Reznik (2018) state that asthma is a chronic respiratory disease that affects more than six million children in the United States each year. In addition. The researchers also state that asthma management is a core subject in residency education, however adherence to the latest clinical guidelines is known to be a challenge among pediatricians and family practitioners (Talib, Lax, & Reznik, 2018). Talib, Lax, and Reznik (2018) continue on and state that clinical pathways are a good tool to guide practitioners towards practicing evidence-based medicine. The researchers also mention that barriers to adherence may be related to the lack of familiarity and awareness of the institutional policies set in place (Talib, Lax, & Reznik, 2018). The purpose of this study was to compare the residents' knowledge regarding asthma management before and after the implementation of an asthma clinical pathway. In addition, the researchers also wanted to examine the residents' perceived educational benefits and the barriers related to the clinical pathway (Talib, Lax, & Reznik, 2018).

The researchers began their study by obtaining permission from the residency training program directory to provide the pediatric residents with a survey to examine the residents'

knowledge and attitudes towards an asthma clinical pathway before and after implementation (Talib, Lax, & Reznik, 2018). Talib, Lax, and Reznik (2018) then developed a multidisciplinary team consisting of pediatric emergency medicine physicians, nurses, pharmacists, respiratory therapists, and pediatric chief residents in order to create the asthma clinical pathway. Three months before the implementation of the asthma clinical pathway, the pediatric residents had to attend an educational session where the clinical pathway was introduced. In addition, at this educational session the inclusion and exclusion criteria and the respiratory score were also discussed (Talib, Lax, & Reznik, 2018). Additionally, two educational sessions were provided one month before implementation of the clinical pathway and one month after in order to reinforce the pathway. Lastly, materials outlining the clinical pathway were given to the clinical staff both electronically and through paper and posters (Talib, Lax, & Reznik, 2018).

Talib, Lax, and Reznik (2018) administered their survey using the SurveyMonkey software, six months before the implementation of the asthma clinical pathway and six months after. The survey's consisted of 22 questions which identified the training level and previous experiences with clinical pathways. The surveys also assessed the residents' knowledge using case scenarios, they assessed the residents' knowledge and attitudes towards clinical pathways by using a 5-point Likert-type scale, and they assess the perceived educational benefits and barriers to clinical pathways by using check-all-that-apply type questions (Talib, Lax, & Reznik, 2018).

Talib, Lax, and Reznik (2018) found that the average knowledge score increased after the asthma clinical pathway was implemented. In addition, the researchers also found that the residents responded to feeling more prepared to manage asthma exacerbations after the implementation of the asthma clinical pathway (Talib, Lax, & Reznik, 2018). Lastly, Talib, lax,

& Reznik (2018) found that the residents documented top three educational benefits of a clinical pathway include: application of evidence-based medicine, ability to assess asthma exacerbations, and skill at communicating respiratory status.

One of the limitations to this study is that it was conducted at a single children's hospital and the results may not be generalizable. Another limitation to this study is that the post-survey results were collected 6 months after the implementation of the asthma clinical pathway and it may have taken longer to fully institutionalize (Talib, Lax, & Reznik, 2018). Lastly, Talib, Lax, and Reznik (2018) state that this study was conducted on residents who have gone through trainings and who have a good understanding regarding asthma and its management, so the questions asked were formulated for clinical practice rather than general knowledge. Although there are many limitations to this study, Talib, Laz, and Reznik (2018) found that implementing a clinical pathway led to an increase in knowledge and understanding regarding asthma management.

### **Limitations**

The limitations for each cohort study are defined above. A limitation to the study conducted by Bekmezian, Fee, & Weber (2015) was that the study took place in a single pediatric emergency department, which means that their results may not be generalizable. In addition, their study was not randomized which means that their results could have been biased (Bekmezian, Fee, & Weber, 2015). McCoy et al (2018) also lacked generalizability due to the fact that the hospital in which the study took place allows for the use of nurse and respiratory therapist-initiated pathways. Browne et al (2001) also faced this limitation because their hospital allowed for nurse-initiated interventions during triage and other institutions may not allow the same interventions. A limitation to the study conducted by Rutman et al (2016) was that they

used the International Classification of Diseases, Ninth Revision, Clinical Modification discharge diagnosis codes which could have led to study misclassification. In addition, instead of using more commonly used tools for their pathway Rutman et al (2016) used the Respiratory Clinical Score. Lastly, a limitation to the study conducted by Talib, Lax, and Reznik (2018) was that their study took place at a single children's hospital and like Bekezian et al (2015), their results may not be generalizable. In addition to the limitations mentioned above, there is a further limitation in relation to one study that is specific to the PICO question. A thorough literature search was conducted and there was only one study found that was related to the PICO clinical question, which was included in this review. After reviewing the literature, it is evident that clinical pathways in regard to asthma management can help improve the time it takes for corticosteroids to be administered, which in turn helps decrease hospitalization rates. However, more research needs to be conducted to define the impact a clinical pathway can have on clinical staff knowledge.

