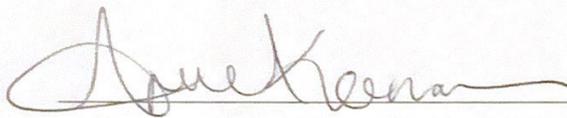


Impact of a Nurse-Led Virtual Asthma Education Program on Middle School-Aged
Children's Asthma Self-Management

By Jessica L. Erisman

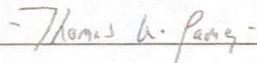
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August 5, 2021

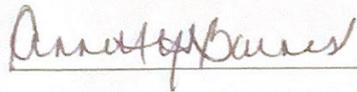
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Running Head: IMPACT OF A NURSE-LED VIRTUAL ASTHMA EDUCATION PROGRAM

Impact of a Nurse-Led Virtual Asthma Education Program on Middle School-Aged
Children's Asthma Self-Management

By

Jessica L. Erisman

DNP Project submitted to the School of Nursing
of Salisbury University in partial fulfillment of the requirements
for the degree of
Doctor of Nursing Practice
July 15, 2021

IMPACT OF A NURSE-LED VIRTUAL ASTHMA EDUCATION PROGRAM

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By

Jessica L. Erisman

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Abstract

Asthma is a leading chronic disease among school-aged children and adolescents. In one rural Maryland public school system, asthma accounts for many school health visits, missed school days, and emergency room (ER) visits, especially among middle schoolers. Learning asthma self-management techniques must become a priority to prevent poor health outcomes in this group. Currently in the school system, asthma self-management education is not provided to asthmatic adolescents. This Doctor of Nursing Practice (DNP) project sought to explore whether a school-based, nurse-led group asthma education program, called *Kickin' Asthma*, implemented virtually, could improve asthma symptoms, spacer use technique, rescue inhaler needs, and frequency of ER visits among students with persistent asthma in grades 6 through 8 over three months. Current evidence suggests school-based asthma education may improve asthma knowledge and self-management abilities with resultant improved health outcomes among asthmatic adolescents. Despite limitations set forth by COVID-19, this project found school-based asthma education can improve asthma-related sleep disturbance ($p < 0.05$), frequency of asthma controller medication use ($p < 0.05$), and spacer use technique ($P < 0.05$) among adolescents with asthma, as well as modestly decrease frequency of rescue inhaler use ($p = 0.53$). School-based asthma education is a cost-effective intervention with potential to reach many adolescents in a single location and improve population health for this group. Future interventions are needed with larger samples to evaluate whether similar school-based asthma education initiatives can reproduce positive health benefits and improve disease-specific knowledge and skills among asthmatic adolescents nationwide.

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Project Overview

Introduction

In the United States, asthma is the most prevalent chronic disease of childhood, leading to significant morbidity and premature death if not managed properly (American Lung Association, 2020). According to the Centers for Disease Control and Prevention (CDC) (2018), approximately 6 million children in the United States (U.S.) under the age of 18 years old currently have asthma. Asthma is one of the leading causes of pediatric emergency room (ER) visits and the third leading cause of hospital admissions among children nationwide (Johnson, Chambers, & Dexheimer, 2016). Approximately 4 million children in the U.S. experience at least one asthma exacerbation yearly, resulting in over 14 million missed school days and 1.8 million emergency room visits annually (Johnson, Chambers, & Dexheimer, 2016).

In Maryland, asthma is also one of the leading causes of pediatric ER visits and hospitalizations (Maryland Asthma Control Program, 2011a). It is estimated over 440,000 children in Maryland have a current asthma diagnosis (LaFave, 2020). Of the nine eastern shore counties in Maryland, the county involved in this project has the fourth greatest hospitalization rate for children with asthma (Maryland Asthma Control Program, 2011b). Of all twenty-four counties in the state of Maryland, the county ranks the eighth highest for pediatric asthma hospitalizations (Maryland Asthma Control Program, 2011b). Additionally, the rate of ER usage for children aged 5-17 years with asthma in the county is 162.9 per 10,000 children (Maryland Asthma Control Program, 2011c). This is significantly higher than the state of Maryland's overall rate for ER usage in this population, which is 114.7 per 10,000 children (Maryland Asthma Control

Program, 2011c). Following a 2010 data brief on pediatric asthma, it was determined “asthma in adolescents continues to be a public health concern in Maryland” as asthma prevalence in adolescents remains the highest of any other youth group (Maryland Asthma Control Program, 2011b, p. 2). In terms of cost, this population accounts for a significant amount of healthcare spending in Maryland due to high ER utilization and inpatient hospitalizations (Maryland Asthma Control Program, 2011b). Every year, pediatric asthma costs Maryland approximately “\$69 million in health care spending alone” (LaFave, 2020, p.3).

The high rates of pediatric ER visits and hospitalizations for children living in the county where this project took place suggests many asthmatic children in the region have poor disease control. Adolescents with uncontrolled asthma are of particular concern due to developmental changes and tendency to deprioritize self-care behaviors (Tseng, Chang, & Wu, 2017). Buckner, Copeland, Miller, and Holt (2018) contend adolescents have several educational needs regarding asthma self-management which include medication management, spacer use, trigger avoidance, and “coaching to take on the responsibility of asthma care” (p. 45). To prevent future ER visits and hospitalizations for adolescents with asthma in the county, community-based initiatives are needed to promote prevention of asthma exacerbations and ensure local middle school-aged youth with asthma are adequately educated about the disease. One avenue to reach adolescents for asthma education activities is through the school systems. Increasing asthma self-management knowledge among school-aged children through educational self-management programs has the potential to improve lung function, increase children’s

asthma related self-efficacy, decrease missed school days and activity limitations, and reduce ER visits in this population (Liptzin & Szeffler, 2016).

Problem Statement

Within one rural public school system in Maryland, there is currently a lack of formalized asthma education provided to adolescents in the school setting by school nurses. As a result, many adolescents with asthma demonstrate poor asthma self-management behaviors as well as high utilization of both the school health room and hospital ER for asthma complications. Educational interventions are needed to improve adolescents' understanding of and ability to manage their asthma so future exacerbations can be prevented and children can remain in their classrooms.

Purpose of Project

As students with asthma approach middle school, they are expected to become more responsible for asthma self-management both at school and at home. Asthma self-management requires children to become knowledgeable about the disease process and understand disease management techniques needed to stay healthy.

The purpose of this project was to examine whether a nurse-led asthma education program improves middle school students' asthma self-management as evidenced by improvements in their self-reported asthma symptoms, reduced need to use a rescue inhaler, improvement in their spacer use technique, and a reduced frequency in reported ER or hospital visits for asthma. While this project was initially intended to be implemented in the school setting, health concerns surrounding the COVID-19 pandemic required shifting to a virtual mode of implementation via Zoom video conferencing.

Clinical Question

The clinical question explored in this project was, “for adolescents in grades 6 through 8 with persistent asthma, does implementation of a nurse-led virtual asthma education program improve asthma symptoms, improve valved holding chamber (spacer) use technique, and reduce activity limitations, rescue inhaler use, and emergency room visits in a 3-month timeframe?”

Succinct Synthesis/Analysis of Supporting/Related Literature

Literature Search Strategy

Database searches were completed in CINAHL, ProQuest, MEDLINE, and Cochrane Library using search terms asthma education, school, school-based OR in-school, knowledge, self-management, student, teen, and variations of the word “adolescent.” The initial database search yielded 72 records. A search in Google Scholar yielded an additional 10 records, and hand searching through article reference lists yielded another 10 records. After duplicate articles were removed, 55 records were screened for eligibility. After screening abstracts, 30 records were removed, and 25 full text articles were screened. Inclusion criteria for articles included publication date since 2014 for the database search, English language, human studies, an adolescent study population, use of an asthma education intervention, and a school-based setting. Hand searching for articles yielded additional high-quality studies older than 2014 that were included. Exclusion criteria included use of an intervention not completed in a school setting, interventions only taught at the individual level, interventions which relied mostly on pre-recorded video-based education, use of a study group not including adolescents (i.e., elementary only), interventions not facilitated or taught by a nurse,

healthcare professional or other trained adult (i.e., taught by “peers”), and non-English language articles. Following screening of full text articles, n=14 met criteria to be included in the final literature review. The PRISMA diagram outlining the search strategy and article elimination process can be found in Appendix A.

Literature Synthesis and Analysis

Introduction

Vast literature exists exploring the impacts of school-based asthma education programs on young children with asthma, though there is limited research available studying its impacts on adolescents. A review of fourteen studies examining the effects of school-based asthma initiatives on various health and educational outcomes in adolescents revealed several similarities and differences in methodology and research findings. A table of evidence summarizing these studies can be found in Appendix B.

Overview of Methodologies

Research designs utilized. Four studies were systematic reviews, two were randomized controlled trials (RCTs), and eight used quasi-experimental designs. One systematic review included a meta-analysis of RCTs. Of the quasi-experimental studies, six used a one group pre-test post-test design without a control group, while two utilized a non-randomized control group.

Variations in populations studied. Populations studied in the fourteen articles varied in age from 5 to 19 years old. Most studies included solely middle schoolers (Buckner, Copeland, Miller & Op’t Holt, 2018; Clark, Shah & Little, 2010; Lawson, 2014; Lloyd, 2018; Mosnaim et al., 2011; Shrimali et al., 2010). Others evaluated a mix of elementary and middle school students or a mix of middle and high school students

(Coelho, Barretto, Cardoso, & Souza-Macahdo, 2016; Geryk, Roberts, & Carpenter, 2017; Harris et al., 2019; Liptzin et al., 2016; Mosnaim et al., 2016; Suwannakeeree, Deerojanawong, & Prapphal, 2016; Zografos, Marshak, Dyjack & Neish, 2010). Because high schoolers are still considered adolescents, with some being as young as 14 years, one study of only high schoolers was included in the review (Bruzzese et al., 2011). Studies were all implemented in school settings. Two primary studies included primarily racial minority groups (i.e., Latinos and African American students from low-income households), which is similar to the population demographic of one school included in this project (Bruzzese et al., 2011; Mosnaim et al., 2011). One primary study was conducted in a rural setting (Lawson, 2014), while three were conducted in urban areas considered low-income or medically underserved (Buckner et al., 2018; Mosnaim et al., 2011, Shrimali et al., 2010). Others did not identify whether their setting was urban, rural, or underserved. One study was conducted internationally in Thailand (Suwannakeeree et al., 2016). Though an international study, this study was included for review because it utilized similar interventions, outcome measures, and studied a similar age group as this project. Participants in all reviewed studies collectively ranged from having intermittent to severe persistent asthma.

Types of educational initiatives utilized. Various educational interventions were utilized, including the American Lung Association's established *Open Airways for Schools* and *Kickin' Asthma* programs either alone or in conjunction with other initiatives (Clark et al., 2010, Lawson, 2014; Liptzin et al., 2016; Lloyd, 2018; Shrimali et al., 2010; Zografos et al, 2010). Other educational interventions were researcher designed or adapted from previously published programs, such as the *Power Breathing Program* for

teens, which have less rigor (Bruzzeze et al., 2011; Suwannakeeree et al., 2016). One study utilized the *Fight Asthma Now* educational program (Mosnaim et al., 2011).

Systematic reviews included studies with various educational interventions, some of which included the educational programs aforementioned, including the *Kickin' Asthma* educational program utilized in this project.

Thematic Analysis of Study Findings

Several themes were found in grouping and analyzing outcomes of the fourteen studies.

Impact on asthma knowledge and/or self-management abilities. Eleven of the fourteen studies assessed asthma knowledge or self-management skills as an outcome measure. Bruzzeze et al. (2011) and Clark et al. (2010) found educational interventions improved students' confidence or self-regulation abilities regarding asthma. Nine studies found school-based asthma educational interventions improve asthma knowledge in at least one area of disease management, with variable sustainability reported at follow-ups beyond immediate post-test (Buckner et al. 2012; Coelho et al., 2016; Lawson, 2014; Liptzin et al., 2016; Lloyd 2018; Mosnaim et al., 2011; Mosnaim et al., 2016; Suwannakeeree et al., 2016; Zografos et al., 2010).

Impact on asthma symptoms. Eight studies assessed asthma symptoms as an outcome measure, five of which found asthma educational interventions to improve asthma symptoms (Buckner et al., 2018; Lawson, 2014; Lloyd, 2018; Shrimali et al., 2010; Suwannakeeree et al., 2016). Two studies reported no improvement in asthma symptoms following an educational intervention (Bruzzeze et al., 2011; Clark et al., 2015). One systematic review found that some studies' educational interventions

improved asthma symptoms (29%), while a greater majority did not (47%) (Coelho et al., 2016).

Impact on medication use and/or spacer technique. Six studies evaluated whether an educational intervention would improve proper medication use and/or inhaler/spacer technique. All six studies found improvements in correct medication usage or inhaler or spacer technique following asthma educational interventions (Geryk et al., 2017; Lawson, 2014; Liptzin et al., 2016; Mosnaim et al., 2011; Shrimali et al., 2010; Suwannakeeree et al., 2016). A systematic review by Geryk et al. (2017) reported inhaler technique improvements were not always maintained long-term.

Impact on ER visits and hospitalizations. Five studies assessed educational interventions' impacts on frequency of ER visits and/or hospitalizations. Three studies reported asthma educational interventions were associated with a reduction in ER visits and hospitalizations (Bruzzese et al. 2011; Harris et al., 2019; Liptzin et al., 2016). Suwannakeeree et al. (2016) saw a statistically significant reduction in ER visits in children under the age of 12 years at 3- and 6-months post-intervention, with a reduction also seen in children age 12+ years only after 6 months. A systematic review by Coelho et al. (2016) found some educational interventions reduced hospital and ER encounters (29%), while a greater majority did not (47%).

Quality Comparison & State of the Evidence

Studies included in this review varied in quality due to differences in methodology, sample size, and ability to draw clear conclusions. Studies were assessed and graded for quality using the Johns Hopkins Evidence-Based Rating Scale (Dang & Dearholt, 2012). Seven studies ranked either 1A, 1B, 2A, or 2B meaning they provided

high level evidence of good to high methodical quality, allowing for fairly definitive conclusions to be drawn (Dang & Dearholt, 2012). One systematic review ranked 3A due to its inclusion of non-experimental studies, though it had excellent methodology. Six studies ranked 2C or 3C, meaning their methodologies had insufficient sample sizes or significant flaws, limiting their ability to draw conclusions (Dang & Dearholt, 2012). Overall, the state of the evidence is mixed in quality to support the notion that asthma education interventions positively impact outcomes related to adolescent asthma. Many studies noted more research was needed with education of adolescents with asthma to verify both statistical and clinical significance of various outcomes in this group. This project further explored effects of a school-based asthma education intervention on adolescent asthma symptoms, inhaler and spacer use technique, and ER visits.

Conceptual/Theoretical Framework & Evidence-Based Practice (EBP) Model

Three models were selected to guide development of this project, including the Health Belief Model, the Model of Asthma Self-Management in Teens, and the Iowa Model for Evidence-Based Practice.

Theoretical Model: Health Belief Model

The Health Belief Model (HBM) is one of the most commonly used models in health behavior research, functioning “both to explain change and maintenance of health-related behavior interventions” (Glanz, Rimer, & Vizwanath, 2008, p. 46) Historically, the model is used to assess responses to symptoms of diseases and behaviors such as adherence to prescribed medical regimens (Glanz et al., 2008). The Health Belief Model is applicable to this project as outcome measures will assess whether a virtual school-based educational intervention positively impacts adolescent self-management behaviors

and in turn improves asthma control. Improved asthma control would be evidenced by reduced frequency of asthma symptoms and/or rescue inhaler use, and reduced visits to the ER for asthma.

Health educators must understand what factors contribute to asthmatic adolescents' health beliefs to effectively educate this group about disease self-management. According to Glanz et al. (2008), "the HBM contains several primary concepts that predict why people will take action to control illness conditions" (p. 46). The HBM is intended to help assist a project team to understand what factors lead adolescents to take control (or not take control) of their asthma. The six constructs of the HBM include: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Glanz et al., 2008). These constructs were assessed in the context of asthma control rather than risk, since the target population for this project was adolescents already diagnosed with asthma. Therefore, we considered how adolescents perceive their susceptibility to an asthma exacerbation and how they perceive the severity of asthma as a threat to overall health. Then, the project team considered perceived benefits and barriers to effective asthma self-management in this population given their age and developmental level. Best practices of the HBM led to the development of adolescent cues to act on asthma self-management behaviors alongside methods intended to improve adolescent self-efficacy in managing the disease. These six constructs together helped guide the application of the educational intervention, *Kickin' Asthma*, that was implemented with the schools for this project.

Conceptual Model: Model of Asthma Self-Management in Teens

(Mammen et al., 2018)

An important part of this project was defining and conceptualizing the term “asthma self-management” in the context of adolescents, as this project aimed to determine whether a nurse led educational initiative would improve asthma self-management among a sample of middle school-aged adolescents with asthma.

Through several qualitative studies involving literature reviews and in-depth interviews with clinicians, researchers, parents, and adolescents, Mammen et al. (2018) were able to define and conceptualize the term “self-management” in the context of teens with asthma. According to Mammen et al. (2018)’s model, there are two primary self-management constructs including *processes* of self-management and *tasks* of self-management. Self-management was defined as, “the iterative process of assessing, deciding, and responding to specific situations in order to achieve personally important outcomes” (Mammen et al., 2018, p. 1). Mammen et al. (2018) identified “clinically relevant self-management tasks” as 1) monitoring asthma, 2) managing active issues through pharmacologic and non-pharmacologic strategies, 3) preventing future issues, 4) and communicating with others as needed (p. 1). According to Mammen et al. (2018), self-management processes are “reciprocally influenced by intrapersonal factors (both cognitive and physical), interpersonal factors (family, social and physical environments), and personally relevant asthma and non-asthma outcomes” (p. 7). In order to teach adolescents about asthma self-management for this project, it was essential for this term to be defined and conceptualized. Mammen et al. (2018)’s model does an excellent job defining and conceptualizing this rather complex topic. Many of the clinically relevant

asthma self-management tasks Mammen et al. (2018) defines are included in the *Kickin' Asthma* curriculum chosen for implementation in this project. Intrapersonal, interpersonal, and personally relevant influences on asthma self-management were also included in recommended discussion points with students throughout the program.

EBP Model: Iowa Model for Evidence-Based Practice

The evidence-based practice model used to guide the progression of this project was the Iowa Model for Evidence-Based Practice. The Iowa Model begins with identification of a “triggering issue” or opportunity of a healthcare organization and determining if it is an organizational priority (Iowa Model Collaborative et al., 2017). The identified issue for this project was the lack of structured asthma education provided to students by school nurses in the local school system due to time constraints and lack of training in asthma education. Asthma is the most prevalent chronic disease among children in the school system, and one of the leading causes of school health room visits, thus it is a school health priority. To reduce the burden of asthma on the school system, related to school absenteeism and frequent school health room visits, the school system was in support of this asthma self-management educational intervention for its middle schoolers.

