AN EVIDENCE-BASED PEDIATRIC ASTHMA TOOLKIT

FOR THE PRIMARY CARE PROVIDER

by

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DEDICATION

This professional project is dedicated to my loving family. You have tirelessly supported me through this tough graduate program as you have through every other accomplishment or struggle in my life. You are my rock and my inspiration and I am very lucky to have this support in my life. Thank you for the endless phone calls and visits to keep me going, the laughs through tears, and the inspiration and encouragement that has lead me to always finish with pride. May we continue to "Rock on baby!" to the next adventure.

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ABSTRACT

Uncontrolled asthma has costly health and economic consequences. There is a clear clinical need for better asthma management programs in the pediatric primary care setting (Akinbami et al., 2011; Sleath et al., 2011). The current system for asthma management in primary care offices is not improving outcomes for pediatric asthma patients in the United States or the state of Montana. Barriers to providing comprehensive evidence-based pediatric asthma care exist in the primary care setting nationwide (US DHHS, 2010; & Meyer, 2011). The creation of an evidence-based pediatric asthma toolkit for the primary care provider based on the EPR-3 Asthma Diagnosis and Management Guidelines (NIH, NHLBI, 2007) is an attempt to alleviate prevalent barriers primary care providers face in pediatric asthma care. A toolkit was assembled based on literature reviewed, interviews with experts in the field, and suggestions from primary care providers after reviewing the tool. The toolkit was found to be evidence-based, appropriate for use in the primary care setting, efficient for use in a busy primary care setting, and desired for use by primary care providers in the state based on informal interviews and reviews. It is suggested that the Pediatric Asthma Toolkit for the Primary Care Provider be tested using a formal research study for its' effectiveness in improving pediatric asthma care in the primary care setting as well as improving asthma outcomes in the state of Montana. More research needs to be done in the U.S. to evaluate the effectiveness and use of asthma toolkits by primary care providers. The toolkit will need to be updated when new research is published on asthma care as well as when new national asthma guidelines are issued. The toolkit will also need to be updated with current available pharmaceuticals and devices for asthma. This professional project is in alignment with the national Asthma Control Goals for Healthy People 2020 as well as the National Asthma Education and Prevention Program recommendations for implementation of the EPR-3 Guidelines. It is also in alignment with the Montana Asthma Control Program's goals to create partnerships throughout the state and improve asthma outcomes for Montana.

CHAPTER ONE

INTRODUCTION

Asthma is the most common chronic condition in the pediatric population in the United States (U.S.) and represents a prevalent worldwide problem (Sleath et al., 2011). In 2011, there were 7.1 million children in the U.S. with asthma and the numbers continue to grow (Center for Disease Control and Prevention, [CDC], National Asthma Control Program [NACP], 2013a). This number translates to 10% of all U.S. children being diagnosed with asthma currently (CDC, 2011b). The American Academy of Pediatrics (AAP) has recognized asthma as a serious childhood disease that needs significant improvement in the realm of management and education. Asthma is twice as common in children as adults and it is also the third leading cause of hospitalization in children in the U.S. In 2009, there were over two million asthma related emergency room visits and almost half a million asthma related hospitalizations. In 2010, 156 children died as a result of their asthma (CDC, NACP, 2013a).

The rural state of Montana, with a population of 998,199 in 2011, had an estimated 15,000 children diagnosed with asthma in 2010 (Montana Department of Health and Human Services [MT DPHHS], 2013). This figure represents a 6.9% prevalence rate in for asthma in children in the state. The MT DPHHS and the CDC partnered in 2009 to address the eight asthma-related Healthy People 2020 objectives with the Montana Asthma Control Program [MACP]. The MACP was funded by the state legislature in 2007 to address asthma control in the state of Montana and the CDC

provided a five-year grant for the MACP in 2009 (MT DPHHS, 2013). The goals of the CDC's NACP and Montana's ACP are aligned to address the many burdens of asthma on Montana citizens.

Pediatric and family primary care providers are in optimal positions to provide direct pediatric asthma education for patients and their families. Barriers to providing quality primary care for pediatric asthma patients are numerous. Some of these barriers include: lack of time during office visits for patient education about asthma management; lack of resources in primary care offices for proper education delivery; lack of trained asthma educators in primary care offices; lack of communication between emergency departments and primary care offices for follow-up management (Davis et al., 1999). By eliminating barriers that primary care providers face with asthma education and management in the primary care setting, asthma patients have a better chance of keeping their chronic condition under control and avoiding costly emergency room visits or hospitalizations (Rance & Trent, 2005).

Background

Asthma Control

Many of these estimated 7.1 million children in the U.S with asthma do not have their asthma under appropriate control (Carlton, Lucas, Ellis, Conboy-Ellis, Shoheiber & Stempel, 2005). Based on EPR-3 guidelines, one-third of children less than 18 years old have either poor controlled or not well-controlled asthma (U.S. Department of Public Health and Human Services [US DHHS], National Institute of Health [NIH], National

Heart, Lung and Blood Institute [NHLBI], 2007). Uncontrolled asthma in pediatric patients leads to more school absences per year and more work absences for parents each year. Asthma related incidences caused an estimated 10.5 million school day absences in 2008 (Akinbami, Moorman & Xiang Lui, 2011).

The state of Montana in 2010 had an estimated 15,000 children with asthma and 69,000 adults. Uncontrolled asthma was significantly more prevalent in this rural state among people with household incomes of less than $25,000 per year. Based on data from 2006 through 2010, half of the adults and one third of the children in Montana diagnosed with asthma had uncontrolled asthma. Hospitalizations with a primary diagnosis of asthma in MT averaged 665 per year from 2002-2011. In an additional 4,200 hospitalizations each year, asthma was the secondary diagnosis in the state of Montana. Children under the age of 17 and adults over the age of 65 had significantly higher rates of hospitalization due to asthma in 2011 in the state over other age groups (MT DPHHS, 2013).

National Economic Impact of Asthma

The economic impact of asthma in the U.S. in 2007 was $50.1 billion. This number is trending upward as the numbers of those affected with asthma continue to grow (CDC, 2013a). Asthma is one of the leading causes of school absenteeism, with nearly 12.8 million school days missed per year (CDC, 2013b). When missed school and work days are factored into asthma related costs yearly, the number climbs to an astounding $56 billion spent on asthma total expenditures (excluding primary care visits)

(CDC, 2013a). The burden of asthma is apparent on the health of our nation, the impact on our health care system, and the economic wellbeing of our citizens.

Economic Impact of Asthma in Montana

The cost of asthma hospitalizations in the rural state of Montana reached a near 5 million dollars in 2009. The average cost of an emergency room visit for asthma was about $900 while the average hospital stay for asthma was $8000 in 2009 (MT DPHHS, 2013). The costly consequences of uncontrolled asthma in the state of Montana have an even more profound effect on residents of this rural state due to the fact that the median household income in MT is about 12% lower than the median income for the rest of the United States as a whole. Also, there are lower rates of insured residents in the state of Montana vs. the rest of the nation. 18.4% of Montanans reported having no health insurance in 2010 as compared to the national average of 15%. Nearly half, (49.2%), of Emergency Department visits by children were paid by Medicaid or some other governmental insurance in Montana from 2010 to 2012 (MT DPHHS, 2013). These economic disparities make for a huge impact on seeking care and appropriately following up on asthma management in the state (MT DPHHS, 2013).

Patient/Family Impact of Asthma

There are costly consequences for the patient, family, and health care system when a child's asthma is uncontrolled. Pediatric asthma emergency visits cost 3.2 billion dollars annually (Meyer, 2011). There were 640,000 pediatric emergency visits due to asthma, 157,000 pediatric hospitalizations for asthma and 185 pediatric deaths due to

asthma in 2007 (Akinbami, Moorman & Xiang Lui, 2011). Parents of children with uncontrolled asthma suffer economic strain due to the fact that they have to stay home from work with their children when they are experiencing symptoms. Families also experience further economic burden with more emergency room and office visits for their sick children who are not well controlled on their current asthma medications (Liu, Gilsenan, Stanford, Lincourt, Ziemiecki & Ortega, 2010). Families with a child who has uncontrolled asthma experience undue stress and fear, and constantly anticipating a possible asthma attack can take a toll on their ability to perform necessary daily activities (Peterson-Sweeny, 2009).

Asthma Management

Some of the main reasons that childhood asthma is not well managed or controlled are that health facilities fail to properly educate the children and parents, demonstrate correct use of asthma-related devices, create and give out a written asthma action plan for the child, and schedule consistent asthma management visits with a primary care provider (Ducharme et al., 2011; Lob, Boer, Porter, Nunez & Fox, 2011). There are many factors that play into this oversight. There is often not enough time in a pediatric office visit for one provider to cover all that needs to be discussed in the realm of a child's asthma issues. There is a lack of consistent, correct asthma education and device demonstration in many pediatric care settings, which leads to poor management outcomes (Baena-Cagnani & Bacharier, 2011; Sleath et al., 2011).

The quality of asthma care in the pediatric population has remained suboptimal well after the publication of the National Asthma Education and Prevention Program

(NAEPP) evidence-based guidelines for asthma diagnosis and management (Lob et al., 2011). The lack of adherence to guidelines by health care providers, the lack of funding and time provided in primary care settings for appropriate asthma management and the lack of a cost-effective and streamlined program for implementation into all pediatric primary care settings are contributing to the suboptimal care and abundant energy expenditure on this problem in the U.S. (Meyer, 2011; Lui et al., 2010; Baena-Cagnani & Bacharier, 2011). Our health care system is spending energy in the realm of cost and time at alarming rates for emergent pediatric visits and hospital admissions. Children are expending extra energy trying to live with uncontrolled asthma missing school and experiences. Parents of children with uncontrolled asthma are spending extra time, money, and mental anguish by missing work, taking their child to multiple emergent visits, and buying a variety of expensive medications for their child (Akinbami et al., 2011; Lui et al., 2010; Borgmeyer, Byr, Jamerson & Henry, 2008). All of these energy costs need to be managed better in a way that is all encompassing for the child, family, and health care system.

Statement of the Problem

Uncontrolled asthma has costly health and economic consequences. There is a clear clinical need for better asthma management programs in the pediatric primary care setting (Akinbami et al., 2011; Sleath et al., 2011). The current system for asthma care and management in primary care offices is not improving outcomes for pediatric patients in the nation or the state of Montana.

Purpose

The purpose of this professional project is to assist in the elimination of barriers to providing succinct, evidence-based, up-to-date and efficient asthma education and management in primary care offices in Montana. This project creates a pediatric asthma education and management toolkit for primary care providers based on current EPR-3 asthma guidelines. The toolkit was developed for ease-of-use in busy primary care practice settings in order to improve asthma education and management in Montana.

Project Goal

The project goal is to create an evidence-based asthma diagnosis, education and management toolkit for use in a primary care setting.

Project Improvement Aim Statement

Implementation of a pediatric asthma education and management toolkit for primary care offices will address the National Asthma Control Goals for Healthy People 2020 as well as the National Asthma Education and Prevention Program recommendations for implementation of the EPR-3 guidelines for the diagnosis and management of asthma. Specifically, this project provides a resource that could lead to increasing the percentage of children in Montana who receive formal asthma education and management in primary care offices and the percentage of children in Montana who receive appropriate asthma care according to the National Asthma Education and Prevention Guidelines. In accordance with the Healthy People 2020 Guidelines for

asthma, this proposal will aim to: “increase the proportion of persons who receive formal asthma education”, “increase the proportions of persons with current asthma who receive asthma care according to National Asthma Education and Prevention Program guidelines”, “reduce the rate of asthma emergency visits”, “reduce the rate of asthma hospitalizations”, and “reduce the rate of asthma deaths” in the state of Montana (U.S. Department of Health and Human Services [US DHHS], 2010).

Outcomes Framework

The “Expert Panel Report-3: Guidelines for the Diagnosis and Management of Asthma” (EPR-3) is a report that was released by the National Asthma Education and Prevention Program (NAEPP) in 2007. The NAEPP is coordinated by the National Heart, Lung and Blood Institute (NHLBI) and was created in 1989 to address the growing problem of asthma in the U.S. The initial set of guidelines for asthma assessment and management was released in 1991 by the NAEPP. The EPR-3 guidelines is the third and most recent set of recommendations on asthma by a committee of 18 experts, chosen for their expert scientific and clinical knowledge in the field of asthma diagnosis and management. The guidelines in the EPR-3 are detailed, evidence-based recommendations for how patients should be diagnosed, treated and managed for optimal asthma control based on individual needs of the patient. The updated guidelines focus on the individuality of the patient’s asthma severity and control with a stepwise approach to management (Yates, 2013).

The EPR-3 Guidelines for the Diagnosis and Management of Asthma is an abundance of information for clinical providers that is also very lengthy and time consuming for providers to read (440 pages). The NAEPP recognized that the goal of the evidence-based EPR-3 guidelines was to provide clinicians with the recommendations for how patients with asthma *should* be diagnosed and managed, but that the implementation of these guidelines into clinical practice was a whole other challenge. In response to this challenge, the NAEPP put together a committee of 17 experts in the fields of clinical practice, public health, research, education, and asthma policy in order to identify priority messages from the EPR-3 guidelines for implementation into clinical practice. The result of tasking this job to another expert committee was the "Guidelines Implementation Panel (GIP) Report- Partners Putting Guidelines into Action" (DPHHS, NIH, NHLBI, 2008). The National Asthma Control Initiative was also created as a result of this process.

The GIP report gives recommendations for implementing the EPR-3 Asthma Guidelines into practice by outlining achievable strategies for overcoming barriers to guideline implementation in the clinical workplace. There are six priority messages that the GIP report released as a result of the review of the EPR-3 guidelines. They are intended to support the implementation of high quality patient-centered care in the realm of asthma in primary care offices. The six priority messages are as follows:

- Use inhaled corticosteroids to control asthma.
- Use written asthma action plans to guide patient self-management.
- Assess asthma severity at the initial visit to determine initial treatment.
- Assess and monitor asthma control and adjust treatment if needed.
- Schedule follow-up visits at periodic intervals.
- Control environmental exposures that worsen the patient's asthma (US DHHS, NIH, NHLBI, 2008, P.8)

These six GIP messages will serve as a framework for this professional project in order to create an evidence-based asthma toolkit for diagnosis, education and management of asthma in primary care offices. This framework aligns with the goals of this professional project because it focuses on eliminating barriers to providing high-quality asthma care in the clinical setting and also supports the EPR-3 Guidelines that are evidence-based clinical practice recommendations. The asthma toolkit this professional project will design will incorporate the six priority messages from the GIP in its contents and thereby work to target the elimination of practice implementation barriers that could arise with the EPR-3 guidelines.