## **Conclusions**

The purpose of this systematic review was to examine the impact of asthma clinical pathways on patient care and clinical staff knowledge that will lay the foundation for a Quality Improvement project. Asthma is the most common chronic illness in children and each year one in six children with asthma visit the emergency department (CDC, 2018). Due to the fact that so many children are seen in the emergency department for asthma related conditions, it is important for clinical staff to have a clear understanding on how to manage asthma exacerbations. Clinical pathways are an effective tool in the emergency department and can help standardize care among practitioners, which will result in better patient outcomes and efficiency in the health organization (Jabbour et al., 2013). After reviewing the literature above, it is evident

that clinical pathways can help improve the time it takes for corticosteroids to be administered, which in turn helps decrease the number of children who get admitted to the hospital for asthma.

Four of the cohort studies reviewed above strongly support the implementation of an asthma clinical pathway in a pediatric emergency department. Two of the studies reviewed showed a significant decrease in the amount of hospital admissions. In addition, these two studies also found a decrease in the amount of time it takes for corticosteroids to be administered after the pathways were introduced. Clinical pathways are effective tool in managing asthma exacerbations in the emergency department. In addition, in their study Talib, Lax, and Reznik (2018) found that residents who participated in their study reported increased knowledge and preparedness to manage asthma exacerbations after the implementation of an asthma clinical pathway. Currently, there is little research on the impact a clinical pathway can have on nursing staff knowledge. More research needs to be conducted on whether or not clinical pathways can help improve nursing staff knowledge regarding asthma management and its subsequent impact on patient care and outcomes.

### **Quality Improvement Project**

Each year, nearly 20 million people are diagnosed with asthma. Of those diagnosed with asthma, roughly 9 million of them are children (Medline Plus, 2019). Asthma is a chronic inflammatory lung disorder that is characterized by coughing, wheezing, chest tightness or discomfort, and difficulty breathing. Every year, one in six children will visit the emergency department for asthma exacerbations or asthma related complications (Centers for Disease Control and Prevention, 2018). The treatment for asthma exacerbations in the emergency department involves a multidisciplinary approach and consists of an initial assessment and numerous reassessments in order to determine the appropriate plan of care for the patient. Research suggests the use of clinical pathways for the management of asthma in the emergency department. Clinical pathways can help reduce the use of unnecessary resources, decrease the variation in care among health care providers, and improve the quality of care provided to patients (Dexheimer, Abramo, Arnold, Johnson, Shyr, Ye, Fan, Patel, & Aronsky, 2013).

A systematic review was conducted to examine the impact of asthma clinical pathways on patient care and the impact of an educational intervention on clinical staff knowledge. It was found that asthma clinical pathways can potentially help reduce hospitalization rates, decrease the amount of time that it takes for corticosteroids to be administered, and decrease the average length of stay in the emergency department. It was also found that educational interventions are a feasible way of improving staff's knowledge. The findings of the systematic review laid the foundation for a quality improvement project, which included the development of an educational intervention for the nursing staff in order to increase their knowledge of asthma management and the asthma clinical pathway currently being used in the emergency department.

### **Primary Aim**

The primary aim for the quality improvement project was to improve the nursing staff knowledge on asthma management and the asthma clinical pathway that is currently in place. This was accomplished through an educational intervention that was provided to the nursing staff at a pediatric emergency department in a large teaching hospital in order to improve their knowledge and understanding of asthma. The expected long-term benefits of this project would be to improve patient outcomes by keeping the nursing staff up to date on the latest practices and protocols.

### **Goals and Outcomes**

The SMART goal of this quality improvement project is to improve the nursing staff knowledge on asthma, along with its associated signs and symptoms, as well as its management and the asthma clinical pathway that is currently being used in the emergency department. The educational intervention would consist of a fifteen-minute presentation that would review asthma and include a breakdown of the ED asthma clinical pathway.

The short-term goals of this quality improvement project include improving the nursing staff's knowledge on asthma, the respiratory score that is used in the ED asthma clinical pathway, and the other areas of the asthma clinical pathway. One of the long-term goals for this project would be to promote early detection of asthma exacerbations and how to properly manage these exacerbations through the use of the emergency department's asthma clinical pathway. This in turn could lead to a decrease in the amount of time that it takes for the proper medications to be administered to the patient. By doing so, this could lead to better patient outcomes and a decrease in the amount of hospital admissions.

### **Rationale**



Clinical pathways are increasingly being used in the emergency department and inpatient settings to guide patient care. A clinical pathway defines the arrangement and timing of patient care (Glauber, Harold, Homer, & Homer, 2001). Numerous studies have been conducted that support the use of clinical pathways for the management of asthma. Studies have shown that clinical pathways have had a positive effect on hospitalization rates, length of stays, and the misuse of resources (Simmons & Kotagal, 2008). Studies have also found that clinical pathways can help improve the patient's education and understanding of asthma which helps improve the overall quality of care (Glauber, Harold, Homer, & Homer, 2001).

