CLINICAL SCHOLARS

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Toolkit for BREATHE: Equity in Asthma Treatment in Healthcare and Education

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ABOUT THE PROGRAM

Clinical Scholars is a national leadership program of the Robert Wood Johnson Foundation led by the University of North Carolina at Chapel Hill. Learn more about RWJF's Leadership for Better Health programs by visiting: rwjf.org/leadershipforbetterhealth

ABOUT THE TOOLKIT

This toolkit can be used as a road map for a school-based asthma controller Directly Observed Therapy (DOT) program.

For more information visit: ralescenter.hopkinschildrens.org

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TOOLKIT
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List of Commonly Used Abbreviations

SAMPRO – School-Based Asthma Management Program

AFSI – Asthma Friendly Schools Initiative

RAMP – Regional Asthma Management and Prevention

DOT – Directly Observed Therapy

SBHC – School-Based Health Center

PCP – Primary Care Provider

AAP – Asthma Action Plan

ACT – Asthma Control Test

IHP – Individualized Health Care Plan

EP – Emergency Care Plan

CMT – Certified Medication Technician

Asthma Background

Asthma is a chronic inflammatory disease of the airways in the lungs, characterized by symptoms such as coughing, wheezing, shortness of breath, and/or chest tightness, which can be triggered by a variety of factors like tobacco, dust, other allergens, and exercise. Children with asthma have airways that may swell and tighten when they are exposed to a trigger. In an acute attack, bronchoconstriction can occur quickly and narrows the airways. As the disease becomes more persistent and progressive, other factors such as mucus hypersecretion, edema and inflammation can further limit airflow.[1] This underlying pathology is what causes typical asthma

symptoms such as coughing, wheezing, and shortness of breath, The National Asthma Education and Prevention Program has classified asthma into the following categories: intermittent, mild persistent, moderate persistent, and severe persistent, based on a variety of criteria. Charts from the NAEPP detailing these criteria are included in Appendix A-1.[1]

Asthma in the United States

Asthma affects approximately 6 million children in the United States.[2] It disproportionately affects children from poor and minority racial and ethnic backgrounds, with these children having a greater burden of disease due to many factors, including environmental inequities, stress levels, access to health care, and medication adherence.[3,4,5] Asthma is the most common cause of disability among children in the U.S. and is a leading medical cause of school absenteeism, contributing to disengagement in school and lower educational attainment.[6] National guidelines for the management of asthma recommend daily preventive anti-inflammatory medication for all children with persistent asthma symptoms, but implementation of these guidelines has been problematic.[1] Many children do not receive effective preventive medications; one study found that more than 1/3 of children with persistent asthma symptoms reported no use of preventive medication.[7] Asthma control is categorized as: well-controlled, not well-controlled, and poorly controlled.[8]

- Well controlled: experience asthma symptoms two days a week or less
- Not well-controlled: experience asthma symptoms that occur more than two days a week
- Poorly controlled: experience asthma symptoms throughout the day

Asthma's Effect on Health and Education

Uncontrolled asthma is not only a health problem, it also negatively impacts a child's education. On average, a child with asthma will miss 9 days of school per year, which is 1.5 times higher than their peers.[6] These absences can be due to asthma exacerbations, clinic and emergency department visits, and/or impaired sleep caused by poor asthma control, among other factors. Asthma status can also exacerbate ethnicity-based disparities in academic performance in children with asthma who live in urban areas; not only do urban children with asthma experience

a greater number of school absences when compared to their healthy peers, but there are greater disparities in academic outcomes when ethnic differences within the groups are examined. Latino and black children with asthma appear to have poorer academic outcomes than their non-Latino white counterparts, with Latino children having the poorest outcomes.[9] Since poorly controlled asthma can manifest itself in absenteeism and other markers of school performance, school staff can provide integral information to health care providers about their patients' disease control while in school.

Role of Schools in Asthma Management

Schools play an important role in recognizing and addressing uncontrolled asthma in their students. As a first step, school staff are instrumental in identifying children with asthma, who may be absent more often and exhibit poor asthma control, by referring them to the school nurse. Recognizing poor asthma control can come in the form of observing symptoms in the school setting, listening to parent reports, and communication with the students' health care provider. On a larger scale, school-based health centers (SBHCs) are one way to provide quality clinical care and education in a school setting. They often serve as primary care centers for hard-to-reach and underserved populations.[10] There are 2,200 SBHCs around the country, primarily in low income areas, and nearly 90% of these SBHCs offer chronic disease management.[11] Studies have shown that the risk of hospitalization and ED visits for children with asthma decreases significantly when children have regular access to health care providers through SBHCs,[12] and children also report a decrease in activity restriction due to asthma after enrolling in SBHCs.[13] However, schools without a SBHC can successfully leverage their existing resources and work towards better asthma management for their students.

Resources such as the School-Based Asthma Management Program (SAMPRO) and the Asthma Friendly Schools Initiative outline the different ways schools can managing asthma in their student body. SAMPRO specifically outlines four components that schools can adopt to integrate themselves within the asthma care team, including developing a circle of support and implementing asthma management plans, asthma education plans for school personnel, and environmental asthma plans to address asthma triggers at home and at school.[14] The Asthma Friendly Schools Initiative Toolkit also contains strategies for maximizing school health

services, integrating asthma education into the curriculum, promoting a healthy school environment, and managing physical education and activity.[15] These ideas have been implemented in myriad ways in diverse school settings. For example: schools have implemented a targeted web-based asthma education program to improve asthma management among their students,[16] enacted anti-idling measures in bus loading zones[17], and developed an asthma curriculum that complements existing core content areas.[18] School-based directly observed therapy (DOT) of asthma controller medication has also been shown to improve utilization of healthcare, school attendance, academic performance, and quality of life.[19,20] All of these measures can improve asthma management without requiring intensive resources. Ultimately, increased communication between parents, school nurses, and teachers can ensure that children are receiving the asthma care they need both inside and outside of school.

Purpose of This Guide

The Rales Health Center has taken steps to practically establish a school-based DOT program along with other asthma management strategies in two urban public charter schools serving students from predominantly low-income communities. This implementation guide is designed to help school staff understand and adopt the BREATHE approach- evidence-based initiatives to manage asthma in a real-world setting. These initiatives can range from small steps such as brief education sessions for teachers and staff, to more school-wide approaches to case identification such as asthma screening, to comprehensive directly observed therapy (DOT) programs.

Part I provides an overview of the Rales Health Center Asthma Program model, including DOT, and gives step-by-step guidance for schools seeking to implement such a program.

Part II outlines a stepwise approach to asthma management in schools, highlighting the different measures that can be taken depending on a school's interests, resources, and particular needs of their student population.

Who Should Use This Guide?

School Nurses and Health Staff can find key information about different steps to asthma management that can be implemented in schools, as well as guidance on starting, running, and monitoring these programs.

Teachers and School Staff can become more aware of the measures and programs that can exist at a school to help with asthma management and find information about how they can support asthma management in their schools.

Prescribers can use this guide to gain insight into the forms of asthma management that may be present in their patients' schools. Using this information, they can serve as advocates, along with families and schools, to create a community-based approach to asthma management.

What Will Users of This Guide Gain?

Users will understand the components needed to develop a plan among partners and stakeholders to implement a school-based DOT program for asthma and other asthma management steps in their schools.

Users will be able to monitor and evaluate the process of implementation and outcomes of school-based DOT for asthma.

Users will understand how school-based asthma management can work to improve health and educational outcomes for students and address disparities in asthma care.

Users will gain insight into the myriad of steps, from simple to more complex, that they can take to improve asthma management and care in their school.

Case Study: School-Based Asthma Directly Observed Therapy at the Rales Health Center:

The Ruth and Normal Rales Center for the Integration of Health and Education is a comprehensive school wellness program located at two co-located public charter schools in an urban area. Together, these schools serve over 1,500 students in grades K-8.