Significance of the Study

This professional project will assist in improving pediatric asthma management in primary care offices in the state of Montana. This will be done by creating an organized, all-inclusive, evidence-based, time saving asthma toolkit for primary care providers in Montana to use in the diagnosis and management of asthma in the pediatric population. The goal of this professional project is to assist in the implementation of high quality pediatric asthma care in the primary care setting. The outcome of implementation of this asthma toolkit in primary care practices would be to increase the number of well-controlled asthma cases in the state of Montana. The intent of the toolkit is to help improve health outcomes for pediatric patients with asthma and reduce spending on costly asthma exacerbations and treatments. By focusing on the delivery of high quality asthma care in the state of Montana, we can hope to decrease the overall number of

people impacted by asthma exacerbations in the U.S. Asthma as a chronic condition continues to grow, with about 25 million people reporting current asthma in 2009 vs. 20 million people in 2001 (CDC, 2011a). Focused interventions, such as the creation and implementation of an asthma toolkit to improve asthma care delivery will help address this growing chronic condition.

Cornforth (2010) identified the need for providers to be proficient at delivering in-office patient education and training for asthma patients that aligns with the most current EPR-3 (Expert Panel Report -3) guidelines for asthma care. A primary care provider must be able to make the appropriate diagnosis of asthma, classify the severity of asthma for the patient, initiate appropriate therapy based on severity, set up monitoring guidelines, provide patient/parent education and develop an action plan for exacerbations or uncontrolled asthma (Wechsler, 2009). Based on the observation of a local provider of asthma care, a toolkit that contains current EPR-3 guidelines, training devices, educational materials and an asthma action plan could help cut down on time spent gathering materials and researching best practice (M. Zachariason, personal communication February & March, 2012; D. Kern & L. Carleson, personal communications, August, 2013).

This professional project is aligned with goals of the Montana Asthma Control Program to integrate evidenced-based, up-to-date, easy-to-use asthma education and management tools into primary care offices across the state (K. Loveland & J. Cannon, personal communication, October and November, 2012). One of the overarching goals of the Montana State Asthma Program is to “Improve systems and quality of asthma care”

(Montana State Asthma Plan, 2009, p. 11). The first objective under this umbrella goal for the Montana Asthma Control Program is to "Support delivery of evidence-based health care according to the EPR-3 Asthma Guidelines in the primary care setting" (Montana State Asthma Plan, 2009, p. 15). The creating of this asthma toolkit for the primary care setting is an attempt to assist with the achievement of this objective for the Montana State Asthma Control Program.

Key Terms

Asthma: "a complex disorder characterized by variable and recurring symptoms, airflow obstruction, bronchial hyperresponsiveness and an underlying inflammation" (DPHHS, NIH, NHLBI, 2007).

Asthma Action Plan: A written plan that is developed with a patient by a provider that explains how to control asthma symptoms. It can include instructions on when to take, medications daily and during an asthma attack, when to go in for an office visit, and when to go to the Emergency Department (CDC, 2012).

CDC: Centers for Disease Control and Prevention

ED: Emergency Department

EPR-3 Guidelines: Expert panel report- 3rd edition. This report presents a stepwise approach for managing asthma based on scientific evidence and current reviews.

DPI: Dry Powder Inhaler

GIP: Guidelines Implementation Panel

Primary care: "Primary care is the level of a health services system that provides entry into the system for all new needs and problems, provides person-focused (not disease-oriented) care over time, provides care for all but very uncommon or unusual conditions, and coordinates or integrates care, regardless of where the care is delivered and who provides it" (John's Hopkins University, 2013).

Healthy People 2020: "Healthy People provides science-based, 10-year national objectives for improving the health of all Americans"(US DHHS, 2010). Last released December of 2010.

ICS: Inhaled Corticosteroid

LABA: Long acting beta-agonist

LTRA: Leukotriene receptor antagonist

MACP: Montana Asthma Control Program

MDI: Metered Dose Inhaler

MT DPHHS: Montana Department of Public Health and Human Services

NAEPP: National Asthma Education Prevention Program

NACP: National Asthma Control Program

NIH: National Institute of Health

NHLBI: National Heart, Lung, and Blood Institute

NACI: National Asthma Control Initiative

Peak Flow Monitoring: Assessment tool used to assess expiratory flow from a person's lungs as compared to optimal expiratory flow estimated by a person's height and gender (Burns et al., 2013).

PFT: Pulmonary Function Testing.

SABA: Short acting beta-agonist

Spirometry: A pulmonary function test that measures both the amount (volume) and speed (flow) at which air can be inhaled or exhaled. Used to diagnose and manage asthma (Dombkowski et al., 2010).

US DHHS: United States Department of Health and Human Services

Organization of the Remainder of the Project

Chapter two will contain a review of literature on the implementation of the EPR-3 guidelines, support for scheduled asthma visits, support for asthma toolkits or the parts that collectively make up the created asthma toolkit, evidence of time constraints in the primary care setting, support for why asthma should be managed in the primary care setting, and the evidence supporting the need for an asthma intervention in the primary care setting. Chapter three will explain the method by which the asthma toolkit was designed and give an explanation of what is included in the toolkit. Chapter four will address the findings of this professional project and address how these findings support the aim of the project to support the intervention of an asthma management toolkit for primary care providers in the state of Montana. This chapter will also include a method suggested for the toolkit's distribution to primary care providers and the method by which it should be used in the primary care setting. Chapter five will include conclusions and recommendations based on project development, the creation of the toolkit, and the potential for implementation of the asthma toolkit in primary care settings in the rural state of Montana.

CHAPTER 2

LITERATURE REVIEW ON PEDIATRIC ASTHMA CARE PRACTICES IN THE PRIMARY CARE SETTING

Introduction

The review of literature for this study focused on support for the six priority messages from the GIP report based on the EPR-3 guidelines for diagnosis and management of asthma; support for managing asthma in the primary care setting; the need for better systems or tools to implement EPR-3 guidelines in the clinical setting; and the need for time-saving tools for clinicians to use during complex asthma visits. The studies were evaluated for information that would support the need for the creation of an evidenced-based asthma toolkit for primary care providers to use in diagnosing and managing asthma in an efficient manner. Many of the studies identified the poor asthma control that exists in the pediatric population and the need for primary care providers' adherence to the EPR-3 guidelines for asthma diagnosis and management. The GIP Report was used as a focus for this literature review since this expert panel has already identified the 6 priority messages from the EPR-3 guidelines that need to be put into action in the clinical setting. The literature reviewed supports the creation of an asthma toolkit that includes tools for implementing the 6 priority messages from the GIP report. Keywords used in this literature search were asthma *and*: action plan, adherence, barriers, control, education, efficient, environmental exposures, EPR-3, face to face, guidelines, inhaled corticosteriods, kits, management, pediatric, primary care, time, tool, toolkit,

visits, and written. Databases used were CINAHL, Cochrane Library, Ebsco host, Medline, Pubmed, ScienceDirect and Web of Science.

Managing Asthma in the Primary Care Setting

Primary care providers are the cornerstones of clinical care for asthma assessment and management worldwide (Small, 2012). The majority of asthma cases are diagnosed, treated and chronically managed in the primary care setting, leaving only a small percentage of those with asthma who need to be seen by an asthma specialist (Small, 2012). Many studies focus on the primary care setting for creating and improving asthma interventions because this is where the majority of asthma care occurs.

There are several steps to cover in the diagnosis and management of asthma in the primary care setting. Small (2012) listed five key areas that need to be covered for effective asthma management in primary care. These were (a) establishing an accurate diagnosis, (b) gaining control of asthma, (c) treatment options, (d) special circumstances (i.e. special patient groups), and (e) exacerbations (Small, 2012). Ali (2009) discussed the key areas that need to be addressed at each asthma review visit. These were (a) symptomatic asthma control using the three questions from the Royal College of Physicians, (b) Asthma Control Questionnaire or Asthma Control Test, (c) lung function test (spirometry or peak flow), (d) exacerbation rate, (e) inhaler technique, (f) Compliance with medications (prescription refill review), (g) bronchodilator reliance (refill review), and (h) possession and use of a personalized asthma action plan. All of these steps need to be completed by the primary care provider in addition to education

about the disease process, inhaler techniques, environmental triggers, and self-management techniques (Cornforth, 2010).

The NAEPP's most recent EPR-3 recommendations for asthma diagnosis and management splits the tasks of the primary care clinician into two categories; the initial visit and the follow up visit. The recommended tasks for the clinician in the initial visit are:

1. Diagnose asthma
2. Assess asthma severity
3. Initiate medication and demonstrate use of devices
4. Develop written asthma action plan
5. Schedule follow-up appointment

(US DHHS, NIH, NHLBI, 2012, p. 2).

The recommended tasks for asthma follow up visits in the primary care setting are:

1. Assess and monitor asthma control
2. Review medication technique and adherence; assess side effects; review environmental control
3. Maintain, step up, or step down medication
4. Review asthma action plan, revise as needed
5. Schedule next follow-up appointment

(US DHHS, NIH, NHLBI, 2012, p. 2).

All of these steps completed by the primary care provider focus on achieving and maintaining asthma control and improving asthma outcomes.

Primary care providers have the unique opportunity to address asthma control at office visits that are scheduled for non-respiratory reasons (i.e. well child visits, sports physicals). Mintze et al. (2009) completed a multi-site cross-sectional survey of adult patients with asthma who were seen in the primary care setting for non-respiratory reasons. The study found that 48% of patients with asthma visiting their primary care

provider for a non-respiratory reason had uncontrolled asthma at the time of the visit (Mintze et al., 2009). Adolescents are a particularly hard patient population as far as adherence to asthma plans and the primary care provider has the opportunity to address this issue with the adolescent asthma patient when they are seen for sports physicals or school required visits (Yawn, 2011). The NAEPP guidelines recommend frequent follow up visits for keeping asthma well controlled. The guidelines recommend regular follow up visits at one to six month intervals, with modification of this schedule for follow up as needed (Gallagher, 2002) but statistics show that these regularly scheduled visits often do not happen (Swartz, Banasiak & Meadows-Oliver, 2005). Therefore, it would be optimal if asthma control were addressed at every office visit regardless of the visit reason (Swartz, Banasiak & Meadows-Oliver, 2005).

Barriers to Use of EPR-3 Guidelines by Primary Care Providers

Achieving good asthma control for all patients is a main focus of the EPR-3 guidelines, yet outpatient asthma management and control remains suboptimal (US DHHS, NIH, NHLBI, 2013, & Lob et al., 2011). These evidenced-based practice recommendations are intended to be used by all providers diagnosing and managing asthma patients so that treatment is stepped up to the appropriate level where patients have well controlled asthma (Yates, 2013). However, primary care providers have not been consistent in the implementation of evidence-based guidelines thereby highlighting a gap between evidence-based medicine and actual clinical practice (Kim & Cho, 2011). A study by Cabana et al. (2007) found that in the U.S., 91% of health care providers were

aware of the NAEPP guidelines but only 54% were adhering to the guideline recommendations. Another study by Wisnivesky et al. (2009) showed that out of 202 inner-city primary care providers only 62% were adhering to NAEPP recommendations for ICS prescriptions, 10% for allergy testing, and only 9% were using the recommendation for an asthma action plan.

Worldwide, the problem of implementation of evidence-based asthma guidelines has proven to be a challenge. The Global Initiative for Asthma (GINA) program was created to raise international awareness for asthma with a mission of developing international asthma guidelines that could be customized around the world to meet unique health care systems' needs. This organization represents a collaboration between the World Health Organization and the National Heart, Lung, and Blood Institute. Although countries across the globe have adopted evidenced-based guidelines, like the EPR-3 Guidelines released in 2007 in the U.S., dissemination of these guidelines in a practical and concise format for use in clinical practice has fallen short. When evidenced-based practice guidelines are not summarized and disseminated as convenient and easily accessible tools for clinical practice, they are less likely to be used by clinicians (Kim & Cho, 2012).

Clinical guidelines decrease variation in the treatment of asthma by providing protocols for management of the disease (Rance et al., 2011). When guidelines are provided in the form of reminders in the clinical setting, literature shows that adherence to clinical guidelines improves (Rance et al., 2011). Despite the fact that asthma guidelines have been available in the U.S. for more than 20 years, their utilization has not

been optimal in the clinical setting (Rastogi, Shetty, Neugebauer, & Harijith, 2006). The implementation and use of the EPR-3 guidelines has proven to improve patient outcomes in the primary care setting in many studies. Cloutier et al. (2005) describe how the use of asthma guidelines improved patient outcomes in a large group of low-income, urban, minority children in a primary care clinic, as well as increased the use of inhaled corticosteroids (ICS) and asthma treatment plans, reduced asthma related ED visits and hospitalizations, and decreased outpatient asthma visits (Cloutier et al., 2005).

Ting (2002) found that there were four common reasons for primary care providers not adhering to the NAEPP guidelines for asthma diagnosis and management. These were: (a) not remembering classification parameters of asthma severity, (b) not remembering various brands and exact dosages of inhaled steroids for different asthma severities, (c) not remembering to ask about various triggers of asthma, and (d) not having sufficient time or resources to provide asthma education and an asthma action plan (Rance et al., 2011). Shah et al. (2008) found that concerns arise with primary care providers providing sole asthma care for patients because they are often not well informed on current asthma guidelines and recommendations. Adherence to asthma guidelines in primary care has been problematic in the realm of initial diagnosis and ongoing management using spirometry, as recommended by the EPR-3 guidelines (Dombkowaski et al., 2010). In a study of 360 pediatric primary care providers, only 21% used spirometry as recommended for diagnosis and follow up of asthma care (Dombkowaski et al., 2010). Primary care providers in this study cited several barriers to adhering to this EPR-3 guideline of using spirometry for pediatric asthma assessment and

management including: not being comfortable with interpreting spirometry, adequate training of staff to perform spirometry was not done, insufficient time in the office, inadequate reimbursement for spirometry testing (Dombkowaski et al., 2010).

Cabana et al. (2001) completed a qualitative study that involved 22 pediatric primary care providers and their perceived barriers to adhering to the NAEPP guidelines for asthma assessment and management. They found that older providers disagreed with ICS recommendations while younger providers were not confident with their dosing of the ICSs in children. Also, older providers cited that a barrier was lack of training in the use of peak flow meters and other training devices as well as lack of time in the office to provide complete asthma education and lack of outcome expectancy (Cabana et al., 2001).

Davis et al. (1999) completed a similar study on physician behaviors related to implementation of the NAEPP guidelines with asthma and found several similar barriers to implementing the guidelines in practice. Some of these barriers to implementing the asthma guidelines were lack of time, lack of reimbursement for following guidelines, limited staff to complete all guidelines, lack of experience in educating patients, lack of belief that the guidelines would affect patient outcome, and routines of previous practice.

Small (2012), as an expert in asthma care in the UK, identified potential barriers to implementing asthma care guidelines in a country where an estimated 5.4 million people have asthma, the highest prevalence of asthma in the world. Some of the barriers to implementing asthma care guidelines that Small (2012) identified were: (a) workload, particularly in primary care, (b) a false impression that asthma is straightforward and

already well-managed, (c) limitations of asthma targets in the quality outcomes framework, and (d) patient factors such as adhering to therapy plan, unwilling to follow up routinely, and patient complacency about symptoms and control. So as one can clearly see the barriers identified in the United Kingdom overlap with barriers seen through studies in the United States.