The next steps of the model included forming a project team and assembling and synthesizing available research evidence on the topic (University of Iowa Hospitals and Clinics, 2017). The project team consisted of a graduate nurse practitioner student and Salisbury University faculty members including a pediatric nurse practitioner and a respiratory therapist who is a certified asthma educator. A review and synthesis of available research evidence was conducted and found to support the effectiveness of

school-based asthma education initiatives for improving various aspects of asthma self-management in adolescents. Therefore, a pilot implementation of school-based virtual asthma education in the school system was warranted.

The final steps in the model were to design and pilot the practice change, which in this case involved implementation of this project (University of Iowa Hospitals and Clinics, 2017). Following implementation of the pilot project, the Iowa model recommended determining whether the program was sustainable for future use in the school system. While the project demonstrated ability to improve various asthma related outcomes in adolescents, sustainability of the project was unclear and depends on school nurses' or other school employee or stakeholder's willingness to receive training to repeat the program in future years. Sustainability also depends on the school system's willingness to invest any costs in repeating the program in future years. It was unclear whether the school system found the program to be sustainable or beneficial for integration into routine school system activities following the project. While school nurses liked the idea of implementing Kickin' Asthma in the future, they identified several barriers decreasing the likelihood of project sustainability such as the time commitment required to become a KA facilitator and an unlikely ability to leave their health rooms to conduct asthma education. If the project is not sustained in the future, the Iowa model suggests next steps of brainstorming alternative solutions to the problem and re-entering the cycle (University of Iowa Hospitals and Clinics, 2017).

Definition of Key Variables

Key variables assessed in this project included asthma symptoms, spacer use technique, rescue inhaler use, activity limitations, and frequency of emergency room

visits. These variables do not have theoretical definitions; however, each was measured operationally. The operational definition of “asthma symptoms” for this project was the frequency (in days) in which the child experienced coughing, wheezing, chest tightness, or shortness of breath in the past month and past three months. Valved holding chamber (VHC) or spacer use technique refers to the child’s ability to correctly use a VHC or spacer with their metered dose inhaler (MDI) in a series of four steps. A spacer is a “reservoir placed between the mouthpiece of an MDI and the mouth of a patient” designed to slow down the aerosolized particles emitted from the MDI, so a greater concentration of medication is delivered to the lungs (Vincken et al., 2018, p. 2). Spacer use technique was measured by the number of steps a child completed correctly out of four steps established by the American Lung Association (see Appendix F). Rescue inhaler use refers to the number of times a child used their short acting beta agonist inhaled medication in a given time period. For the purpose of this project, at each outcome evaluation, children were asked how many days per week they used their rescue inhaler. Activity limitations were measured by asking children how many times in the past month asthma made it difficult for them to exercise or play a sport. Children were also asked about how often asthma interfered with their sleep or caused them to miss school in the past month, which are related to asthma symptoms and activity limitations. To operationalize frequency of ER visits, children were asked how many times in the past three months asthma caused them to visit the ER or hospital.

Project Design

Participants and Setting

The study population for this project was adolescents with persistent asthma in grades 6 through 8 at three local middle schools in a rural Maryland public school system. The target sample size for the project was 30 to 35 students. However, only 11 students enrolled in the project. Ages of participants were projected to range from 10 to 14 years, based on typical ages associated with children in grades 6 through 8; however, ages of students in the project ranged from 11 to 15 years. Students were not excluded from the project if they fell outside of projected age ranges due to grade retention. To participate in the project, students had to be enrolled at one of three specific middle schools chosen for project implementation. Additionally, for inclusion, students had to meet a minimum criterion for classification of persistent asthma, which includes being on a daily controller medication or meeting certain symptom criteria outlined in Appendix C. Finally, students had to be able to read and speak English. Due to the COVID-19 pandemic, all project implementation and data collection activities occurred virtually via Zoom video conferencing with each of the three middle schools-located on Maryland's Eastern Shore.

Sampling Procedures

Students were recruited via convenience sampling by a referral from their school nurse. School nurses have access to a registry in their electronic health record of students with a diagnosis of asthma, which is self-reported by parents at the beginning of each school year. For this project, school nurses were asked to gather a list of students with asthma in their schools and parent contact information for these students, including phone

numbers and e-mail addresses. From this list, school nurses sent out an initial recruitment e-mail to parents to inform them of the upcoming asthma education project to garner interest in child enrollment and participation. This initial recruitment e-mail was used to give parents the chance to opt out of being contacted by the graduate nurse practitioner student if they did not want to participate or learn more about the project. Parents were given two weeks to opt out of being contacted if they wished not to participate.

After two weeks, school nurses provided a list of students whose parents either expressed interest in the project or did not opt out of being contacted. Each parent was sent an e-mail with a project recruitment letter, consent form, and a child assent form to read, sign, and return by e-mail if their child wanted to participate in the project (see parent consent and child assent forms in appendices D and E; see project recruitment letter in appendix L).

After ten days, if there was no response from parents, an identical e-mail was resent with the three documents. A week after sending the second e-mail, if there was again no response from parents, phone call recruitment was used with a verbal recruitment script (see Appendix M). Phone calls were used to explain the project in the event parents never saw or received the recruitment e-mails. Parents who expressed interest over the phone were asked to give a valid e-mail address and the recruitment documents were e-mailed once more for parents to complete and return. Many parents had trouble accessing their e-mail or returning documents electronically, therefore each parent who expressed interest in the project over the phone was also mailed a recruitment packet home that included the recruitment letter, consent and assent forms. Parents could

choose to scan or take a picture of these documents and return them by e-mail or send them back in the mail via a pre-postmarked envelope.

Following receipt of consent and assent forms, parents were contacted and scheduled for an introductory Zoom meeting, which included the parent(s), their child, and the graduate nurse practitioner student. This introductory meeting included getting the child's verbal assent and verifying the child met eligibility criteria for the project by assuring they had English reading and speaking capability and met diagnostic criteria for persistent asthma classification.

English speaking and reading ability were determined by having the child read the assent form aloud on Zoom. Following the reading, children were verbally asked whether they provided their assent to participate in the project. To determine whether the child had persistent asthma, the screening procedure outlined in Appendix C was used. Both parent and child were first asked whether the child takes a daily controller medication for asthma. If they answered yes, the child was presumed to have persistent asthma. If they answered no, the child was screened for persistent asthma based on clinical criterion established by the National Heart, Lung and Blood Institute (2007), including frequency of symptoms, nighttime awakenings due to asthma, frequency of short acting beta agonist inhaler use, and asthma's impact on daily activities (see Appendix C). The child had to fall into a mild, moderate, or severe persistent asthma classification for one of the above metrics (i.e., symptoms, nighttime awakenings, rescue inhaler use, etc.) to qualify for the project.

Once children provided verbal assent, demonstrated capability to read and speak English, and were determined to have persistent asthma, they were invited to continue on

with the project. All 11 students who met criteria enrolled in the project and completed baseline data collection activities at the introductory Zoom meeting.

Methodology

Intervention

The intervention for this project was implementation of a virtual school-based asthma education series designed for adolescents (aged 11-16 years old). This program, entitled *Kickin' Asthma* (KA), was created and has been piloted by the American Lung Association for several years. *Kickin' Asthma* consists of four, 45-minute educational sessions with a lecture piece and opportunities to engage students in hands-on learning and interaction. While the educational sessions were originally intended to be held in a classroom setting, health concerns imposed by the COVID-19 pandemic required a transition to virtual implementation. The KA curriculum covered information including asthma facts, asthma pathophysiology, common symptoms, warning signs, and triggers of asthma, common medications and devices used for asthma (i.e., spacers and peak flow meters), and skills for problem-solving and management of asthma emergencies. Each session took place on Zoom during normal school hours agreed upon by the school principal and school nurses and were spread out over four consecutive weeks. Prior to implementing this program, an hour-long KA facilitator training session was completed. Facilitator training entailed attending an online lecture to review the *Kickin' Asthma* curriculum. The online training also provided an overview of strategies for educational delivery and student engagement and reviewed ALA expectations for use of the program. Instructor and student workbooks for *Kickin' Asthma* were provided by the American Lung Association at no cost following completion of the training. Due to copyright

restraints, KA materials must be requested directly from the American Lung Association for viewing by non-KA facilitators. Written permission to use the KA curriculum for this project can be found in Appendix G.

Data Collection Procedures

Data collection consisted of a pre-test and an immediate and three-month post-test questionnaire administered via Google Classroom. The pre-test questionnaire was administered at the end of January 2021 prior to the first week of group asthma education sessions on Zoom. The first post-test questionnaire was administered at the end of February 2021 immediately after the last Zoom educational session was completed. Lastly, the second post-test questionnaire was administered three months after the first post-test questionnaire, at the end of May 2021. The questionnaire remained the same for all three measurement times. The questionnaire was included within the ALA's *Kickin' Asthma* curriculum, entitled "Asthma and You", which is included in Appendix F. The first section of the questionnaire asked children to answer the following: frequency of asthma symptoms in the past 4 weeks and 3 months (Likert type response), the number of school days the child missed in the last month due to asthma, the amount of nights in the last 4 weeks asthma bothered the child's sleep, the amount of times asthma impacted exercise tolerance in the past month (Likert type response), how often the child uses a spacer with their inhaler, and how many times the child had to go to the ER or hospital due to asthma in the last three months. The second section of the questionnaire asked children to fill in what types of inhalers they use, how often they use them, and when they use them (when they feel fine, before exercise, or for symptoms). Students were

allowed to ask for parental help in identifying their inhaler with picture charts provided to complete the second section.

In addition to questionnaires, students were evaluated on correct spacer use by demonstrating this skill to the graduate student on Zoom. The stepwise instructions for correct spacer use in the Kickin' Asthma Curriculum was used to check off how many steps out of four the student completed correctly during their demonstration (see Appendix F). This evaluation was completed with each student pre-test at the introductory Zoom meeting in January 2021 and again at three months post-test in May 2021. Written permission to use the KA data collection tools can be found in Appendix G.

Data Analysis Plan

Data analysis consisted of both descriptive and inferential statistics. Frequency and means were conducted for demographic data including students' age, gender, and grade level. Due to a small sample size recruited for the project, the non-parametric Wilcoxon matched pairs signed rank test was used to compare medians of asthma questionnaire responses from pre-test to post-test at two measurement points: immediately following the asthma education intervention and three months following the asthma education intervention. The Wilcoxon matched pairs signed rank test was also used to compare medians of spacer technique assessment scores from pre-test to three months post-test. All data analysis was conducted using IBM SPSS 26 statistical software.

Organizational System Analysis (SWOT)

An organizational system analysis of the school system was conducted to determine the internal strengths and weaknesses, as well as external opportunities and threats that exist with regard to project implementation and sustainability. Identified strengths for this project included dedication of school nurses, school nurses' previous asthma knowledge, having a highly invested school health services supervisor, and having strong support for the project from school administrators. One weakness identified regarding project implementation was the need for virtual instead of in person asthma education due to the COVID-19 pandemic. Identified weaknesses in the school system which may hinder project success and sustainability include historically low parent involvement in school health activities and limited availability of school nurses to help with project activities. Additionally, there is a shortage of substitute school nurses and a lack of funding to pay substitute school nurses to cover the health room in the event school nurses facilitate KA sessions in the future.

External opportunities that may facilitate sustainability of the project include willingness of ALA staff to train school nurses on the KA curriculum, the free cost of KA materials, the short training time to become an ALA KA facilitator, potential to expand the program to all middle schools in the county after the pilot, and the potential to expand the program to surrounding Maryland counties. External threats that may hinder sustainability of the project include KA facilitator trainings only being held a few times per year, need for KA to be implemented in four different sessions and preferably on four different days, and competing school health priorities. The COVID-19 pandemic may or

may not be a threat to project sustainability in future school years. A grid of the complete SWOT analysis of the school system for this project can be found in Appendix H.

IRB and Agency Approval

Project approval was sought from Salisbury University's Institutional Review Board (IRB) to assure adequate protection of human subjects through the project. A full committee review of the project proposal took place in November 2020 and the project was conditionally approved with a request for minor protocol revisions. Official Salisbury University IRB approval for the project was granted in December 2020. A letter of SU IRB approval is included in Appendix I.

An amendment to the IRB protocol was requested in February 2021 during project implementation. Due to the small number of participants enrolled in the project, some schools only had two to four students logging in to group Zoom sessions each week, which did not provide a robust group learning experience. Therefore, a request was made to the IRB to allow combining of two schools to attend the last two weeks of Zoom sessions together. This amendment was approved by the IRB and all parents and students involved consented to the change. This change allowed for a larger group of about six students on Zoom sessions and provided a better group education experience. The Salisbury IRB amendment request approval can be found in Appendix I.

Project approval from the public school system was obtained in October 2020 after review by school administrators as well as a research review committee at the board of education. An agency collaboration letter can be found in Appendix J.

Implementation Timeline

Implementation of the project began upon receipt of Salisbury University IRB approval in December 2020. In mid-December 2020, meetings with school nurses were held to explain the intervention in more detail, discuss the project timeline for completion, and verify group Zoom dates and times to assure school nurses could attend. School nurses then sent out initial project recruitment e-mails to parents before students went on their winter break. In January 2021, parents were contacted by the graduate nurse practitioner student for further recruitment activities and at the end of January 2021 introductory Zoom meetings were held with parents and students who consented to participate in the project. Baseline data collection began with evaluation of students' spacer technique during introductory Zoom calls in late January 2021 and concluded with students completing their first *Asthma & You* questionnaires before their first group education Zoom session on February 3, 2021.

Virtual group asthma education began in February 2021 and was held each Wednesday during students' asynchronous learning days. Three, forty-five-minute sessions were held on Zoom each day for each school, with the exception of the last two weeks of implementation where two schools were combined for group education. Immediately following the fourth and final group Zoom education sessions in late February 2021, the second *Asthma & You* questionnaire was made available to students in Google Classroom for completion within one week. This was the first post-test questionnaire.

In April of 2021, preliminary data analysis of pre-test and first post-test data commenced. In late May 2021, final post-test data collection was completed. Students

and their parents attended a final individual Zoom call for students to demonstrate their valved holding chamber (spacer) use technique once more. At the same time, the third and final *Asthma & You* questionnaire was made available to students in Google Classroom for completion.

In May and June of 2021 all data analysis was completed in SPSS. In August 2021, project findings were finalized and shared with Salisbury University, the public school system, the American Lung Association, and other invitees via audiovisual presentation on Zoom. A summary of the project timeline can be found in Appendix K.

Project Implementation

Recruitment

Project implementation began with recruitment of participants over a series of weeks in December 2020 and January 2021. After sending out their initial recruitment e-mails, school nurses sent the graduate nurse practitioner student a combined list of 87 students with asthma that would likely meet criteria for the project along with their parents' contact information. From this list, only 70 parents had valid, deliverable e-mail addresses and these parents were e-mailed recruitment packets consisting of recruitment letters, consent forms, and assent forms on two occasions. After no e-mail responses were received, phone call recruitment was completed over a period of three days. Twenty-nine parents expressed interest in the project over the phone and all of these parents were mailed and e-mailed recruitment packets. Many parents had difficulty completing paperwork electronically, which resulted in paperwork being mailed along with a pre-postmarked envelope. Of the 29 parents who were successfully contacted for recruitment, 15 returned completed consent forms and assent forms by the third week of January

2021. All 15 of these parents were contacted and scheduled for introductory Zoom meetings in the last week of January, however, of the 15, only 11 parents attended their scheduled Zoom meetings with their child.

Study Participants

The total sample size for the project was 11 students. In total, five students from the first middle school enrolled in the project, four students from the second middle school enrolled, and two students from the third middle school enrolled. These students ranged in age from 11 years to 15 years and represented each middle school grade level (6, 7, and 8). Most students reported having asthma since infancy or toddlerhood, with one developing asthma in elementary school. All students had some form of persistent asthma. Nine of eleven students met criteria for classification of mild persistent asthma, while two met criteria for classification of moderate persistent asthma. All students were able to read and speak English.

Student Participation and Attendance in Virtual Group Education

Student participation in the Kickin' Asthma program as well as attendance in group sessions gradually increased over the four weeks of Zoom asthma education. In week one, eight of eleven students attended their respective group Zoom sessions. In week two, ten students attended, and in week three all eleven students attended their group sessions. In week four, ten students were in attendance for their final Zoom sessions. Students who missed any group Zoom education sessions were encouraged to review relevant pages in their Kickin' Asthma workbooks for that week as well as watch a recorded recap video for the week in Google Classroom to learn about topics they missed during group education. The recap videos were recordings of the graduate nurse

practitioner student reviewing topics discussed during each KA session, without students present.

In the first week of the program, there was difficulty getting students engaged during group Zoom sessions, particularly with answering discussion questions and sharing their own asthma experiences. It is believed the lack of engagement occurred because students were unfamiliar with the instructor and adjacent participants. However, also of importance is that week one included a great deal of educational material to cover so students spent most of the class listening to the instructor talk. This could have been tedious for them causing further disengagement. Many students had their cameras off, which was allowed, though it was encouraged for students to have their cameras on if they felt comfortable.

In weeks two through four, some changes were made to the way content was delivered in group sessions. Instead of simply watching the instructor talk, students were able to follow along with workbook pages on their Zoom screen, viewing pictures and diagrams as content was taught. Games or skits were also incorporated in weeks two through four which got students more engaged in the content. By week four, students were freely participating in group discussions and sharing their own personal experiences with asthma with the group. It was likely a combination of the change in instructional delivery as well as increasing comfortability with the group that led students to become more engaged over the series of weeks where group Zoom education was held. Games and skits have been successfully used to engage students in school-based asthma education in the past, which is consistent with observations made in this project (Drummond et al., 2016; Hunt, 2020; McLeod, 2015).

Evaluation of Project Implementation

Formative Evaluation of Implementation Process

The project was completed as planned with both challenges and successes along the way. Overall, project activities were carried out with the planned target population despite a small sample size. It is inappropriate to conclude the project target population was adequately reached or represented due to small sample size. However, the study participants were well engaged in the program and served as an excellent pilot group for implementation of Kickin' Asthma in the public school system.

Barriers and Facilitators

The major barriers to project success included a short window of time for participant recruitment, inherent challenges set forth by the COVID-19 pandemic, a lack of parent involvement in the project, and intermittent technologic difficulties experienced throughout the project.

Due to a strict timeline set for project implementation, there was approximately one month available to recruit participants for the project. As a result, parents had less than two weeks to check and respond to e-mails before phone call recruitment began. Over the phone, many parents reported they do not check their e-mail accounts regularly or use e-mail as a primary mode of communication. The project team did not foresee this when planning recruitment, and ultimately about two weeks of time went by without any potential participants responding with interest in the project. Because there were only three days available for phone call recruitment, many parents did not have a chance to check and return voicemails before the project was nearing its start. If a longer window for recruitment was allowed, more participants may have been recruited.

The COVID-19 pandemic created many barriers for project implementation. First, Kickin' Asthma has not been implemented virtually in the past, so this was an adjustment for both the American Lung Association and KA facilitators to ensure transition to virtual implementation would be possible and of similar quality to in-person education. Additional facilitator training was required for virtual implementation in the fall of 2020. The pandemic also challenged the project team to use unfamiliar school system technologies such as Google Classroom. Lastly, COVID-19 made recruitment more challenging due to limiting recruitment methods to sending e-mails and making phone calls, which are impersonal and can be difficult to follow with a large number of potential participants.