Although numerous studies have shown the benefits of incorporating the use clinical pathways for the management of asthma, there are still several barriers to adherence (Jabbour, Newton, Johnson, & Curran, 2018). One of the main concerns frequently reported by health care providers is that using clinical pathways for patient care may limit their critical thinking skills. Other barriers to adherence include the resistance to change, lack of awareness, and lack of institutional policies (Talib, Lax, & Reznik, 2018). Instead of seeing clinical pathways as a limitation to their practice, health care providers should understand that pathways may help reduce their mental effort which would allow them to focus on other aspects of care (Jabbour, Newton, Johnson, & Curran, 2018). Lastly, Talib, Lax, & Reznik (2018) found that clinical pathways can improve education by promoting the latest standards of care.

As the evidence suggests, the use of clinical pathways in the emergency department is an effective tool for the management of asthma. Based on the information gathered, this quality improvement project was implemented in order to improve the nursing staff's knowledge regarding asthma management and the asthma clinical pathway currently being used in the ED.

### **Quality Improvement Method**

The quality improvement project took place at a pediatric emergency department in a large teaching hospital in Florida. The nursing staff was invited to participate in the project. The proposal for this project was submitted to Florida International University's Institutional Review Board (IRB) for approval. After receiving approval from Florida International University's IRB, the DNP student in agreement with the nurse manager set a date for the implementation of the project.

The project consisted of a pre-test and post-test questionnaire which focused on three main areas. The first category assessed the nursing staff's knowledge regarding asthma and its associated signs and symptoms. The next category assessed the nurse's knowledge regarding the respiratory score that is used in the ED asthma clinical pathway. The last category assessed the nursing staff's knowledge regarding the asthma clinical pathway that is currently being used in the emergency department. All of the data collection and data analysis was conducted at the clinical site. The results of the pre-test and post-test questionnaire was recorded in Excel. Both the pre-test and post-test questionnaire results were scored individually and as a group in percentages. The results from both questionnaires were compared in order to determine the group's overall improvement score.

### **Program Structure and Outline**

After obtaining signed consent from the participants, they were provided the pre-test questionnaire through a link on SurveyMonkey. The pre-test questionnaire consisted of twenty questions that focused on demographic information, background knowledge of asthma, knowledge of the respiratory score, and knowledge of the ED asthma clinical pathway.

After completing the pre-test questionnaires, the nurses participated in the educational intervention during their routine morning huddle. Multiple sessions were offered in order to

accommodate the nursing staff and their work schedules. In addition, all COVID-19 social distancing practices were followed throughout the duration of this project. The educational intervention included a fifteen-minute presentation along with an educational handout which contained information on asthma, the signs and symptoms of asthma exacerbations, and a breakdown of the asthma clinical pathway currently in place in the emergency department. After attending the educational intervention, the nurses received the post-test questionnaire through a link on SurveyMonkey. The post-test questionnaire consisted of the same questions from the pre-test questionnaire.

Both the pre-test and post-test questionnaires were anonymous in order to protect the participant's privacy. The results from the pre-test and post-test questionnaire were scored individually and then together as a group. The DNP student was responsible for obtaining the signed consent, providing the participants with the pre-test and post-test questionnaires, collecting the data, and analyzing the results.

### **Evaluation**

The results of the quality improvement project were calculated once the participants completed the post-test questionnaire. The results of the pre-test and post-test were compared in order to determine the group's improvement scores. The short-term goals of the educational intervention were evaluated through the nurse's responses in the post-test questionnaire. It was expected that the participant's scores would improve in the three main categories assessed, which included background knowledge of asthma, knowledge on the respiratory score, and knowledge of the ED asthma clinical pathway. Although the quality improvement project did not determine the long-term benefits, it is expected that keeping the staff's knowledge up to date on asthma

management and how to properly use the asthma clinical pathway can lead to better patient outcomes.

### **Plan for Sustaining Change**

In order to ensure the sustainability of this project, the nursing staff will be provided with the same questionnaire in a few months to evaluate whether or not they retained the information learned throughout the course of this project. In addition, routine evaluations of the impact of this project should continue in order to ensure that the nurse's stay up to date on the latest practices in order to meet the long-term goal of improving patient outcomes.

### **Results**

There was a total of eleven participants who participated in the pre-test questionnaire. The demographic characteristics of the pre-test questionnaire respondents are included in Table 1. The participants were composed of all female (11=100%) nurses. Most of the participants were Black or African American (5=45%), with more than ten years of nursing experience (5=45%). For the post-test questionnaire there was a total of eight participants who responded. The demographic characteristics of the post-test questionnaire respondents are included in Table 2. The participants were composed of all female (8=100%) nurses. Most of the participants were Black or African American (3=38%), with one to five years of nursing experience (4=50%). Only 72.7% of the participants responded to the post-test questionnaire. This discrepancy may be due to the COVID-19 pandemic and the increased workload for the nursing staff at that time.

Overall, there was an improvement as a group when the pre-test and post-test questionnaires were compared (Figure 3). As a group, there was an overall improvement score of 15% after the educational intervention. In regard to background knowledge of asthma, there was a slight decrease in the post-test questionnaire of -0.4%. In regarding to knowledge of respiratory

score, there was a 31.3% improvement score. Lastly, in regard to knowledge of the ED asthma clinical pathway there was an improvement score of 13% (Table 3).