Improving Asthma Care in the Primary Care Setting

Several studies have been conducted implementing asthma diagnosis, management, treatment, and education tools for the primary care setting in an effort to discover ways to improve asthma care delivery to promote better asthma outcomes. Prompting the clinician and the patient/parent to constantly assess, manage and treat asthma symptoms based on evidence can improve asthma outcomes worldwide (NHLBI, 2013).

Asthma Action Plans

Individualized asthma action plans aim to astutely manage a variable disease in the home setting (Booth, 2012). This is considered a "self-management" tool for asthma that can be applied to patients of all different ages. The use of written asthma action plans coupled with appropriate prescriptions for treatment have been shown to improve adherence to asthma care plans and result in more well-controlled asthma in children (Ducharme et al., 2011; Teo, 2005). This tool helps children and their families to categorize their symptoms and take appropriate and timely actions that match their current symptoms. Asthma action plans also help to organize and disseminate the

provider's plan for the asthma patient. It is recommended by the EPR-3 guidelines that clinicians fill this out at the initial asthma assessment visit as well as review and update it at each subsequent visit (EPR-3 guidelines, 2007). There are many different forms of the asthma action plan in existence, but Gibson and Powell (2004) recommend that successful written asthma action plans should contain: (a) when to increase treatment (action point), (b) how to increase treatment, (c) how long to increase treatment for, and (d) when to seek medical help. Gibson and Powell (2004) also established that asthma action plans should be based on Peak Expiratory Flow Rate (PEFR) of personal best over percentage of predicted PEFR. The patient/parent should be asked about preferences and understanding of the action plan they are given because the action plan can be tailored to support better adherence (Gibson & Powell, 2004).

Ducharme et al. (2010) completed a single-masked randomized controlled trial of children presenting with acute asthma in the emergency room of a pediatric hospital using asthma action plans for discharge management. They found that providing a written asthma action plan to pediatric patients and their families significantly increased adherence to inhaled and oral corticosteroid use in asthma control as well as adherence to follow up recommendations and maintenance fluticasone use. Children given a written asthma action plan upon ED discharge displayed significantly better asthma control over a 90 day period.

Lieu and colleagues (1997) completed a study that established that written asthma action plans reduced hospitalizations and ED visits for children with asthma. The study further showed that the ability of patients to use written asthma action plans at the onset

of a cold or flu was associated with decreased ED visits for these reasons (Lieu et al., 1997). Cowie et al. (1997) compared the effect of a symptom based asthma action plan, to a PEFR based asthma action plan to no action plan given on controlling asthma. They found that the asthma patients with the PEFR based asthma action plan had a significant decrease in required visits for asthma exacerbations.

Provider Decision Support Tools

Many decision-support tools have been developed to enhance providers' adherence to evidence-based asthma guidelines. Some examples of these decision support tools that have been created and tested for efficacy on clinical outcomes with asthma are the "Acute asthma management pathways"(Lougheed & Oajos-Clow, 2010), the "Multi-colored simplified asthma guideline reminder (MSAGR)" (O'Laughlen, Hollen & Ting (2009), the "Paper stamp checklist" (Renzi et al., 2006), and the "Asthma Toolbox" (Shapiro et al., 2011). These have all proved to increase provider's knowledge on evidence-based asthma care as well as improve adherence to evidence-based guidelines and improve documentation of asthma management (Kim & Cho, 2012).

Educational programs for providers about asthma guidelines exist as well. Since primary care providers predominantly manage asthma, it is crucial that asthma guidelines are easily accessible and understandable for providers (Kim & Cho, 2012). Computer based disease management systems for chronic conditions such as asthma have proven to be effective in implementing guidelines into clinical practice (Hunt et al., 1998). These computer programs act as a prompting mechanism for providers to adhere to evidence-based guidelines. Some examples of these that exist are the "Easy asthma management

program" (Cho et al., 2010), the "AsthmaCritic" (Kuilboer et al., 2006), and the "Asthma medication management information system" (Twigg et al., 2004).

Provider Preference: Quick Reference Forms

Time constraints in primary care often interfere with the provision of complete asthma care based on the EPR-3 guidelines (Foggs, 2005). In a study done by Kang et al. (2010), physicians were found to prefer decision making tools and guideline recommendations in a format that could facilitate rapid decision-making in a busy clinical setting. Preferences by these providers were that the asthma guidelines needed to be presented in practical and concise formats such as with flowcharts, algorithms, and diagrams (Kang et al., 2010). They also further discovered that providers preferred concise materials to be presented on laminated sheets, pocket cards or in electronic medical records (Kang et al., 2010). Stone et al. (2005) had similar findings with a study conducted on guideline implementations for pediatric asthma and other diseases. They found that providers preferred more concise and easy-to-use practical guideline references (Stone et al., 2005).

Patient Education

Evidence-based patient and parent education remains a mainstay in the management and control of pediatric asthma (Cornforth, 2010). Several educational tools and methods have been tried in the primary care setting in order to improve asthma outcomes for pediatric patients. Sleath et al. (2011) provides research showing that there is a need for providers to demonstrate the use of asthma devices to children and parents in

clinic and get a return demonstration back from them as well to insure proper use and understanding of asthma treatments. The National Heart Lung and Blood Institute also recommend this practice in order to prevent improper use of inhalers, peak flow meters, turbuhalers, nebulizers, and other asthma devices (National Heart Lung and Blood Institute, 1997). This "hands-on" asthma education and demonstration will ensure better management of symptoms and prevent unnecessary emergent/urgent visits and hospitalizations as well as decrease health care costs (Sleath et. al, 2011).

Patient/Parent centered asthma education has been proven to be very effective in improving outcomes for pediatric asthma patients. This type of teaching approach with asthma care involves providing medical information adjusted to the individuals learning style, educational level, and performance abilities (Steward et al., 1995). Tzeng et al. (2010) completed a quasi-experimental study on children ages 6-14 in Taiwan with moderate to severe asthma that involved a three-month patient-centered asthma education program. This study showed that individualized assessment, planning, coordination of care, appropriate referrals, timely monitoring visits and follow up visits as part of the patient-centered education program improved home environmental control behaviors thereby improving patient outcomes (Tzeng et al., 2010).

Asthma education and management programs implemented in the clinical setting have been shown to greatly improve adherence to asthma plans and improve asthma outcomes. Farber and Oliveria (2004) completed a randomized, controlled clinical trial to see the effect of an asthma education program implemented as part of an ER visit in a New Orleans hospital for children ages 2-18. The study showed that the education

program improved the use of controller medications but did not have an impact on functional severity of the patients' asthma or on future exacerbations.

Boyd et al. (2009) completed a meta-analysis to uncover if asthma education promotes improved health outcomes. This meta-analysis included 38 randomized, controlled studies that involved 7,843 children. The findings of this review showed that providing asthma education to patients, parents, or both reduced ER visits and decreased office sick visits (Boyd et al., 2009). Educational interventions that are both written and face-to-face presented in a patient-centered fashion are optimal tools for promoting pediatric asthma control (Shah et al., 2008).

Literature Review Summary

Assessment and management of asthma in the primary care setting should be based on evidence-based guidelines like the EPR-3 Guidelines for Asthma Assessment and Management. However, primary care providers often fail to utilize the guidelines.. In order to implement evidence-based guidelines into clinical practice, strategies must be used to make the guidelines concise, understandable and practical for the clinical setting. Clinical decision making tools, action plans, patient education tools and strategies have all been found to be beneficial in promoting good asthma control and outcomes in the primary care setting. A combination of these prompts, tools, materials and strategies would be beneficial in the care of pediatric asthma patients nationwide as well as the adherence to the EPR-3 Guidelines for Asthma Assessment and Management.

CHAPTER THREE

METHODS

Overview

The objective of this project was to create an evidence-based pediatric asthma education and management toolkit for primary care providers in Montana to use in the primary care setting. The project aim is to assist in eliminating barriers to providing comprehensive evidence-based asthma care in a busy primary care office. The organization and content of the toolkit was based on the EPR-3 Guidelines for the Diagnosis and Management of Asthma (2007). Recommendations from pediatric asthma specialists in Montana as well as the Montana Asthma Control Program were incorporated into creating this toolkit for primary care providers. The literature review for this project was used to uncover the most efficient and effective asthma management and education tools tested in the primary care setting. Combining national evidence-based recommendations with local state recommendations was an attempt to decrease barriers to asthma care based on researched and tested tools.

Design of Toolkit

The general design of this asthma toolkit for pediatric primary care providers was set up in a way that would assist the provider in easily accessing all aspects of an initial asthma care visit as well as possible aspects in asthma follow-up visits for the busy primary care setting. The goal was to make the EPR-3 Asthma Diagnosis and

Management Guidelines (2007) easy to use in a short amount of time when visits in the primary care setting are often limited to twenty minutes or less (Konrad et al., 2010). In order to accomplish this, the toolkit was created to have a conveniently tabbed sections for providers to easily find diagnosis, management, education, and reference tools without having to spend time finding or gathering evidence-based tools to use during their asthma visits. Educational flyers demonstrating how to use peak flow meters, different types of inhalers, and spacers were also included in the toolkit in an organized and convenient to use fashion in the toolkit based on the demonstration device kit used by the Montana Asthma Control Program in the past. Each holding container for the devices clearly labels the device and is coordinated with an educational handout in the toolkit that explains how to use (and sometimes clean) the device. These handouts can be used to both educate the provider and the patient on the proper use and care of the devices.

The EPR-3 Guidelines for Asthma Diagnosis and Management (2007) recommends several key clinical activities for the evidence-based diagnosis and management of asthma. These clinical recommendations were used as a basis for what to include in the asthma toolkit for providers. In order to incorporate the literature on the barriers to asthma care delivery in the primary care setting, additional provider training tools and references were included in the kit in an attempt to alleviate some implementation barriers. As an example, spirometry is recommended to be performed at the initial asthma assessment and diagnosis visit by the EPR-3 Guidelines. The literature shows that a barrier to primary care providers ordering this gold standard of asthma diagnosis in children greater than or equal to 5 years of age is that they are not

comfortable interpreting spirometry results. In order to help with alleviating this barrier, the toolkit was equipped with a simple lesson on interpreting spirometry results.

The tools and references in the asthma toolkit are grouped into easy to use sections based on what the provider needs to address in each particular asthma visit. The EPR-3 Guidelines recommend dividing the tasks for complete evidence-based asthma care in the primary care setting into two categories. The "initial asthma assessment and diagnosis visit" and the "asthma follow-up visits" (EPR-3 Guidelines, 2007). Within each of these visits there are subcategories that are recommended to be addressed. The toolkit is designed with provider instructions so that the recommended provider tasks for the initial visit are outlined with a checklist and the follow up visit recommendations are also outlined for the provider with a checklist. Since every child will have individual needs because asthma is such an individualized chronic disease, the provider can do the recommended basics for asthma care on the checklists at each visit and then supplement the asthma care with additional materials as the provider sees fit for that individual child. This helps to prioritize necessary asthma care at visits given the limited time the primary care providers have to complete asthma visits.

Each tool or reference in the toolkit was intended to be able to be found quickly and used quickly in the pediatric primary care setting. Individual reference tools were chosen based on their ease of use (i.e. quick reference, algorithm, chart, or handout) and also based on provider preference reviewed in literature. All forms were laminated to prevent wear and tear in a busy office setting, for easy replicating for patient education and take-home tools, and to keep the kit hygienic so that it could be sanitized when

necessary. Each provider or team member of that provider, is responsible for replicating the "master copies" that are laminated for provider/patient use in the office in order to give written materials to the patient and family for optimal asthma education and adherence to management plan. The original toolkit will be distributed with 10 copies of each laminated tool or reference to get the provider started with the use of the toolkit.

Content Outline of Pediatric Asthma Toolkit for Primary Care Providers

The contents of this asthma toolkit are listed and described below. All pages in the toolkit were given a number and referenced in *Appendix A* at the end of this report.

- Page 1: Cover Page. Includes bulleted 6 priority messages for provider to follow when dealing with an asthma visit.
- Page 2: Flow-sheet/algorithm of asthma care. This is just an overall flow-sheet that can be used by providers as a quick reference guide to the steps for asthma care in their primary care practice.
- Page 3: Quick Reference for Asthma Care: Step-by-Step Quick Reference for flow of asthma care in the primary care setting.
- Page 4: Initial Asthma Visit Checklist for the Primary Care Provider. This checklist gives the provider a quick reference for what needs to be done at the initial asthma diagnosis visit. The checklist contains references for which pages of the toolkit to access for each step. They can also be found by the quick-tab titles on the actual pages of the toolkit.

- Page 5: Asthma Follow-Up Visit Checklist for the Primary Care Provider. This checklist gives the provider a quick reference for what needs to be done at each asthma follow up visit. The checklist contains references for which pages of the toolkit to access for each step. They can also be found by the quick-tab titles on the actual pages of the toolkit.
- Page 6: Common findings upon pediatric exam and history for asthma assessment. Also lists possible differential diagnoses for the pediatric patient.
- Page 7: Spirometry terms defined. When to perform spirometry for a suspected asthma patient or current asthma patient.
- Page 8: Spirometry Interpretation Reference. This gives the provider a quick reference in interpreting spirometry results performed for assessing asthma severity in children 5 years of age or older.
- Page 9: Spirometry Flow Volume Curve Interpretation Guide. Demonstrates by picture flow volume curve variations and how to interpret these.
- Page 10: Asthma Severity Classification Chart for Children Ages 0-4 years and 5-11 years. This chart classifies the child's asthma as "intermittent", "mild persistent", "moderate persistent", or "severe persistent" based on the child's age, impairment and risk. It also recommends which "Step" to use for initiating therapy.
- Page 11: Asthma Severity Classification Chart for Children 12 years of age or older. This chart classifies the child's asthma as "intermittent", "mild persistent", "moderate persistent", or "severe persistent" based on the child's

age, impairment and risk. It also recommends which "Step" to use for initiating therapy.

- Page 12: Stepwise approach chart for managing asthma long term in children 0-4 years of age and 5-11 years of age. This quick reference chart assists the provider in deciding which treatment to use for which child based on their severity classification and age.
- Page 13: Stepwise approach for managing asthma in adolescents 12 years of age or older and adults. This quick reference chart assists the provider in deciding which treatment to use for which adolescent/adult based on their severity classification and age.
- Pages 14-16: Usual doses for long term control asthma medications for different ages of children. This chart is three pages long and categorizes asthma medications available by class of medication. It is organized in a way so that providers can quickly references different doses of different medications for various ages of their pediatric patient population.
- Pages 17-18: Usual doses for quick-relief asthma medications for different ages of children. This chart is three pages long and categorizes asthma medications available by class of medication. It is organized in a way so that providers can quickly references different doses of different medications for various ages of their pediatric patient population.
- Pages 19: General information about side effects of different asthma medications by category. Made to be used as a handout for parents/patients.