In August 2017, the BREATHE: Baltimore Realizing Equity in Asthma Treatment, Healthcare, and Education project was started at the Rales Health Center. Asthma disproportionately affects low-income, urban communities, such as the one that the school serves, and is a primary medical risk factor for chronic school absenteeism.

Thus, the BREATHE program was started with the following aims:

1. Implement school-based asthma controller DOT
2. Evaluate process, health, and educational outcomes of the program pre- to post-implementation
3. Create a road map for implementation, reproducibly, and scalability of school-based asthma controller DOT for other schools.

We have included case scenarios that illustrate how the program is run throughout this guide (in green background).

Part I: DOT Model

Background

Directly observed therapy (DOT) was originally developed for tuberculosis treatment as an effective strategy to ensure adherence to treatment. More recently, school-based DOT for asthma has also been shown to be effective in improving utilization of healthcare and school attendance, and decreasing days with symptoms and activity limitation.[21,22] School-based DOT can also promote family-centered, culturally competent care that builds a child's self-motivation and capacity to manage their own care in the future. Though the Rales Center provides DOT for a large number of students with persistent asthma, it is possible to start with a smaller population of students and scale the program up or down depending on the resources available at your school.

Why do it

Benefits for Children

Children who enroll in a school-based DOT program can see decreased frequency of asthma symptoms, leading to reduced healthcare utilization, fewer absences, and more engaged learning time. Previous studies have shown that teens who received DOT of preventive asthma medications in school as well as motivational interviewing sessions to build confidence around asthma management and medication adherence, saw a decrease in symptoms, less activity limitation, and less rescue medication use. Furthermore, they reported higher motivation to take their preventive medication every day and felt better at managing their asthma on their own. [23] Thus, DOT programs can not only decrease asthma symptoms, but can also be a way to incorporate education on transitioning age- appropriate students to independent medication management. A similar study done with children ages 3-10 also found that students receiving DOT therapy in school had an increase in symptom-free days, fewer nighttime symptoms, less activity limitation, and less rescue medication use.[24] School-based asthma therapy can result in improved health and educational outcomes for children of all different ages, especially if medication is delivered in a way that minimizes missed seat time during the school day.

Benefits for Families

School-based DOT can help students better manage their asthma, which can translate into fewer inconveniences and lost work productivity for parents and caregivers. A child with uncontrolled asthma usually loses 3 to 5 school days per year and at least one of his or her parents/caregivers loses the same working time. [25] One study investigated the indirect costs of asthma for children born in the year 2000 in the United States and found that a loss in parents' work productivity accounted for a $1.3 billion lifetime cost for this cohort.[26] Another study found that in 1996, parents' loss of productivity from asthma related school absences resulted in a cost of $719.1 million for the 2.52 million children with asthma treated that year, or an average of $285 per child with asthma.[27] Since asthma disproportionately affects low-income populations, missed work opportunities may further exacerbate the income gap between poor and wealthy communities. Thus, it is important to address asthma as not only a health concern, but an issue of equity. The primary goal of school-based DOT is to reduce the frequency and severity of asthma exacerbations, reducing the need for caregivers to attend urgent appointments and ED visits. Families can also benefit from the increased self-efficacy and empowerment students show after receiving personalized asthma education.

Benefits for Schools

For the school as a whole, school-based DOT can reduce absenteeism, resulting in increased seat-time and more engaged classroom learning for students. Additionally, funding for school districts in several states is calculated partly based on average daily attendance, so student absenteeism due to asthma can result in high costs for the public education system; in California, schools lose about $50 per student for every day they are absent.[28] For school health staff in particular, school-based DOT shifts time and resources from being reactive to proactive, which can result in less time spent overall responding to asthma exacerbations. Ultimately, schools will see improved attendance rates and learning, and may save time and resources as students are able to better control their asthma.

Benefits for Prescribers

Prescribers can benefit from a school-based DOT program as well. With regular communication with school staff, prescribers will see improved asthma management in their patients.

Prescribers can also help in building community and trust between schools, parents, and themselves, ultimately rallying a community around asthma management and advocacy. The American Academy of Pediatrics has put out two policy statements, the Role of the School Physician and Role of the School Nurse in Providing School Health Services, that outline the important roles that school nurses and physicians can play in promoting the well-being of students in school. Briefly, these roles include advocating for all school districts to have a school physician or nurse, working effectively within a school setting to provide health care for students, and to foster collaboration between community clinicians and school health staff.[29,30] These steps play an important part in identifying students with asthma and coordinating care for these students between the community and school setting.

Benefits for the Healthcare System

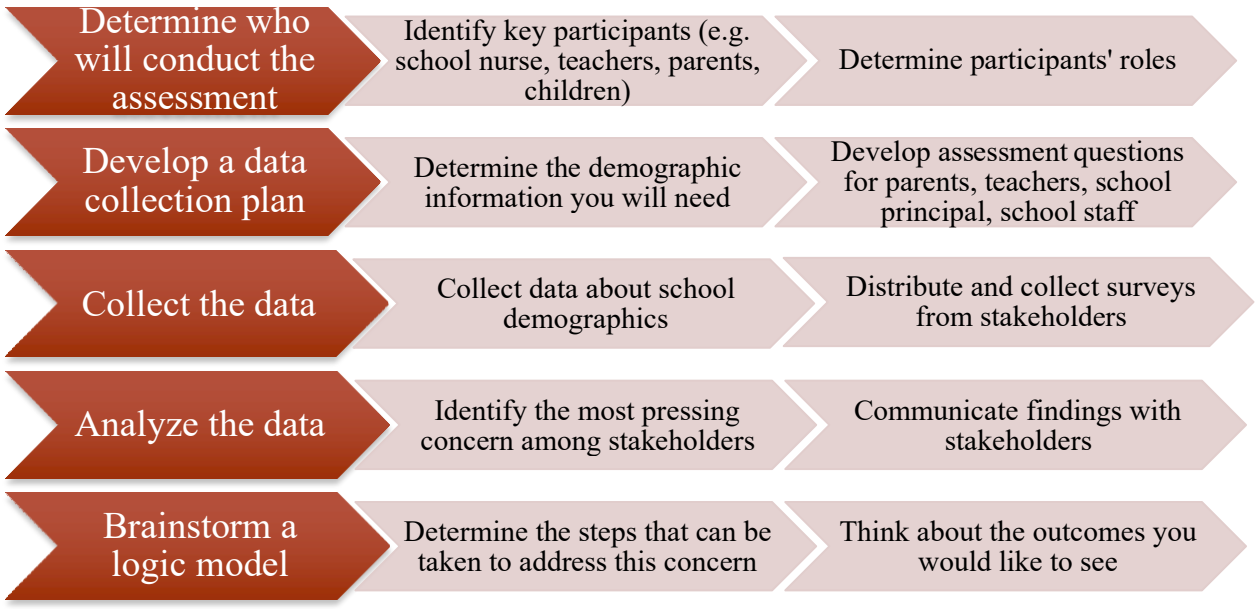
School-based asthma management will also benefit the healthcare system by saving money over the life course. An estimated national cost of $272 million in asthma-related ED visits covered by Medicaid/CHIP was calculated for the year 2010,[31] highlighting the high economic burden of asthma for the healthcare system. One cost-benefit analysis estimated that for students with asthma enrolled in a SBHC and enrolled in Medicaid and/or Children's Health Insurance programs (CHIP), the potential cost-savings for hospitalization would be $970 per child due to decreased risk of hospitalization and emergency department visits for both asthma-related symptoms and other conditions. Furthermore, as proper asthma management leads to increased engagement in school, over a lifetime, the societal benefits of increased school attendance can manifest itself as higher educational attainment, improved job opportunities and future earnings as an adult, and therefore more opportunities to give back to the community.