## **Pre-test analysis**

### **Background Knowledge of Asthma**

In regard to assessing the nurses' understanding of asthma along with its associated signs and symptoms, 64% of the participants knew that asthma is a chronic inflammatory disorder of the lower respiratory airways. The remaining 36% of nurses stated that asthma was a viral infection that leads to inflammation of the bronchioles which causes wheezing and difficulty breathing. Although there was some confusion regarding the definition of asthma, all of the nurses who participated in this project (100%) knew that breathlessness, coughing, wheezing, and chest tightness are symptoms of an asthma exacerbation. In addition, all of the nurses (100%) also knew that agitation, increased respiratory rate, increased pulse rate, decreased oxygen saturation, and sometimes the use of accessory muscles and the inability to talk in full sentences were signs on an asthma exacerbation.

### **Knowledge of Respiratory Score**

Regarding the four categories of the respiratory score, 36% of the participants knew that they should be assessing the patient's for respiratory rate, retractions, dyspnea/activity, and auscultation. The remaining 64% of participants thought that the four categories of the respiratory score were auscultation, respiratory rate, retractions, and oxygen saturation. In addition, there was some noted confusion among participants on how to score patients in regard to retractions. 55% of participants knew that in order to give a patient 3 points in regard to retractions this meant that the patient had to have retractions in 3 areas such as subcostal, intercostal, substernal, suprasternal, supraclavicular, or head bob in infants. 36% of the

participants thought that 3 points in regard to retractions meant that the patient was retracting in 2 areas and the remaining 9% of participants believed that the patient was retracting in one area, either subcostal or intercostal. The next area that was assessed in the respiratory score was dyspnea and activity. 40% of the participants knew that 2 points in regard to dyspnea and activity for a patient 4 years of age or older meant that the patient can count to 4-6 in one breath. 20% of participants thought that 2 points meant that the patient can count to 7-9 in one breath, 20% of the participants thought that a score of 2 meant that the patient could count to 3 or greater in one breath, and the remaining 20% of participants thought that it meant that the patient could count to 10 in one breath. The last category that we assessed in regard to the respiratory score was auscultation. 80% of the nurses who participated in this project knew that 3 points in regard to auscultation for all patients meant that the patient was experiencing inspiratory and expiratory wheeze. 10% of the participants thought that 3 points in regard to auscultation meant that the patient had an end-expiratory wheeze and the remaining 10% thought that it meant that the patient had an expiratory wheeze.

### **Knowledge of the ED Asthma Clinical Pathway**

In regard to categorizing a mild asthma exacerbation, only 20% of participants knew that this meant that the patient received a respiratory score of 4 or less. 50% of the participants believed that a respiratory score of 3 or less was the criteria for categorizing a mild asthma exacerbation. 20% of the participants thought that a mild exacerbation was a score of 3 or more and the remaining 10% thought that the criteria was a respiratory score of 4 or greater. In addition, there was some noted confusion in regard to categorizing a moderate to severe asthma exacerbation. 40% of the nurses who participated in this project knew that a moderate to severe asthma exacerbation meant that the patient received a respiratory score greater than 4. The other

30% of participants thought the criteria was a respiratory score greater than 5 and the remaining 30% thought that it was a respiratory score greater than 7.

Regarding treatment for a mild asthma exacerbation, only 36% of the participants in this project knew that the patient should receive 1 Albuterol nebulization. The remaining 27% of participants thought that the treatment for a mild exacerbation was 3 Albuterol nebulization's and the remaining 36% of nurses thought that the treatment included 3 DuoNeb's back to back and a steroid load. 91% of the participants in this project knew that the treatment for a moderate to severe exacerbation was 3 DuoNeb's back to back and a steroid load. The remaining 9% thought that the treatment was 3 DuoNeb's plus a chest x-ray. All of the participants (100%) knew that Magnesium Sulfate and Terbutaline can be used as early adjunctive therapy for a patient with a respiratory score greater than 8.

55% of the nurses who participated in this project knew that you should reassess the patient after 1 hour of treatment. 27% of the participants thought that you should reassess the patient after 30 minutes, 9% thought that you should reassess the patient in 2 hours, and the remaining 9% believed that you should reassess the patient in 15 minutes. In addition, 82% of participants knew that if a patient still had a respiratory score greater than 4 after reassessing them that they should receive one hour of continuous Albuterol and then they should observe off the nebulization's for 1 hour before disposition. 9% of the participants thought that the patient should receive 3 DuoNeb's back to back and the remaining 9% thought that you should discharge the patient home with an asthma action plan and appropriate prescriptions. 91% of participants knew that they should discharge the patient home with an asthma action plan and appropriate prescriptions in their respiratory score was 1-4 after one hour of observation. The remaining 9% believed that the patient should receive one hour of continuous albuterol and