The last two barriers to project implementation experienced during this project were poor parent involvement and technologic difficulties. Prior to recruitment, school nurses warned of historical lack of parent involvement in school health activities. This was seen with some parents when trying to contact them to return consent and assent forms, or when reminding them of upcoming Zoom class times or approaching due dates for questionnaires. While some parents were very receptive to contact, other parents were not and seemed inconvenienced by the project. While students were ultimately responsible for logging in to KA Zoom sessions on their own, Zoom meeting times changed weekly which caused some confusion among both students and their parents. For parents who were involved, support and openness to reminders about the project and associated activities was helpful to keep students on track with attendance and questionnaire submissions.

Technologic difficulties were experienced almost weekly with either Zoom or Google Classroom throughout the project. Difficulties ranged from trouble logging in to inability to upload content into Google Classroom. Fortunately, all issues were resolved quickly by the school system's information technology (IT) team and this did not have a major impact on project activities.

The main facilitators to project success were ongoing support from school system staff such as the research coordinator, school health services coordinator, the IT Team, and school nurses. Without their support, this project would not have been possible. Likewise, support from SU faculty mentors was invaluable throughout project implementation as they quickly helped with working through project challenges and offered support with potential solutions.

The other main facilitators of project success were students' commitment to the project as well as students' prior knowledge of Zoom and Google Classroom. Students showed up week after week ready to learn and completed project activities as assigned. Their knowledge of using Zoom and Google Classroom for virtual schooling allowed them to easily access Zoom group sessions each week and complete questionnaires online. Overall, the commitment of those involved in the project outweighed barriers to project success along the way and allowed for successful project implementation as a whole.

Summative Evaluation of Implementation Process

Clinical integration of evidence-based practice and leading quality improvement initiatives to improve health outcomes are two major competencies expected of DNP prepared advanced practice nurses (American Association of Colleges of Nursing

(AACN), 2006). This project utilized a prior developed and piloted group asthma education program designed for adolescents with intention to (1) address a clinical problem and care gap in a public school system, and (2) improve health outcomes for a vulnerable population with complex health education needs.

The Kickin' Asthma program selected for this project was used as intended by the American Lung Association, and despite aforementioned challenges and the unforeseen need to transition to a virtual implementation process, the project was implemented in its entirety as planned following the Iowa Model of Evidenced Based Practice, within the proposed timeline. The sample size recruited for the project was much smaller than anticipated, however, this was expected with the virtual delivery of the project. Despite a small sample size, project activities were carried out with a group of well engaged middle school students.

The purpose of this project was to prepare adolescents with asthma to become more independent and responsible with asthma self-management activities by helping them become more knowledgeable about their disease process and more confident in the skills they would need to perform to keep their asthma under control. Ultimately, the project purpose was accomplished by observing for improvements in students' self-reported asthma symptoms, needs for a rescue inhaler, spacer use technique, and frequency of emergency room or hospital visits for asthma. Improvements were seen in all of these metrics except for frequency of ER visits, which were not a baseline problem for students. Overall, the project produced desired outcomes despite the small number of participants. This sheds light on the usefulness of school-based asthma education and justifies its potential benefit for future use with larger groups in public school systems.

Data Analysis

This DNP project examined whether a nurse-led asthma education program would improve middle school students' asthma self-management as evidenced by improvements in their self-reported asthma symptoms, reduced need to use a rescue inhaler, improvement in their spacer use technique, and a reduction in the frequency they visit the ER or hospital for their asthma.

To assess the impact of asthma education on these various outcomes, the graduate nurse practitioner student utilized an asthma questionnaire on three occasions and conducted Zoom meetings for spacer technique demonstration on two occasions. The asthma questionnaire primarily assessed asthma symptoms, activity limitations, utilization of the ER or hospital for asthma, and medication usage. The spacer demonstrations assessed whether students knew and could perform the correct steps of using a valved holding chamber (spacer) device with their inhalers in the correct order.

Questionnaires were submitted by students in Google Classroom in the week preceding asthma education, in the week following conclusion of asthma education, and in three months following asthma education. Students were allowed to ask their parents for help on the questionnaires if needed. Spacer demonstrations were conducted pre-asthma education and three months following the conclusion of asthma education using a checklist for correct spacer demonstration with four steps.

Raw data from Google Classroom was compiled to an Excel spreadsheet and then exported into SPSS statistical software for analysis. Once in SPSS, raw data was destroyed from Google Classroom and Excel. Students were identified by their project ID number only on questionnaires submitted to Google Classroom, in Excel, and in SPSS.

SPSS was used to analyze demographic data and produce pre-test to post-test comparisons of median data points for asthma questionnaire items as well as spacer demonstration scores. Only the DNP student and project faculty advisors had access to data for analysis. All data was stored on password protected laptops in secure files. Descriptive statistics were determined using mean and standard deviation and frequencies for age, gender, and grade level, where applicable. For comparison of pre-test and post-test medians of asthma questionnaire responses and spacer demonstration scores at immediate and three months post-test, the Wilcoxon matched pairs signed-rank test was used. This non-parametric test was chosen due to the project’s small sample size.

Discussion of Findings

Characteristics of Participants

A total of 11 students enrolled in the project, with one student lost to follow up for the three-month post-test data collection. The average age of students was 12.45 years old (*SD* = 1.37). There were eight students who identified as male and three students who identified as female in the project. Finally, in the sample population there were four 6th grade students, one 7th grade student, and six 8th grade students.

Table 1. Sample Demographics

	Mean	Frequency	Proportion
Age (years)	12.45	-----	-----
Gender			
Male	-----	8	73%
Female	-----	3	27%
Grade Level			
6 th grade	-----	4	36%
7 th grade	-----	1	9%
8 th grade	-----	6	55%

Characteristics of participants (January 2021)

Asthma Questionnaire

The American Lung Association's *Asthma and You* questionnaire, created to go along with the Kickin' Asthma Program, consisted of thirteen items (See Appendix F). These items asked students to report the frequency of their asthma symptoms, missed school days due to asthma, nighttime awakenings due to asthma, and number of times asthma made it difficult for them to exercise. The questionnaire also asked students how frequently they used a spacer and how often they had to visit the ER or hospital due to asthma. Lastly, the questionnaire had students fill in the type of medications they use, how often they used them, and when or for what reason they use them (i.e., when they feel fine, for asthma symptoms, or before exercise).

This questionnaire was administered to students via Google Classroom in January 2021 before the start of group asthma education, in the week following conclusion of the last group asthma education session in February 2021, and at three months following the last group asthma education in May 2021. Medians of questionnaire answers were compared from pre-test to immediate post-test to assess short-term outcomes following asthma education, and again from pre-test to three months post-test to assess longer term outcomes following asthma education. See table 2 for individual item analysis.

Eleven students completed both the pre-test and immediate post-test questionnaires. Ten students completed the three-month post-test questionnaire.

Immediate Post Test Questionnaire Findings

Asthma Symptoms

From pre-test to immediate post-test, students reported a modest decrease in the frequency of their asthma symptoms (i.e., coughing, wheezing, chest tightness, or shortness of breath) in the last four weeks, from a median of one to two days per week to a median of less than one day per week ($p=.272$). There was no change in the reported frequency of asthma symptoms over the last three months, with a median of one to two days per week at pre- and post-test ($p=1.0$). These findings were not statistically significant.

Missed School Days

Students reported no change in the number of missed school days due to asthma from pre-test ($Mdn=0$) to immediate post-test ($Mdn=0$), $p=.66$. This is expected since students were attending school virtually during the time of the project due to the COVID-19 pandemic.

Sleep Disturbance

Students experienced a reduction in the frequency their sleep was bothered by asthma in the last month, from a median of 1.5 nights at pre-test, to a median of 0 nights at immediate post-test. This finding was statistically significant ($p<0.05$).

Exercise Tolerance

Students experienced no change in the number of days asthma made playing a sport or exercising difficult from before ($Mdn=1$) to immediately after ($Mdn=1$) the asthma education. This change was not statistically significant ($p=0.50$).

Spacer Use

From pre-test to immediate post-test, students reported no change in the frequency they used a spacer with their inhaler. Students reported using an inhaler “sometimes” at both pre ($Mdn=2.0$) and post-test ($Mdn=2.0$), $p=.18$.

ER or Hospital Visits

With regard to ER or hospital visits, there was no change in the frequency students needed to go to the ER or hospital in the past three months due to their asthma before and immediately after the educational intervention. The median score reported was zero acute care visits for asthma before and after the intervention ($p=0.18$).

Medication Use

From pre-test to immediate post-test, there was an increase in the number of students who reported taking a controller medication for their asthma, though this finding was not statistically significant ($p=0.08$). The median value for students was answering “yes” ($Mdn=1.0$) to use of a controller medication at both pre and post-test. However, three students either started taking a controller medication or recognized they were or should have been taking a controller medication already in the time between pre-test and immediate post-test.

Furthermore, students reported an increased frequency in days per week they were taking their controller medication from a median of four days per week before, to a median of seven days per week immediately after asthma education. This finding was statistically significant ($p<0.05$) and suggests students learned the importance of taking their controller medication daily during the asthma education.

Both at pre-test and immediate post-test, most students were found to be using their controller medication correctly (i.e., when they feel fine and not for asthma symptoms or before exercise) ($Mdn=1.0$). Therefore, there was no statistically significant improvement ($p=0.32$).

At both pre-test and immediate post-test, all students reported having a rescue inhaler ($Mdn=1.0$, $p=1.0$), which is expected with their diagnosis of persistent asthma. From pre-test to immediate post-test, students reported a reduction in days per week they used their rescue inhaler from a median of 2 days per week to a median of 1 day per week. While this finding is clinically significant, it was not statistically significant ($p=0.53$). Lastly, at both pre-test and post-test, most students reported correct use of their rescue inhaler (i.e., using it for asthma symptoms or before exercise, and not when they feel fine) ($p=1.0$).

Three Month Post-Test Questionnaire Findings

Asthma Symptoms

From pre-test to three months post-test, students reported a modest decrease in the frequency of their asthma symptoms (i.e., coughing, wheezing, chest tightness, or shortness of breath) in the last four weeks as well as in the last three months, from a median of one to two days per week to a median of less than one day per week ($p=.19$; $p=.17$). These findings were not statistically significant.

Missed School Days

Students reported no change in the number of missed school days due to asthma in the last month from pre-test ($Mdn=0$) to three months post-test ($Mdn=0$), $p=.66$. This

was again an expected finding considering most students were still attending school virtually in May of 2021.

Sleep Disturbance

At three months, students reported a decrease in the frequency their sleep was bothered by asthma in the last month, from a median of 1.5 nights at pre-test, to a median of 0.5 nights at three months post-test. This decrease was sustained from immediate post-test, and once again found to be statistically significant ($p < 0.05$).

Exercise Tolerance

Students experienced a mild reduction in the number of days asthma made playing a sport or exercising difficult from before ($Mdn=1$) to three months after ($Mdn=0$) the asthma education. This change was not statistically significant ($p=.75$). Many students mentioned during the program they had been exercising less frequently due to being at home from COVID-19. Therefore, little change in exercise tolerance was expected.

Spacer Use

From pre-test to three months post-test, students reported an overall increase in the frequency they used a spacer with their inhaler from “sometimes” ($Mdn=2.0$) to “every time” ($Mdn=1.0$). While this change is clinically significant, it was not statistically significant ($p=0.08$).

ER or Hospital Visits

With regard to ER or hospital visits, there was no change in the frequency students needed to go to the ER or hospital in the past three months due to their asthma

before and three months after the educational intervention. The median score reported was zero acute care visits for asthma before and after the intervention ($p=0.32$).

Medication Use

From pre-test to three months post-test, there was an increase in the number of students who reported taking a controller medication for their asthma, though this finding was not statistically significant ($p=0.08$). The median value for students was answering “yes” ($Mdn=1.0$) to use of a controller medication at both pre and three months post-test. Three students either started taking a controller medication, or recognized they already were or should be taking a controller medication at home in the time before the asthma group education started to the time after it was delivered. This change was seen at immediate pre-test and sustained at three months post-test.

Increased frequency in days per week students took their controller medication was also sustained from a median of four days per week at pre-test, to a median of seven days per week three months following asthma education. This finding was statistically significant ($p<0.05$) and suggests students retained education regarding the importance of taking controller medications daily.

Both at pre-test and three months post-test, most students were found to be using controller medications correctly (i.e., when they feel fine and not for asthma symptoms or before exercise) ($Mdn=1.0$, $p=0.32$).

At both pre-test and three months post-test, all students reported having a rescue inhaler ($Mdn=1.0$, $p=1.0$), consistent with their diagnosis of persistent asthma. From pre-test to three months post-test, students reported a reduction in days per week they used their rescue inhaler from 2 days per week to 1 day per week. While this finding was

sustained from immediate post-test, and is clinically significant, it was not statistically significant ($p=0.57$). Lastly, at both pre-test and three months post-test, most students reported correct use of their rescue inhaler (i.e. using it for asthma symptoms or before exercise, and not when they feel fine) ($p=1.0$).

Correct medication use was a topic discussed throughout the Kickin’ Asthma program, and project results revealed students demonstrated improvements in several outcomes related to medication self-management.

Table 2. Kickin’ Asthma Questionnaire Results: Pre-Test, Immediate and Three Months Post-Test

ALA Kickin’ Asthma- “Asthma and You” Questionnaire Questions	Pre-Test KA Questionnaire Responses (Mdn)	Immediate Post-Test KA Questionnaire Responses (Mdn)	Three Month Post-Test KA Questionnaire Responses (Mdn)
1. In the past 4 weeks, how often do you have coughing, wheezing, or shortness of breath? (Likert scale: 0= not at all, 1=<1 day/week, 2= 1-2 days/week, 3= 3-6 days/week, 4= everyday)	3	2 ($p=0.272$)	2 ($p=0.19$)
2. In the past 3 months, how often do you have coughing, wheezing, or shortness of breath? (Likert scale: 0= not at all, 1=<1 day/week, 2= 1-2 days/week, 3= 3-6 days/week, 4= everyday)	3	3 ($p=1.0$)	2 ($p=0.17$)

3. My asthma caused me to miss ___ days of school in the past month.	0	0 (p=0.18)	0 (p=0.66)
4. My sleep was bothered by asthma about ___ times in the past four weeks.	1.5	0 (p<0.05)*	0.5 (p<0.05)*
5. My asthma made it hard for me to play a sport or exercise about ___ times in the past month.	1	1 (p=0.50)	0 (p=0.75)
6. I use my spacer with my inhaler: every time (1), sometimes (2), never (3), or I don't know (4)	2	2 (p=0.18)	1 (p=0.08)
7. In the past 3 months, how many times did asthma cause you to go to the emergency room or hospital? 0 times (0), 1 time (1), 2 times (2), 3 times (3), 4 times (4), 5-10 times (5), more than 10 times (6)	0	0 (p=0.18)	0 (p=0.32)
8. Use of a controller medication? (selected using a diagram) Yes=1, 2= No	1	1 (p=0.08)	1 (p=0.08)
9. Number of days per week controller medication is used	4	7 (p<0.05)*	7 (p<0.05)*
10. Correct use of controller medication (i.e. when you feel fine, not for relief of asthma symptoms or for exercise) Yes=1, 2=No	1	1 (p=0.32)	1 (p=0.32)
11. Use of a rescue medication? (selected using a diagram) Yes=1, 2=No	1	1 (p=1.0)	1 (p= 1.0)
12. Number of days per week rescue medication is used	2	1 (p=0.53)	1 (p=0.57)
13. Correct use of rescue medication (i.e., for asthma symptoms or			

with exercise, not when you feel fine) Yes=1; 2=No	1	1 (p=1.0)	1 (p=1.0)
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**Indicates a statistically significant result.*

Spacer Demonstration

Students demonstrated use of a spacer with inhaler on two occasions via Zoom video conferencing alongside their parents. Parents were asked not to coach their child on this skill during the video discussion. Demonstrations took place at pre-test before group asthma education began, and at three months after the completion of asthma education. Students were objectively scored on their ability to correctly perform four steps of using a spacer with a metered dose inhaler in the correct order. See Appendix F for the tool used to score spacer use technique.

From pre-test to three months post-test, median spacer demonstration scores increased from two correct steps performed to three correct steps performed. The Wilcoxon matched pairs signed rank test found this change to be statistically significant (p<0.05).

Results Overview

This DNP project demonstrated nurse-led, school-based group asthma education is an effective approach to improve asthma self-management among adolescents with asthma. As described in Mammen et al. (2018)’s conceptual model of asthma self-management in teens, improved asthma self-management for adolescents requires an intellectual appreciation for and understanding of processes of asthma-self management as well as the ability to carry out tasks of asthma self-management, both of which project participants demonstrated following asthma education.

Students displayed both improved knowledge and skills related to asthma self-management evidenced by improved controller medication use, decreased asthma symptoms and nighttime awakenings due to asthma, decreased rescue inhaler use, and improved frequency and technique with valved-holding chamber (spacer) use after the educational intervention. Many of these outcomes were consistent with findings in previous research (Buckner et al., 2018; Geryk et al., 2017; Lawson, 2014; Liptzin et al., 2016; Lloyd, 2018; Mosnaim et al., 2011; Shrimali et al., 2010; Suwannakeeree et al., 2016; & Geryk et al., 2017).

Despite limited statistical power of findings, and inability to demonstrate statistical significance for small improvements in asthma outcomes from pre to post-test, such as with reduced frequency of asthma symptoms and rescue inhaler use, these improvements are clinically meaningful especially for the short-time frame in which the project was conducted. Neither four weeks nor three months is a considerable amount of time for any changes made at home to significantly impact asthma symptoms for children who are not experiencing an exacerbation. Most clinical changes in asthma control resulting from lifestyle changes typically take three to six months to appear (Global Initiative for Asthma, 2021). However, small changes seen in this project both immediately and three months following the education indicates the program prepares students to quickly apply new knowledge and make changes in the right direction to improve their asthma control. Therefore, school-based asthma education is a worthwhile process change to consider in public schools.

Project Limitations

The major limitation experienced in this project was the small sample size of participants, which eliminates the ability to generalize findings of the project to a larger population of similar asthmatic adolescents in a school system. Small sample sizes lack diversity and statistical power, which also make it inappropriate for the project team to make definitive conclusions concerning project findings. However, despite lack of statistical power, the project team did find clinical significance in many project outcomes which are meaningful to school health practice and population health for this group. Examples of clinically significant outcomes found in this project were improved controller medication compliance, reduced rescue inhaler use, improved compliance and technique with spacer use, reduced sleep disturbances due to asthma, and reduced days per week students experienced asthma symptoms. Collectively, if sustained, these improvements may contribute to better overall asthma control for adolescents in the school system, which is the primary goal in asthma disease management.

Additional project limitations included a limited time frame for participant recruitment, project implementation, and data collection. Due to time constraints, we were unable to observe any long-term outcomes following the asthma education past the three-month follow-up. While students were educated on impacts of seasonal factors that could affect their asthma like ambient temperature changes, flu and cold viruses, and returning back to school, these were not relevant during the time the project was implemented. As a result, we will not be able to observe students' application of asthma prevention and self-management knowledge for many common asthma triggers encountered more often in fall and winter months.