How to do it

Needs Assessment

A needs assessment is a way to identify strengths, weaknesses, and opportunities for improvement so that a school can make meaningful change in a particular area. If a school is interested in implementing a DOT program for asthma, a needs assessment should be conducted to see first if asthma is a community concern and, if it is, what families list as their stated needs.

Planning your needs assessment



A sample logic model used at the Rales Center identifying action steps and measured outcomes can be found in Appendix B-1.

Case Study: Rales Center Needs Assessment

Parents, students, and teachers regularly cited uncontrolled asthma as a major concern at KIPP Baltimore. 20-30% of visits to the SBHC were for asthma and stakeholders stressed the need for chronic disease management and patient/family education. Parents identified a need for easy access to prescription medications and refills, and nurses and other school staff also saw firsthand the impact of frequent asthma exacerbations in the student body; students were missing class time and sitting out of physical education classes.

Before the official DOT program was started, providers collaborated with families to initiate school administered controller inhalers for a few students. This pilot showed the feasibility of daily controller therapy for this student population.

This information can be used to determine what a school is doing well in terms of asthma management for its students, what is missing, and what can be improved. The American Lung Association has a guide, Conduct a Needs Assessment[32], that describes how to conduct an in-depth needs assessment on asthma in schools.

The Team

Starting a DOT program in school requires support from many different stakeholders. Each individual has a role in creating and sustaining a program that will promote better asthma management. The chart below lists examples of potential collaborators. Some roles may not be necessary in each school or district depending on the scale of the DOT program and the available resources.

School Principal	Be a champion for DOT by prioritizing its implementation and communicating its importance to staff, students, and families • Support policies that may be necessary in implementing DOT
School Nurse	• Assess asthma needs of students in school • Lead DOT efforts by identifying, enrolling, and managing students in the program
School Health Staff	• Assist in medication administration and management • Communicate with students and families about importance of asthma management
Community Clinicians	• Prescribe medication and routinely check asthma management status • Communicate with schools to ease transition between home and school asthma management • Communicate with school health staff to improve patient outcomes
Teachers	• Help remind students about importance of asthma management and reporting to scheduled DOT appointments • Monitor students for asthma symptoms and flare-ups and report changes to school health staff
Social worker or guidance counselor	• Assist in case management between students and health care in their community
Community Partners (e.g. pharmacy)	• Identify ways in which your organization can support school-based DOT by providing resources or partnership in building the program
Families/Parents	• Learn about steps the school is taking to improve asthma management and how you can support these efforts for your children when they are at home • Serve as liaison between school health staff, your child, and their community clinician
Students	• Provide helpful feedback on what is and is not working for them in the DOT program • Gain a greater understanding of asthma management and work towards taking ownership of their own health
State and Local Agencies that oversee Education and Health	• Partner with schools to enact policies (ex. environmental, educational) that may benefit children with asthma
Managed Care Organizations (MCOs)	• Work with prescribers to advocate for insurance controller coverage necessary for run a school-based DOT program

Case Study: Rales Center Team

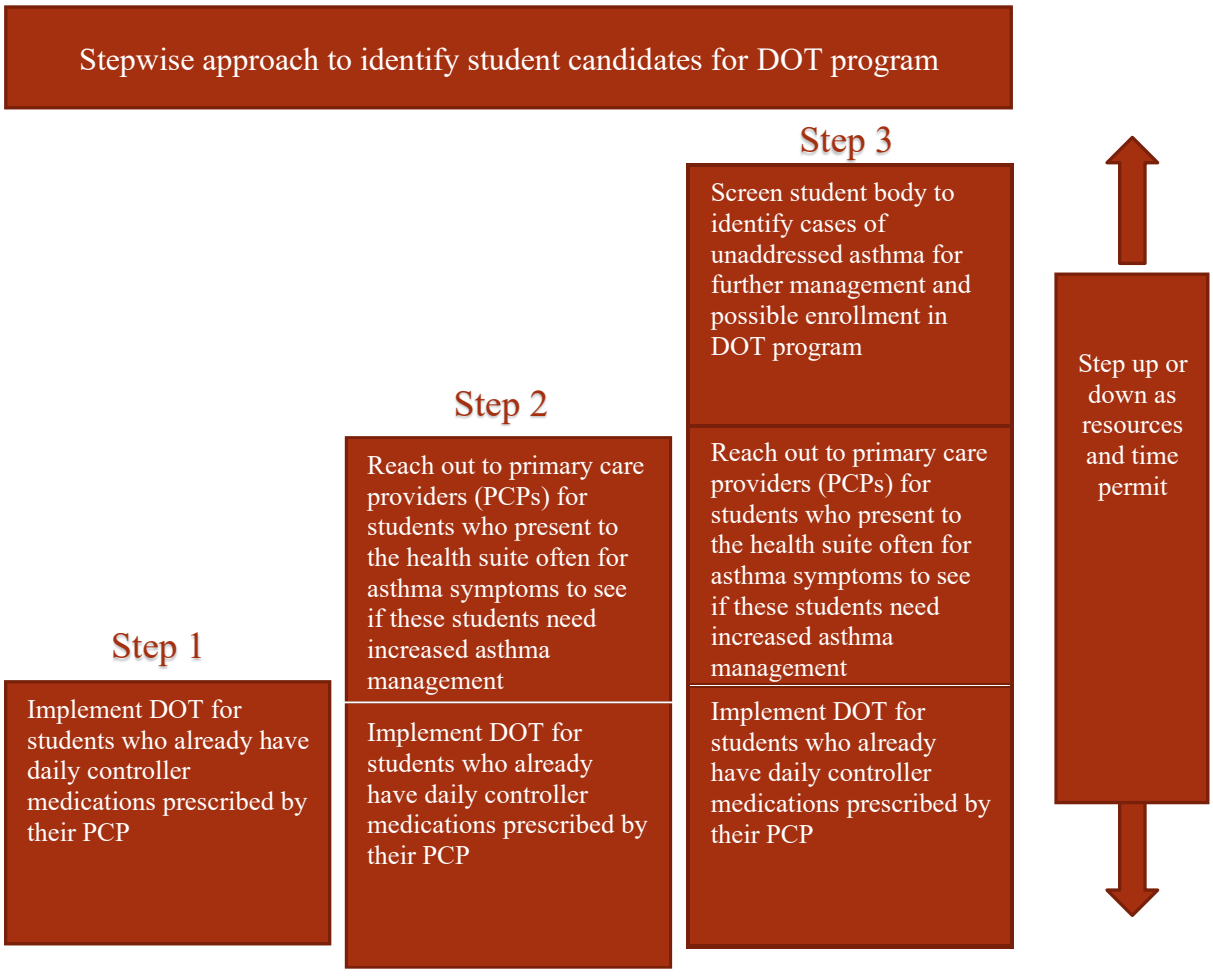
The program was started by a team of pediatricians and nurses. Many other individuals help ensure that the program is well-functioning on a day to day basis.

The DOT team at Rales is comprised of:
Pediatricians: Analyzes program outcomes, prescribes medication, spearheads systems level implementation and communication
Nurses: Administers daily medication, provides on the ground case management, analyzes program outcomes, collaborates with school staff and families to promote adherence
Nurse practitioner: Prescribes medication for some students in program, provides on the ground case management
Certified medication technician: Administers daily medication
Family advocate: Conducts family needs assessments, engages families in asthma management, troubleshoots insurance issues

In addition, a local pharmacy, parents, and students all play a vital role in helping the program run smoothly and reach its goals of improving asthma management for students.

Eligibility

There are different levels of involvement that a DOT program can have in addressing asthma management for the student population. DOT can be started for just a few students who are already known to have poorly managed asthma, or a school-wide screening approach can be adopted. This approach may be modified based on the amount of resources and time available.