- Pages 20: Provider reference for aerosol delivery devices. This provides a quick chart reference for the provider that shows population to prescribe which aerosol device for, technique for using the aerosol devices and any possible therapeutic issues with the devices.
- Page 21: How to use a Metered Dose Inhaler (MDI) handout. This can be given to parents/patients. Provides instructions on how to use and clean the device.
- Page 22: How to use a Metered Dose Inhaler (MDI) with a spacer and mask. This can be given to parents/patients. Provides instructions on how to use and clean the device.
- Page 23: How to use a Dry Powder Inhaler (DPI). This shows techniques and tips for using a Flexhaler and a Diskus. This can be given to parents/patients. Provides instructions on how to use and clean the device
- Page 24: How to prime and clean a Metered Dose Inhaler and a Spacer. This can be given to parents/patients. Provides instructions on how to prime and clean the devices.
- Page 25: How to use a Nebulizer and how to clean a Nebulizer. This can be given to parents/patients. Provides instructions on how to use and clean the device.
- Page 26: Peak-Flow information for the provider. Why these are an important part of asthma care and how to utilize the peak flow meter in the office setting.

- Page 27: Peak-Flow Chart for provider reference. Gives expected peak flow readings for child's age and height.
- Pages 28-29: Peak-Flow Teaching and Handout. This is intended to aid the provider in teaching a patient how to perform Peak-Flow monitoring at home and can also be given as a handout to the parents/patient.
- Page 30: All about asthma informational handout for patients.
- Pages 31: Montana Asthma Action Plan for Children. Included to use in office visits and for parents/patients to take home.
- Page 32: Montana Student Asthma Action Plan. Included to use in office visits and for parents/patients to take to their schools.
- Page 33: Another Asthma Action Plan for patients of all ages. Provider and patient preference will guide which action plan is chosen. Included to use in office visits and for parents/patients to take home.
- Page 34: Another Asthma Action Plan for patients of all ages. This is the NIH asthma action plan and the format is different from the others. . Included to use in office visits and for parents/patients to take to their schools.
- Page 35: Daycare/School form that is a checklist to assess how asthma-friendly the family's childcare/school setting is. Intended to give to parents/patients to take home and do assessment of their school/daycare setting.
- Page 36: Environmental Triggers of Asthma checklist/highlights. This page helps the Provider/family to discover and keep track of their patient's

environmental triggers. This can be given to the patient/parents as well to help them keep track of their asthma triggers at home or school.

- Page 37: Asthma Control Test (ACT) for children 4 to 11 years old. This can be used at the beginning of the office visit to assess the control the patient has over their asthma with the current treatment regimen (or before a treatment regimen is started). It can also be given as a handout to parents/patients so that their asthma can be assessed at home.
- Page 38: Asthma Control Test (ACT) for children 12 years and older. This can be used at the beginning of the office visit to assess the control the patient has over their asthma with the current treatment regimen (or before a treatment regimen is started). It can also be given as a handout to parents/patients so that their asthma can be assessed at home.
- Pages 39-40: TRACK (Test for Respiratory and Asthma Control in Kids) form for children under age 5 years. This can be used at the beginning of the office visit to assess the control the patient has over their asthma with their current treatment regimen (or before a treatment regimen is started). It can also be given as a handout to parents so that asthma can be assessed at home in children under 5 years old.
- Page 41: Asthma Symptom Diary. This can be used by the patient or parents to keep track of their asthma symptoms and medication use between visits.
- Page 42: Assessing Asthma Control and Adjusting Therapy in Children ages 0-4 years and 5-11 years. Quick reference chart for providers to use at asthma

follow up visits to assess asthma control and adjust therapy based on age, impairment and risk.

- Page 43: Assessing Asthma Control and Adjusting Therapy in Youths 12 years of age or older and adults. Quick reference chart for providers to use at asthma follow up visits to assess asthma control and adjust therapy based on age, impairment and risk.
- Page 44: Asthma resources for the provider and the patient. This is a list of websites and organizations that can provide more information and materials about asthma care. This can be used as a handout to parents/patients if they are requesting more information as well.
- Page 45: Local resources in Montana for provider and patient/parents. This is a list of asthma resources in the state of Montana.
- Page 46: Back cover page. Created by credits.

CHAPTER FOUR

RESULTS

Overview: Description of Findings

Uncontrolled asthma is a prevalent problem in children throughout the U.S., including in the state of Montana (Sleath et al., 2011 & MT DPHHS, 2013). There are costly consequences, both health and economic, to uncontrolled pediatric asthma in the U.S and Montana. These "costs" involve more frequent ED visits, higher hospitalization rates, more office visits, more missed days of school and work and the emotional strain on families (CDC, 2013a, CDC, 2013b, Liu et. al, 2010 & Akinbami, Moorman & Xiang Lui, 2011). The economic consequences of uncontrolled asthma may be more severe in the rural state of Montana due to the fact that the median household income is 12% lower than the rest of the U.S. as well as having lower average rates of insured residents than the rest of the U.S. (MT DPHHS, 2013).

Primary care providers are the key to managing uncontrolled asthma. The majority of pediatric asthma is managed in the primary care setting (Small, 2012). However, barriers do exist to providing comprehensive and evidence-based pediatric asthma care in the primary care setting. Some of the most prevalent barriers found in literature were lack of time in a visit to provide necessary care, lack of adherence to current EPR-3 guidelines, lack of reimbursement for comprehensive asthma management, limited staff available to complete all the necessary steps, and lack of access to easy-to-use tools (Small, 2012, Davis et. al, 1999, Dombkowaski et al., 2010,

Ting, 2002, Kim & Cho, 2012, & Cabana et. al, 2007). Eliminating all or some of these barriers to providing comprehensive evidence-based pediatric asthma care in the primary care setting would improve asthma outcomes for children in the U.S. and the state of Montana (NHLBI, 2013 & MT DPHHA, 2013).

Many studies have been conducted on individual tools that have been implemented in the primary care setting to improve asthma outcomes in children. When providers utilize decisions support tools that prompt evidence-based asthma care, use quick reference charts, forms and flow-sheets for diagnosis, management and follow up, use individualized asthma action plans to direct home management, and provide patient education based in demonstration and patient involvement, asthma outcomes are better for patients (Booth, 2012, Ducharme et. al, 2011, Kim & Cho, 2012, Kang et al., 2010, Stone et al., 2005, Cornforth, 2010, & Boyd et. al, 2010). Although much research has been done to show the effectiveness of these individual tools and concepts on pediatric asthma outcomes in primary care, not much research has been done on comprehensive toolkits for the primary care provider that include a mixture of all of these tools for asthma diagnosis, management and education.

To develop the pediatric asthma toolkit, I reviewed literature, consulted members of the Montana Asthma Control Program, asthma specialists and primary care providers in Montana, and incorporated personal observations in pediatric and family practices as a nurse and graduate nursing student. Interviews were conducted with Dr. Zacharisen, allergy and asthma specialist and pediatrician, Jeanne Cannon, RHIA, CPHT, CWPM and Katie Loveland, MPH, MSW, past program managers of the Montana Asthma

Control Program, and Josy Jahnke, RN for the Montana Asthma Project Home Visiting Program, in order to gather expert opinion on the best asthma diagnosis, management, and education tools to include in this toolkit for Montana primary care providers in addition to reviewed literature. Certain asthma toolkits existing in other states were also reviewed in an attempt to compare diagnosis, management, and education materials being distributed currently to primary care providers in other states. Some of these toolkits included the Fight Asthma Milwaukee Asthma Toolkit (Children's Hospital and Health System of Wisconsin, 2012), the Colorado Asthma Toolkit (National Jewish Health, 2013), and the Pennsylvania Pediatric Asthma Toolkit (Philadelphia Allies Against Asthma Coalition & the Pennsylvania Department of Health, 2012).

Included materials were prioritized according to which were most likely to eliminate barriers to providing comprehensive evidence-based pediatric asthma care in the primary care setting. The toolkit was based on the most current EPR-3 Asthma Diagnosis and Management Guidelines (2007) so that all providers were using the most up-to-date recommendations in asthma care and that they were easy to access. Also prioritized were tools to clarify the many steps to pediatric asthma care into clearly outlined and easy to access with checklists. The toolkit was designed so that all of the elements were in one place, easy-to-access, and comprehensive. This toolkit was intended for use from initial diagnosis of asthma to the long-term management stable patients as well as follow-ups for uncontrolled asthma. The intent was to have all diagnosis, management, and educational tools located in one toolkit so that the primary care

provider could save time and energy providing the best evidence-based asthma care possible.

The research for the development of this toolkit identified that primary care providers prefer individualized tools that may not be the same as other providers in the state or even in their rural town. However, many providers expressed a desire to "all be on the same page" with their asthma care so that continuity of care could be accomplished with their patients. The idea of using a succinct pediatric asthma toolkit across the state of Montana did appeal to many providers who were asked. Many primary care providers were very interested in acquiring a pediatric asthma toolkit so that they would not have to piece together their own resources. It was expressed that the toolkit would indeed save them time and also help their staff to provide patients with resources and education.

In creating this toolkit, I found that not all asthma "tools" are created equal. Many asthma flow-sheets, references, self-assessment tools, and action plans do not align with current EPR-3 guidelines. For this toolkit, all checklists, charts, and education handouts were altered or created to reflect guideline's recommendations. Asthma specialists and primary care providers were consulted on the creation of these tools as well.

Creating a comprehensive pediatric asthma toolkit was challenging with limited time and resources as a full time graduate student. Many asthma toolkits in other states were created by teams of people working for hospitals, public health departments, or health systems (i.e. Colorado Asthma Toolkit by National Jewish Health, 2013 and the Pediatric Asthma Toolkit by Philadephia Allies Against Asthma Coalition & the

Pennsylvania Department of Public Health, 2012). In retrospect, the creation of a pediatric asthma toolkit for the primary care provider in the state of Montana could have been a full time job. However, this leaves room for future improvements, testing of the toolkit, and possibly the creation of an outreach program for the Montana Asthma Control Program to primary care providers in the state of Montana.

CHAPTER 5

DISCUSSION, RECOMMENDATIONS, CONCLUSION

Discussion

Montana primary care providers do not have a designated pediatric asthma toolkit to use that is evidence-based or integrated across the state. Resources are scattered and awareness of available resources for pediatric asthma care is limited. The rural state of Montana provides special circumstances for pediatric patients and their families gaining access to asthma specialists (Winters & Lee, 2010). Although most pediatric asthma patient visits are managed by primary care providers across the U.S., primary care providers must assume an even greater leadership role in their patients asthma care in Montana (MT DPHHS, 2013). This care must be evidence-based and coordinated across the state in order to improve asthma outcomes for Montana children. Continuity of care in a rural state is paramount when access to specialists is limited (McClune, 2009). Rural areas are unique in their access to any health care and distance from specialty care (Winters & Lee, 2010). Using a state-wide asthma toolkit could improve asthma outcomes for children, reduce spending on asthma care, and decrease hospitalizations and ED visits. Providing rural pediatric patients in Montana with a continuity of care thread through a succinct asthma toolkit for primary care providers across the state would parallel with the need for Patient Centered Medical Homes for children with special health care needs (McClune, 2009).

Easy-to-use, easy-to-access, evidence-based tools are the most supportive to primary care providers for complete pediatric asthma care. This pediatric asthma toolkit for the primary care provider is an attempt to support the need for better pediatric asthma outcomes in the state of Montana. In order to gain insight on the toolkit that was created, opinions were gathered from pediatric asthma specialists as well as primary care providers in the state of Montana. Two asthma specialists in Montana reviewed the pediatric asthma toolkit for the primary care provider and found it to be evidence-based, appropriate in content to parallel their specialty practices, appropriate for use in the primary care setting, and also appropriate for use as a time-saving tool. The asthma specialists gave input on what medications should no longer be recommended and also preferred educational tools for device demonstrations. These items were updated in the toolkit.

Three primary care providers were given the toolkit to review. The providers found the toolkit to be evidence-based, appropriate for use in their primary care setting and very helpful as a time-saving tool in their busy practices. Other opinions gathered from primary care providers included that they: (a) appreciated the step-by-step checklists; (b) liked the centralized system for all information or teaching tools needed; (c) found that everything was in one place so they didn't have to go to internet or other sources to get information or teaching tools (d) liked the spirometry interpretation review; (e) liked the easily identifiable tabs to avoid spending time using a table of contents; (f) liked the list of Montana specific resources; (g) liked the ability to photocopy any page of

the toolkit for a patient hand-out and; (h) liked the correlation with the device demonstration kit for patient education.

There were certain requests and suggestions for the toolkit from experts/providers whom reviewed the toolkit. These requests and suggestions were as follows:

1. Wanted a peak flow goal chart added for estimating optimal large airway function and filling out asthma action plans;
2. Wanted a bulleted list of priorities for practice on the front cover so a provider could easily see the focus of the toolkit;
3. Wanted an additional page showing typical spirometry flow curves and interpretations;
4. Wanted a more durable binding;
5. Wanted certain medication devices removed that were taken off the market this last year;
6. Wanted qualification of why you need to get a chest x-ray on initial diagnosis;
7. Wanted device re-demonstration added to follow-up checklist.

All of these requests and suggestions were incorporated into the final draft of the pediatric asthma toolkit for the primary care provider.

Additional requests and suggestions from providers who were shown the toolkit could not be accommodated at this time due to lack of resources and implementation time. However, these requests and suggestions should be considered in future development and testing of the toolkit. One such suggestion was to make the checklists

even shorter because they seemed somewhat overwhelming for a traditional 20-minute visit. I found it to be very hard to shorten the checklists any more than I had due to the fact that all steps need to be covered at some time during evidence-based pediatric asthma management. However, I think that a reminder might be issued with the kit on the checklists that not all of the steps need to be completed in one visit. The checklists are intended to be kept with the child's chart so that a provider can keep track of what steps have been completed in the process and what steps still need to be done. The checklists can also be created using more concise medical language that takes out explanations and just uses minimal amounts of words.

Another request from providers was that the toolkit somehow be connected to their electronic medical records (EMR) system. It is true that there is a national initiative to convert all patient charting to electronic medical records. Though EMR integration would be optimal for many practices, there was not enough time to set up a computer program for this project. Also, the toolkit was created to be easily accessible to all primary care providers in the state of Montana. Currently, there are multiple different EMR systems across the state of Montana and the U.S and many small rural clinics in Montana are still using paper charting. It would be very hard to incorporate this kit into an EMR system and then not have it "communicate" with other EMR systems. I also felt it was necessary to provide a toolkit that could be in plain sight and the actual hands of the provider and office staff. Many of the pages in this kit are meant to be photocopied for patient education hand-outs. Connecting the toolkit to the EMR system would mean that you would not have the physical copies for hand-outs unless you printed them from

the EMR chart. This could be done, but then the provider is essentially creating a paper toolkit again. The intention of the toolkit is not for tracking and medical charting, but for guiding the provider to follow evidence-based steps for complete asthma care. I believe that the contents of this kit can, and hopefully will be, connected to EMR systems in the future but right now most asthma resources are in paper form. One asthma specialty clinic uses Cerner as an EMR system, which has the capacity to fill in different asthma action plans through this system. They did tell me that this was the only part of their asthma care plan that was connected to their EMR system, however, at this time. All educational materials were printed out in folders from different sources. Hopefully the future will bring an EMR that is friendly to asthma care.