observe off the nebulization's for 1 hour before disposition. In regard to treatment for a patient with a respiratory score of 5-8 after one hour of observation, only 45% of participants knew that they should begin transfer for admission to the floor and consider 2<sup>nd</sup> hour of continuous Albuterol versus every 2-hour Albuterol nebulization's. 27% of the nurses thought that the patient should receive one hour of continuous Albuterol and observe off of the nebulization's for 1 hour before disposition and the remaining 27% of participants believed that they should consider Magnesium Sulfate and admit the patient to the pediatric intensive care unit. Lastly, 91% of the participants knew that they should begin a second hour of continuous Albuterol, consider Magnesium Sulfate 50mg/kg IV, & admit the patient to the PICU for a patient with a respiratory score greater than 8 after one hour of observation. The remaining 9% of participants believed that the patient should be discharged home with an asthma action plan and appropriate prescriptions.

## **Post-test analysis**

### **Background Knowledge**

The overall understanding of asthma, along with its associated signs and symptoms remained roughly the same from the pre-test results to the post-test. The overall average for background knowledge of asthma in the pre-test was 87.9%. This number remained roughly the same, with a slight decrease, in the post-test results. The overall average for background knowledge of asthma in the post-test was 87.5%. These results can be attributed to the fact that majority of participants already had some knowledge regarding the definition of asthma along with its associated signs and symptoms prior to participating in this quality improvement project.

The average score in regard to the definition of asthma increased from 64% in the pre-test to 75% in the post-test. The average score in regard to the symptoms of asthma decreased in the



post-test from 100% to 88%. Lastly, the average score regarding the signs of an asthma exacerbation remained the same at 100% in both the pre-test and the post-test.

### **Knowledge of Respiratory Score**

After participating in the educational intervention, there was a significant increase in the understanding of the respiratory score used in the emergency department. The overall average increased from 50% to 81.3%. Prior to the educational session, 36% of the participants knew the four categories of the respiratory score. This number increased to 88% after the nurses attended the educational session. In addition, there was a significant increase in the number of nurses who had a better understanding of how to score retractions according to the respiratory score. Before the intervention, 55% of participants knew that three points in regard to retractions for a patient 0-2 years of age meant that the patient had to have retractions in 3 areas such as subcostal, intercostal, substernal, suprasternal, supraclavicular, or head bob in infants. This number increased to 88% after the educational session. There was also an increase in regard to knowledge of how to score dyspnea and activity according to the respiratory score. Prior to the intervention, 40% of the participants knew that 2 points in regard to dyspnea and activity for a patient 4 years of age or older meant that the patient can count to 4-6 in one breath. This number slightly increased to 50% after the intervention. The last category that we assessed in regard to the respiratory score was auscultation. Prior to the educational session, 80% of the nurses knew that 3 points in regard to auscultation for all patients meant that the patient was experiencing inspiratory and expiratory wheeze. This number increased to 100% after the nurses attended the educational session during their morning huddle.

### **Knowledge of the ED Asthma Clinical Pathway**

The overall scores regarding knowledge of the asthma clinical pathway that is currently in place in the emergency department increased from 64.5% in the pre-test to 77.5% in the post-test. Prior to the educational session, only 20% of participants knew that categorizing a mild asthma exacerbation meant that the patient received a respiratory score of 4 or less. This number increased to 75% after the educational intervention. In addition, there was a significant increase in the understanding of how to categorize a moderate to severe asthma exacerbation. Prior to the education session, 40% of the nurses who participated in this project knew that a moderate to severe asthma exacerbation meant that the patient received a respiratory score greater than 4. This number increased to 63% in the post-test. There was also a significant increase in scores in regard to the treatment of a mild asthma exacerbation. Prior to the education intervention, 36% of nurses knew that the patient should receive 1 Albuterol nebulization. This number increased to 86% after the intervention. In the pre-test, 91% of the participants knew that the treatment for a moderate to severe exacerbation was 3 DuoNeb's back to back and a steroid load. This number decreased to 88% in the post-test. In both the pre-test and the post-test all of the participants (100%) knew that Magnesium Sulfate and Terbutaline can be used as early adjunctive therapy for a patient with a respiratory score greater than 8.

In regard to reassessment, 55% of the nurses who participated in the pre-test knew that you should reassess the patient after 1 hour of treatment. This number increased to 88% after the educational intervention. In addition, 82% of the registered nurses who participated in the pre-test knew that if a patient still had a respiratory score greater than 4 after reassessing them that they should receive one hour of continuous Albuterol and then they should observe off the nebulization's for 1 hour before disposition. This number increased to 86% after the nurses participated in the educational session. There was a significant decrease in regard to the

understanding of the treatment for a patient with a respiratory score of 1-4 after one hour of observation. 91% of the nurses who participated in the pre-test knew that these patients should be discharged home with an asthma action plan and appropriate prescriptions. This number decreased to 63% in the post-test results. We also noted a decrease in the understanding of the treatment plan for a patient with a respiratory score greater than 8 after one hour of observation. Prior to the educational intervention, 91% of participants knew that these patients should begin a second hour of continuous Albuterol, consider Magnesium Sulfate 50mg/kg IV, & admit the patient to the PICU for a patient with a respiratory score greater than 8 after one hour of observation. This number decreased to 88% in the post-test results. Lastly, we saw an increase in understanding in regard to treatment for a patient with a respiratory score of 5-8 after one hour of observation. Prior to the educational session during the nurse's morning huddle, 45% of participants knew that these patients should begin transfer for admission to the floor and consider 2<sup>nd</sup> hour of continuous Albuterol versus every 2-hour Albuterol nebulization's. This number increased to 63% in the post-test results.