Students with not well controlled asthma and inadequate adherence to daily controllers can be considered for a DOT program. Students may be eligible for the program if they:

- Have poorly or not well controlled persistent asthma
- Have inadequate adherence to daily controller therapy as described:
    - There are currently no validated tailored self-monitoring questionnaires that address adherence in children with asthma.[33] However, adherence can be assessed in the following way, as is done at the Rales Center: Ask the student (as

developmentally appropriate) and the parent/guardian: “everyone misses doses of their daily medicines sometimes. In the last two weeks, how many doses of [MEDICATION] did [NAME] miss? *More than two doses missed per week can be considered inadequate adherence.*

- Families may express a need for help ensuring adequate adherence in the face of daily barriers such as work schedules or shared custody arrangements

- Are able to obtain prescriber orders and medications

Enrollment

School health staff can describe the program to students and their parents who may benefit from DOT to gauge interest in participation. If a student/parent is interested in DOT, the school nurse can refer them for a clinician visit to:

- Assess asthma severity and control
- Adjust medication regimen as needed
- Complete orders for DOT, necessary PRN medications, and an updated asthma action plan

The clinician visit can be completed in a school-based health center, if available, or by the student’s PCP. In some states and districts, school nurses do not have permission to speak with PCPs so they should have the family sign a release for them to talk to the child’s prescriber. An asthma visit checklist for the family and for the prescriber from SAMPRO can be found in Appendix A-2 to help guide this visit. If the visit will be completed by the PCP, the school nurse can call the PCP to discuss the DOT program and the necessary requirements.

Note: Generally, schools must have written permission from the parent in order to release information about a student’s education record to outside parties, including providers. Student health records maintained by schools receiving federal funds are covered under FERPA. However, a student’s school health record can be shared with the clinician to the student without authorization, as long as this information is used for the purpose of providing treatment to the student. The HIPAA Privacy Rule allows covered clinicians to disclose personal health information about students to school nurses for treatment purposes without the authorization of the student or student’s parent.[34]

If consensus on the utility of DOT for the patient is agreed upon, the prescriber fills out the appropriate school medication administration authorization form, dependent on local and state guidelines. The prescriber and parent/guardian sign the form and the form is returned to the school along with the inhaler. After the order is reviewed the nurse also signs it.

The Maryland state medication administration authorization form used at the Rales Center is included in Appendix B-2 as a reference. The forms used at the Rales Center meet Maryland standards. It is important to know what forms are required by your district, as each locale will have their own regulations and requirements.

The prescriber will be advised of:

- The components of the program
- The necessity of writing the prescriptions to dispense two inhalers – one for home and one for school
- The possibility and procedure for prescribing medication for delivery from a local pharmacy to the school
- The plan for monthly in-school assessment of asthma control by the nurses

If available, and family chooses this option- a prescriber at the school-based health center may conduct the visit to initiate DOT. Ongoing communication with the student's PCP is critical, even if the SBHC clinician is the DOT prescriber.

Students in the DOT Program should have the following completed and documented in their chart:

- PRN medication order(s)
- Daily medication order(s)
- Asthma action plan (AAP)
- Nursing appraisal/assessment

An individualized health plan (IHP) and emergency care plan (EP) may be needed depending on a student's degree of asthma severity and control and local or state regulations surrounding these forms.

See documentation section in appendix for more information on these forms, as required in the state of Maryland.

Case Study: Rales Center Enrollment

At the Rales Center, 46 students currently receive DOT, all of whom are enrolled in the SBHC. Of these students, 4 are prescribed medication by their PCP and the rest by an SBHC prescriber.

Enrollment Procedure:
All first and fifth grade students are screened for asthma annually, and students who are new to the school are screened during their first year.

Students are considered for the program based on frequency of asthma exacerbations and their ACT score. The school nurse talks to the family about the program and refers the student to the SBHC for a visit with a nurse practitioner or pediatrician, where the student can be enrolled into the program.

Throughout this process, the nurse communicates regularly with the student's PCP about the plan. This collaboration is important because the SBHC does not serve as a comprehensive medical home, and coordination of care is needed for school breaks and summer vacation.

Medication Administration

All medications should be administered in accordance with local and state regulations.

This page from The Center for Health and Health Care in Schools[35] provides up-to-date information on medication administration rules by state.

Decide on dosing frequency

Depending on the specific inhaled glucocorticoid, medication can be either taken twice a day or combined into one daily dose. The dosing regimen is best decided in a conversation between school health staff and the prescribing clinician.

- Students taking twice a day medication may have their doses combined into once a day administration (if approved and written order completed by the managing prescriber). Studies have shown that combining two daily doses into one daily dose of various controller medications can lead to greater adherence in children and adolescents.[36] Additional studies illustrate that this increased adherence may explain why one daily dose is as effective or even more effective in controlling asthma symptoms than two daily doses.[37,38]
- Students taking twice a day medication whose doses cannot be combined may be advised to take the second daily dose at home before bedtime OR scheduled to take morning and afternoon doses at school.
- Administration of daily medications at home on weekends and school holidays can be discussed in detail with the student and parent and documented in the student's IHP.

Administration

There are multiple ways to go about administering medication in school, depending on staffing, scheduling, physical space, etc. To ensure consistency, it is imperative to develop a policy around administration, storage, and documentation of medication, that adheres to local and state guidelines. There should also be a procedure in place to record medication administration, errors, and any reactions and side effects.

Who: Nurses and others trained in medication administration can alternate administering medication on days of the week as convenient with other job responsibilities. Dependent on state regulations, all persons other than nurses who administer medication in school may need to go through a medication administration training course. Aligning medication administration with pre-existing workflow of school health staff is integral to making the program sustainable. While personalized education should be delivered regularly by a nurse, medication administration can be delegated to certified medication technicians (CMTs) or other unlicensed personnel to maximize resources.

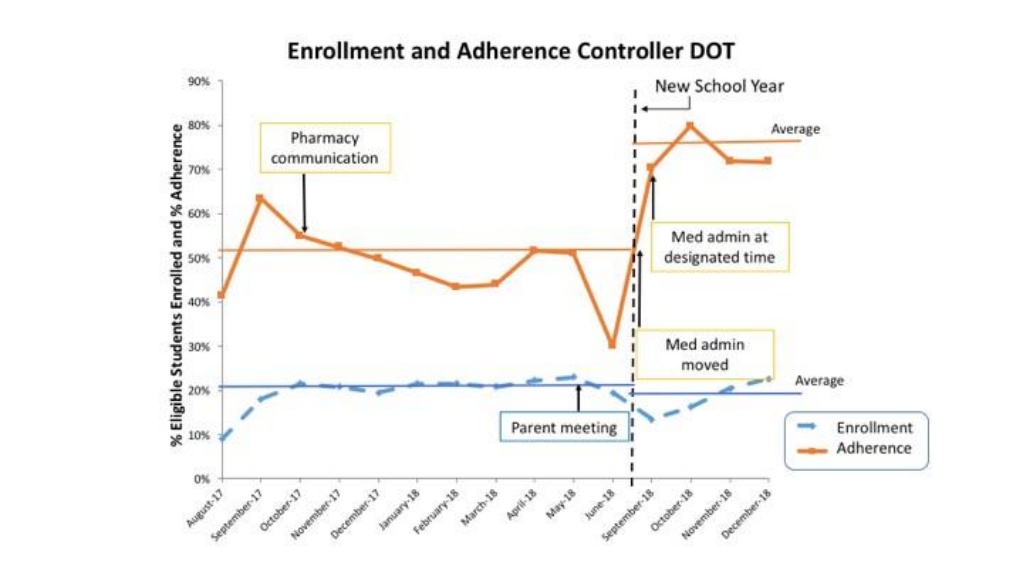
Where: Medications should be administered in a private setting to protect the health information of students in the program. Students can come to the health suite to take their medication, or they can report somewhere else for DOT every day. Integral to the intention of the intervention is to minimize missed class time. Therefore, medication should be given before or after school, or during lunch so as not to interfere with classroom content.