The last suggestion/request was for improved advertisement of this toolkit/asthma resource to providers in Montana. Many primary care providers I spoke with were not aware of the resources available to them through the MACP and were very interested in how to access these resources and this toolkit in the future. I asked these providers what their preferred route of contact was for increasing awareness to these resources and the majority stated that face-to-face encounters were best. They discussed it being easy to get lost in mailings and emails about resources available but very memorable to meet someone offering you tools for practice.

Recommendations

Suggested Use of Toolkit in the Primary Care Setting

This asthma toolkit designed for primary care providers in Montana is intended to be an individual provider toolkit that makes it easier to efficiently complete evidence-based asthma care for pediatric patients and their families. Providers should keep the asthma toolkit in a convenient location in their office so that it is easily accessible when they have a patient with asthma, or a potential diagnosis, on their daily schedule. All primary care offices have different systems of staffing, work-flow, office visit time assigned, resources available and comfort levels with asthma care. This toolkit is aimed to be comprehensive and applicable to all primary care providers and offices, no matter what the variables in care systems may be.

Once a provider is aware that they have an asthma patient or potential diagnosis of asthma on their schedule, they can access the entire toolkit in their office prior to the visit or after the initial exam of the patient and pull out what they need based on the steps outlined in the kit. The provider accesses the section of the toolkit under "initial asthma visit." The provider can access the kit to see the medical history and exam findings consistent with an asthma patient as well as access the recommendations for ordering spirometry and evaluation of spirometry results. The provider can look at the "asthma initial visit checklist" and see it is recommended to diagnose the level of severity of the patient's asthma based on history of symptoms and spirometry (if age 5 or greater). The provider can then continue down the checklist and access the stepwise approach for

treatment of the patient's asthma based on their severity classification and age. All of these tools are easily accessible in the toolkit. The next step is to prescribe a treatment, initiate use, and demonstrate use of asthma inhaler device(s) based on recommendations and resources in the toolkit. The provider can then continue to the next step on the "initial asthma visit checklist" and create a written asthma action plan for the patient/parents. The provider might also discuss the need for an action plan and or inhaler at the child's school if the child is of school age. This school action plan would be an example of an additional step that is not in the base requirement for the visit but should be addressed if the provider has the time or at a later visit. The final step the provider would have to check off on the "initial asthma visit checklist" would be to schedule the patient's follow up visit.

The ideal and recommended primary care practices for evidence-based asthma care are presented in this asthma toolkit. However, sometimes lack of visit time or special circumstances with individual patients present in the primary care setting. In these situations, the toolkit is designed to be easily accessed for just what the provider may need at an individualized visit. For instance, a child might come in with problems using their spacer or inhaler or a child's parents might need more education about environmental asthma triggers in the home and the prevention of asthma exacerbations. The provider can access the tools needed to address these specific issues for quick acute asthma visits. Since research shows that pediatric asthma should be addressed and reviewed at non-respiratory visits as well, the toolkit can be accessed for quick asthma control assessment tools, management adjustment tools, and educational handouts or

references for patients and their parents. Self-assessment tools (ACT and TRACK) can be accessed from the toolkit prior to the office visit and completed while the patient is still in the waiting room in order to save time. There are many possibilities for how this toolkit can be used as a time-saving evidence-based primary care tool.

Testing the Pediatric Asthma Toolkit for the Primary Care Provider

In order to establish the usefulness of the toolkit in the primary care setting and determine improvements in pediatric asthma outcomes in the state of Montana, a study related to implementation of this toolkit is needed. Ideally, this toolkit should be tested in different primary care settings including rural pediatric and family practices as well as urban pediatric and family practices. It must be tested by all types of providers that provide primary care in the state of Montana, including Nurse Practitioners, Physician Assistants, and Physicians. Different regions of the state should be allowed to test the toolkit and data from all regions should be included in the review of the toolkit. The toolkit should be tested by providers across the state of Montana over at least a one year period in order to track its' usefulness, efficiency, and effectiveness through all asthma seasons and varying levels of pediatric "high volume visits" times of year. It would be helpful to base this study off of a previous study completed on other more established asthma toolkits, however, there are no studies that were found in the literature that reviewed the existing asthma toolkits in other states.

Distribution of Toolkit to Primary
Care Providers in Montana

Next Steps. The Montana Asthma Control Program has a State Plan that includes the goals of "Partnerships: Establish and maintain effective partnerships to increase the reach and impact of asthma control efforts" and "Health care: Improve systems and quality of asthma care" (MT DPHHS, 2009). These two goals align with the need to improve asthma diagnosis, management, and education in the state of Montana by integrating the EPR-3 Asthma Diagnosis and Management Guidelines into clinical primary care practice. As a next step, the Montana Asthma Control Program should create a database of primary care providers in the state of Montana to advertise this pediatric asthma toolkit for use in their primary care settings.

The Montana Asthma Control Program gives health care providers access to several individual tools and resources on their website that are evidence-based and recommended by the EPR-3 Guidelines (MT DPHHS, 2013). However, there is room to improve the systematic outreach to primary care providers in the state about the use and implementation of these resources. There is also not a comprehensive provider asthma diagnosis and management toolkit offered for primary care providers to order through the Montana Asthma Control Program. This professional project has revealed many barriers to asthma care in the primary care setting that this toolkit would help to alleviate. The Montana Asthma Control Program can use this tool as a way to help create partnerships between their program and primary care providers around the state as well as help to

provide a solution to creating a succinct asthma management program between all primary care providers in the state of Montana.

Distribution. The Montana Asthma Control Program can market this asthma toolkit to primary care providers in several ways. The toolkit could be posted on their website as a "Comprehensive Pediatric Asthma Toolkit for Primary Care Providers" that providers can order online. This would work for some primary care providers who are already aware of the state website and are partners with the Montana Asthma Control Program. However, if the goal is to reach providers that may not be aware of resources available for asthma care in Montana, it would be recommended to send out information via mail to primary care offices around the state advertising the toolkit with a picture brochure discussing its' contents, use, and means by which a provider could obtain the toolkit. This could be done systematically using a database of primary care providers in the state of Montana.

Outreach. Once the initial outreach about the toolkit was distributed, it would be necessary to keep track of primary care offices/providers that ordered the toolkit for use. This way, the Montana Asthma Control Program could follow up with those primary care offices that did not respond/order a kit and inquire by phone if they would be interested in a toolkit or a demonstration of a toolkit in their office. This type of outreach can build connections between the primary care providers of Montana who may be too busy with their schedules to acknowledge or order the resources that are available to them for efficient and evidence-based asthma care. It would also be very helpful if asthma

specialists in the state of Montana endorsed this clinician-friendly toolkit to primary care providers at conferences, with consults, or other presentations. Developing an outreach plan to create solid partnerships between primary care providers in the state and the Montana Asthma Control Program should be a priority in the goal to provide succinct and evidence-based asthma care in the state of Montana.

Developing a pediatric asthma toolkit for primary care providers to use in the busy clinic setting has been a project rooted in national evidenced based guidelines, scientific literature and expert recommendations. The methodology behind this toolkit's development was to make it practical for clinical use in a busy primary care setting. The goals behind the categorized comprehensive content based on the EPR-3 Guidelines was to streamline the abundance of asthma care information available to providers and to attempt to alleviate barriers providers face delivering comprehensive asthma care. Distribution of this asthma toolkit should be completed in a systematic manner through the Montana Asthma Control Program using web-based, printed mail, telephone, and face-to-face outreach in staged and methodical succession.

Updates to the Toolkit

The Pediatric Asthma Toolkit for the Primary Care Provider will need to be updated when new EPR-3 Asthma Diagnosis and Management Guidelines are published. The most current EPR-3 Guidelines will always be the basis of the toolkit in addition to published current research on diagnosis, assessment and educational tools for pediatric asthma care. This will ensure that its' contents are always evidence-based and up-to-date for providers across the state of Montana. It is my hope that the Montana Asthma Control

Program will offer this toolkit on their website and that their program will keep it updated with the most current guidelines. When updates are made to the toolkit, providers across the state should receive notices of the updates and also given the option to order an entirely new toolkit or just the updated pages. A database of primary care providers in the state that have ordered the toolkit should be kept to keep track of those needing a notice of updates.

Medication lists and available devices will need to be frequently updated. The pediatric asthma specialists that consulted on this toolkit underscored this problem. The pharmaceutical companies are frequently coming out with new medication options as well as discontinuing certain medications. Some will also be taken off the market due to lack of evidence for use or for safety reasons. These will need to be frequently updated by the distributer of the kit. It is my hope that the Montana Asthma Control Program will assume this role and make updates as necessary based on current pharmaceutical changes.

Conclusion

Improvements in pediatric asthma care delivery in the primary care setting are necessary to improve pediatric asthma outcomes in the U.S. and state of Montana. There are several steps to providing complete evidence-based asthma care for children. There are barriers to providing this care in the primary care setting including time restrictions on office visits, lack of resources, lack of use or awareness of current asthma guidelines, lack of follow up visit planning, and lack of consistent care. These barriers need to be

overcome in order to improve pediatric asthma outcomes in the U.S. and the state of Montana. The creation of the Pediatric Asthma Toolkit for the Primary Care Provider is an attempt to alleviate these barriers.

By providing primary care providers with a state-wide pediatric asthma toolkit for the diagnosis and management of asthma, asthma outcomes may be improved including fewer ED admits or hospitalizations for pediatric asthma, a decrease in the economic impact of asthma in the state, less uncontrolled pediatric asthma patients, and increased adherence to the EPR-3 Asthma Diagnosis and Management Guidelines (2007). It is the hope that this toolkit can eliminate common barriers to providing evidence-based asthma care in the primary care setting. Availability of this toolkit should be advertised state-wide through the Montana Asthma Control Program in order to create better partnerships between providers and public health in order to effectively tackle this growing chronic pediatric condition.

More research needs to be done on the effectiveness of using asthma toolkits in the primary care setting in improving pediatric asthma outcomes. Other states have implemented asthma toolkits that are available online to their primary care providers but no research exists on the effectiveness of these toolkits. It is recommended that the Pediatric Asthma Toolkit for the Primary Care provider be tested for effectiveness in improving pediatric asthma outcomes in the state of Montana in the future. The rural nature of the state of Montana should be considered when testing this toolkit so that all primary care clinic-types across the state have the opportunity to evaluate and take advantage of this tool and make recommendations for improvement.

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APPENDIX A

PEDIATRIC ASTHMA TOOLKIT FOR THE PRIMARY CARE PROVIDER

Pediatric Asthma Toolkit



For the Primary Care Provider

Created Using Current Evidence-Based EPR-3 Asthma Guidelines

6 Priority Messages to Guide Asthma Care

- **Prescribe Inhaled Corticosteroids**
- **Use Written Action Plans**
- **Assess Asthma Severity at Initial Visit**
- **Assess and Monitor Asthma Control and Adjust Treatment as Needed**
- **Schedule Follow-Up Visits at Periodic Intervals**
- **Control Environmental Triggers that worsen Asthma for Individual Patient**

Pediatric Asthma Toolkit

For the Primary Care Provider

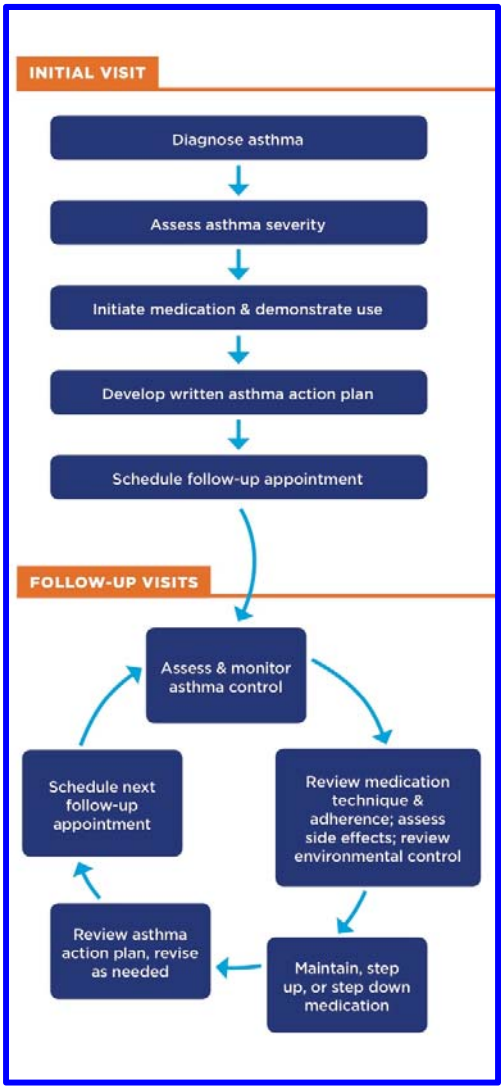
Asthma Care Quick Reference

GOAL: Asthma Control

Educate!

Educate!

Educate!