### **Discussion**

As the study conducted by Talib, Lax, and Reznik (2018) suggested, educational interventions are an effective tool in improving clinical staff's knowledge. Although the study conducted by Talib, Lax, and Reznik (2018) focused on pediatric residents, this quality improvement project focused on the nursing staff caring for children with asthma in the emergency department. The implementation of the quality improvement project improved the nursing staff's knowledge regarding the respiratory score and the ED asthma clinical pathway. The slight decrease in the improvement score regarding the nurse's background knowledge of asthma may be attributed to the fact that most of the nurses who participated in this project have

multiple years of nursing experience. This means that those nurses have been caring for patients with asthma for a significant amount of time which may make it easier for them to identify the associated signs and symptoms.

### **Conclusion**

It is feasible to improve nursing staff's knowledge regarding asthma management and asthma clinical pathways through the use of an educational intervention. It is expected that by improving the nurse's knowledge of asthma, they will be better able to identify exacerbations and provide their patients with the appropriate medications in a timely manner. This in turn could lead to better patient outcomes and can lead to an overall improvement in the quality of care that is delivered. More research needs to be conducted to assess the effectiveness of such interventions on patient outcomes.

Table 1: Pre-test Demographic

Gender	Number (n=11)	% of the participants
Male	0	0%
Female	11	100%
Ethnicity		
Hispanic or Latino	4	36%
Black or African American	5	45%
White or Caucasian	1	9%
Asian or Asian American	0	0%
Another Race	1	9%
Years of Experience		
Less than one year	0	0%
One to five years	4	36%
Five to ten years	2	18%
More than ten years	5	45%

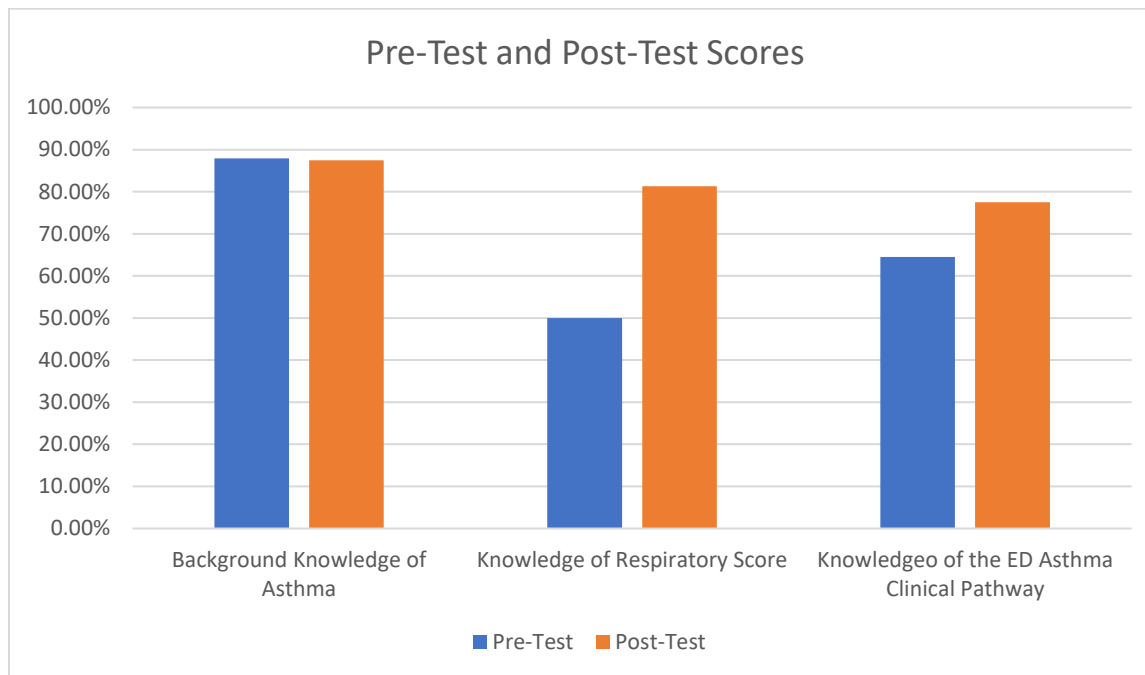
Table 2: Post-test Demographic

Gender	Number (n=8)	% of the participants
Male	0	0%
Female	8	100%
Ethnicity		
Hispanic or Latino	2	25%
Black or African American	3	38%
White or Caucasian	1	12%
Asian or Asian American	0	0%
Another Race	2	25%
Years of Experience		
Less than one year	0	0%
One to five years	4	50%
Five to ten years	1	12%
More than ten years	3	38%