Case Study: Rales Center Medication Administration

At the start of the program during the school year 2017-2018, medication was inside the health center. Students had to leave class to take their medication, thus missing valuable seat time.

At the start of the 2018-2019 school year, the location of medication administration was changed. Students are now administered their medication in a private room off of the cafeteria during their lunch periods (which range between 10:30AM and 1PM). Therapy is given by a dedicated staff member each day, which rotates between two school nurses and a CMT. One school nurse is trained as a delegating nurse and trains, observes, and provides feedback to the CMTs who operate under her supervision.

This change prevented missed seat time and improved adherence, as seen in the graph below. Students more easily remembered to take their medication during lunch when not preoccupied with class material. Additionally staff in the lunchroom could locate and remind students who forgot to report for medication.



How: One goal of directly observed medication administration is to provide robust education until students can prove that they have reached competency in self-administration. Districts must develop their own criteria for measuring competence, but objectivity and consistency for all students in the DOT program is important. Dependent on age, students can take on more or less responsibility for each step of the process. Inhaler and spacer technique should be observed, and real time feedback and teaching provided with every medication administration. Wherever the medication is administered, staff should make sure that all students have a place to rinse their mouth out with water after taking steroid medication. Eventually, the goal is that a student will be able to talk the staff member through why and how they are taking the medication, building towards ownership of their own asthma management.

Storage

Medications should be kept in individual labeled tubs, bags, or containers for each student, with controller and rescue medications kept separate so the two are never confused. The controller medication can be transported to the room where the medications will be given, or if the medication will be given in the health suite, staff should find a place to store these medications for the year. The rescue medication should stay in a specified location so that everyone knows where it is when it needs to be used. It is also important that nurses deliver education on differentiating between controller and rescue medications, to students, parents, and other staff who will have access to these medications.

Health staff should regularly check for expired medication and fill refills or contact the prescriber to make them aware of refill needs. A variety of strategies can be used, such as establishing electronic health record flags, spreadsheets where expiration dates are detailed, or different colored stickers on medication containers that correspond to month of expiration.

Documentation

Documentation of asthma medication administration should align with existing systems that the school already has for documentation, as well as state and local regulations. It is important to keep track of both taken and missed doses to monitor how well adherence is being achieved through DOT. A template for tracking controller adherence and unscheduled albuterol use is included in Appendix B-3.

School Breaks and Summer Vacation

School breaks and weekends:

An integral part of DOT case management is ensuring the family understands the method and schedule of administration, and that they have sufficient medication for weekend and vacation use. Education should be delivered by the prescriber, and the school nurse, in both verbal and written form with details on medication administration outlined. Prescribers should make a plan with families regarding at which pharmacy they'd like refills for home use.

Summer vacation:

Several weeks before the end of the school year, RHC nursing staff sends home a letter to each child in the DOT program instructing families on how to pick up medication and reiterating the details of their child's daily medication regimen. The nursing staff or prescriber should speak on the phone or in person with families about which pharmacy they would like to use for refills over the summer.

As the last day of school approaches, staff should throw out any expired medication and pack up the rest of medication for each family. The school should follow existing district or school-level regulations around sending medication home. This transition is a particularly important time for SBHC prescribers to communicate with PCPs to ensure continuity of care over the summer months.

Asthma Education

Students in the DOT program and their parents should receive asthma education at the initiation of the program. This education may be delivered by school health services staff individually or in groups, and include:

- Asthma: mechanism, triggers, trigger avoidance
- Asthma medications:
  - Rescue medications
  - Controller medications
  - Allergy medications
  - Inhaler use and use of spacer including proper technique
- Self-management

Insurance/Prescription Fills

Insurance companies' formulary restrictions on the number of controller inhalers and spacers that can be dispensed at a time, or over a certain period of time, may create barriers to successful implementation of in school DOT programs. It is critical that students have a controller at home as well as at school - carrying the inhaler back and forth may increase the likelihood of loss, damage, unsafe administration, or gaps in access to medication when forgotten. If children have more than one place of residence and/or a childcare provider outside of school, more than two inhalers and spacers may be needed. Insurance companies may require prior authorizations to dispense more than one inhaler. Or they may decline the request entirely. Proactive communication can reduce prescriber time, and ensure patients timely access to medications.

Tips for talking with insurance:

If prescriptions to dispense multiple controllers and/or spacers at once are consistently being declined or requiring individual authorizations, it may be worthwhile to arrange a meeting with the companies providing coverage to students. Examples of outcomes that can facilitate success of DOT programs include: a way to write the prescription that obviates the need for a separate authorization, a waiver of specific authorization for students identified as being part of an in-school DOT program (special HIPAA/FERPA sensitive permission may be required), or a change to the formulary restrictions. Some talking points that Rales Center leadership has used in

their discussions with Maryland Medicaid managed care organizations (MCOs) are included in the call-out box below.

It is important to emphasize to payers that inclusion in a DOT program can provide long-term health benefits for their patients. These patients may cost the insurance company less over the life course, as their utilization of more expensive asthma care, like ED visits, should decrease. When preparing for discussions with any stakeholder group involved in successful DOT implementation, consider the outcomes that matter most to that stakeholder group. If it is not clear what motivates a given group, ask them!

Insurance companies, particularly Medicaid MCOs, are often evaluated based on their performance against standard quality measures such as Healthcare Effectiveness Data and Information Set (HEDIS). In Maryland, the asthma medication ratio (AMR) was recently added to a list of key quality measures for Medicaid MCOs. This is the ratio of controller inhalers to albuterol inhalers filled. Improving controller adherence can be expected to decrease rescue medication use- a key measure to focus on while extolling the benefits of our program. Measures and motivators will differ from one insurance company to the next, but identifying them in preparation for a meeting may help in developing a persuasive argument about the importance of school-based DOT.

Bringing the controller into school

Once a controller has been prescribed, there are multiple options for getting the medication into school. For DOT programs with a limited number of students, parents can pick up the prescription from the pharmacy and bring it into school (with a spacer if necessary) where it will be kept for the year. This approach may be difficult if parents face barriers either filling the prescription or transporting it to school; if so, other options can be considered.

For a DOT program with 5 or more participants, it may be worthwhile to set up a partnership with a local pharmacy. Particularly if a delivery infrastructure already exists, local pharmacies may be enthusiastic in partnering with a program that will generate reliably filled prescriptions.

Here are some tips that may help in setting up a partnership with a pharmacy

- Seek out pharmacies that already deliver
- If your school health program is affiliated with a large medical center, FQHC, or other organization, initiate conversations with that organization's pharmacy
- Be flexible around delivery dates and times
- Provide an estimate of forecasted monthly prescriptions

Once a partnership has been established, it is also important to find an easy way to communicate regularly with the pharmacy and a way to document and track receipt of medication. A HIPPA secure platform such as Box, spreadsheets can be useful in tracking.

Monitoring/Evaluation

Before initiation of a DOT program, staff must decide which metrics they will evaluate each month. Individual adherence is of utmost importance, and must be evaluated regularly so barriers can be addressed. Perhaps most important is control of asthma symptoms, which the nurse administered monthly ACT can capture. On a program level, staff can track the percentage of eligible students enrolled who were offered participation in the program. If resources allow, assessing the effects that DOT has on days of school missed and school performance can be illustrative and help secure additional buy in from school administration.

To help gauge the program's success, the following can be assessed and compiled in a report for each student in the DOT program on a monthly basis:

- Adherence to DOT (% possible doses administered)
- Use of PRN rescue medication (# doses administered)
- Absences due to asthma (# of absences reported by student or parent as due to asthma)
- ED visits due to asthma (# ED visits reported by student or parent as due to asthma)
- Hospitalizations due to asthma (# hospitalizations reported by student or parent as due to asthma)
- Asthma Control Test score

This monthly report can be shared with the student, parent, and prescriber to evaluate whether participation is improving asthma control.