One final major limitation of this project were restrictions imposed by COVID-19, most notably the need for virtual project recruitment and implementation. Virtual restrictions made reaching parents for recruitment more difficult than anticipated, as many parents were not active in e-mail communication nor quick to return phone calls. It is likely the virtual mode of recruitment, alongside the short time frame for recruitment contributed to the sample size limitations we experienced. Additionally, as aforementioned, *Kickin' Asthma* was initially designed and intended for use for in-person group asthma education with adolescents in their schools. While the ALA did allow for virtual implementation of KA during the pandemic, virtual implementation came with many challenges such as technologic difficulties with online programs, difficulty getting students engaged in educational activities, and a harder time getting students to complete questionnaires given they had to complete them online in their own time versus on paper with the instructor present.

Implications for Practice

Implications for Clinical Practice and Population Health

School nursing is at the core of population health (Bergren, 2017). While the school nurse's role is often viewed as limited to simply providing hands on care for acute and chronic illnesses in the school setting, there is much to be said for the value of school nursing in health promotion and illness prevention (Bergren, 2017, p. 1). Improving population health requires nurses to creatively reach those in vulnerable health groups in a way that is not only convenient, but accessible. In some cases, schools are the only avenue for children to come in contact with the healthcare system for access to care and health promotion activities (Love et al., 2019). Among students who are economically

disadvantaged or living in rural areas, opportunities for exposure to health outreach and education are often limited. However, public school systems serve as a consistent entity where every child can be reached for health education despite home circumstances, geographic location, or socioeconomic status. This makes schools an ideal setting for asthma education, especially if it can be implemented in a way that does not greatly interfere with other academic obligations.

Kickin' Asthma is a relatively short program that can be implemented in less than a month, taking less than 45 minutes in a child's school day to implement each session for a total of four sessions. For a small time commitment, this education can have a potentially significant impact on the health of many asthmatic adolescents. While asthma self-management efforts must take precedence at home, school systems can and should continue to promote and reinforce asthma self-management while students are at school. By working to educate adolescents on better asthma control, school systems can help reduce the burden of asthma not only for students and their families but also the local community. This can be demonstrated in ways such as decreasing the need for ER visits and hospitalizations at local hospitals, decreasing parents' time away from their workplaces to care for a sick child, and by sharing the responsibility of disease education and monitoring with primary care providers.

Implications for School Nurses

School nurses are in a unique position to promote asthma self-management and educate students on the disease process due to their clinical knowledge, expertise, and frequent contact with asthmatic children, especially those of which who exhibit poor asthma control necessitating frequent visits to the school health room. School nurses are

increasingly embracing their ability to “assess community needs, deliver evidence-based programs, and evaluate population-based interventions” (Bergren, 2017, p. 1). School-based asthma education is one example of an evidence-based program that could be useful in many school systems nationwide, due to the high prevalence of childhood asthma in the U.S. (CDC, 2018).

By implementing school-based group asthma education, school nurses are not only likely to benefit their students, but they could also reduce burdens to daily workflow. By teaching and coaching children to adopt better asthma control, school nurses may be able to reduce health room visits due to asthma and decrease the frequency in which they must administer rescue medications at school or call 911 for in-school asthma emergencies. Lastly, educating students in a group setting could reduce the amount of time school nurses might otherwise spend educating students individually about their asthma in the health room.

Implications for the DNP Role

The Doctor of Nursing Practice degree prepares advanced practice nurses to make an impact in both clinical practice and leadership arenas (Edwards et al., 2018). DNP prepared nurses are expected to lead the way in creating positive change in complex organizational systems as well as finding and implementing innovative solutions to identified clinical problems through evidenced-based practice (Brad, 2016). Efforts to improve population health are at the forefront of AACN DNP Essential VII, *Clinical Prevention and Population Health for Improving the Nation’s Health*, which was the primary DNP essential targeted with this project (AACN, 2006). This project also incorporated DNP essentials II, and III, exemplified by navigation of a complex

organizational system and implementation of evidence-based practice to both address an identified clinical practice problem as well as improve population health for a vulnerable population (AACN, 2006).

While the public school system utilized in this project does not have employed nurses with doctoral preparation at this time, this project demonstrates how DNP prepared nurses could be beneficial in leading change in this area of public health in the future. In recent years, there has been exponential growth of school-based health centers in school systems nationwide which exist to provide clinical care to public school students in need (Love et al., 2019). If this trend continues, it is likely employment of DNP prepared advanced practice nurses in school systems will become more commonplace in coming years. If this occurs, these healthcare leaders will be in an opportune setting to work toward improving population health for students with various health needs through a variety of quality improvement and EBP initiatives.

Economic Considerations

While cost and healthcare savings were not outcomes evaluated in this project, it is important to consider the potential economic impacts of school-based asthma education initiatives. The *Kickin' Asthma* Program is a free asthma education curriculum offered by the American Lung Association to nurses, health educators and any other adult professionals who are interested in teaching group asthma education, so long as the potential facilitator attends the required training courses through the ALA. This project curriculum was free of cost to implement as the ALA provided all program materials needed for both the facilitators and students, including the cost of *Kickin' Asthma* workbooks, valved holding chambers (spacers), and peak flowmeters for each participant.

To implement this project in school systems in the future, associated costs would be paying a school nurse or substitute nurse for the time spent planning, organizing, and conducting *Kickin' Asthma* group sessions. This cost could be eliminated or mitigated if any school nurses or school health professionals were willing to donate their time for these activities, possibly with the incentive of earning continuing education credits for these activities or a one-time stipend at the completion of the program.

The potential economic advantages to both the school system and the healthcare system associated with keeping children's asthma well controlled far outweigh any small costs of implementing the *Kickin' Asthma* program. Public schools are awarded funding partly based on student attendance; therefore, it is of interest for schools to assure children with chronic illnesses like asthma maintain their health to be able to attend school. While this project did not demonstrate a reduction in missed school days due to asthma, likely due to the virtual nature of schooling over the past year, previous studies have demonstrated a reduction in school absenteeism associated with school-based asthma education (Bruzzese et al., 2011; Lawson, 2014; Liptzin et al., 2016; Lloyd, 2018; Suwannakeeree et al., 2016). With improved attendance of children with asthma, who in the U.S. collectively miss on average 14 million school days per year, public school systems could see improved funding (Johnson, Chambers, & Dexheimer, 2016).

Regarding healthcare cost savings, direct patient care for pediatric asthma costs the U.S. a significant amount in healthcare spending annually, averaging billions of dollars per year (Perry et al., 2019). Much of this spending is on acute care visits related to poor asthma control and asthma exacerbations (Perry et al., 2019). While this project did not demonstrate a reduction in ER or hospital visits, as most students did not visit the

ER or hospital at all in the months before or after asthma education, previous studies have demonstrated a decrease in acute care visits following school-based asthma education (Bruzzese et al. 2011; Harris et al., 2019; Liptzin et al., 2016; Suwannakeeree et al., 2016). If this project was implemented in the school system again in the future with a larger sample of students, and particularly those identified by school nurses to use acute care services often, a reduction in use of the ER or hospital could be demonstrated.

Potential cost savings to families related to better asthma control could include less out of pocket costs for acute care visits, as well as less lost income from missing work to care for a sick child. However, these outcomes were not evaluated with this project.

Process and Outcome Recommendations

Future implementation of similar quality improvement projects with asthmatic adolescents in public school systems is needed with inclusion of students from varying demographic backgrounds and ideally with larger sample sizes. We recommend implementation of Kickin' Asthma with a longer period of time allotted for both recruitment and data collection in order to enroll more participants in the program and follow their asthma outcomes for a longer time period to determine long-term impacts of school-based asthma education. We also recommend implementation of the program in person instead of virtually if health metrics allow, as KA was originally designed for face-to-face delivery. In-person instruction will likely garner greater student engagement and provide a more personal learning environment without potential for technical disruptions.

School nurses can be trained to facilitate asthma education in their schools with support of educators and administrators in their public school systems. However, it is unlikely sustainability of such programs will occur without support from school leadership as well as interest and dedication of school nurses in implementing these activities. Pre-designed asthma education curriculums like *Kickin' Asthma* are available to school systems at no cost. With low cost, no demonstration of harm to students, and many potential benefits to students, their families, and school nurses, incorporation of school-based asthma education into routine school health activities should be seriously considered within public school systems both locally and nationwide.

Dissemination Plan

This project was disseminated to the local school system involved in this project by audiovisual presentation via Zoom video conferencing in August 2021. Parents and students involved in the project, as well as school health staff including school nurses were invited to attend the presentation. In addition to school stakeholders, additional invitees included DNP project committee members, Salisbury University students and faculty, and American Lung Association Staff involved in the project.

A project manuscript will be submitted to a scholarly journal that highlights school health topics for viewing by national and international audiences. A school health journal was selected with hopes to have the project reach academic audiences as well as clinicians interested in pediatric asthma and school-based asthma initiatives. The primary audience we intend to reach with this submission are professionals working in school health roles, such as school nurses, who may find interest in reproducing the project or

implementing similar quality improvement initiatives for adolescents with asthma in their school systems.

Findings from this project may also be submitted in the form of an abstract for poster or oral presentation at local, regional or national conferences in order to reach target audiences aforementioned in coming months or years. Such conferences can provide an opportunity to network with school health professionals, clinicians, and policy makers regarding school-based health initiatives to improve population health for children with asthma.

References

- American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice*. AACN.
<https://www.aacnnursing.org/DNP/DNP-Essentials>
- American Lung Association. (2020). *Asthma and children fact sheet*. American Lung Association. <https://www.lung.org/lung-health-and-diseases/lung-disease-lookup/asthma/learn-about-asthma/asthma-children-facts-sheet.html>
- Bergren, M.D. (2017). School nursing and population health: Past, present, and future. *Online Journal of Issues in Nursing*, 22(3).
<https://dx.doi.org/10.3912/OJIN.Vol22No03Man03>
- Brad, S. (2016). DNP-prepared leaders guide healthcare system change. *Nursing Management*, 47(9), 13-16.
<https://dx.doi.org/10.1097/01.NUMA.0000491133.06473.92>
- Bruzzese, J., Sheares, B.J., Vincent, E.J., Du, Y., Sadeghi, H., Levison, M.J., Mellins, R.B. & Evans, D. (2010). Effects of a school-based intervention for urban adolescents with asthma: A controlled trial. *American Journal of Respiratory and Critical Care Medicine*, 183(8), 998-1006. <https://doi.org/10.1164/rccm.201003-0429OC>
- Buckner, E.B., Copeland, D.J., Miller, K.S., & Holt, T.O. (2018). School-based interprofessional asthma self-management education program for middle school students: A feasibility trial. *Progress in Community Health Partnerships: Research, Education and Action*, 12(2018), 45-59.
<https://dx.doi.org/10.1353/cpr.2018.0020>

- Centers for Disease Control and Prevention. (2018). *Asthma in children*. CDC.
<https://www.cdc.gov/vitalsigns/childhood-asthma/index.html>
- Clark, N.M., Shah, S., Dodge, J.A., Thomas, L.J., Andridge, M.S. & Little, J.R.A. (2010).
An evaluation of asthma interventions for preteen students. *Journal of School Health, 80*(2), 80-87. <https://dx.doi.org/10.1111/j.1746-1561.2009.00469.x>
- Coelho, A.C.C., Barretto Cardoso, L.S., de Souza-Machado, C. & de Souza-Machado, A. (2016). The impacts of educational asthma interventions in school: A systematic review of the literature. *Canadian Respiratory Journal, 2016*.
<https://dx.doi.org/10.1155/2016/8476206>
- Dang, D., & Dearholt, S. (2017). *Johns Hopkins nursing evidence-based practice: Model and guidelines* (3rd ed.). Indianapolis, IN: Sigma Theta Tau International.
- Drummond, D., Monnier, D., Tesniere, A., & Hadchouel, A. (2016). A systematic review of serious games in asthma education. *Pediatric Allergy and Immunology, 28*(3), 257-265. <https://doi.org/10.1111/pai.12690>
- Edwards, N., Coddington, J., Erler, C., & Kirkpatrick., J. (2018). The impact of the role of Doctor of Nursing practice nurses on healthcare and leadership. *Medical Research Archives, 6*(4), 1-11. <https://doi.org/10.18103/mra.v6i4.1734>
- Geryk, L.L., Roberts, C.A., & Carpenter, D.M. (2017). A systematic review of school-based interventions that include inhaler technique education. *Respiratory Medicine, 132*(2017), 21-30. <https://doi.org/10.1016/j.rmed.2017.09.001>
- Glanz, K., Rimer, B.K., & Viswanath, K. (Eds.). (2008). *Health behavior and health education: Theory, research, and practice*. San Francisco, CA: Jossey-Bass.

- Global Initiative for Asthma. (2021). *Global strategy for asthma management and prevention (2021 update)*. GINA. https://ginasthma.org/wp-content/uploads/2021/04/GINA-2021-Main-Report_FINAL_21_04_28-WMS.pdf
- Harris, K., Kneale, D., Lasserson, T.J., McDonald, V.M., Grigg, J., & Thomas, J. (2019). School-based self-management interventions for asthma in children and adolescents: A mixed methods systematic review. *Cochrane Database of Systematic Reviews*, 2019(1), 1-335. <https://dx.doi.org/10.1002/14651858.CD011651.pub2>
- Hunt, L. (2020). Effectiveness of a school-based asthma education program for 8-10-year-old children. *University of Kentucky DNP Projects*. 324. https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1356&context=dnpe_tds
- Iowa Model Collaborative, Buckwalter, K.C., Cullen, L., Hanrahan, K., Kleiber, C., McCarthy, A.M., Rakel, B., Steelman, V., Tripp-Reimer, T., & Tucker, S. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing*, 14(3), 175-182. <https://dx.doi.org/10.1111/wvn.12223>
- Johnson, L.H., Chambers, P., Dexheimer, J.W. (2016). Asthma-related emergency department use: Current perspectives. *Open Access Emergency Medicine*, 2016(8), 47-55. <https://dx.doi.org/10.2147/OAEM.S69973>
- LaFave, S. (2020, October). *The unequal burden of pediatric asthma: A call for an equity-driven, multimodal, public health approach to asthma in Baltimore*. Abell Foundation. [https://abell.org/sites/default/files/files/2020_Abell_pediatric%20asthma_FINAL-web%20\(dr\).pdf](https://abell.org/sites/default/files/files/2020_Abell_pediatric%20asthma_FINAL-web%20(dr).pdf)
- Lawson, K.A. (2014). School-based asthma education program: A research translation

project. *Doctor of Nursing Practice (DNP) Projects*, 42, 1-54.

https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1039&context=nursing_dnp_capstone

Liptzin, D.R., Gleason, M.C., Cicutto, L.C., Cleveland, C.L., Shocks, D.J., White, M.K.,

Faino, A.V., & Szeffler, S.J. (2016). Developing, implementing, and evaluating a school-centered asthma program. *Journal of Allergy and Clinical Immunology*,

4(5), 972-979. <https://dx.doi.org/10.1016/j.jaip.2016.04.016>

Liptzin, D.R., Szeffler, S.J. (2016). Evolution of asthma self-management programs in

adolescents: From the crisis plan to Facebook. *Journal of Pediatrics*, 179, 19-23.

<https://doi.org/10.1016/j.jpeds.2016.08.062>

Lloyd, J. (2018). A school-based asthma education program to reduce absenteeism.

<https://usmai-illiad-oclc-org.proxy->

[su.researchport.umd.edu/illiad/SSC/illiad.dll?Action=10&Form=75&Value=4649](https://usmai-illiad-oclc-org.proxy-su.researchport.umd.edu/illiad/SSC/illiad.dll?Action=10&Form=75&Value=4649)

61

Love, H.E., Schlitt, J., Soleimanpour, S., Panchal, N., & Behr, C. (2019). Twenty years of

school-based health care growth and expansion. *Health Affairs*, 38(5), 755-764.

<http://dx.doi.org/10.1377/hlthaff.2018.05472>

Mammen, J. R., Rhee, H., Norton, S.A., Butz, A.M., Halterman, J., & Arcolego, K.

(2018). An integrated operational definition and conceptual model of asthma self-management in teens. *Journal of Asthma*, 55(12), 1315-1327.

<https://dx.doi.org/10.1080/02770903.2017.1418888>

Maryland Asthma Control Program. (2011a). *Asthma in Maryland 2011*. Maryland

Department of Health and Mental Hygiene.

https://phpa.health.maryland.gov/mch/Documents/Asthma_in_Maryland-2011.pdf

Maryland Asthma Control Program. (2011b). *Asthma in Maryland's children and youth*.

Maryland Department of Health and Mental Hygiene.

<https://phpa.health.maryland.gov/mch/Documents/Data%20Brief%205%20Asthma%20in%20Maryland%27s%20Children%20and%20Youth.pdf>

Maryland Asthma Control Program. (2011c). *Asthma in Wicomico County*. Maryland

Department of Health and Mental Hygiene.

https://phpa.health.maryland.gov/mch/Documents/asthma_control_Profile_Wicomico.pdf

McLeod, D.A., Jones, R., & Cramer, E.P. (2015). An evaluation of a school-based, peer-facilitated, healthy relationship program for at-risk adolescents. *Children & Schools*, 37(2), 108-116. <https://doi.org/10.1093/cs/cdv006>

Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement*. *PLoS Med*, 6(7): e1000097. <https://doi.org/10.1136/bmj.b2535>

Mosnaim, G. S., Li, H., Damitz, M., Sharp, L. K., Li, Z., Talati A, Mirza, F., Richardson, D., Rachelefsky, G., Alfrick, J., & Powell, L. H. (2011). Evaluation of the Fight Asthma Now (FAN) program to improve asthma knowledge in urban youth and teenagers. *Annals of Allergy, Asthma & Immunology*, 107(4), 310-316.