Table 3: Group scores: Pre-test and post-test analysis with improvement scores

Background Knowledge	Pre-Test	Post-Test	Improvement Score
Average Score	87.9%	87.5%	-0.4%
Knowledge of Respiratory Score.3%			
Average Score	50%	81.3%	31%
Knowledge of ED Asthma Clinical Pathway			
Average Score	64.5%	80.2%	13%
Overall Average Group	65.2%	80.2%	15%

Figure 3: Pre-test and post-test questionnaire analysis





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### **Dissemination Plan**

In order to ensure the sustainability of this project, the nursing staff will be provided with the same questionnaire in a few months to evaluate whether or not they retained the information learned during the educational intervention. In addition, regular reviews of the quality improvement project's impact with the stakeholders, such as the medical director of the emergency department. Lastly, the limitations and challenges that were presented throughout this project will be solved and used to create improvements and new approaches for future projects.

The plan moving forward is to submit the results of the systematic review and the quality improvement project to the Journal of Emergency Nursing. The reason for choosing this journal is because they are committed to providing relevant data to all areas of emergency nursing across the lifespan. In addition, the plan is to present the results of the systematic review and the quality improvement project at the 2021 Florida Nurses Association Nursing Research Evidence-Based Practice Conference. This conference promotes nursing research and improvement projects being conducted throughout different settings in Florida. It is hoped that the positive results of this quality improvement project can be duplicated in other clinical sites. Although this quality improvement project did not determine the long-term benefits, it is expected that keeping the nursing staff's knowledge updated on asthma management and how to properly use the asthma clinical pathway can lead to better patient outcomes.



### PRETEST AND POSTTEST QUESTIONNAIRE

An educational intervention regarding asthma management and an asthma clinical pathway to increase knowledge of nursing staff in a pediatric emergency department.

#### Personal Information:

1. Gender:

A. Male

B. Female

2. Ethnicity:

A. Hispanic

B. African American

C. Caucasian

D. Asian

E. Other

3. How many years of nursing experience do you have?

1. Less than one year

2. One to five years

3. Five to ten years

4. More than ten years

#### Background Knowledge

4. What is asthma?

A. A chronic inflammatory disorder of the lower respiratory airways

- B.* Genetic disorder that affects cells that produce mucus, digestive fluids, and sweat
  - C.* Upper airway infection that blocks breathing and has a distinctive barking cough
  - D.* Viral infection that leads to inflammation of the bronchioles which causes wheezing and difficulty breathing
5. What are symptoms of asthma exacerbations?
- A.* Breathlessness, coughing, wheezing, and chest tightness
  - B.* Cough, repeated lung infections, inability to gain weight, and fatty stools
  - C.* Difficulty breathing, shortness of breath, wheezing, and barking cough
  - D.* Rapid breathing, shortness of breath, wheezing, coughing, and fever
6. What are the signs of an asthma exacerbation?
- A.* Agitation, increased respiratory rate, increased pulse rate, decreased oxygen saturation, and sometimes the use of accessory muscles and the inability to talk in sentences
  - B.* Salty sweat, poor weight gain, failure to thrive, constant coughing and wheezing
  - C.* Difficulty breathing, shortness of breath, wheezing, and barking cough
  - D.* Rapid breathing, shortness of breath, wheezing, coughing, and fever

#### Knowledge of Respiratory Score

7. What are the four categories of the Respiratory Score?
- A.* Respiratory rate, retractions, dyspnea/activity, and auscultation
  - B.* Respiratory rate, blood pressure, dyspnea/activity, and oxygen saturation
  - C.* Oxygen saturation, auscultation, age, and respiratory rate
  - D.* Auscultation, respiratory rate, retractions, and oxygen saturation

8. According to the respiratory score what would be considered 3 points in regard to retractions for a patient 0-2 years of age?
- A. 3 areas: subcostal, intercostal, substernal, suprasternal, supraclavicular, OR head bob (infant)
  - B. 2 areas: subcostal, intercostal, substernal, OR nasal flaring
  - C. Subcostal or intercostal
  - D. None
9. According to the respiratory score what would be considered 2 points in regard to dyspnea/activity for a patient 4 years of age or older?
- A. Counts to 4-6 in one breath
  - B. Counts to 3 or greater in one breath
  - C. Counts to 7-9 in one breath
  - D. Counts to 10 in one breath
10. According to the respiratory score what would be considered 3 points in regard to auscultation for all patients?
- A. Inspiratory and expiratory wheeze
  - B. End-expiratory wheeze
  - C. Expiratory wheeze
  - D. Inspiratory wheeze