Graduation

In the interest promoting independent asthma care before moving to higher grade levels, students can be considered for graduation from the program if they meet a certain set of criteria. After a student graduates from the program, the nurse may choose to track these criteria for a period of time to ensure adherence and control are maintained. If the nurse or family feel there is a need for a student to re-enter the program, they may work with the student to do so at any time.

Case Study: Graduating the Program at the Rales Center

At the Rales Center, students may graduate from the program if they achieve these measures:

- Adherence > 90%
- Use of PRN medications: <5 times/month on average
- Absences due to asthma: <1 total
- ED visits due to asthma: none
- Hospitalizations due to asthma: none
- ACT score > 19

We strive to slowly transition students to self-management by the 8th grade, their last year at the school.

In some cases, the school nurse may also feel that it is necessary to remove a student from the DOT program. Reasons for removal may include:

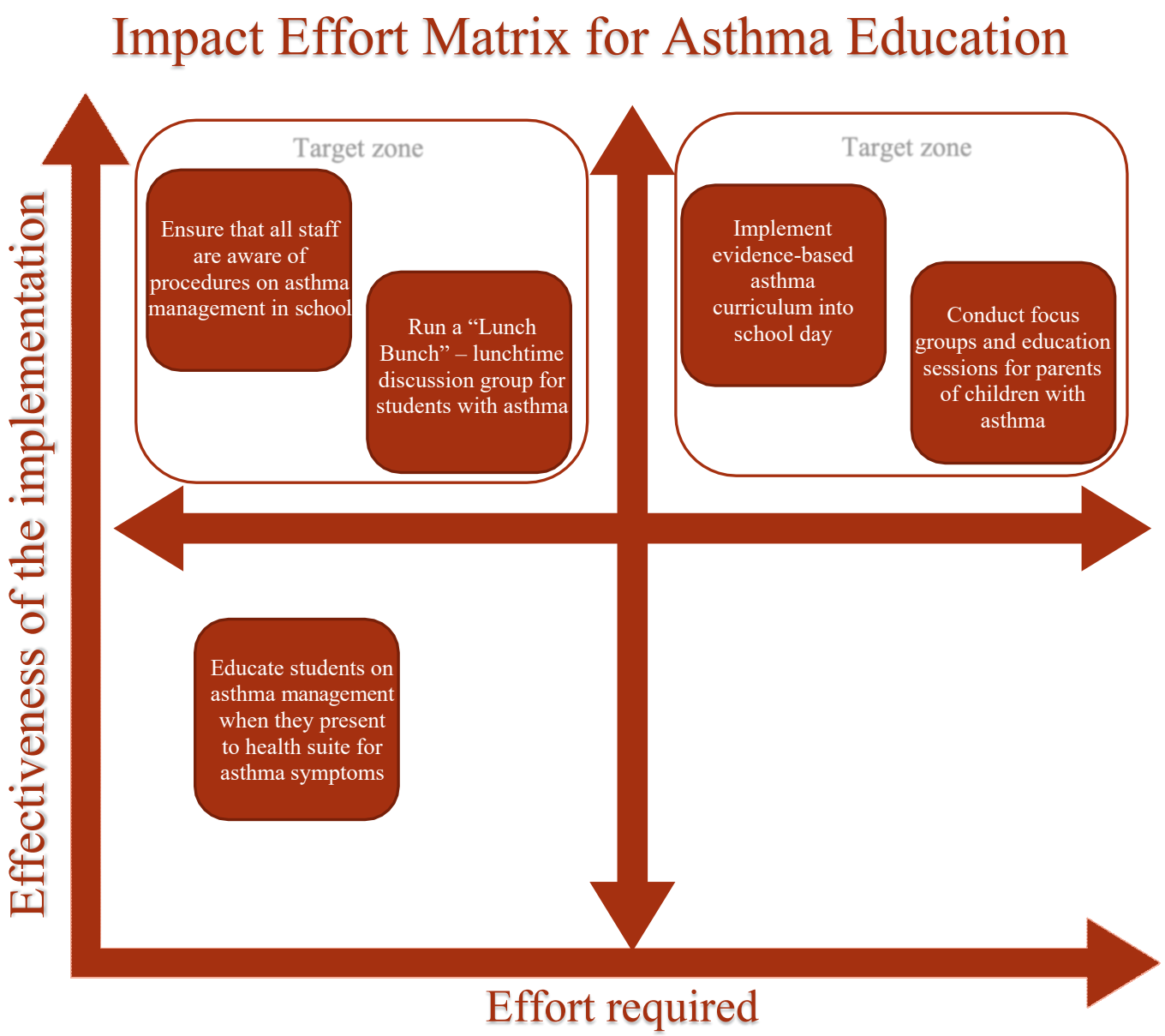
- Repetitive disruptive behavior during DOT visits
- <60% adherence (ex. Missing more than 3 out 5 weekdays of therapy) to DOT despite school nurses' attempts to address barriers
- Unable to establish or maintain regular communication between school nurse and family and/or prescriber.

Part II: Stepwise Guide to Asthma Management

There are many steps that schools can take to manage asthma in their student body without implementing a DOT program. Toolkits and guides from SAMPRO, the AFSI, and the Regional Asthma Management and Prevention (RAMP) program detail ways in which schools can reduce asthma symptoms for students through a variety of measures.[14 ,32,39] Depending on the needs of the student body and the resources of the school, nurses can implement one or multiple of the following steps when trying to better manage asthma in a school setting. This section illustrates how the Rales Health Center has adopted some of these initiatives to support school staff in promoting practices that will reduce asthma symptoms in students.

Education

Education for students, families, and school staff is an essential strategy for the management of asthma. This education can take place in multiple ways and is easiest when incorporated or added into existing events and opportunities within the school community. On a larger scale, nurses and other school health staff can focus on school policy adoption to establish asthma education as a sustainable part of the school's curriculum. Consider conducting a presentation for school administrators or a parent-teacher organization to talk about the need for asthma education in schools and to garner support for the initiative. The Rales Center has established educational sessions for students, family, and school staff surrounding asthma and asthma management. Details about these sessions can be found in the green box at the end of this section.



For Students

Students with asthma should be educated on symptoms and disease management during prescriber visits, as well as anytime they interact with school nursing staff. But all students in a school should have a basic understanding of asthma and know what to do in case a classmate has a breathing emergency. Staff can order and/or print free educational materials to be made available at the health center, or conduct group education for students with asthma.

When implementing student education programs, it is important to consider limited time and resources available during the school day. Some programs may be better suited as an after-school session. Nursing staff can act as instructors for these classes, but creative alternatives could include student teachers, college or medical students, AmeriCorps volunteers, or asthma groups in the school's community.

Below are details on numerous age-specific programs available from different advocacy organizations.

Open Airways for Schools

Target grade levels: 3rd-6th

The American Lung Association's Open Airways for Schools program is a validated approach to asthma self-management education, which can increase children's self-management skills and self-efficacy, and decrease the frequency and average duration of self-reported asthma attacks. Children in the intervention group increased the number of actions they took to manage their asthma compared to children who did not receive the intervention.[40] This program has also been shown to be effective when undergraduate students are used as instructors[41], which could be a way to overcome some resource barriers that may preclude the program from being implemented. It takes place in an interactive group setting through six 40-minute sessions.