<https://dx.doi.org/10.1016/j.anai.2011.07.008>

Mosnaim, G.S., Pappalardo, A.A., Resnick, S.E., Codispoti, C.D., Bandi, S., Nackers, L.,

- Malik, R.N., Vijayaraghavan, M.B.B.S., Lynch, E.B., & Powell, L.H. (2016). Behavioral interventions to improve asthma outcomes for adolescents: A systematic review. *Journal of Allergy and Clinical Immunology Practice*, 4(1), 130-141. <https://dx.doi.org/10.1016/j.jaip.2015.09.011>
- National Heart, Lung, and Blood Institute. (2007). *Expert panel report 3: Guidelines for the diagnosis and management of asthma*. NHLBI. https://www.ncbi.nlm.nih.gov/books/NBK7232/pdf/Bookshelf_NBK7232.pdf
- Perry, R., Braileanu, G., Palmer, T., & Stevens, S. (2019). The economic burden of pediatric asthma in the United States: Literature review of current evidence. *Pharmacoeconomics*, 2019(37), 155-167. <https://doi.org/10.1007/s40273-018-0726-2>
- Shrimali, B.P., Hasenbush, A., Davis, A., Tager, I., & Magzamen, S. (2010). Medication use patterns among urban youth participating in school-based asthma education. *Journal of Urban Health*, 88(1), 573-584. <https://dx.doi.org/10.1007/s11524-010-9475-z>
- Suwannakeeree, P., Deerojanawong, J., & Prapphal, N. (2016). School-based educational interventions can significantly improve health outcomes in children with asthma. *Journal of the Medical Association of Thailand*, 99(2), 166-174. <http://www.thaiscience.info/journals/Article/JMAT/10986013.pdf>
- Tseng, T., Chang, A.M., & Wu, C. (2017). A randomized control trial of an asthma self-management program for adolescents in Taiwan: A study protocol. *Contemporary Clinical Trials Communications*, 8, 122-126. <https://doi.org/10.1016/j.conctc.2017.09.005>

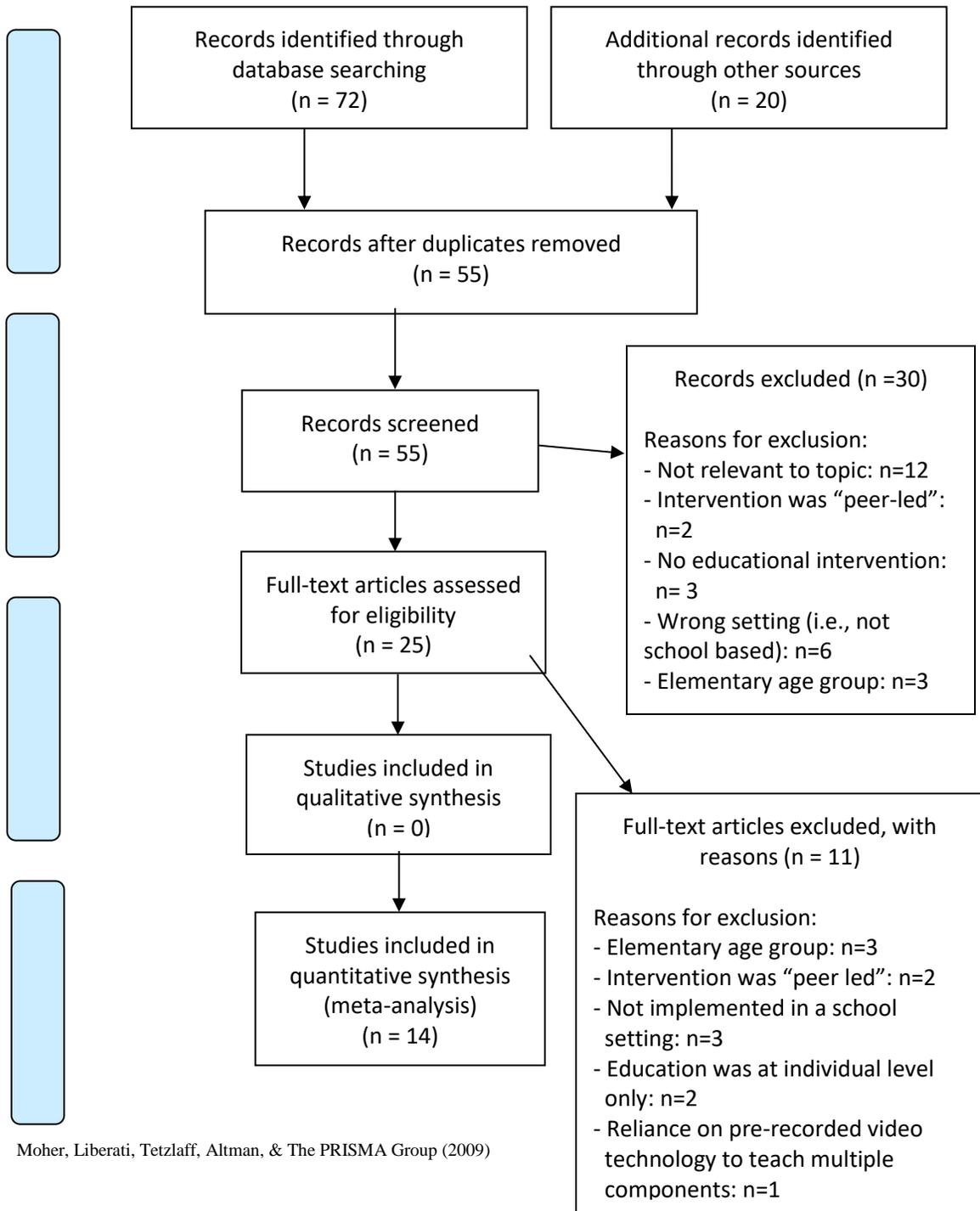
Vincken, W. Levy, M.L., Scullion, J., Usmani, O.S., Dekhuijzen, P.N.R., & Corrigan, C.J. (2018). Spacer devices for inhaled therapy: Why use them, and how? *ERJ Open Research*, 2018(4), 1-7. <https://doi.org/10.1183/23120541.00065-2018>

Zografos, K., Marshak, H.H., Dyjack, D.T., & Neish, C. (2010). The effects of an adolescent asthma education intervention on knowledge, intention, behavior, self-efficacy, and self-consciousness. *Californian Journal of Health Promotion*, 8(1), 60-71. <https://doi.org/10.32398/cjhp.v8i1.2031>

Appendix A: PRISMA Diagram



PRISMA 2009 Flow Diagram



Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group (2009)

Table 1.

Table of Evidence

Citation	Purpose	Design	Sample/ Setting	Intervention/ Methodology	Data Collection & Outcome Measures	Study Findings	Study Limitations & Worth to Practice /Project	Strength and Quality of Evidence (Dearholt & Dang, 2012)
Bruzzeze, Sheares, Vincent, Du, Sadeghi, Levison, ... & Evans. (2011). Effects of a school-based intervention for urban adolescents with asthma: A controlled trial.	To test the efficacy of <i>Asthma Self-Management for Adolescents (ASMA)</i> , a school-based intervention for adolescents and medical providers	RCT	n=345 primarily Latino and African American high school students in 5 high schools with self-reported asthma Eligibility: In 9 th or 10 th grade with moderate to severe persistent asthma Mean age 15.1 years	Researcher designed program-ASMA, which provides teens group & individual sessions and includes education for medical providers delivered over 8 weeks	Bimonthly assessments given to students + a baseline, 6 mo. & 12 mo. comprehensive assessment Outcome measures: asthma self-management, symptom frequency, QOL, asthma medical management, school absences, days with activity limitations, & urgent health care use	Over 12 mo., students reported significantly greater confidence to manage asthma over control group. Also took more preventative measures & had more use of written tx plans from their doctors. Had fewer nighttime awakenings, days with limitations, and school absences compared to control (all p-values <0.05) ASMA students had improved QOL, fewer acute care visits, ED visits & hospitalizations (all p-values <0.05).	Limitations: Reliance on self-report data, cannot generalize to non-minority populations ASMA program is effective in improving asthma self-management, and reducing symptoms, morbidity, and acute care use among minority adolescents. Findings have important	1A

						No differences b/w groups in steps to manage asthma episodes, daytime symptom frequency, or school reported absences.	public health & financial implications supporting use of school-based self-management education programs.	
Buckner, Copeland, Miller,, & Op't Holt (2018). School-based interprofessional asthma self-management education program for middle school students: A feasibility trial.	To assess whether a school-based asthma self-management education program presented by an interprofessional team was feasible for teens with asthma in a medically underserved area	Quasi-experimental pre-test post-test design	N=18 middle school students with asthma aged 11-14 from a medically underserved area in Mobile, AL Convenience sampling via self-selection or school nurse referral	Asthma Self-Management Education Program based on the <i>Power Breathing Program</i> for teens & Individual assessment and need-based education	Questionnaires including the Self-Efficacy Scale (SES), ARQ, PAQLQ, & childhood ACT Outcome measures: asthma symptom control, knowledge, self-management of asthma, self-concept, responsibility, interdependence & QOL, spirometry & PEF measurements	Improvements in mean PEF from pre to post-test, improvement in % of students moving from yellow to green zone on AAP from pre to post-test SS improvement in asthma knowledge via correct demonstration of 4 skills (p=0.00). Improvement in mean ACT scores from 18.45 to 19.69. Mean ARQ scores improved from 3.36 to 3.48 (both not SS)	Limitations: Small sample size, couldn't obtain all outcome data for all participants, no control group, little to no generalizability A collaborative asthma self-management education program for teens may increase	2C

						Improvements in SES mean scores PAQLQ not done post-test.	knowledge and asthma control in teens and shift them to take more responsibility for their asthma	
Clark, Shah & Little (2010). An evaluation of asthma interventions for preteen students.	To assess two different school-based asthma education programs' impact on several outcomes related to students' asthma	RCT	N=1292 students 10-13 years old with "probable" asthma in 19 Detroit area middle schools	1. OAS program from the American Lung Association 2. OAS + a peer led asthma involvement program Students were randomized to intervention 1 or 2 or a control group with neither intervention I	Baseline, 12, and 24 mo. data collected by telephone (parents), at school (students) & from school system records. Outcome measures: asthma symptoms, QOL, academic performance, self-regulation, & asthma-management practices	No SS changes in asthma symptoms or QOL seen with either program (p-values > 0.05). Students in program 1 saw a SS increase in grades at 24 mo.(p=-0.02). Students in program 2 saw a SS increase in asthma self-regulation scores at 24 mo. (p=0.01). Both programs slowed the decline in self-regulation in undiagnosed preteens at 12 mo. and increased self-	Limitations: co-occurring significant economic cutbacks for the school system during the study, causing many students to have to leave their schools, high attrition rate OAS+ peer-led support programs can	1B

						regulation at 24 mo. (p=0.04; p=0.003).	positively impact academic performance & asthma-self regulation among pre-teens but may have little impact on asthma symptoms and QOL	
Coelho, Barretto, Cardoso, & Souza-Machado (2016). The impacts of educational asthma interventions in school: A systematic review of the literature.	To review the literature on the impact of school-based asthma education interventions on asthma knowledge and morbidity for students, families, and school staff	Systematic review	N=17 articles included from 2005 to 2014	Database search of: CENTRAL, PubMed, LILACS, MEDLINE, and SciELO, & hand searching of reference lists Search terms: asthma, children, adolescent, schools, health, intervention study	Articles screened for inclusion/exclusion criteria, then data gathered on primary & secondary outcomes. Results on outcome measures combined & reported in aggregate. Primary outcome measure: knowledge of asthma	Asthma education promotes improvement of knowledge about the disease in at least one area: concept, pathophysiology, triggers, treatment, action plan, or beliefs about asthma 29% of studies showed a reduction in asthma symptoms & 35% showed a reduction in hospitalizations and ED visits, 47% showed no	Limitations: Individual studies had varying periods of f/u & inadequate school records of absences due to asthma, many studies included students with very mild asthma School-based	2A

				<p>Inclusion criteria: investigates the effectiveness of educational asthma intervention in a school environment, controlled clinical trial, targets both genders age 10-19 with asthma or non-asthmatic individuals, caregivers, or staff, published in any language in last 10 years.</p>	<p>Secondary outcome measures: s/s of asthma and exacerbation, hospitalization instances due to asthma</p>	<p>reduction in symptoms or hospital/ED encounters</p> <p>29% showed a reduction in school absenteeism</p> <p>41% of studies increased individuals' quality of life</p>	<p>asthma education interventions have the potential to improve many asthma outcomes for school-aged children and/or their caregivers and school staff</p>	
<p>Geryk, Roberts, & Carpenter (2017). A systematic review of school-based interventions that include inhaler technique education.</p>	<p>To review the literature on school-based asthma interventions that included instructions on inhaler technique & assess their impact on</p>	<p>Systematic review</p>	<p>N=9 articles included for review, from 1995 to 2016</p>	<p>Database search of PubMed, ERIC, CINAHL, Embase, Informit, & PsychInfo, & search of Google Scholar with various</p>	<p>Article eligibility screening completed by 2 authors</p> <p>2 reviewers individually extracted data w/ use of standardized extraction form</p>	<p>Few studies have evaluated asthma education program effects on inhaler technique</p> <p>Studies that have assessed this phenomenon demonstrated improved inhaler</p>	<p>Limitations: small sample size, included non-experimental studies, extreme variability in how inhaler technique</p>	<p>3C</p>

	children's ability to correctly use an inhaler			search term combinations Article inclusion criteria: school-based, about asthma, strictly an intervention, program, curriculum, or any form of education, targeted children and adolescents aged 5-18 years, taught inhaler technique, included inhaler technique as outcome measure	& analyzed each article Outcome measures: Inhaler technique	technique immediately post-intervention Studies with a 12 mo. f/u period show mixed evidence for sustained technique improvement	assessed/measured Inclusion of inhaler technique instruction recommended in school-based asthma education programs	
Harris, Kneale, Lasserson, McDonald, Grigg, & Thomas. (2019). School-based self-management interventions for asthma in children	To identify intervention features aligned with successful intervention implementation & to assess	Mixed methods systematic review	N= 55 articles included N=33 studies provided info for QCA	Database search of Cochrane Airways Trial Register, MEDLINE, Embase, CINAHL,	To measure effects of RCT interventions, data combined from eligible studies for primary outcomes:	Compared w/ no intervention, school based self-management interventions probably: ↓ mean hospitalizations by	Limitations: -Potential measurement error -Effect size transformations to complete	3A

<p>and adolescents: A mixed methods systematic review.</p>	<p>effectiveness of school-based interventions provided to improve asthma self-management among children via meta-analyses</p>		<p>N=33 RCTS for meta-analyses measuring effects of interventions</p>	<p>PsycINFO, CDSR, Web of Knowledge, DoPHER, DARE, IBSS, HTA, ASSIA, & SocAbs.</p> <p>Selection criteria: -Participants school-aged children w/asthma -Received an intervention in school -Intervention had purpose of increasing asthma knowledge, skills, or changing behavior</p> <p>RCTs analyzed via series of meta-analyses</p> <p>Qual. & Quant. studies, and quasi-experiments</p>	<p>-hospital admissions -ED visits -school absences -days of activity restriction d/t asthma</p> <p>Secondary outcomes: -unplanned HCP visits -daytime & nighttime symptoms -use of reliever therapies -asthma related QOL</p> <p>QCA used to identify intervention features leading to successful implementation</p> <p>Measures of implementation success: -reports of attrition -intervention dosage</p>	<p>approx. 0.6 admissions per child ↓ # of children who visit ED from 7.5% to 5.4% over 12 mo. ↓unplanned visits to HCPs from 26% to 21% over period of 6-9 mo. ↓ # of days of restricted activity by approx.. ½ day over a 2 week period ↑children’s’ asthma related QOL by small amount</p> <p>Evidence not clear about effects on school absenteeism & reliever medication requirements</p> <p>QCA results highlighted important qualities of successful intervention studies:</p>	<p>meta-analyses -Potential underpowered analyses -Trouble identifying process evaluation studies -harmful effects in few studies -potential for alternative explanations</p> <p>School-based asthma management interventions are likely to reduce hospitalizations & ED visits and improve symptoms among school-aged</p>	
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				analyzed via a QCA	-treatment adherence -irrespective effects of interventions	-being theory driven -involving parents -child satisfaction -running intervention outside of child's own time	children with asthma	
Lawson. (2014). School-based asthma education program: A research translation project.	To assess the impact of in-school asthma education program Kickin' Asthma on middle school student's asthma knowledge, health outcomes, and self-management skills	One group pre-test post-test pilot study	n=21 asthmatic adolescents in one middle school in Henrico County, Virginia	Kickin' Asthma curriculum implemented in 4, 40-minute sessions	Self-report surveys, pre and post-test Outcome measures: students' asthma knowledge, health outcomes (daytime & nighttime symptoms, activity restrictions), self-management skills, school absenteeism	Students experienced a modest decrease in # of days with daytime symptoms & # of nights with nighttime symptoms following the intervention. Also modest decreases in activity restrictions and school absences Post-intervention, modest decrease in knowledge of asthma fundamentals & a modest increase in knowledge of triggers, warning signs, medications,	Limitations: small sample size, no control group, limited generalizability, use of non-validated researcher created data collection survey KA may help to modestly improve some aspects of asthma knowledge, health-related outcomes, and self-	2C

						and asthma symptoms seen 48.2% improvement in student's recognition of how to properly use asthma meds, and modest increase in recognition of when to use a peak flow meter and spacer seen post-intervention	management skills among adolescents.	
Liptzin, Gleason, Cicutto, Cleveland, & Shocks (2016). Developing, implementing, and evaluating a school-centered asthma program.	To create and evaluate a school-centered asthma program to reduce asthma morbidity & create asthma-friendly schools	Pre-intervention post-intervention design	n=252 elementary and middle school students with asthma	Implementation of the Step-Up Asthma Program, which consists of 7 components: (1) case identification; (2) asthma risk and control assessment, (3) care coordination engaging the student, family, school nurse, and health care provider; (4)	Outcomes measured & tools: Asthma control (using ACT test) at baseline & every 3 mo. Questionnaire asking about asthma history, demographic characteristics, asthma management, asthma exacerbations, and asthma triggers given at	Increase in # of school AAPs & rescue medications at school & increase in # of controller meds prescribed SS increase in inhaler technique, OAS scores, & modified KA scores from baseline to f/u (p<0.005 for all) Decrease in asthma exacerbations &	Limitations: insufficient statistical power for some comparison tests, use of parental reports for exacerbations, pre-test post-test design, lack of a control group A comprehensive school-	2B