Reduce Impairment

- Prevent Chronic Symptoms
- Require infrequent use of short-acting beta2-agonist (SABA)
- Maintain (near) normal lung function and normal activity levels

Reduce Risk

- Prevent exacerbations
- Minimize need for emergency care, hospitalization
- Prevent loss of lung function (or, for children, prevent reduced lung growth
- Minimize adverse effects of therapy

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Quick Reference: Steps to Follow for Asthma Care

➔Step 1: Use Spirometry, Exam & History for Initial Asthma Diagnosis

➔Step 2: Classify Asthma Severity based on Guideline Charts

➔Step 3: Initiate Asthma Medication based on Guideline Charts

➔Step 4: Demonstrate Device use and give Education

➔Step 5: Complete a Written Action Plan

➔Step 6: Monitor Asthma Control with Follow-Up Visits

➔Step 7: Adjust Therapy as Needed based on Guideline Charts

➔Step 8: Review Asthma Triggers and Reduce Exposures

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Initial Asthma Visit Checklist

Patient Name:_____Age:____Wt:____Ht:___Allergies:_____

Parent/Guardian:_____Contact Info:_____

1. ☐ History and Physical Exam
   - ☐See Page 6 for History and Physical Tips
   - ☐Give Symptom Diary for future use. See page 41.
   - ☐Give ACT or TRACK (age) for future use. Pgs.37-40.
2. ☐ Spirometry on all patients 5 years of age and older
   - ☐Pages 7-9 for Spirometry Interpretation & pgs. 26-29 for Peak Flow Info.
   - ☐Pre & Post Bronchodilator Test on Initial Spirometry
   - ☐Chest X-Ray on initial asthma: R/O other lung conditions
   - ☐Figure Predicted Peak Flow for Age, Ht. & Sex____ Pg.27
3. ☐ Consider other causes of airway obstruction based on above data OR:
   - ☐Page 6 for list of differential diagnoses. ☐ Get Chest X-Ray
4. ☐ Diagnose with Asthma based on above data/Check Immunizations
   - ☐Recommend Flu and Pneumococcal Vaccines if not already done
5. ☐ Assess Asthma Severity using EPR-3 Asthma Guidelines Charts
   - ☐See Pages 10-11 for Asthma Severity Classification Charts
   - ☐ Severity Classification_____
6. ☐ Initiate Medication based on Severity Classification
   - ☐See Pages 12-13 for Step-Wise Initiating Therapy Charts
   - ☐See Pages 14-18 for Usual Dosages of Asthma Medications
   - ☐Send Prescriptions to Pharmacy
   - ☐Consider the need for devices for school/daycare/other residences
7. ☐ Demonstrate Use of Medication Delivery Device and Give Proper Handouts to Patient/Parent on Device Use/Cleaning
   - ☐See Pages 20-25 & Choose proper instructions/handouts for device(s)
8. ☐ Complete a written Asthma Action Plan
   - ☐See Pages 31-34 & Choose an Asthma Action Plan that is appropriate
   - ☐Confirm Patient/Parent Understanding
   - ☐Make copies for school/daycare/other residences
9. ☐ Schedule Follow-Up Visit_____
   - ☐2-6 weeks from initiation of medication is recommended

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Asthma Follow-Up Visit Checklist

Patient Name:_____Age:____Wt:____Ht:___Allergies:_____

Parent/Guardian:_____Contact Info:_____

1. ☐ History since last Asthma Visit and Physical Exam
   - ☐ ACT or TRACK in office-pages 37-40 for self-assessment tools
   - ☐ Review or dispense Asthma Symptom Diary & Review Inhaler Technique -see page 41.
   - ☐ Peak flows if over 5 years old. Pages 26-29.☐ Repeat Spirometry if more than 1 year, change in medication or change in control. Pages 7-9.
2. ☐ Assess Asthma Control Using EPR-3 Guidelines Charts
   - ☐ See pages 42-43 for Assessing Control and Adjusting Therapy Charts
3. ☐ Adjust Therapy if Needed Using EPR-3 Guidelines Stepwise Charts
   - ☐ See pages 10-13 for Stepwise Approach Charts for Therapy
4. ☐ Send in New Prescriptions if needed and Demonstrate Device Use Again. Re-demonstration is key even if stays on same medication.
   - ☐ See pages 14-18 for Usual Asthma Medication Dosage Charts
   - ☐ See pages 20-25 and choose proper instructions/handouts for device(s) prescribed
5. ☐ Review Asthma Action Plan and Revise if Needed
   - ☐ See Pages 31-34 and Choose an Asthma Action Plan that is appropriate
   - ☐ Confirm Understanding. Make copies for school/daycare/other residences
6. ☐ Review Environmental Triggers
   - ☐ See page 36 for Environmental Trigger Handout/Checklist
7. ☐ Give symptom Diary ☐Give Self Assessment Tool (ACT) for home
   - ☐ See page 41 for symptom diary ☐ See Pages 37-40 for ACTs or TRACK for appropriate age
8. ☐ Schedule Next Follow-Up Visit
   - ☐ Every 2-6 Weeks While Gaining Control_____
   - ☐ Every 1-6 Months While Monitoring Control_____
   - ☐ Every 3 Months if Step-Down in Therapy is Anticipated_____

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For the Primary Care Provider

Asthma Exam Findings and Alternate Diagnoses

Key Asthma Symptom Indicators

*The presence of multiple key indicators increases the probability of asthma, but spirometry is needed to establish a diagnosis (5yrs. of age and older). *

- History of any of the following:
  - ____Cough (worse particularly at night)
  - ____Recurrent wheeze
  - ____Recurrent difficulty breathing
  - ____Recurrent chest tightness
- Wheezing—high pitched whistling sounds when breathing out—especially in children. A lack of wheezing does not exclude asthma.
- Symptoms occur or worsen in the presence of:
  - ____Exercise
  - ____Viral Infection
  - ____Inhalant Allergens (e.g. pollen, mold, pet dander, house-dust mites
  - ____Irritants (e.g. tobacco or wood smoke, airborne chemicals)
  - ____Changes in weather
  - ____Stress
  - ____Strong emotional expression (e.g. crying or laughing hard)
  - ____Menstrual Cycles
- Symptoms occur or worsen at night, awakening the patient

Differential Diagnoses for Infants & Children

- Upper Airway Diseases
  - •Allergic rhinitis and sinusitis
- Obstructions involving large airways
  - •Foreign body in trachea or bronchus
  - •Vocal cord dysfunction
  - •Vascular rings or laryngeal webs
  - •Laryngotracheomalacia, tracheal stenosis, or bronchostenosis
  - •Enlarged lymph nodes or tumor
- Obstructions involving small airways
  - •Viral bronchiolitis or obliterative bronchiolitis
  - •Cystic fibrosis
  - •Bronchopulmonary dysplasia
  - •Heart disease
- Other Causes
  - •Recurrent cough not due to asthma
  - •Aspiration from swallowing Mechanism dysfunction or gastroesophogeal reflux

Charts adapted from NIH Publication Number 08-5846. NAEPP EPR-3 Guidelines for the Diagnosis and Management of Asthma

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Spirometry Basics for Asthma Care

Terms to Know

- FVC: (Forced Vital Capacity): The maximum volume of air that can be exhaled during a forced maneuver. <80% predicted is low.
- FEV1: (Forced Expired Volume in One Second): Volume expired in the second of maximal expiration after a maximal inspiration. This is a measure of how quickly the lungs can be emptied. <80% predicted is low.
- FEV1/FVC: FEV1 expressed as a percentage of the FVC, gives a clinically useful index of airflow limitation.
<85% predicted suggests airway obstruction. A low FVC and FEV1 with a normal FEV1/FVC suggests restriction without obstruction
- FEF 25-75%: Forced Expiratory Flow. Velocity measurement. Measurement is focused on small airways.

When to Perform

- Initial Assessment Visit
- After treatment is initiated and symptoms and Peak Expiratory Flow (PEF) have stabilized. This will assist in the knowledge and documentation of (near) “normal” airway function.
- During a period of progressive or prolonged loss of asthma control or a change in medication or treatment plan.
- At least every year to assess the maintenance of airway function. Spirometry measures should be followed over time to detect potential for decline and rate of decline of pulmonary function over time.

Chart adapted from NHLBI, Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report-3:2007

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SPIROMETRY INTERPRETATION GUIDE

The most important tools for diagnosing asthma are medical history, physical examination, and spirometry. Interpreting your spirometry results correctly will help assure an accurate diagnosis and disease classification (severity).

1. The first step is to make sure that the quality of the spirometry test is good. Poor quality tests can cause diagnostic misclassifications. Be sure to explain the procedure and demonstrate if necessary. Coach the patient through the maneuver and watch his/her effort. It's important to take the deepest breath possible and blow out as fast and as long as possible. Be sure there are 3 reproducible results of appropriate duration (6 seconds for children/adults, 3 seconds for younger children).

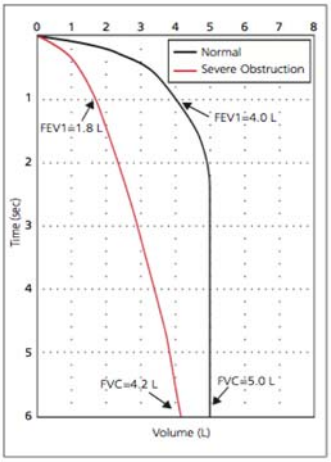
2. Look at the curve patterns and numbers to help guide your interpretation.

3. A normal flow-volume curve looks like a sail, rising rapidly to a peak then descending at about a 45-degree angle.

4. A concave flow-volume curve suggests mild to moderate airways obstruction, while a prolonged finish "rat's tail shape" suggests severe obstruction.

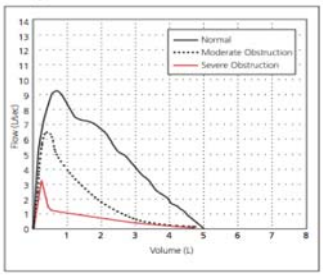
5. A normal volume-time curve rises sharply from the baseline and reaches a flat plateau. A gradual curve that never plateaus suggests airway obstruction.

Sample Volume / Time Curve



Note: If the effort stops before 6 seconds in adults (3 seconds in children) the FVC may be underestimated.

Sample Flow / Volume Curve



6. A low (<85% pred in children) FEV1% (FEV1/FVC) suggests airway obstruction. A low (<80% pred) FVC and FEV1 with a normal FEV1% suggests restriction without obstruction. If the asthma is flaring, there may be both a restrictive and obstructive pattern.

7. Patients with symptoms and airway obstruction should receive a post-BD (bronchodilator) spirometry test. After administration of a bronchodilator (i.e., albuterol, 2-4 puffs of 90 mcg/puff), allow 15 minutes prior to performing the post BD spirometry test. An increase of 12% (and more than 0.2 liters) in the measured FEV1 suggests reversible airways obstruction, as is seen in asthma.

8. In patients with intermittent respiratory symptoms and normal spirometry, consider performing a post-BD test to identify intermittent or mild asthma which is confirmed by a >12% improvement in FEV1, despite normal pre-BD spirometry results. Normal spirometry without reversibility does not exclude the diagnosis of asthma. A challenge procedure may need to be considered, or re-evaluation pre and post bronchodilator during a flare. If a patient with asthma is already on controller medication and symptom free, reversibility may be minimal.

If a diagnosis is still uncertain consider additional diagnostic testing or referral to a specialist for consultation or co-management.

Created by Barbara A. Chilmonczyk for the Maine AAP Asthma Learning Session #3, April 2010. Adapted from Jones Medical Instrument Company's "Easy Spirometry Interpretation Guide" handout, www.jonesmedical.com.

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Spirometry Flow Volume Curve Interpretation

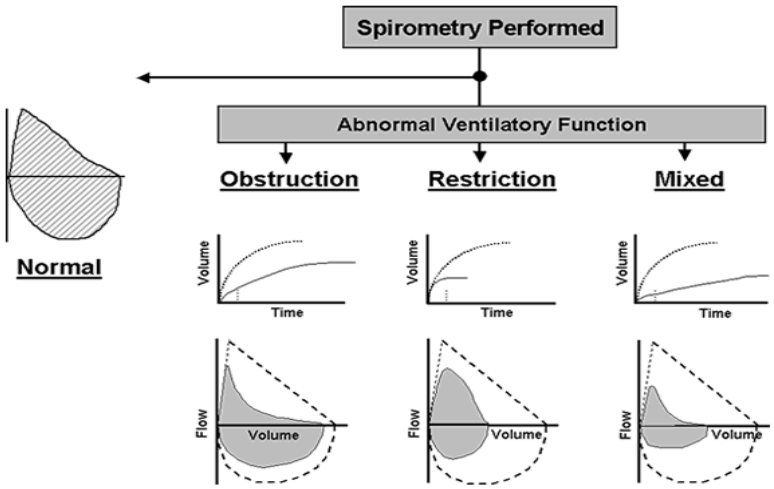


Figure 4
Schematic diagram illustrating idealised shapes of flow-volume curves and spirograms for obstructing, restrictive and mixed ventilatory defects.

Classification Of Ventilatory Abnormalities by Spirometry

	OBSTRUCTIVE	RESTRICTIVE	MIXED
FEV_1	↓	↓ or Normal	↓
FVC	↓ or Normal	↓	↓
FEV_1/FVC	↓	Normal or ↑	↓

The shape of the expiratory flow-volume curve varies between **obstructive ventilatory defects** where maximal flow rates are diminished and the expiratory curve is scooped out or concave to the x-axis, and **restrictive diseases** where flows may be increased in relation to lung volume (convex).

A "tail" on the expiratory curve as residual volume is approached is suggestive of obstruction in the small peripheral airways. Examination of the shape of the flow-volume curve can help to distinguish different disease states, but note that the inspiratory curve is effort-dependent.

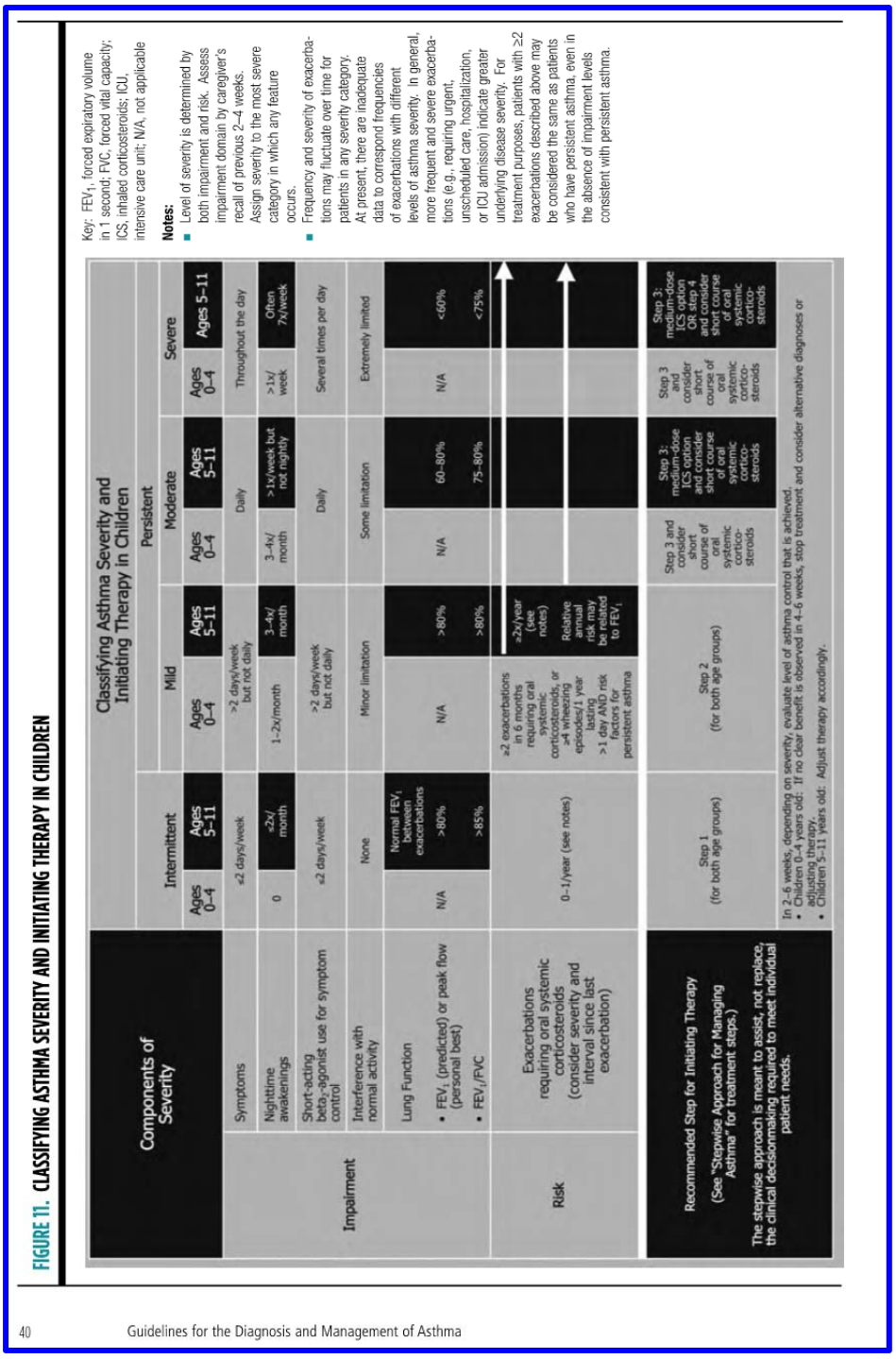
For example, a plateau of inspiratory flow may result from a floppy extra-thoracic airway, whereas both inspiratory and expiratory flow are truncated for fixed lesions.