Kickin' Asthma

Target grade levels: 6th -10th

Kickin' Asthma includes four 45-minute-long sessions spaced 1 week apart and one review session 3 months after the 4th session. This series educates and empowers children through a fun and interactive approach to asthma self-management, such as recognizing triggers and proper medication use. It includes role-playing, games, skits, videos, and peer educators. This program was validated, showing that students who completed the program experienced significantly fewer days with activity limitations and significantly fewer nights of sleep disturbance. Students also reported significantly less frequent emergency department visits and hospitalizations after the intervention.[42]

Fight Asthma Now (FAN)

Target grade levels: 3rd – 6th grade (youth edition), 7th – 12th grade (teen edition)

Fight Asthma Now (FAN) is a free, school-based asthma management program that uses engaging and active lesson plans to give children the tools and knowledge they need to identify and avoid triggers, manage asthma episodes, and control asthma on a long-term basis. There is a youth edition and a teen edition depending on the target age group. A study validating the effectiveness of this study showed that FAN significantly increases knowledge about asthma and the technique for using a spacer in youth and teens.[43]

Iggy and the Inhalers

Target grade levels: 3rd – 5th grade

Iggy and the Inhalers is an asthma education project created by a pediatric allergist. It has been validated in a Midwestern school district; asthma knowledge increased significantly and was retained at a 1-month follow-up.[44] This website has free downloadable patient handouts and videos with cartoons that explain what asthma is and how to use an inhaler, and has comics, stickers, posters, and other materials for sale.

SHARP (Staying Health – Asthma Responsible & Prepared)

Target grade levels: 4th – 6th grade

The SHARP program is based on the acceptance of asthma model (AAM) and aims to increase long-term responsibility in students for maintaining and promoting health and preventing complications. It consists of 50-minute sessions once a week for 10 weeks and complements existing curriculum by integrating biology, psychology, and sociology topics with related spelling, math, and reading and writing assignments. Students who complete this program show statistically significant improvements in their knowledge of asthma, reasoning about asthma, use of risk reduction behaviors, participation in life activities, use of episode management behaviors, and acceptance of asthma outcomes, compared with students who did not complete the program.[45]

For Families

Conducive to ensuring continuity of care between home and school is the provision of education sessions for families that cover asthma symptoms, management, and emergency response protocols. Studies have shown that family empowerment programs designed to increase knowledge about asthma management among caregivers have a positive impact on Asthma Control Test (ACT) scores of school-age children with asthma.[46] Community asthma education programs for parents of children with asthma have also been shown to be effective in increasing asthma knowledge and ability to control their child's asthma.[47]

Education sessions should be held at a variety of times convenient for families- potentially in the morning immediately after school drop off, or during after work evening hours. If budget permits, providing food and/or childcare can help families overcome barriers to attending. Written materials should also be sent home with children after each prescriber visit, and efforts should be made to educate families who can't make it to school for a session.

For School Staff

All school staff should be aware of common asthma triggers, basic asthma management, how to recognize and respond to an asthma emergency, as well as policies that permit students to carry and self-administer prescribed quick-relief medications. Classroom teachers, physical education teachers, and coaches should all know how to access students' asthma action plans.

It is important that staff members understand the school's responsibilities under the Individuals with Disabilities Education Act (IDEA), Section 504 of the Rehabilitation Act of 1973, Title II of the Americans With Disabilities Act (ADA), and, where applicable, Title III of the ADA, which applies to nonreligious private schools.

Asthma and allergies are usually considered disabilities under the ADA because these conditions can seriously limit one or more major life activity (breathing, eating, going to school). All 50 states and the District of Columbia have laws that allow students to carry and self-administer their prescribed quick-relief asthma medications in school. Required documentation usually includes written asthma action plan and/or medication authorization form that is signed by the prescriber and parent or guardian; school staff should be aware of these policies and how they apply to students.

Case Study: Rales Center Education

Students

The nursing staff at the Rales Center runs twice yearly education sessions for all students in the DOT program. Separated by grade level, small cohorts of students (6 or less) are invited to "asthma lunch bunch". These sessions are broken down into two parts: group discussion around the experience of living with asthma, and the delivery of age appropriate education.

Student experience:

Student led conversation typically includes stigma around having asthma, feelings of unfairness, feedback about DOT program, desire to be empowered in managing their own health, and issues of power and control with parents and school health staff.

Asthma education:

Identification and differentiation between rescue medication and controller, pathophysiology of asthma, the importance of adherence in improving symptom control, asthma management plans, responding to questions or teasing from peers.

Families

The Rales Center holds focus group dinners for parents of students in the DOT program twice a year. The purpose of these sessions is to: provide asthma education, glean feedback on how the DOT program is working for their families, and understand what they need from the program. This data helps health center staff continuously refine their goals and operations.

Staff

At the beginning of the school year, the nurses include information about asthma and the BREATHE program during a state-mandated professional development presentation they deliver for faculty. In addition to explaining the pathophysiology and treatment of asthma, they discuss asthma an equity issue and how this intervention can help improve health and academic outcomes for their students.

Screening and referral

An important first step in asthma management is case identification and assessment of level of control in students. This step can often be difficult due to the low rate of parent-completed student health form return; for example, the Rales Center saw a 40% return in forms for the 2016-2017 school year, so many cases of asthma may not be communicated. Alternative school-wide screening practices can be implemented to navigate this barrier. Various asthma screening programs for children have been developed and validated, and may be adopted for use in school depending on school resources.[48-50]

The Rales Center has implemented risk stratification procedure called the Rales Asthma Prioritization System (RAPS), which uses a two-tiered system of asthma risk stratification to identify students in greatest need of follow up from school nurses. In a large, resource-constrained urban elementary and middle school, the RAPS can efficiently risk stratify students with asthma into the high priority group, improve case identification in children with previously undetected asthma, and improve communication with parents/guardians of students with asthma who do not have a rescue medication/order in school (Rabner et al, under review).

Below is a sample protocol for what these screening procedures are like at the Rales Center:

Primary Risk Stratification Screening:

All first and fifth grade students are screened annually. Students entering the school in grades 2-4 or 6-8 are screened during the year of school entry.

Screening should take place as early in the school year as possible, ideally before the end of November.

Students are screened in their homerooms using a four-item self-administered questionnaire. They will also indicate demographic and contact information.

1. **I have MORE problems breathing than other kids after I run or play hard.**
2. **When I am awake my breathing sounds noisy.**
3. **I take medication for asthma.**
4. **I went to the hospital or emergency room because I had trouble breathing.**
5. What is the best phone number for the person you live with?

6. Whose phone number did you give us?

Previous research has shown that the first two questions regarding asthma symptoms (problems breathing and noisy breathing have a sensitivity of 82% and a specificity of 71% in identifying children with asthma.[51] The third and fourth question regarding asthma medication and health care utilization due to asthma together have a sensitivity of 43% and specificity of 93% using SBHC-diagnosed asthma as the gold standard. These two questions correctly predicted asthma 78% of the time and the absence of asthma 93% of the time (Johnson et al, under review).

Screening results are collected and aggregated as follows:

- In first grade classrooms students will receive a paper form. Paper forms are used in first grade because there is not a 1:1 student device ratio like in the upper grades. The teacher explains the directions and then reads each question individually, prompting the student to identify the yes/no response that applies to them.
- In fifth grade classrooms students will complete the questionnaire on Chromebooks. Teachers will read the directions and will read each item, prompting the student to identify the yes/no response that applies to them.

Below is an example of an approach to primary risk stratification that can be used, applied automatically by an Excel worksheet:

Asthma Symptoms		**Healthcare Utilization**		
Question 1: I have MORE problems breathing than other kids after I run or play hard.	**Question 2:** When I am awake my breathing sounds noisy.	**Question 3:** I take medication for asthma.	**Question 4:** I went to the hospital or emergency room because I had trouble breathing.	**Primary Risk Stratification**
Both affirmative		Yes	Yes	High
		No	Yes	High
		Yes	No	High
		No	No	Medium
Either affirmative		Yes	Yes	High
		No	Yes	High
		Yes	No	Medium
		No	No	Medium
Neither affirmative		Yes	Yes	Medium
		No	Yes	Medium
		Yes	No	Low
		No	No	Low

Secondary Risk Stratification Screening:

Because the Rales Center expects a large number of positive screens, a two-tiered risk stratification is used to identify those students who are highest priority for school nurse outreach, appraisal, and assessment. This secondary screen may not be needed in a school setting with a low number of positive screens.