				<p>asthma self-management skills training; (5) evidence-based asthma educational curriculum: OAS and Kickin' Asthma (KA); (6) asthma education and skills training for school nurses and ancillary staff; and (7) provision of controller medication for children needing services while medical homes are established</p>	<p>baseline & yearly</p> <p>Pre and post asthma knowledge questionnaire to evaluate OAS & KA effectiveness</p> <p>Modified KA score system at baseline and at f/u (3 mo.) evaluating symptom frequency, health care utilization, activity limitation, and medication use</p> <p>Evaluation of inhaler technique using an inhaler device assessment tool at the beginning & end of program</p>	<p>ED visits (not SS) at 1 & 2 years</p> <p>SS decrease in urgent care visits, use of systemic corticosteroids, missed school days at 1 and 2 years (P-values all <0.007)</p> <p>SS decrease in hospitalizations at 1 year f/u (p=0.002) but not 2 year f/u (p=0.2)</p>	<p>based asthma program, which includes an in-school education program, can reduce asthma exacerbations and acute care visits and hospitalizations.</p> <p>KA is effective in improving inhaler technique and asthma knowledge & improving other aspects of asthma management for school-aged children (reflected in modified KA score)</p>	
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<p>Lloyd (2018). A school-based asthma education program to reduce absenteeism.</p>	<p>To examine the effectiveness of a school-based asthma education program on adolescents' knowledge of managing asthma & to observe its impact on absenteeism</p>	<p>One group pre-test post-test intervention study</p>	<p>N=30 middle-school aged students with asthma at one school</p>	<p>Implementation of the ALA's <i>Kickin' Asthma</i> curriculum in four weekly after school sessions</p>	<p>Self-report pre-test post-test knowledge surveys used to test asthma knowledge</p> <p>School absenteeism was self-reported by students at beginning and end of four weeks</p> <p>Improvement in asthma related symptoms & symptom control measured by ACT</p>	<p>There was SS improvement in scores for all 5 ACT items, indicating improved asthma control from pre-test to post-test (p=.001)</p> <p>SS decrease in student absences seen from pre-test to post-test (p=.001).</p> <p>SS increase in scores on knowledge surveys from pre-test to post-test (p<0.001)</p>	<p>Limitations: small sample size from 1 school, limits generalizability, self-reported data-potential for recall bias, no validity/reliability data for data collection tools</p> <p>KA may be an effective in-school program for increasing adolescents' asthma knowledge, improving asthma control and decreasing absenteeism</p>	<p>2C</p>
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<p>Mosnaim, Li, Damitz, Sharp, Li, Talati Mirza, ... & Powell (2011). Evaluation of the Fight Asthma Now (FAN) program to improve asthma knowledge in urban youth and teenagers.</p>	<p>To assess the impact of the Fight Asthma Now (FAN) educational program among 2 populations of predominantly low-income minority students: youth (3rd through 6th graders) and teens (7th and 8th graders).</p>	<p>Stratified , 2 armed, clustered , 3:1 randomized design</p>	<p>N=344 youth; N= 192 teens, predominately from low-income minority backgrounds</p>	<p>Fight Asthma Now (FAN) educational program, administered over 45 minutes on 4 consecutive school days</p>	<p>Pre- and post-intervention asthma knowledge questionnaire used to assess asthma knowledge</p> <p>Observation used to assess spacer technique competency</p> <p>Student scored based on absolute # of correct items</p>	<p>Prior to stratification of data to control for various clusters of factors, no SS difference seen in changes in scores from pre-test to post-test b/w intervention and control groups for asthma knowledge or spacer technique in youth or teens.</p> <p>Multilevel models adjusting for school, class, ethnicity, sex, and pretest score predict the FAN intervention significantly increased both knowledge and spacer competency scores among both youth and teen participants (p=.011 for knowledge score among teen students, p<0.0001 for all other cases).</p>	<p>Limitations: Limited generalizability, could not achieve complete randomization, unequal balance of sex and ethnicity b/w groups, significant missing post-test data in teen intervention group</p> <p>FAN program may be an effective in-school educational program to improve asthma & spacer use among minority low-income teens</p>	<p>1B</p>
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<p>Mosnaim, Pappalardo, Resnick, Codispoti, Bandi, Nackers, & Malik (2016). Behavioral interventions to improve asthma outcomes for adolescents: A systematic review.</p>	<p>To characterize behavioral interventions at the child, family, home, medical system, and community level to improve asthma management among adolescents</p>	<p>Systematic review</p>	<p>N=24 studies from 2000 to 2014</p>	<p>Database search of PubMed, SCOPUS, OVID, PsycINFO, CINAHL and reference reviews completed to obtain articles</p> <p>Article inclusion criteria: title or abstract included asthma and intervention and education OR self-management OR behavioral OR technology OR trigger reduction, & mean/median age of participants 11-16 years old</p> <p>PRISMA reference standards for</p>	<p>Title & abstract review completed by a minimum of 2 authors at a time</p> <p>Studies grouped by intervention level (single; ,or multilevel- including combinations of the child, family, home, medical system & community) & analyzed in groupings according to identified intervention level</p> <p>Outcomes summarized for articles at each intervention level; studies identified as having positive or negative results</p>	<p>Objective monitoring of daily ICS adherence, allergist/immunologist feedback on medication-taking behavior & school nurse directly observed therapy can improve medication compliance in adolescents</p> <p>School-based group interactive learning is effective at increasing asthma self-management skills among adolescents</p>	<p>Limitations: no meta-analysis, potential publication bias</p> <p>Schools are an appropriate setting for group educational interventions to improve asthma knowledge and self-management skills</p>	<p>2A</p>
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				reviews utilized				
Shrimali, Hasenbush, Davis, Tager, & Magzamen, (2010), Medication use pattern among urban youth participating in school-based asthma education.	To assess whether participation in Kickin' Asthma program improved appropriate asthma medication use among middle school students & to determine whether improvement in med use resulted in subsequent improvement in asthma symptoms	One group pre-test post-test design	N=579 Sixth grade students in non-charter public schools in the predominantly low-income urban Oakland Unified School District, California	Kickin' Asthma curriculum delivered over four sessions	Students completed an 11-question pre- and 3 mo. post-survey assessing symptom frequency and medication use.	Students participating in program experienced SS improvements in appropriate med use in all categories: 20.0% of students initiated appropriate reliever use when having symptoms ($p < 0.001$), 41.6% of students who had inappropriate medication use "before exercise" initiated reliever use ($p < 0.001$), and 26.5% of students who had inappropriate medication use when "feeling fine"	Limitations: did not assess frequency of med use, appropriate technique or spacer use, self-report data subject to recall bias, no control group, several possible confounding factors identified, high attrition pre-to post	2B

						<p>initiated controller use ($p < 0.02$).</p> <p>61.6% of participants reported fewer symptoms at post-survey, though no SS positive correlation between correct med use and reduced symptoms demonstrated.</p>	<p>Participation in KA has the potential to improve correct medication use among adolescents as well as positively impact asthma symptoms</p>	
<p>Zografos, Marshak, Dyjack, & Neish, (2010). The effects of an asthma education intervention on knowledge, intention, behavior, self-efficacy, and self-consciousness.</p>	<p>To evaluate the effects of an asthma education intervention on various outcomes related to adolescent's asthma</p>	<p>Non-equivalent comparison on group design, with 3 week delayed intervention in comparison on group, shifting to pre-test post-test design</p>	<p>n=87 asthmatic adolescents in six middle and high schools in California</p>	<p>Modified version of ALA's <i>Kickin' Asthma</i> curriculum</p>	<p>Pre-test/ Post-test self-report questionnaire assessing knowledge, intention to perform behaviors, actual behaviors, self-efficacy, and self-consciousness related to asthma.</p>	<p>No SS differences at post-test seen between two groups for any of the variables. After controlling for baseline values, SS improvements seen over time within groups on knowledge ($p = 0.00$), intentions to act when alone ($p < 0.05$), behaviors such as a spacer & peak flow use ($p < 0.05$), and self-efficacy ($p = 0.08$). Not all improvements</p>	<p>KA curriculum may improve asthma knowledge & self-efficacy short term, & asthma intention and behaviors longer-term. Limitations: low statistical power, selection bias/ no randomizati</p>	<p>2C</p>

						sustained at 5-week f/u (i.e. knowledge, self-efficacy) No effects of KA on self-consciousness.	on to groups, included all types of asthma pts.	
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Abbreviations Key

AAP= Asthma Action Plan

ACT= Asthma Control Test

ARQ= Asthma Responsibility Questionnaire

ASMA= *Asthma Self-Management for Adolescents* program

b/w= between

d/t=due to

ED= emergency department

FAN= *Fight Asthma Now* Program

FEF= forced expiratory flow

FEV₁= forced expiratory volume in one second

FVC= forced vital capacity

f/u= follow-up

HCP= healthcare provider

ICS= inhaled corticosteroid

KA= Kickin' Asthma

MDI= Metered dose inhaler

Mo.=Months

OAS= *Open Airways for Schools* Program

p= p-value of test statistic

PAQLQ= Pediatric Asthma Quality of Life Questionnaire

PEF= peak expiratory flow
PFT= pulmonary function test
PRISMA= Preferred Reporting Items for Systematic Reviews and Meta-Analyses
QCA= qualitative comparative analysis
QOL= quality of life
Qual.= qualitative
Quant.= quantitative
RCT= randomized control trial
SES= self-efficacy scale
SS= statistically significant
s/s= signs & symptoms
Tx= treatment
w/= with
↓= decrease in
#= number

Appendix C: Algorithm for Classifying Asthma Severity for Recruitment Eligibility

Your child was referred by their school nurse as a potential participant or the Kickin' Asthma project. However, this project is specifically meant for adolescents with persistent asthma. This means they have asthma which affects them more than just once in a while. To make sure your child has persistent asthma, I will need to ask you a few questions. If your child does not meet criteria for persistent asthma, they will not be qualified to participate in this project. At that point, we cannot move forward and the call will end.

Questions to ask parents:

1. Does your child currently take a daily controller medication for their asthma? Controller medications are medications your child takes every day to prevent asthma attacks. Usually these come in inhaler form.

_____ Yes _____ No

2. How old is your child? _____

3. Does your child meet any of the criteria highlighted in yellow in the chart below for classification of persistent asthma?

_____ Yes _____ No

Note: Parents will be asked about frequency of asthma symptoms, nighttime awakenings, short-term beta-agonist use, and interference with normal activity using the charts below as a visual aid. Answers will be marked down by the student investigator to assure eligibility. As long as the child falls into one of the categories highlighted below, or they are on a daily controller medicine, they will be included in the project.

***Please note, "short-term beta-agonist use for symptom control" means use of a rescue inhaler like albuterol for asthma symptoms (wheezing, shortness of breath, chest tightness, etc.). This does NOT count for albuterol being used prior to exercise.**

For children aged 12 years+, use this chart:

— Assessing severity and initiating treatment for patients who are not currently taking long-term control medications

Components of Severity		Classification of Asthma Severity ≥12 years of age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited

For children under age 12 years, use this chart:

Components of Severity		Classification of Asthma Severity (Children 5–11 years of age)			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited

Reference:

National Heart, Lung, and Blood Institute. (2007). Expert panel report 3: Guidelines for the diagnosis and management of asthma. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK7232/pdf/Bookshelf_NBK7232.pdf

Appendix D: Parent Consent Form

Salisbury University Consent Virtual Asthma Education Program

Dear Parent/Guardian,

I am currently working on a project looking at whether a virtual asthma education program can improve adolescents' management of their asthma. This program is called Kickin' Asthma. I am interested in learning about how this program would affect middle schoolers' asthma symptoms and their ability to correctly use an inhaler. I would also like to see if virtual asthma education reduces students' activity limitations and visits to the emergency room.

This project is purely educational in nature. Students will be taught in a group setting how they can care for their asthma more independently. Your child will not be given any individual medical advice or treatment for their asthma.

Project Details & Timeline

By participating in this project, your child will attend a total of **six** Zoom video sessions as outlined in the recruitment letter attached to this consent.

During the first Zoom session, I will introduce you and your child to the project. I will also run through project criteria, obtain your child's assent to participate, and collect baseline data. Baseline data collection will include your child demonstrating how they use their inhaler with a spacer. Your child will be mailed a spacer with their Kickin' Asthma workbook and other KA materials as soon as I receive your consent form. Your child will be given feedback on their inhaler/spacer technique. They will learn more about this later on in the education program. At any time while completing the online questionnaire, you and your child will be allowed to skip questions if you do not feel comfortable answering them. This will not count against your child in any way. Your child can also ask to stop if they feel uncomfortable with demonstrating how to use a spacer. It will be asked that your child at least attempts to participate in these data collection activities, as it is a requirement to participate in this project.

Following our first Zoom session together, your child will be asked to attend four, 45 minutes asthma education sessions via Zoom. These four sessions will take place over four weeks in February 2021. One session will take place every week. Sessions take place during normal school hours and are held in a group with other students from your child's school. One staff member from the school will also be present. This is to ensure professional conduct of the Salisbury graduate student and conduct of student participants is upheld. The four educational sessions will be held at a different time each week during offline learning days (Wednesdays). If there is a time your child cannot attend for any reason, please e-mail me at jerisman1@gulls.salisbury.edu and I can arrange to have your child attend a different session time with students from another school. The three schools participating in the project are [names of schools].

During the four asthma education Zoom sessions, students will learn about asthma and be taught how to correctly use an inhaler and valved holding chamber (spacer). No parts of the educational sessions will be video-taped or recorded on audio. To ensure confidentiality of all students who are participating in this project, parents and school staff members will not be invited to attend the online sessions. You are invited to look through your child's Kickin' Asthma workbook that will be mailed home if you wish to know what your child is being taught. You can also e-mail the primary investigator, Anastacia Keenan at ajkeen@salisbury.edu or Thomas Lamey, certified asthma educator and co-investigator at twlamey@salisbury.edu should you have any questions about the curriculum. If your child is absent from school on one of the days when a Kickin' Asthma education session takes place, there will be no make-up session for them to attend. However, your child will be given pages in their workbook to review to catch up on any material missed and a review video will be available for them to view on Google Classroom prior to their next session. They can e-mail Anastacia Keenan or Thomas Lamey (e-mails above) with any questions about what they missed, and those questions will be answered as soon as possible.

Following the group Zoom sessions, your child will be asked to complete the "Asthma and You" questionnaire two more times. Once immediately following the last group session, and once more after three months have gone by. The last survey will be completed in May 2021. Surveys can be submitted through Google Classroom. Reminder e-mails will be sent to you when surveys are due.

Also, in May 2021, your child will be asked to attend their sixth and final Zoom session. There will be a date and time arranged in school where these final evaluations are held if school is in person. Only the school staff member, your child, and I will be in attendance. At this Zoom meeting, your child will be asked to demonstrate their inhaler and spacer use technique once more. This final Zoom session will be completed at home if school remains closed, or if this is your preference. You must be present on Zoom with your child in this case.

Risks of Participation

The primary risk involved in your child's participation is the time commitment required. Your child will be required to spend a total of about four hours of their time to complete this project. Three of these four hours (for the 4 educational sessions) will result in missed class time. The other hour is for questionnaire completion and the two other Zoom meetings which should be done outside of school hours.

Students will be required to make up any missed classwork. This must be arranged with their teachers. School principals are aware students may need accommodations for missed class time and will support this request. Additionally, there is a slight risk of data breach with e-mailing consent and assent forms. E-mail cannot always be considered a secure means of transmission. You and your child should use the student's secure school assigned e-mail for sending forms if at all possible to mitigate this risk. There may also be a minor inconvenience for you and your child with filling out surveys. Lastly, being asked to demonstrate a skill, as well as discussing asthma attacks may cause feelings of

minor anxiety in your child. Every attempt will be made to minimize these risks by explaining what each session will involve with your child before starting. This way, they know what to expect.

Benefits of Participation

The main benefit of your child's participation is to help us understand whether this virtual education program is able to improve middle schoolers' asthma self-management. If so, we maybe able to educate and help many students with asthma in the future by continuing the program. Students will also receive a free asthma education workbook, ear buds, valved holding chamber (spacer), and peak flowmeter to keep for participating.

Sharing of Project Results

Findings from this project will be presented to the school board and may be published in journals or presented at conferences. Findings will also be presented to Salisbury University faculty and students. Lastly, project results will be shared with the American Lung Association, who created the educational program being taught. Your child's name will not be included in any presentations or publications. Their participation in this project is confidential.

Assent, Voluntary Participation & Confidentiality

I will get your child's okay to participate before beginning the program. Your child will be given the option to opt out of or leave any session at any time if they need to. Your child may also withdraw from the project at any time without penalty. During data collection, your child may skip any questionnaire questions or activities if they feel uncomfortable. To minimize inconvenience, questionnaires will be made as short as possible, taking no more than 10 to 15 minutes to complete. Students will be given one week to complete the questionnaires.

Your child's confidentiality is of utmost importance to us. Your child's participation or non-participation in the project will be kept confidential. Should you and your child choose to participate, the only people who will know of their participation are myself, the SU faculty listed below, and one school staff member from your child's school.

Your child will not be asked to put their name or any identifying information on any documents. This way, their answers to questions cannot be connected to them. For further protection, questionnaire data will be stored in a secure data file on the Salisbury University student's laptop when it is not being used. Scored data for your child's inhaler technique will be kept in a secure spreadsheet on the student researcher's password protected laptop. No names will be recorded with data. Instead, your child will be assigned a project ID number to keep track of their answers. Data will only be seen by the student and professors at Salisbury University who are conducting this project. Their names are listed again below.

Participation in this project is voluntary. If you choose to have your child *not* participate, this decision will have no negative impact on your child in any way. Participation or non-participation will not affect your child’s school grades. If your child does participate, they will be given time to make up any work they missed in class. This may involve them having to do some make-up work after school hours. During group education days, your child will still break for lunch as normal.

If you give consent for your child to participate in this project, I will also be getting your child’s permission before the program starts. It is okay for your child to state they do not want to participate in the project even if you give the okay. I will need to have your consent and your child’s agreement before continuing the project with your child. If you wish to ask any questions about the project before signing this consent, please contact Anastacia Keenan at ajkeen@salisbury.edu.

If your child should have any adverse effects or if you should have concerns or questions about the study at any time, please contact the primary investigator, Anastacia Keenan. She can be reached at 410-546-4381 or ajkeen@salisbury.edu. You may also contact the Office of Graduate Studies and Research at Salisbury University at 410-548-3549 or toll free 1-888-543-0148. This research is approved by the Salisbury University’s IRB under protocol number 11.

Other contacts for questions about this study include:

Student Investigator- Jessica Erisman: jerisman1@gulls.salisbury.edu
 Co-Investigator- Thomas Lamey: twlamey@salisbury.edu

By signing this consent form, you are acknowledging that you have read both the recruitment letter and consent form in full and understand the benefits, risks, and requirements of this project.

Your signature documents your permission for the named child to take part in this research.

Printed name of child

Printed name of parent or [] individual legally authorized
 [] to consent for the child to participate

Date

Signature of parent or [] individual legally authorized
 [] to consent for the child to participate

Date

Please provide your mailing address for Kickin' Asthma Materials:

First Name

Last Name

Street Address

Apt #, Floor, Suite (etc.)

City

State

Zip Code

If you do not wish to provide your mailing address, please e-mail Anastacia Keenan at ajkeen@salisbury.edu and she can arrange a time to meet you to pick up KA materials at Salisbury University.

Appendix E: Child/Minor Assent Form

Impact of a Nurse-Led Virtual Asthma Education Program on Middle School-Aged Children's Asthma Self-Management

Hello. My name is Jessica Erisman. I am doing a project to see if an online asthma teaching program can make students' asthma better. I want to know if four asthma teaching sessions can lessen students' breathing problems. I will also see if this program helps students correctly use their inhalers and spacer devices.

You are being asked to join this project because your school nurse said you have asthma. This program is designed for kids your age with asthma to help them learn more about what causes it and how they can manage it to stay healthy.

The purpose of this program is to teach you about asthma. I will not give you individual advice about your asthma or treat your asthma. That is your doctor's job.

To be a part of this project, I will ask you to come to four online asthma classes. These classes will be taught on Zoom. You will log in from home. These classes are group sessions. In each class, you will be learning with other students in your school. I will lead each session. Another adult from your school will also be joining us. Your participation in this project is confidential. Only my professors, your fellow classmates, your school staff member, and I will know you are participating. For extra privacy, you can change your name and video settings on Zoom if you wish. This is okay as long as I know who you are.

You will be asked to be active in our discussions and activities. It will take about 45 minutes of your time for each Zoom session. You will be given a workbook to follow along in as we go through our sessions.

For this project, you will also be asked to fill out and submit surveys three times with your parent's help. You will fill out the same survey each time. These surveys ask you several questions about your asthma. They take between 10 and 15 minutes to finish.

You will also be asked to demonstrate how you use an inhaler and spacer two times. The first time will be a week or two before our first asthma teaching session. I will meet with you and your parent on Zoom to do this. The second time you demonstrate, you will be on Zoom with one of your school staff members and me. This should take only about 5 to 10 minutes.

The asthma teaching program I will be leading is called *Kickin' Asthma*. Participating in this program is voluntary. This means you have a choice to participate or not participate. If you do not participate, you will not be penalized in any way.