Expiratory flows alone are reduced for intra-thoracic obstruction *(Figure 5)*.

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FIGURE 11. CLASSIFYING ASTHMA SEVERITY AND INITIATING THERAPY IN CHILDREN



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FIGURE 14. CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN YOUTHS 12 YEARS OF AGE AND ADULTS

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% 20–39 yr 80% 40–59 yr 75% 60–80 yr 70%	Lung function	• Normal FEV$_1$ between exacerbations • FEV$_1$ >80% predicted • FEV$_1$/FVC normal	• FEV$_1$ >80% predicted • FEV$_1$/FVC normal	• FEV$_1$ >60% but <80% predicted • FEV$_1$/FVC reduced 5%	• FEV$_1$ <60% predicted • FEV$_1$/FVC reduced >5%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year (see note)	≥2/year (see note)		
		Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV$_1$.			
Recommended Step for Initiating Treatment (See "Stepwise Approach for Managing Asthma" for treatment steps.)		Step 1	Step 2	Step 3	Step 4 or 5
		In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.		and consider short course of oral systemic corticosteroids	

Key: EIB, exercise-induced bronchospasm, FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; ICU, intensive care unit

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

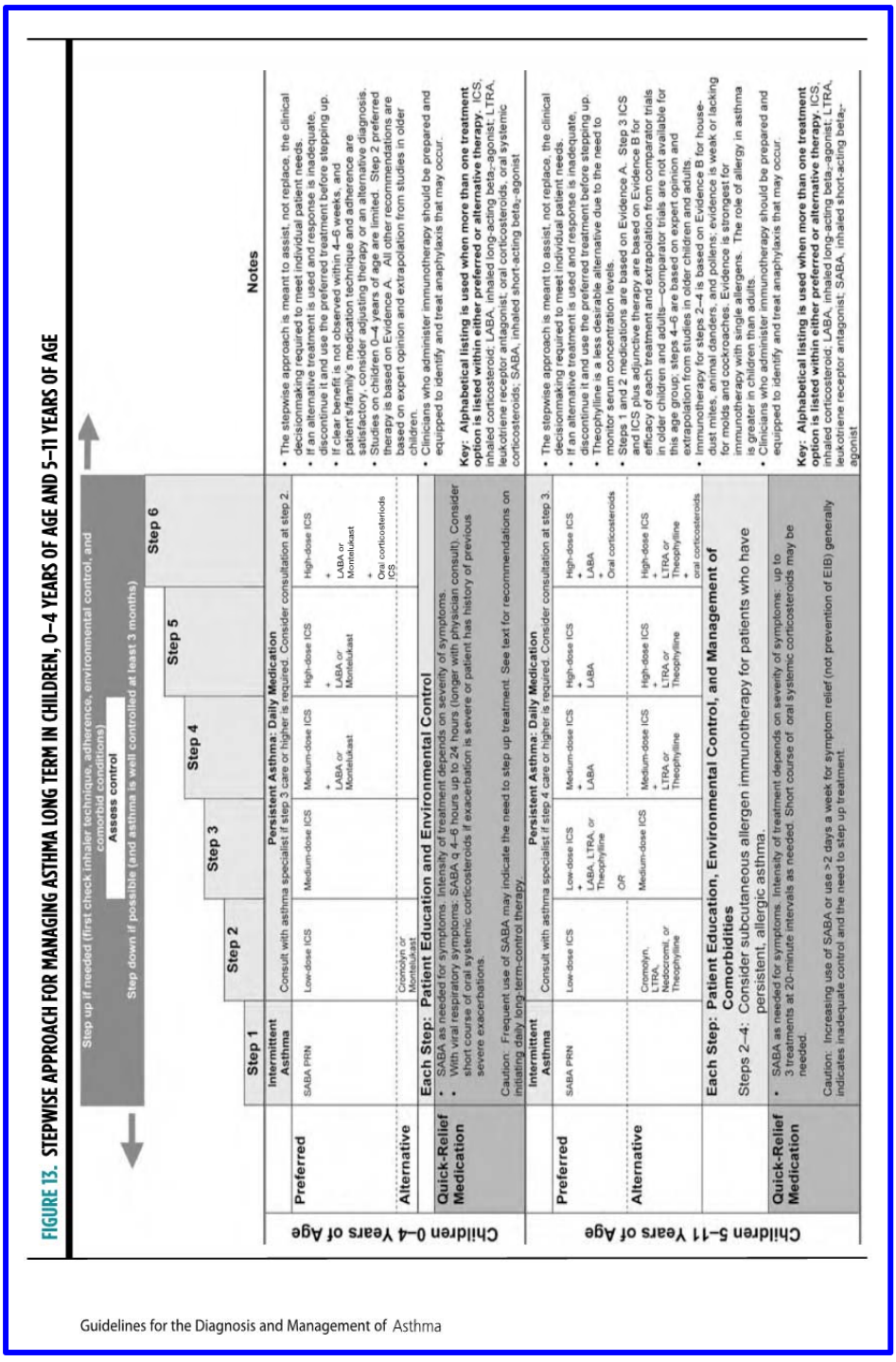


FIGURE 13. STEPWISE APPROACH FOR MANAGING ASTHMA LONG TERM IN CHILDREN, 0–4 YEARS OF AGE AND 5–11 YEARS OF AGE

Step up if needed (first check inhaler technique, adherence, environmental control, and comorbid conditions)

Assess control

Step down if possible (and asthma is well controlled at least 3 months)

Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6

Children 0–4 Years of Age

	Intermittent Asthma	Persistent Asthma: Daily Medication					
		Consult with asthma specialist if step 3 care or higher is required. Consider consultation at step 2.					
Preferred	SABA PRN	Low-dose ICS	Medium-dose ICS	Medium-dose ICS + LABA or Montelukast	High-dose ICS + LABA or Montelukast	High-dose ICS + LABA or Montelukast + Oral corticosteroids
Alternative		Cromolyn or Montelukast				ICS
Each Step: Patient Education and Environmental Control							
Quick-Relief Medication	• SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms. • With viral respiratory symptoms: SABA q 4–6 hours up to 24 hours (longer with physician consult). Consider short course of oral systemic corticosteroids if exacerbation is severe or patient has history of previous severe exacerbations. Caution: Frequent use of SABA may indicate the need to step up treatment. See text for recommendations on initiating daily long-term-control therapy.						

Children 5–11 Years of Age

	Intermittent Asthma	Persistent Asthma: Daily Medication				
		Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3.				
Preferred	SABA PRN	Low-dose ICS	Low-dose ICS + LABA, LTRA, or Theophylline OR	Medium-dose ICS + LABA	High-dose ICS + LABA	High-dose ICS + LABA + Oral corticosteroids
Alternative		Cromolyn, LTRA, Nedocromil, or Theophylline	Medium-dose ICS	Medium-dose ICS + LTRA or Theophylline	High-dose ICS + LTRA or Theophylline	High-dose ICS + LTRA or Theophylline + oral corticosteroids
Each Step: Patient Education, Environmental Control, and Management of Comorbidities Steps 2–4: Consider subcutaneous allergen immunotherapy for patients who have persistent, allergic asthma.						
Quick-Relief Medication	• SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed. Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment.					

Notes

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- If an alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- If clear benefit is not observed within 4–6 weeks, and patient's/family's medication technique and adherence are satisfactory, consider adjusting therapy or an alternative diagnosis.
- Studies on children 0–4 years of age are limited. Step 2 preferred therapy is based on Evidence A. All other recommendations are based on expert opinion and extrapolation from studies in older children.
- Clinicians who administer immunotherapy should be prepared and equipped to identify and treat anaphylaxis that may occur.

Key: Alphabetical listing is used when more than one treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, inhaled long-acting beta$_2$-agonist; LTRA, leukotriene receptor antagonist; oral corticosteroids, oral systemic corticosteroids; SABA, inhaled short-acting beta$_2$-agonist

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- If an alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- Theophylline as a less desirable alternative due to the need to monitor serum concentration levels.
- Steps 1 and 2 adjunctive therapy are based on Evidence A. Step 3 ICS and ICS plus adjunctive therapy are based on Evidence B for efficacy of each treatment and extrapolation from comparator trials in older children and adults—comparator trials are not available for this age group; steps 4–6 are based on expert opinion and extrapolation from studies in older children and adults.
- Immunotherapy for steps 2–4 is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than adults.
- Clinicians who administer immunotherapy should be prepared and equipped to identify and treat anaphylaxis that may occur.

Key: Alphabetical listing is used when more than one treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, inhaled long-acting beta$_2$-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta$_2$-agonist

Guidelines for the Diagnosis and Management of Asthma

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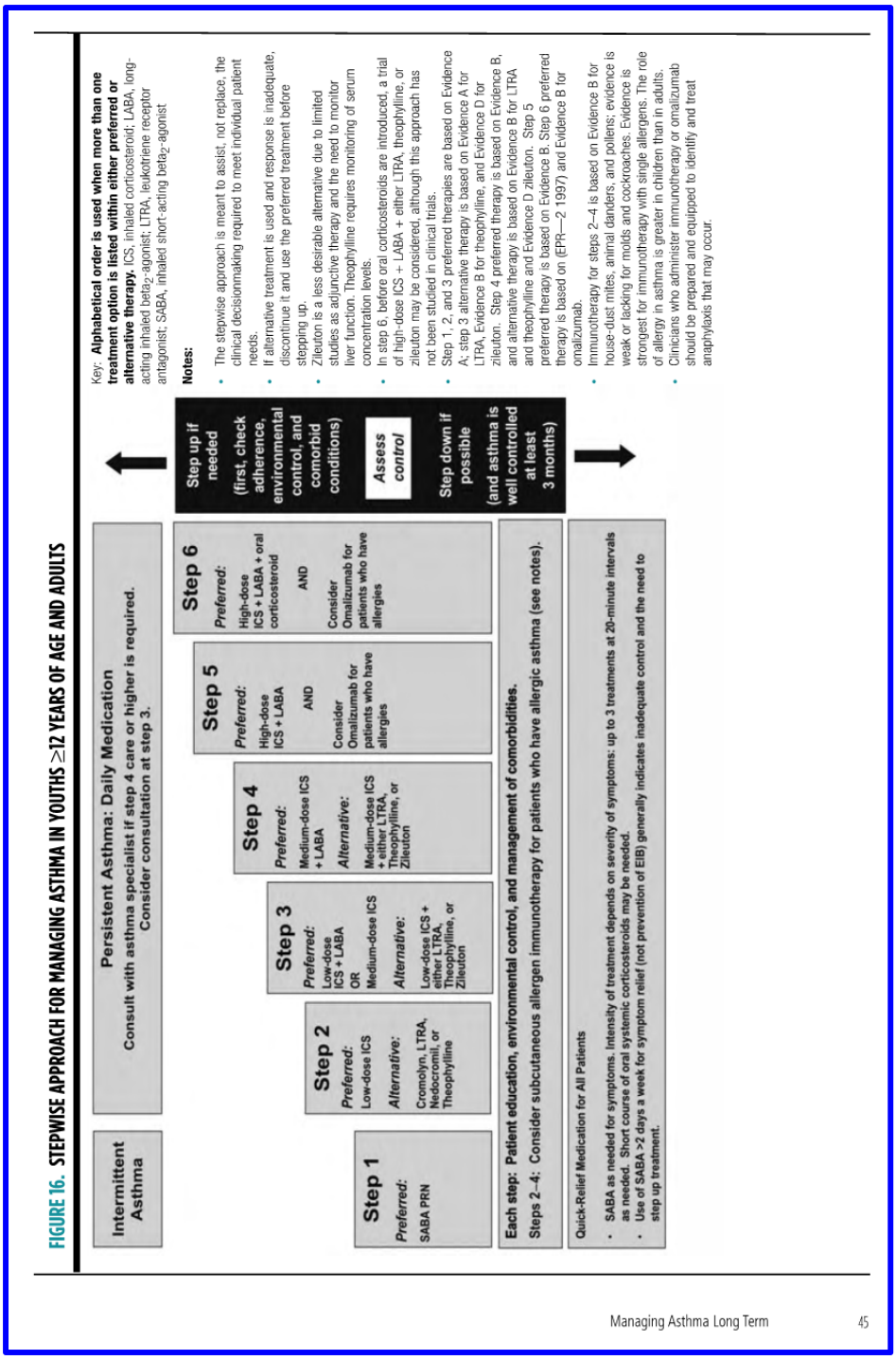


FIGURE 16. STEPWISE APPROACH FOR MANAGING ASTHMA IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Intermittent Asthma	*Preferred:* SABA PRN	*Preferred:* Low-dose ICS *Alternative:* Cromolyn, LTRA, Nedocromil, or Theophylline	*Preferred:* Low-dose ICS + LABA OR Medium-dose ICS *Alternative:* Low-dose ICS + either LTRA, Theophylline, or Zileuton	*Preferred:* Medium-dose ICS + LABA *Alternative:* Medium-dose ICS + either LTRA, Theophylline, or Zileuton	*Preferred:* High-dose ICS + LABA AND Consider Omalizumab for patients who have allergies	*Preferred:* High-dose ICS + LABA + oral corticosteroid AND Consider Omalizumab for patients who have allergies

Persistent Asthma: Daily Medication
Consult with asthma specialist if step 4 care or higher is required.
Consider consultation at step 3.

Each step: Patient education, environmental control, and management of comorbidities.
Steps 2–4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma (see notes).

Quick-Relief Medication for All Patients
- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- Use of SABA >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment.

Step up if needed (first, check adherence, environmental control, and comorbid conditions)

Assess control

Step down if possible (and asthma is well controlled at least 3 months)

Key: **Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy.** ICS, inhaled corticosteroid; LABA, long-acting inhaled beta$_2$-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta$_2$-agonist

Notes:
- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- Zileuton is a less desirable alternative due to limited studies as adjunctive therapy and the need to monitor liver function. Theophylline requires monitoring of serum concentration levels.
- In step 6, before oral corticosteroids are introduced, a trial of high-dose ICS + LABA + either LTRA, theophylline, or zileuton may be considered, although this approach has not been studied in clinical trials.
- Step 1, 2, and 3 preferred therapies are based on Evidence A; step 3 alternative therapy is based on Evidence A for LTRA, Evidence B for theophylline, and Evidence D for zileuton. Step 4 preferred therapy is based on Evidence B, and alternative therapy is based on Evidence B for LTRA and theophylline and Evidence D zileuton. Step 5 preferred therapy is based on Evidence B. Step 6 preferred therapy is based on (EPR—2 1997) and Evidence B for omalizumab.
- Immunotherapy for steps 2–4 is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than in adults.
- Clinicians who administer immunotherapy or omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.