#### Knowledge of the ED Asthma Clinical Pathway

11. What is the criteria for categorizing a mild asthma exacerbation?
- A. Respiratory score < 4



- B.* Respiratory score  $>4$
  - C.* Respiratory score of  $\leq 3$
  - D.* Respiratory score of  $>3$
12. What is the criteria for categorizing a moderate to severe asthma exacerbation?
- A.* Respiratory score  $>4$
  - B.* Respiratory score  $>5$
  - C.* Respiratory score  $>7$
  - D.* Respiratory score  $>3$
13. What is the treatment for a mild asthma exacerbation according to the clinical pathway?
- A.* Albuterol neb x 1
  - B.* Albuterol neb x 3
  - C.* Albuterol neb x 3 plus a chest x-ray
  - D.* 3 DuoNeb back to back and steroid load
14. What is the treatment for a moderate to severe exacerbation according to the clinical pathway?
- A.* 3 DuoNeb back to back & steroid load
  - B.* 3 DuoNeb plus a chest x-ray
  - C.* Ventolin MDI
  - D.* 1 Duoneb and then reassess patient
15. Select all that apply: What early adjunctive therapy would you consider for a patient with a respiratory score  $>8$ ?
- A.* Mag Sulfate
  - B.* Terbutaline
  - C.* Epinephrine
  - D.* Theophylline

16. After how long should you reassess the respiratory score according to the clinical pathway?
- A. 1 hour
  - B. 15 minutes
  - C. 30 minutes
  - D. 2 hours
17. After reassessing your patient, their respiratory score is greater than 4. What is your next step according to the clinical pathway?
- A. One hour of continuous albuterol and observe off nebs for 1 hour before disposition
  - B. Discharge with asthma action plan and appropriate prescriptions
  - C. 3 DuoNeb's back to back
  - D. 3 Albuterol's back to back
18. What is the treatment for a patient with a respiratory score of 1-4 after one hour of observation?
- A. Discharge with asthma action plan and appropriate prescriptions
  - B. One hour of continuous albuterol and observe off nebs for 1 hour before disposition
  - C. 3 DuoNeb's back to back
  - D. 3 Albuterol's back to back
19. What is the treatment for a patient with a respiratory score of 5-8 after one hour of observation?
- A. Transfer for admission to floor and consider 2<sup>nd</sup> hour of continuous albuterol versus every 2-hour albuterol nebs
  - B. Discharge with asthma action plan and appropriate prescriptions

- C. One hour of continuous albuterol and observe off nebs for 1 hour before disposition
- D. Consider Mag Sulfate & admit to PICU


20. What is the treatment for a patient with a respiratory score greater than 8 after one hour of observation?

- A. Begin 2<sup>nd</sup> hour continuous albuterol, consider Mag Sulfate 50mg/kg IV, & admit to PICU
- B. Transfer for admission to floor and consider 2<sup>nd</sup> hour of continuous albuterol versus every 2-hour albuterol nebs
- C. 3 DuoNeb back to back
- D. Discharge with asthma action plan and appropriate prescriptions



Office of Research Integrity  
Research Compliance, MARC 414

**Munoz**  
**MEMORANDUM**

**To:** Dr. Charles Buscemi  
**CC:** Kristina Valiente  
**From:** Maria Melendez-Vargas, MIBA, IRB Coordinator   
**Date:** April 12, 2020  
**Protocol Title:** “An educational intervention regarding asthma management and an asthma clinical pathway to increase knowledge of nursing staff in a pediatric emergency department; A Quality Improvement Project”

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

**IRB Protocol Exemption #:** IRB-20-0135      **IRB Exemption Date:** 04/10/20  
**TOPAZ Reference #:** 108842

As a requirement of IRB Exemption you are required to:

- 1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
- 2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
- 3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

**Special Conditions:** N/A

For further information, you may visit the IRB website at <http://research.fiu.edu/irb>.

MMV/em



March 28, 2020

To: Charles P Buscemi, PhD, APRN, FNP-BC, CWCN

From: Sara Cortes, MD

Re: Ms. Kristina Valiente

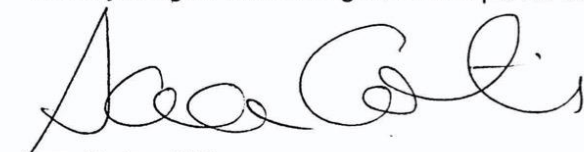
Dear Dr. Buscemi,

Thank you for inviting the department of pediatric emergency medicine at Holtz Children's Hospital to participate in Ms. Valiente's DNP research project. I have reviewed the project entitled "An educational intervention regarding asthma management and an asthma clinical pathway to increase knowledge of nursing staff in a pediatric emergency department." We are happy to be a part of this research project.

We understand that this project will be developed and implemented in our setting. This research will not impede our clinical flow in any way. However, we must also have approval by our internal IRB prior to commencing the project. Ms. Valiente and I are in the IRB process with Jackson/University of Miami at this time.

Please his research will not impede our clinical flow in any way. However, we must also have approval by our internal IRB prior to commencing the project. Ms. Valiente and I are in the IRB process with Jackson/University of Miami at this time.

Thank you again for allowing us to be a part of this educational project.



Sara Cortes, MD

Director of Medical Education

Pediatric Emergency Medicine

Jackson Health System/Holtz Children's Hospital