If you do participate, at any time during our virtual meetings, you can skip any questions you are asked. This will not be held against you. When you are filling out your surveys,

you can also skip questions if you do not want to answer. Lastly, when you are doing your inhaler demonstrations, you may also stop at any time if you want or need to. If you decide at any time you do not want to participate in the asthma program anymore, you can simply tell me you are done.

There are a few risks of participating in this project. You will miss about three hours of class time total. You will be required to make up your work. Your principal has agreed that your teachers must provide you plenty of time to make up any work you missed if you need it. Some of this make-up work might need to be done at home.

You may also feel bothered or nervous about filling out surveys and doing your inhaler demonstrations. Lastly, talking about asthma may make you feel anxious. If this happens, you can take a break from any session and come back when you are ready.

Your parent(s)/people taking care of you have said it is okay for you to participate in this project. You can ask me or them questions at any time. Again, you have the choice on whether or not you want to be in this project and at any time you can change your mind. If you choose not to participate, that's okay. This decision will not negatively affect you or your grades in any way.

Do you have any questions?

If you have questions before our first Zoom meeting, please e-mail them to ajkeenan@salisbury.edu.

Are you willing to come to the Zoom classes and participate in activities and demonstrations?

Are you willing to fill out the brief questionnaires, and demonstrate your use of an inhaler and spacer?

To be completed by the person obtaining assent:

Child's/Participant's response: **Yes** **No**

Check which applies below:

- The child/participant is capable of understanding the study
- The child/participant is not capable of understanding the study
- The **child's parent or participants' Legally Authorized Representative** has already signed a consent document.

Child's/Participant's Name (printed)

[If appropriate, out of respect for the person, invite the participant to sign the form if they want to.]

Child's/Participant's Name (signature)

Name (printed) and Signature of Person Obtaining Assent

Date

Appendix F: Data Collection Instruments

Asthma & You Questionnaire

Produced by the American Lung Association to accompany “Kickin’ Asthma” Curriculum

Page 1



For office only. Do not write here.	
School: _____	Period: _____
Date: _____	
Pre	Post

Asthma and You

First name: _____ Last name: _____ Birth date: _____

Gender: Boy Girl

These questions are about your own experiences. Please answer as truthfully as you can. If we think that your symptoms could be made better, we may share the information with your school nurse or your parent/guardian. We will talk to you first before we do this.

1. In the **past 4 weeks**, how often do you have coughing, wheezing, chest tightness, or shortness of breath?

- Not at all
- Less than 1 day each week
- About 1-2 days each week
- Between 3 and 6 days each week
- Every day

2. In the **past 3 months**, how often have you usually had coughing, wheezing, chest tightness, or shortness of breath?

- Not at all
- Less than 1 day each week
- About 1-2 days each week
- Between 3 and 6 days each week
- Every day

Fill in the blank with a number (even if the answer is “0”).

- 3. My asthma caused me to miss about _____ days of school in the past month.
- 4. My sleep was bothered by asthma about _____ times in the past 4 weeks.
- 5. My asthma made it hard for me to play a sport or exercise about _____ times in the past month.

Just a couple more questions! Keep going!

Please mark the best answer:

- 7. I use a **spacer** with my inhaler: **Every time** **Sometimes** **Never** **I don’t know**
- 8. In the **past 3 months**, how many times did your asthma cause you to go to the **emergency room** or hospital?
 - 0 times** **1 time** **2 times** **3 times** **4 times** **5-10 times** **more than 10 times**





This section is done with instructors' help using the photos to aid student.

Do you use any medicine (like puffers/inhalers) now for your asthma or breathing problems?

Yes No

Code	Used when?	Used how often?	Ran out?
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	

Notes:



SPACER



PEAK FLOW METERS



Asthma Relievers

Short-Acting Beta₂-Agonist

 Alupent B1	 Xopenex HFA B16	 ProAir HFA B8	
 Proventil HFA B8	 Ventolin HFA B8	 Generic Albuterol B8	 Zenith Goldline B8

Anticholinergic

 Martec B8	 Dey, LP B11	 Xopenex B12	 Methylxanthine 100 300 200 400	 Combivent B14	 Atrovent B15
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Provided by the Central California Asthma Project (559) 446-2323 or (800) 586-4872 (rev. 5/07)





Asthma Controllers

The infographic is organized into several categories with red lines connecting them to the product images:

- Steroidal:** AeroBid A1, AeroBidM A2, Azmacort A3, QVAR A4, Asmanex A19.
- Leukotriene Modifier:** Singulair A10.
- Long-Acting Beta₂-Agonist:** Flovent A6, Flovent Rotadisc A7, Serevent A13.
- Non-Steroidal:** Pulmicort Turbuhaler A8, Pulmicort Respules A9, Intal A15, Cromolyn A16, Tilade A17.
- Dual Component Therapy:** Zyflo FilmTAB A11, Accolate A12, Advair HFA A20, Advair A18, Symbicort A21.

Each product is shown with its packaging and a yellow box containing its name and code (e.g., A1, A2, etc.).

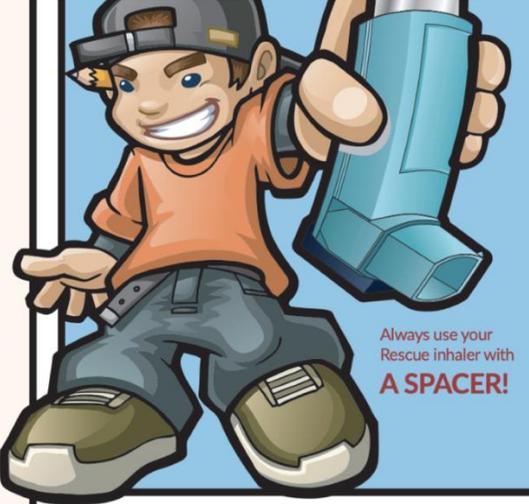
Tool for Assessing Correct Spacer Technique

Evaluator will put a check mark next to each step correctly performed.

Using Your Inhaler With A Spacer



- 1. Get Your Medicine Ready**
 - Shake the inhaler
 - Take the caps off the inhaler and the spacer
 - Prime the inhaler, if needed
 - Connect the inhaler to the spacer
- 2. Get Yourself Ready**
 - Stand up straight
 - Breathe out to empty your lungs
 - Close your lips tightly around the spacer mouthpiece
- 3. Take a Puff**
 - Press the inhaler to spray one puff as you start a slow, deep breath
 - Continue to breathe in slowly and deeply for 5 - 7seconds
- 4. Hold Your Breath Exhale Slowly. Then Repeat If Needed.**
 - Hold your breath while you slowly count to 10
 - Breathe out slowly
 - If your doctor wants you to take two puffs, wait one minute before your next puff
 - Rinse out your mouth and put the caps back on the inhaler and spacer



Always use your Rescue inhaler with A SPACER!

WITH SPACER



WITHOUT SPACER



Appendix G: American Lung Association License Agreement Letter

**LICENSE AGREEMENT**

This License Agreement is between American Lung Association (“ALA”), with its principal place of business at 1331 Pennsylvania Avenue NW, Suite 1425N, Washington, DC 20004 and Jessica Erisman, Salisbury University Doctor of Nursing Practice Student. You have asked for permission to use certain materials owned by ALA in your research project or study. ALA grants your request subject to the following terms and conditions. Your signature below indicates your agreement to comply with all the terms and conditions outlined below.

Nature of Research Project or Study (the “Study”):

Impact of a Nurse-Led In-School Asthma Education Program on Middle School-Aged Children’s Asthma Self-Management: Effects on Symptoms, Spacer Use Technique & Emergency Room Utilization

ALA Materials to be Use in the Study:

Kickin’ Asthma curriculum, “Asthma and You” Pre-Test and Post-Test Assessments

How the ALA Materials will be Used in the Study:

The Kickin’ Asthma curriculum will be used to educate middle-school aged children in three local public schools about the asthma disease process and self-management. Implementation of KA will be done virtually via Zoom K-12 due to the COVID-19 pandemic. Students participating in the study will be mailed their KA workbooks and asked to use them to follow along virtually. Pre-test and post-test questionnaires will be administered to the students once before and twice after the curriculum is taught over four sessions to see the impact the program had on students and their asthma.

Time Period for Use of ALA Materials:

January 2021-August 2021

Your Contact Information (Name, Title, Address, Phone and Email):

Jessica Erisman, BSN, RN
Salisbury University Doctor of Nursing Practice Student

[REDACTED]
[REDACTED]
[REDACTED]

Jerisman1@gulls.salisbury.edu

Terms and Conditions

1. You will use the ALA Materials only as authorized herein and in no other manner or for any other purpose.
2. If ALA believes that your use of the ALA Materials requires training, you will attend all required trainings (at your cost and expense) and will use the ALA Materials in accordance with such trainings.
3. You shall not modify the ALA Materials in any manner without ALA’s prior written permission.
4. You shall share the results of the Study with the ALA and provide the ALA a reasonable opportunity to review and comment upon the results of the Study before such results are made public.
5. You shall keep all copyright and other notices on the ALA Materials.
6. You shall acknowledge the ALA in the results of the Study as follows:

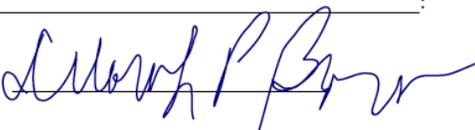
ALA will be acknowledged in the methodology section for allowing me use of the Kickin’ Asthma Curriculum, and the pre-test post-test questionnaires will be used for data analysis.

7. Your contact person at the ALA for the purpose of this License Agreement shall be:

John Keith
Cindy Trubisky

8. Use this space for any additional terms

ACCEPTED AND AGREED TO ON BEHALF OF

By: 

Name: Deborah P. Brown

Title: American Lung Association, Chief Mission Officer

Date: Updated 09/25/2020 (Original 04/01/2020)


9/25/2020
Salisbury University DNP Student

Appendix H: SWOT Analysis Table

<p>Strengths---</p> <p>Dedication of school nurses School nurses have previous asthma knowledge Invested school health services supervisor School administrators support at all three schools</p>	<p>Weaknesses</p> <p>Low parent involvement in school health activities Limited availability of school nurses to help with project activities Limited school system funding to pay for substitute nurse staffing Short staffing of substitute nurses to cover health office for training/future KA implementation School buildings currently closed due to COVID-19 pandemic requiring virtual project implementation</p>
<p>Opportunities</p> <p>ALA staff eager to train nurses Potential to expand program to all middle schools in the county Potential to expand program to surrounding Maryland counties KA materials provided free of cost by the ALA Short training time to become a KA facilitator (~ 1 hour)</p>	<p>Threats</p> <p>Training for KA facilitators only occurs a few times per year Competing school health priorities Newly updated KA curriculum, has not yet been extensively piloted with new changes KA requires four separate sessions for implementation, can be time consuming Unknown duration of COVID-19 pandemic impact on school buildings</p>

Appendix I: Salisbury University IRB Approval Letter & Amendment Approval

Salisbury University
Institutional Review Board
Committee on Human Research
Phone: (410) 548-3549
Fax: (410) 677-0052
Email: humanresearch@salisbury.edu

IRB Research Protocol Approval Notification

Date: 12/9/2020

To: A. Keenan
J. Erisman
RE: Protocol #11
Type of Submission: Full
Type of IRB Review: Full
Protocol is scheduled to begin 1/2021 end 5/2021

Approval for this project is valid from 12/9/2020 to 5/31/2021.

This letter serves to notify Dr. Anastacia Keenan and Jessica Erisman that the Salisbury University (SU) Institutional Review Board (IRB) approved the above referenced protocol entitled, Impact of a Nurse-Led Virtual Asthma Education Program on Middle School-Aged Children's Asthma Self-Management: Effects on Symptoms, Valved Holding Chamber (Spacer) Use Technique & ER Utilization

Pursuant to Federal regulations 21 CFR 56.109, the IRB has determined that this protocol qualifies for Full review.

Federal regulation 45 CFR 46.103 (b)(4)(iii) requires Primary Investigators (PI), except when a subject is in immediate danger, to assure any change to an approved protocol is not initiated prior to IRB review and approval. Additionally, the PI must also inform the IRB of unanticipated problems involving risks to participants.

Your research is scheduled to begin 1/2021 and end 5/2021. It is the PI's responsibility to submit continuing review reports in a timely manner (at least 3 weeks prior to scheduled end date on the protocol approval).

The SU IRB is organized and operated according to guidelines of the United States Office for Human Research Protections and the United States Code of Federal Regulations and under Federal Wide Assurance No. FWA00020237.

If you have any questions about this review or questions, concerns, and/or suggestions regarding this process, please do not hesitate to contact the Office of Graduate Studies and Research at 410-548-3549 or humanresearch@salisbury.edu.



IRB Amendment Request Form

Jessica Crisman

Principal Investigator:	Anastacia Keenan
Protocol Number:	11
Research Title:	Impact of a Nurse-Led Virtual Asthma Education Program on Middle School-Aged Children's Asthma Self-Management: Effects on Symptoms, Valved Holding Chamber (Spacer) Use Technique & Emergency Room Utilization

1. Type of Amendment Request: Check all Changes that apply

- Research Personnel
- Recruitment Methods/ Selection Criteria
- Data Collection Procedure
- Forms
- Other

2. Summary: Provide a detailed description of all changes and rationale below. Attach new and/or revised document(s) with your amendment request. (Do not revise initial IRB application or attach with request; initial applications may not be altered after approval is granted.)

Due to only two students agreeing to participate in the Kickin' Asthma project from [redacted] School, I would like to change the protocol to combine the weekly Zoom sessions to have [redacted] School students participate with [redacted] School Students for a better overall group experience. If I kept the protocol as is, there is a chance that if only one student from [redacted] School shows up to a session, the education would change from a group session to a one-on-one session, which is not how Kickin' Asthma sessions are intended to be delivered. Combining the sessions for students from each school would make for a total group of six students in the combined Zoom session.

Parents and students from both [redacted] School and [redacted] School will be notified of this change first via a phone call, and then in writing via e-mail to let them know of the change and also to make them aware of how this will



affect their child's privacy. Essentially, each child will now take on the risk of students from the other school knowing of their participation in the project. School nurses from both [REDACTED] School and [REDACTED] School, who will take turns sitting in on the Zoom will also now know of student participation from both schools. Nothing else about the privacy measures from the original protocol will change. The text in Appendix A will serve as the parent phone call script for this change. The text in Appendix B will serve as the parent e-mail script for this change. Parents and students will be given a chance to withdraw from the project after hearing of the change either verbally or by e-mail. If parents express they are ok with the change, students will attend the combined sessions for the remainder of the project.

In the original IRB submission, the IRB approved the following statement in the parent consent form:

"Following our first Zoom session together, your child will be asked to attend four, 45 minutes asthma education sessions via Zoom. These four sessions will take place over four weeks in February 2021. One session will take place every week. Sessions take place during normal school hours and are held in a group with other students from your child's school. One staff member from the school will also be present. This is to ensure professional conduct of the Salisbury graduate student and conduct of student participants is upheld. The four educational sessions will be held at a different time each week during offline learning days (Wednesdays). If there is a time your child cannot attend for any reason, please e-mail me at jerisman1@gulls.salisbury.edu and I can arrange to have your child attend a different session time with students from another school. The three schools participating in the project are [REDACTED] and [REDACTED]."

This did not require notification of parents from other schools that a child from another school would be joining in. This amendment request is essentially just allowing two students to attend sessions with another school, but permanently for the remainder of the project. However, we will take extra steps in notifying parents from both schools of the change and make them aware of how this changes the child's privacy.

Description: Change in Implementation Procedure

X I am the principle investigator. I am submitting this form electronically and this submission constitutes my signature.

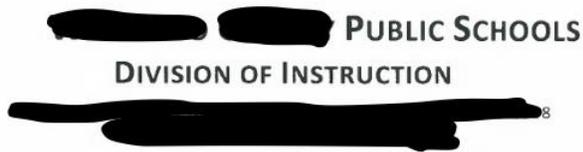


Principal Investigator: Anastacia Keenan

Date: 2/3/2021

Office use only	Amendment #: 11A
Submission Date: 2-3-2021	
IRB Approval Date: 2-15-2021	

Appendix J: Agency Collaboration Letter



October 14, 2020

This letter is concerning the quality improvement study that Anastacia Keenan, Salisbury University Assistant Professor of Nursing, Thomas Lamey, Salisbury University Assistant Professor of Respiratory Therapy, and Jessica Erisman, Salisbury University Doctor of Nursing Practice Student are requesting to conduct at [REDACTED] Public Schools ([REDACTED]). As the Chief Academic Officer for [REDACTED] Public Schools, I give Anastacia Keenan, Thomas Lamey, and Jessica Erisman permission to conduct research at the three middle schools listed above for the study, **Impact of a Nurse-Led Virtual Asthma Education Program on Middle School-Aged Children's Asthma Self-Management: Effects on Symptoms, Spacer Use Technique & Emergency Room Utilization** from January 4, 2021 to May 31, 2021.

I acknowledge that the quality improvement study is to be conducted virtually within three middle schools in [REDACTED] and span over a period of five months total. I acknowledge that virtual education sessions will span four consecutive weeks and will be used to teach students about asthma self-management including asthma facts, physiology and pathophysiology of asthma, common asthma symptoms, warning signs, and triggers, medications and devices used for asthma, and how to problem-solve and effectively manage an asthma emergency. I understand that the student researcher will be conducting four, 45 minute educational sessions virtually through the school system's secure Zoom platform that include opportunities for student interaction, and that students will be allotted time to ask questions. I acknowledge that two other Zoom sessions will occur individually with each student and their parent and/or school staff member before and after the four educational sessions for pre-test and post-test data collection activities as outlined in the IRB application. I acknowledge that data will be collected in a pre-test, post-test questionnaire format and that questionnaires will be submitted securely through the school system's Google Classroom platform. I understand this questionnaire will assess children's asthma symptoms, recent use of the emergency room for asthma, and medication use. I acknowledge that [REDACTED] has been provided a copy of the questionnaire to be administered. I also acknowledge students will be assessed for proper demonstration of using an inhaler and spacer before and after the intervention and will be given feedback on their technique.

It has been agreed upon that the student investigator may conduct virtual Zoom sessions in each of the three middle schools on designated dates allotted by school principals for implementation of the four *Kickin' Asthma* program sessions. The student investigator will be given access to parent e-mail addresses and phone numbers by the school nurse for students with asthma for recruitment, consent/assent, and communication throughout the study as outlined in the IRB application. The student investigator will also use e-mail addresses to send the pre-test and post-test questionnaires for students/parents who agree to participate at the appropriate intervals. It has been agreed upon that the student investigator will be allowed access to the school nurses to help with participant recruitment and to be present during virtual program implementation at each of the four group

[REDACTED]

sessions, lasting 45 minutes each. It has also been agreed upon that school nurses will be present for post-test inhaler demonstrations, taking no more than an hour to an hour and a half of their time in May 2021. If school nurses are not available to attend the four virtual sessions, or be present for post-test data collection, [REDACTED] agrees to provide another adult employed by the school system to sit in as a witness on the sessions. School nurses will aid in recruitment by identifying students in their schools with asthma and providing e-mail addresses and phone numbers for the student investigator to send recruitment letters with consent and assent forms to parents. The student investigator will also have access to the School Health Services Coordinator, [REDACTED] RN, for pertinent questions regarding implementation of the study, and IT personnel that can assist with providing access and orienting the student investigator to Zoom K-12 and Google Classroom.