To stratify students further, data from the primary stratification is combined with school nurse records and school absenteeism data. If a student has asthma but does not have a current medication order and/or asthma rescue medication at school, he/she is triaged into a higher priority group. If a student is not known to have asthma or no record exists, a history of chronic

school absenteeism in the prior school year triages the student into a higher priority group (Rabner et al, under review)

This is a diagram of the algorithm used at the Rales Center for secondary risk stratification:

Implementation of the RAPS in a large urban school with high asthma prevalence allows school health staff to prioritize students most in need of school-based asthma management, in a low-resource and time-intensive fashion.

Physical Education and Physical Activity

One small change important to better school-based asthma management is to be inclusive of students with asthma in physical education and sports. By educating teachers and coaches about how to manage asthma before, during, and after exercise, they can encourage participation with more confidence, and modify some activities if students' symptoms interfere.

It is important for physical education teachers and coaches to be aware of how they should help in an asthma exacerbation. Through interviews with physical education teachers in the Bronx, researchers found that there is often a lack of awareness of written asthma attack procedures among physical education teachers, even though they are often the first to respond to exercise-induced asthma attacks during physical education classes. Most physical education teachers also had not received specific training regarding asthma management.[52] One step that schools can take to mitigate these gaps in knowledge is to use one of the previously outlined training and education programs.

Teachers and coaches should try to include students with asthma in as many activities as possible, as remaining behind or frequently sitting out of activities can set the stage for teasing and loss of self-esteem. One common misconception is that students with asthma should avoid physical activity to prevent their symptoms from surfacing.[53] Students with asthma are less active than their peers due to a variety of factors, including fear of asthma exacerbations, stigma around taking medication in front of peers, and misconceptions about adverse effects of chronic medication use.[54,55] However, with better managed asthma, students with asthma can participate in the same activities as those of their peers without asthma. For students with exercise induced asthma, collaboration among school health staff and physical education coaches and recess staff can be helpful in ensuring that students are able to take their albuterol before physical activity. The solution to exercise induced asthma should be pre-activity albuterol, not reduced exercise. Physical education teachers and coaches should strive to provide safe, enjoyable, and challenging physical education and activity opportunities to all students, including those with asthma, and supervise students at all time to ensure their safety.

Nutrition – Food Allergies

Having food allergies, especially multiple or severe allergies, are associated with an increased prevalence of asthma in children.[56] Asthma also increases the risk of anaphylactic shock, with one study finding a 5 fold higher risk of anaphylactic shock due to food allergy in people with asthma.[57] Therefore, is important to identify students who have food allergies and for cafeteria staff to know what to do in case of an allergic reaction. The Rales Center maintains a list of students who have food allergies. All students who have food allergies have an allergy action plan that also states whether or not they have asthma. Schools should work with nutrition services to ensure that practices are in place to minimize allergen exposure.

Environmental Control

Every student with asthma has certain triggers that increase the likelihood of exacerbation. These triggers increase airway inflammation and/or constrict the airways. **Table 1** lists some examples of common triggers:

Table 1

Allergens	Irritants	Other Asthma Triggers
□ Pollen – from trees, plants, grasses □ Animal dander from pets with fur or hair □ Dust and dust mites □ Cockroach droppings □ Rodents □ Mold	□ Strong smells and chemical sprays, such as perfumes, paints, cleaning products, chalk dust, pesticide sprays □ Air pollutants □ Cigarette and tobacco smoke	□ Colds or flu □ Exercise – running or playing hard, especially in cold weather □ Laughing or crying □ Changes in weather □ Exposure to cold air, dry wind

Exposure to these triggers can be minimized by improving the air quality inside and outside of schools, and in students' homes.

Case Study: Rales Center Environmental Control:

While indoor and outdoor environmental control is an important part of school-based asthma management, the Rales Center has had less experience implementing these procedures in a school setting. However, the center does refer students to the Community Asthma Program (CAP) run by the Baltimore City Health Department. This program uses home visits by trained community health workers to identify asthma triggers in the home, give supplies such as green cleaning supplies and dust mite proof mattresses and pillow covers to reduce asthma triggers in the home, and connect families to other services that may help mitigate environmental allergens.

Improving indoor air quality in schools

Students spend much of their day at school during the school year, and the school environment can contain many common asthma triggers. During their time in school, students and staff can be exposed to indoor asthma triggers such as mold, dust, chemicals from cleaning products, and perfumes that can lead to increased symptoms, missed school days, and decreased academic performance.

Schools can help address poor indoor air quality by

1. Increasing awareness of issues related to indoor air quality
2. Conducting indoor air quality assessment
3. Supporting or leading an intervention to improve indoor air quality

The following chart details examples of steps that can be taken on both a classroom level and a school-wide level to address some common asthma triggers:

Minimize exposure to mold and dust	Pursue integrated pest management	MInimize exposure to chemical irritants
• **Classroom:** reduce items made of cloth in the classroom (e.g. rugs, curtains, bean bag chairs), keep ventilation units free of clutter • **School-wide:** control humidity, ensure adequate ventilation, increase resources for school facility maintenance and repair	• **Classroom:** reduce pets, plants, and food in classrooms • **School-wide:** install door sweeps, block pest entries with steel wool or screening	• **Classroom:** avoid scented personal products and air fresheners, use asthma-friendly cleaning products • **School-wide:** use asthma-friendly cleaning products, use building mateirals and other supplies with low volatile organic compoud (VOC) emissions

The EPA's Creating Healthy Indoor Air Quality in Schools[58] guide takes a comprehensive approach in providing educational materials on indoor asthma triggers, assessment materials, and action plans to implement in improving indoor air problems.

The Asthma-Friendly Schools Initiative Toolkit[32] contains basic steps to take in creating a long-term asthma management plan. Schools can also apply for an asthma-friendly school certificate after taking measures to improve asthma management; each state will have a different application process and set of criteria to meet. As an example, The Maryland Asthma Friendly Schools Initiative[59] website details the process for Maryland schools.

Improving outdoor air quality around schools

The environment outside the school can also exacerbate asthma symptoms for students at school. This is especially relevant when children go outside for recess or PE class and are exposed to outdoor air pollution and pollen. There are many steps that your school can take to improve the air quality surrounding the school. The following chart illustrates some initiatives that can be implemented and helpful links to resources that will help you accomplish these goals.

Initiative	Resources
Encourage students to walk or bike to school to reduce pollution	Action for Healthy Kids[60] – has action steps and educational resources for promoting walk- and bike-to-school programs.
Monitor outdoor air and raise awareness about high pollution days	EPA's Flag Program[61] - uses different colored flags to inform students and staff of daily air quality. American Lung Association – Solutions for Physical Education and Recess on High Ozone Days[62] – provides ideas for reducing risk of asthma symptoms on days with poor air quality.
Implement a tobacco-free policy in and around the school	American Lung Association – Assuring tobacco-free buildings and grounds – outlines importance of tobacco-free policies and includes a sample policy and sample presentation outline to school board/association about tobacco-free campus policy.
Advocate for a no idling policy on school grounds to reduce student exposure to toxic vehicle exhaust	Ditching Dirty Diesel's Anti-Idling Toolkit for Schools[63] – includes curriculum, factsheets, and media and outreach materials to help stakeholders in the school community create idle-free schools.

Summary

This implementation guide demonstrates how to establish and run a school-based DOT program and illustrates how the Rales Center has implemented such a program at two large urban elementary and middle schools. Additionally, part II of this guide gives examples of how schools can use other measures such as asthma education, environmental control, and asthma screening to further mitigate asthma symptoms in their student population and how the Rales Center has implemented these measures in real-life practice.

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