The School Health Services Coordinator will not be required to attend the four virtual educational sessions led by the student investigator. However, [REDACTED] agrees to send one school staff member (preferably the school nurse) to each of the four virtual group sessions, as well as any Zoom meeting that takes place with students individually during school hours (in May 2021). It has been agreed upon that the times and dates for any Zoom meetings needing a school staff member present will be set at least a week in advance. For the purpose of confidentiality, it has been agreed upon that every attempt will be made to use the same school staff member for presence at each Zoom meeting so that as few people as possible know of students' participation.

It has been agreed upon between the researchers and [REDACTED] that the student investigator will disseminate the results of the study to the school nurses and anyone else at the Board of Education who is interested in learning of the results. If this program pilot demonstrates beneficial outcomes, the asthma education program can be taught to school nurses in [REDACTED] so that they can deliver it within their schools to students with asthma in future school years. It has been agreed upon that the student researcher will connect the school nursing supervisor with her contacts at the American Lung Association for future use of the *Kickin' Asthma* program in [REDACTED], if interested. Lastly it has been agreed upon that the researchers' manuscript for publication will be submitted for approval by [REDACTED] before submission to any journal or conference.

If there are any questions, please contact my office.

Signed,



[REDACTED]
Chief Academic Officer
[REDACTED]

Appendix K: Implementation Timeline

Date	Activities
Spring 2020	<ul style="list-style-type: none"> • Initial IRB application/protocol submitted prior to COVID-19 pandemic
September 2020-October 2020	<ul style="list-style-type: none"> • Refine educational intervention to virtual adaptation • Write and submit new IRB proposal to Salisbury University and school board • Submit to IRB by October 22nd
November 2020-December 2020 (Once IRB approval is received)	<ul style="list-style-type: none"> • Obtain IRB approval at scheduled meeting • Meet with school nurses and principals at identified schools to discuss project overview and proposed timeline for completion • Prepare recruitment letters and consent forms in e-mail/ PDF format • Prepare <i>Kickin' Asthma</i> materials for implementation site • Study/Review KA curriculum • Select spring implementation dates with principals • Set up Google Classroom & Zoom K-12 accounts with school system IT Staff • December 2020: School nurses send out initial recruitment e-mail to allow parents to opt out of being contacted • Obtain list of potential participants from school nurse & parent e-mail addresses
January 2021	<ul style="list-style-type: none"> • Send out recruitment e-mail (1st week of January 2021) • Obtain parental consent for students to participate in educational program & signed student assent (by 3rd week of January) • Set up & complete Initial Zoom meeting dates with each parent/child (to occur throughout January & finish by last week in January) • Mail or deliver <i>Kickin' Asthma</i> workbooks to each child • Collect baseline data (Initial Survey sent via e-mail/Google Classroom, valved holding chamber/spacer demonstration in Zoom meeting)
NURS 883: Project Implementation: Feb 2021	<ul style="list-style-type: none"> • Implement educational sessions at three middle schools (Wednesdays) • Send out post-test questionnaire survey on the same day as last session via e-mail/Google Classroom
March 2021	<ul style="list-style-type: none"> • Begin preliminary data analysis (using baseline & immediate post-test data)
April 2021	<ul style="list-style-type: none"> • Continue preliminary data analysis
May 2021	<ul style="list-style-type: none"> • Collect 3-month post-test data questionnaire via Google Classroom (last week of May 2021) • Complete data analysis
Summer 2021	<ul style="list-style-type: none"> • Prepare project presentation • Present project findings to SU, ALA, & school board

Appendix L: Parent Recruitment Letter

[Date]

Dear Parent/Guardian,

This letter is being sent to ask your permission for your child to take part in a virtual school-based asthma education program. The program will be taught by a graduate nursing student from Salisbury University who is a former school nurse. The program will require your child to attend **six** Zoom sessions online and participate in data collection activities. Two of the Zoom sessions will be held individually with your child and either you or a school staff member. Four Zoom sessions will be held in a group based setting with other students. Data collection activities include your child completing a short questionnaire about their asthma on three occasions. Your child will also be asked to demonstrate how to use an inhaler with a valved holding chamber (spacer) on two different occasions.

The program to be taught is called *Kickin' Asthma*. This course was created by the American Lung Association to teach middle school students more about their asthma. The program will also help students practice important skills to manage their asthma. Topics that will be taught during the four group education sessions include:

- Asthma facts
- How asthma works in the body
- Common asthma symptoms, warning signs, and triggers
- Medications and devices used for asthma (i.e. valved holding chambers/spacers, peakflow meters)
- What to do during an asthma emergency

Your child was chosen to participate in the program based on a referral from the school nurse, as your child's records show he/she has asthma. This letter does not mean there are any concerns at school with your child's health. Please note this program is purely educational in nature to help your child better care for their asthma. Your child will not be given any individualized medical advice or treatment for their asthma.

The **first** Zoom session will involve just you, your child, and the Salisbury University student to go over the project. It will take place in January 2021 outside of school hours and take about 35 minutes of your time. During the first Zoom session, the following activities will take place:

- You and your child will be given a brief overview of the project.
- The student will ask you a few questions to make sure your child meets the requirements for participating in the project. To participate, your child must have a diagnosis of persistent asthma. This means their asthma affects them daily. This will be determined using the screening tool in Attachment A. Your child must also be able read and speak English. Lastly, they must be in the sixth, seventh or eighth grade

[at one of the three middle schools] and be willing to participate in data collection activities in order to participate.

- Your child will be asked to give their verbal assent to participate in the project.
- Baseline data for the project will be collected. This is needed to get an idea of where your child currently stands with their asthma. Your child will be asked to demonstrate use of an inhaler and chamber/spacer device. The valved holding chamber (spacer) will be provided to them free of cost.
- Your child will also be asked to complete a questionnaire and upload it into Google Classroom. This should take an additional 10-15 minutes and can be completed after the session. This questionnaire, called “Asthma and You” is provided for you in attachment B.

The **next four** Zoom sessions are 45 minute sessions in length and will occur over four weeks. During these sessions your child will participate in group asthma education with other students in their school. One school staff member will also attend. These sessions will occur during the school day. However, they will be scheduled on Wednesdays when school is asynchronous. Therefore, your child will miss offline learning time during each of the four weeks sessions are held. In total, your child will miss approximately 3 hours of asynchronous learning time. Teachers will be required to provide your child with reasonable time to make up any work missed if needed. The four group educational sessions will be held on the below dates/times:

- 1
- 2
- 3
- 4

After the final educational session on [date], your child will be asked to complete the same questionnaire they completed during the very first Zoom meeting with you.

The questionnaire will be e-mailed to you and posted in Google Classroom. Your child will submit the questionnaire through Google Classroom. The purpose of repeating the questionnaire is to track how things have changed with your child’s asthma since before the program started.

The **last** Zoom session for this project will occur three months after the last educational session. This date will fall in May 2021. This session will include your child, the Salisbury University student, and one school staff member. The session will be used to see how your child is doing with their asthma a few months after finishing the asthma education program. This evaluation will include your child demonstrating their inhaler and spacer technique. This will only take about ten minutes. After the demonstration, your child will be asked to complete the “Asthma and You” questionnaire once more and submit it to Google Classroom.

For a visual breakdown of Zoom sessions, see below:

Zoom Session #	Topic	Who's Required to Attend?	Time Commitment	Date Range
1	Introduction to the Project, Assent, and baseline spacer demonstration	Child and Consenting Parent	30-35 minutes	January 2021
2	Kickin Asthma Group Education: Week 1	Child (group session with classmates)	45 minutes	1 st week of February 2021
3	Kickin Asthma Group Education: Week 2	Child (group session with classmates)	45 minutes	2 nd week of February 2021
4	Kickin Asthma Group Education: Week 3	Child (group session with classmates)	45 minutes	3 rd week of February 2021
5	Kickin Asthma Group Education: Week 4	Child (group session with classmates)	45 minutes	4 th week of February 2021
6	Post-test spacer demonstration	Child and school staff member OR parent	10-15 minutes	Late May 2021

The goal of the program is to help your child become more knowledgeable about asthma. Another goal is to promote asthma self-management for middle school children in [the school system]. It is our hope that through better self-management, your child will have fewer asthma symptoms, sick days, and emergent care visits. Participation in this project is voluntary. If you *do not* want your child to participate, that is okay. This decision will not negatively impact your child or his or her grades. If you *do* want your child to participate in this project, please know that your child may withdraw from the project at any time. They will not be penalized in any way if they withdraw.

Your child's confidentiality is of utmost importance to us. Your child's participation or non-participation in the project will be kept confidential. Should you and your child choose to participate, the only people who will know of their participation are myself, the SU faculty listed below, and one school staff member from your child's school.

This project is being run by a Salisbury University graduate student to complete requirements for her doctorate degree. The project is being overseen by two SU faculty members: a pediatric nurse practitioner and a certified asthma educator. Results from this project will be shared with Salisbury University, the American Lung Association, and [the school system]. If the project is successful, it is our hope that all middle schools in the county will use it to teach students with asthma in the future. Project results may also be published in a scholarly research journal. That being said, there will be no way for anyone to link this project to your child as their participation in this project will remain confidential.

If you and your child are interested in participating in the program, please review and sign the attached consent and assent forms. The consent form is for you to read and sign, and the assent form is for your child to read and sign. Your child will be asked to give assent again verbally before the project starts if he or she decides to participate.

Please e-mail your completed consent and assent forms to Jessica Erisman at jerisman1@gulls.salisbury.edu if you wish for your child to participate and she will e-mail you with next steps at that time. If you have trouble completing the assent and consent forms electronically please also e-mail jerisman1@gulls.salisbury.edu and she can send you a pre-postmarked recruitment package with forms to sign and return by U.S. mail. Please also respond to this e-mail saying "I'm not interested" if you do not wish to be contacted about this project again.

If your child should have any adverse effects or if you should have concerns or questions about this study, please contact the primary investigator, Anastacia Keenan. She can be reached at 410-546-4381 or ajkeenan@salisbury.edu. You may also contact the Office of Graduate Studies and Research at Salisbury University at 410-548-3549 or toll free 1-888-543-0148. This research is approved by the Salisbury University's IRB under protocol number 11.

Thank you,

Jessica Erisman, BSN, RN
Graduate Nursing Student, Salisbury University
Jerisman1@gulls.salisbury.edu

Anastacia Keenan, DNP, CRNP, CPNP-C
Assistant Professor, Salisbury University
ajkeenan@salisbury.edu
410-546-4381

Thomas Lamey, PhD, BSRT, RRT, AE-C
Assistant Professor, Salisbury University
twlamey@salisbury.edu
410-677-0053

**Parent Recruitment Letter Attachment A- Screening Tool for Persistent Asthma
(this will be used to make sure your child qualifies for the project at our first
Zoom meeting)**

Your child was referred by their school nurse as a potential participant for the Kickin’ Asthma project. However, this project is specifically meant for adolescents with persistent asthma. This means they have asthma which affects them more than just once in a while. To make sure your child has persistent asthma, I will need to ask you a few questions. If your child does not meet criteria for persistent asthma, they will not be qualified to participate in this project. At that point, we cannot move forward and the call will end.

Questions that will be asked of parents:

1. Does your child currently take a daily controller medication for their asthma? Controller medications are medications your child takes every day to prevent asthma attacks. Usually these come in inhaler form.

_____ Yes _____ No

2. How old is your child?

3. Does your child meet any of the criteria highlighted in **yellow** in the chart below for classification of persistent asthma? _____ Yes _____ No

*Please note, “short-term beta-agonist use for symptom control” means use of a rescue inhaler like albuterol for asthma symptoms (wheezing, shortness of breath, chest tightness, etc.). This does NOT count for albuterol being used prior to exercise.

For children aged 12 years+, use this chart:

— Assessing severity and initiating treatment for patients who are not currently taking long-term control medications

Components of Severity		Classification of Asthma Severity ≥12 years of age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
Normal FEV ₁ /FVC: 8–19 yr 85%					

For children under age 12 years, use this chart:

Components of Severity		Classification of Asthma Severity (Children 5–11 years of age)			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited

Reference:

National Heart, Lung, and Blood Institute. (2007). Expert panel report 3: Guidelines for the diagnosis and management of asthma. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK7232/pdf/Bookshelf_NBK7232.pdf

**Parent Recruitment Letter Attachment B- Asthma and You
Questionnaire (to be completed by your child on 3 occasions)**



For office only. Do not write here.	
School: _____	Period: _____
Date: _____	
Pre	Post

Asthma and You

First name: _____ Last name: _____ Birth date: _____

Gender: Boy Girl

These questions are about your own experiences. Please answer as truthfully as you can. If we think that your symptoms could be made better, we may share the information with your school nurse or your parent/guardian. We will talk to you first before we do this.

1. In the past 4 weeks, how often do you have coughing, wheezing, chest tightness, or shortness of breath?

- Not at all
- Less than 1 day each week
- About 1-2 days each week
- Between 3 and 6 days each week
- Every day

2. In the past 3 months, how often have you usually had coughing, wheezing, chest tightness, or shortness of breath?

- Not at all
- Less than 1 day each week
- About 1-2 days each week
- Between 3 and 6 days each week
- Every day

Fill in the blank with a number (even if the answer is "0")

- 3. My asthma caused me to miss about _____ days of school in the past month.
- 4. My sleep was bothered by asthma about _____ times in the past 4 weeks.
- 5. My asthma made it hard for me to play a sport or exercise about _____ times in the past month.

Just a couple more questions! Keep going!

Please mark the best answer:

- 7. I use a spacer with my inhaler: Every time Sometimes Never I don't know
- 8. In the past 3 months, how many times did your asthma cause you to go to the **emergency room** or hospital?
 0 times 1 time 2 times 3 times 4 times 5-10 times more than 10 times





This section is done with instructors' help using the photos to aid student.

Do you use any medicine (like puffers/inhalers) now for your asthma or breathing problems?
Yes **No**

Code	Used when?	Used how often?	Ran out?
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day:	
	When you feel fine? Y N	Days/wk:	Yes
	Before exercise? Y N		
	For symptoms? Y N	Days/wk: Times/day	

Notes:



SPACER



PEAK FLOW METERS



Asthma Relievers

Short-Acting Beta₂-Agonist

 Alupent B1	 Xopenex HFA B16	 ProAir HFA B8			
 Proventil HFA B8	 Ventolin HFA B8	 Generic Albuterol B8	 Zenith Goldline B8		
 Martec B8	 Dey, LP B11	 Xopenex B12	 Methylxanthine 100 300 200 400	 Combivent B14	 Atrovent B15

Provided by the Central California Asthma Project (559) 446-2323 or (800) 586-4872 (rev. 5/07)

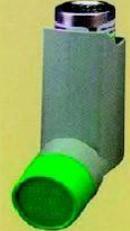




Asthma Controllers



**AeroBid
A1**



**AeroBidM
A2**



**Azmecort
A3**



**QVAR
A4**



**Asmanex
A19**



**Flovent
A6**



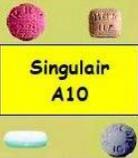
**Flovent
Rotadisc
A7**



**Pulmicort
Turbuhaler
A8**



**Pulmicort
Respules
A9**



**Singular
A10**



**Zyflo
FilmTAB
A11**



**Accolate
A12**



**Serevent
A13**



**Foradil
A14**



**Intal
A15**



**Cromolyn
A16**



**Tilade
A17**



**Advair HFA
A20**



**Advair
A18**



**Symbicort
A21**

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Appendix M: Script for Recruitment Phone Call to Parents

“Hello. My name is Jessica Erisman. I am a nursing student at Salisbury University in the graduate program. I would like to invite your child to participate in my virtual asthma education project. I am looking at how virtual asthma education may impact middle schoolers' management of their asthma.

Your child may participate if they are in the sixth, seventh, or eighth grade. They must also have a diagnosis of persistent asthma, which is asthma that affects them daily. They must also be able to read and speak English.

As a participant, your child will be asked to attend four, 45 minute group asthma education sessions on Zoom, which have been approved by the school principal. These sessions will include other students in your child's school who have asthma as well.

In addition to the four group education sessions, your child will be required to attend one Zoom session before the program starts and one Zoom session after the project ends. The first Zoom session will include you, me, and your child to explain the project and collect pre-project data. The second Zoom session will include me, your child, and a school staff member to collect post-project data.

The sessions will be interactive and teach your child about asthma, including why it occurs, common triggers, and medications. Children will also be taught what they can do to self-manage their asthma and how they can respond to an asthma emergency. Please note this program is purely educational. Your child will not be given any individualized medical treatment or advice.

Is this something you are interested in?”

If yes—“Let me explain some more about the risks and benefits of the project.”

“While there are no major risks expected with this project, participating would mean your child will miss about three hours of class time. They will need to make up any work assigned. This will be arranged with their teacher(s). Your child may also feel slightly inconvenienced by needing to answer a few short questionnaires. These questionnaires are needed to collect data for the project and they must be completed to participate. Your child will also be asked to demonstrate how to use their inhaler which may make them nervous. Lastly, your child could also experience some minor anxiety while talking about asthma attacks.

The benefits of this project include your child learning how they can be more independent with taking care of their asthma. Your child will also be taught what they can do to lessen asthma's impact on their everyday life. Your child's participation will help me identify if this type of program improves outcomes for adolescents with asthma such as reducing asthma symptoms, activity limitations, and need for emergency room visits.

There are no costs associated with this project. Your child will receive a free asthma workbook, earbuds, a free spacer, and a free peak flowmeter for participating.

Participation is voluntary. The choice of whether or not your child may participate will have no impact on their school grades. If they do participate they will be given time to make up any work missed, but some of this missed work might become homework. Your child will still be allowed to break for lunch as normal.

Your child's participation in this project will be kept confidential. Only myself, one school staff member, and other participating students will know of your child's participation. Your child can keep their identity anonymous during Zoom sessions by changing their name if they wish.

Your child's answers to surveys will not be able to be linked to them. Your child's name will also not be mentioned in any presentations or publications.

If you would like your child to participate in this project, I will e-mail a consent form to you explaining what we talked about again. You will need to sign this consent and return it by e-mail. What is your e-mail address?

In this e-mail you will also receive a written recruitment letter and a child assent form. You will need to review the assent form with your child and have them sign it if they agree to participate. Once your consent and assent forms are completed, please e-mail them back to me at jerisman1@gulls.salisbury.edu and I will contact you with next steps.

If you have questions at any time, please contact my graduate faculty advisor, Anastacia Keenan at 410-546-4381. You can also e-mail her at ajkeenana@salisbury.edu. She will either answer your questions or put you in contact with me directly. You can contact me directly by e-mail at jerisman1@gulls.salisbury.edu. Lastly, you may contact Thomas Lamey, who is a certified asthma educator, for any questions related to asthma, peak flow meters, spacer devices, or asthma medications. His e-mail is twlamey@salisbury.edu

You may also contact the Office of Graduate Studies and Research at Salisbury University at 410-548-3549 or toll free 1-888-543-0148. This project has been approved by Salisbury University's Institutional Review Board under protocol number 11.