Managing Asthma Long Term 45

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FIGURE 17. USUAL DOSAGES FOR LONG-TERM CONTROL MEDICATIONS*

Medication	0–4 Years of Age	5–11 Years of Age	≥12 Years of Age and Adults	Potential Adverse Effects	Comments (not all inclusive)
Inhaled Corticosteroids (See Figure 18, "Estimated Comparative Daily Dosages for ICSs.")					
Oral Systemic Corticosteroids					**(Apply to all three corticosteriods.)**
Methylprednisolone 2, 4, 8, 16, 32 mg tablets Prednisolone 5 mg tablets, 5 mg/5 cc, 15 mg/5 cc Prednisone 1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/cc, 5 mg/5 cc	0.25–2 mg/kg daily in single dose in a.m. or qod as needed for control Short-course "burst": 1–2 mg/kg/day, maximum 60 mg/day for 3–10 days	0.25–2 mg/kg daily in single dose in a.m. or qod as needed for control Short-course "burst": 1–2 mg/kg/day, maximum 60 mg/day for 3–10 days	7.5–60 mg daily in a single dose in a.m. or qod as needed for control Short-course "burst": to achieve control, 40–60 mg per day as single or 2 divided doses for 3–10 days	■ Short-term use: reversible abnormalities in glucose metabolism, increased appetite, fluid retention, weight gain, mood alteration, hypertension, peptic ulcer, and rarely aseptic necrosis. ■ Long-term use: adrenal axis suppression, growth suppression, dermal thinning, hypertension, diabetes, Cushing's syndrome, cataracts, muscle weakness, and—in rare instances—impaired immune function. ■ Consideration should be given to coexisting conditions that could be worsened by systemic corticosteroids, such as herpes virus infections, varicella, tuberculosis, hypertension, peptic ulcer, diabetes mellitus, osteoporosis, and Strongyloides	■ For long-term treatment of severe persistent asthma, administer single dose in a.m. either daily or on alternate days (alternate-day therapy may produce less adrenal suppression). ■ Short courses or "bursts" are effective for establishing control when initiating therapy or during a period of gradual deterioration. ■ There is no evidence that tapering the dose following improvement in symptom control and pulmonary function prevents relapse. ■ Children receiving the lower dose (1 mg/kg/day) experience fewer behavioral side effects, and it appears to be equally efficacious. ■ For patients unable to tolerate the liquid preparations, dexamethasone syrup at 0.4 mg/kg/day may be an alternative. Studies are limited, however, and the longer duration of activity increases the risk of adrenal suppression.
Inhaled Long-Acting Beta$_2$-Agonists (LABAs)					**(Apply to both LABAs.)**
Salmeterol DPI 50 mcg/blister Formoterol DPI 12 mcg/single-use capsule	NA NA	1 blister q 12 hours 1 capsule q 12 hours	1 blister q 12 hours 1 capsule q 12 hours	■ Tachycardia, skeletal muscle tremor, hypokalemia, prolongation of QTc interval in overdose. ■ A diminished bronchoprotective effect may occur within 1 week of chronic therapy. Clinical significance has not been established. ■ Potential risk of uncommon, severe, life-threatening or fatal exacerbation; see text for additional discussion regarding safety of LABAs.	■ **Should not be used for acute symptom relief or exacerbations. Use only with ICSs.** ■ Decreased duration of protection against EIB may occur with redgular use. ■ Most children <4 years of age cannot provide sufficient inspiratory flow for adequate lung delivery. ■ Do not blow into inhaler after dose is activated. ■ Each capsule is for single use only; additional doses should not be administered for at least 12 hours. ■ Capsules should be used only with the inhaler and should not be taken orally.

Key: DPI, dry powder inhaler; EIB, exercise-induced broncospasm; HFA, hydrofluoroalkane; ICS, inhaled corticosteroids; IgE, immunoglobulin E; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group); SABA, short-acting beta$_2$-agonist

***Note:** Dosages are provided for those products that have been approved by the U.S. Food and Drug Administration or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use.

Medications Available and Dosing Recommendations in Chart Current as of 2007 Guidelines. These are often changing based on market and research. See 2014 edits at bottom of charts

Pediatric Asthma Toolkit

For the Primary Care Provider

FIGURE 17. USUAL DOSAGES FOR LONG-TERM CONTROL MEDICATIONS* (continued)

Medication	0–4 Years of Age	5–11 Years of Age	≥12 Years of Age and Adults	Potential Adverse Effects	Comments (not all inclusive)
Combined Medication					
Fluticasone/Salmeterol DPI 100 mcg/50 mcg, 250 mcg/50 mcg, or 500 mcg/ 50 mcg HFA 45 mcg/21 mcg 115 mcg/21 mcg 230 mcg/21 mcg	NA	1 inhalation bid, dose depends on level of severity or control	1 inhalation bid; dose depends on level of severity or control	■ See notes for ICS and LABA.	■ There have been no clinical trials in children <4 years of age. ■ Most children <4 years of age cannot provide sufficient inspiratory flow for adequate lung delivery. ■ Do not blow into inhaler after dose is activated. ■ 100/50 DPI or 45/21 HFA for patients who have asthma not controlled on low- to medium-dose ICS ■ 250/50 DPI or 115/21 HFA for patients who have asthma not controlled on medium to high dose ICS.
Budesonide/ Formoterol HFA MDI 80 mcg/4.5 mcg 160mcg/4.5 mcg	NA	2 puffs bid, dose depends on level of severity or control	2 puffs bid; dose depends on level of severity or control	■ See notes for ICS and LABA.	■ There have been no clinical trials in children <4 years of age. ■ Currently approved for use in youths ≥12 years of age. Dose for children 5–12 years of age based on clinical trials using DPI with slightly different delivery characteristics. ■ 80/4.5 for patients who have asthma not controlled on low- to medium-dose ICS. ■ 160/4.5 for patients who have asthma not controlled on medium- to high-dose ICS.
Cromolyn/Nedocromil					
Cromolyn MDI 0.8 mg/puff	NA	2 puffs qid	2 puffs qid	■ Cough and irritation. ■ 15–20 percent of patients complain of an unpleasant taste from nedocromil. ■ Safety is the primary advantage of these	■ One dose of cromolyn before exercise or allergen exposure provides effective prophylaxis for 1–2 hours. Not as effective as inhaled $beta_2$-agonists for EIB as SABA. ■ 4- to 6-week trial of cromolyn or nedocromil may be needed to determine maximum benefit. ■ Dose by MDI may be inadequate to affect hyperresponsiveness. ■ Once control is achieved, the frequency of dosing may be reduced.
Nebulizer 20 mg/ampule	1 ampule qid NA <2 years of age	1 ampule qid	1 ampule qid		
Nedocromil MDI 1.75 mg/puff	NA <6 years of age	2 puffs qid	2 puffs qid		

Note: Cromolyn MDI and Nedocromil MDI No Longer Available as of 2014

*Chart from NHLBI: Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report 3: 2007

FIGURE 17. USUAL DOSAGES FOR LONG-TERM CONTROL MEDICATIONS* (continued)

Medication	0–4 Years of Age	5–11 Years of Age	≥12 Years of Age and Adults	Potential Adverse Effects	Comments (not all inclusive)
Immunomodulators					
Omalizumab (Anti IgE) Subcutaneous injection, 150 mg/ 1.2 mL following reconstitution with 1.4 mL sterile water for injection	NA	NA	150–375 mg SC q 2–4 weeks, depending on body weight and pretreatment serum IgE level	■ Pain and bruising of injection sites in 5–20 percent of patients. ■ Anaphylaxis has been reported in 0.2% of treated patients. ■ Malignant neoplasms were reported in 0.5 percent of patients compared to 0.2 percent receiving placebo; relationship to drug is unclear.	■ Do not administer more than 150 mg per injection site. ■ Monitor patients following injections; be prepared and equipped to identify and treat anaphylaxis that may occur. ■ Whether patients will develop significant antibody titers to the drug with long-term administration is unknown.
Leukotriene Modifiers					
Leukotriene Receptor Antagonists (LTRAs)					
Montelukast 4 mg or 5 mg chewable tablet 4 mg granule packets 10 mg tablet	4 mg qhs (1–5 years of age)	5 mg qhs (6–14 years of age)	10 mg qhs	■ No specific adverse effects have been identified. ■ Rare cases of Churg-Strauss have occurred, but the association is unclear.	■ Montelukast exhibits a flat dose-response curve. Doses >10 mg will not produce a greater response in adults. ■ No more efficacious than placebo in infants ages 6–24 months. ■ As long-term therapy may attenuate exercise-induced bronchospasm in some patients, but less effective than ICS therapy.
Zafirlukast 10 mg tablet 20 mg tablet	NA	10 mg bid (7–11 years of age)	40 mg daily (20 mg tablet bid)	■ Postmarketing surveillance has reported cases of reversible hepatitis and, rarely, irreversible hepatic failure resulting in death and liver transplantation.	■ For zafirlukast, administration with meals decreases bioavailability; take at least 1 hour before or 2 hours after meals. ■ Zarfirlukast is a microsomal P450 enzyme inhibitor that can inhibit the metabolism of warfarin. Doses of these drugs should be monitored accordingly. ■ Monitor hepatic enzymes (ALT). Warn patients to discontinue use if they experience signs and symptoms of liver dysfunction.
5-Lipoxygenase Inhibitor Zileuton 600 mg tablet	NA	NA	2,400 mg daily (give tablets qid)	■ Elevation of liver enzymes has been reported. Limited case reports of reversible hepatitis and hyperbilirubinemia.	■ For zileuton, monitor hepatic enzymes (ALT). ■ Zileuton is a microsomal P450 enzyme inhibitor that can inhibit the metabolism of warfarin and theophylline. Doses of these drugs should be monitored accordingly.
Methylxanthines					
Theophylline Liquids, sustained-release tablets, and capsules	Starting dose 10 mg/kg/day; usual maximum: ■ <1 year of age: 0.2 (age in weeks) + 5 = mg/kg/day ■ ≥1 year of age: 16 mg/kg/day	Starting dose 10 mg/kg/day; usual maximum: 16 mg/kg/day	Starting dose 10 mg/kg/day up to 300 mg maximum; usual maximum: 800 mg/day	■ Dose-related acute toxicities include tachycardia, nausea and vomiting, tachyarrhythmias (SVT), central nervous system stimulation, headache, seizures, hematemesis, hyperglycemia, and hypokalemia. ■ Adverse effects at usual therapeutic doses include insomnia, gastric upset, aggravation of ulcer or reflux, increase in hyperactivity in some children, difficulty in urination in elderly males who have prostatism.	■ Adjust dosage to achieve serum concentration of 5–15 mcg/mL at steady state (at least 48 hours on same dosage). ■ Due to wide interpatient variability in theophylline metabolic clearance, routine serum theophylline level monitoring is essential. ■ Patients should be told to discontinue if they experience toxicity. ■ Various factors (diet, food, febrile illness, age, smoking, and other medications) can affect serum concentrations. See EPR—3 Full Report 2007 and package inserts for details.

*Chart from NHLBI: Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report 3: 2007

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For the Primary Care Provider

FIGURE 19. USUAL DOSAGES FOR QUICK-RELIEF MEDICATIONS*

Medication	<5 Years of Age	5–11 Years of Age	≥12 Years of Age and Adults	Potential Adverse Effects	Comments (not all inclusive)
Inhaled Short-Acting Beta$_2$-Agonists					
	Dose applies to Albuterol.	***Dose applies to Albuterol/and Levalbuterol.***	***Dose applies to all four SABAs***		***Apply to all four (SABAs)***
MDI					
Albuterol CFC 90 mcg/puff, 200 puffs/canister	1–2 puffs 5 minutes before exercise	2 puffs 5 minutes before exercise	2 puffs 5 minutes before exercise	■ Tachycardia, skeletal muscle tremor, hypokalemia, increased lactic acid, headache, hyperglycemia. Inhaled route, in general, causes few systemic adverse effects. Patients with preexisting cardiovascular disease, especially the elderly, may have adverse cardiovascular reactions with inhaled therapy.	■ Drugs of choice for acute bronchospasm. ■ Differences in potencies exist, but all products are essentially comparable on a puff per puff basis. ■ An increasing use or lack of expected effect indicates diminished control of asthma. ■ Not recommended for long-term daily treatment. Regular use exceeding 2 days/week for symptom control (not prevention of EIB) indicates the need for additional long-term control therapy. ■ May double usual dose for mild exacerbations. ■ For levalbuterol, prime the inhaler by releasing 4 actuations prior to use. ■ For HFA: periodically clean HFA actuator, as drug may plug orifice. ■ For autohaler: children <4 years of age may not generate sufficient inspiratory flow to activate an auto-inhaler. ■ Nonselective agents (i.e., epinephrine, isoproterenol, metaproterenol) are not recommended due to their potential for excessive cardiac stimulation, especially in high doses.
Albuterol HFA 90 mcg/puff, 200 puffs/canister	2 puffs every 4–6 hours, as needed for symptoms	2 puffs every 4–6 hours, as needed for symptoms	2 puffs every 4–6 hours, as needed for symptoms		
Levalbuterol HFA 45 mcg/puff, 200 puffs/canister	NA <4 years of age				
Pirbuterol CFC Autohaler 200 mcg/puff, 400 puffs/canister	NA	NA			
Nebulizer solution					■ May mix with cromolyn solution, budesonide inhalant suspension, or ipratropium solution for nebulization. May double dose for severe exacerbations. ■ Does not have FDA-approved labeling for children <6 years of age. ■ Compatible with budesonide inhalant suspension. The product is a sterile-filled preservative-free unit dose vial.
Albuterol 0.63 mg/3 mL 1.25 mg/3 mL 2.5 mg/3 mL 5 mg/mL (0.5%)	0.63–2.5 mg in 3 cc of saline q 4–6 hours, as needed	1.25–5 mg in 3 cc of saline q 4–8 hours, as needed	1.25–5 mg in 3 cc of saline q 4–8 hours, as needed	(Same as with MDI)	
Levalbuterol (R-albuterol) 0.31 mg/3 mL 0.63 mg/3 mL 1.25 mg/0.5 mL 1.25 mg/3 mL	0.31–1.25 mg in 3 cc q 4–6 hours, as needed for symptoms	0.31–0.63 mg, q 8 hours, as needed for symptoms	0.63 mg–1.25 mg q 8 hours, as needed for symptoms	(Same as with MDI)	

Key: CFC, chlorofluorocarbon; ED, emergency department; EIB, exercise-induced bronchospasm; HFA, hydrofluoroalkane; IM, intramuscular; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group); PEF, peak expiratory flor; SABA, short-acting beta$_2$-agonist

*Dosages are provided for those products that have been approved by the U.S. Food and Drug Administration (FDA) or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use.

Albuterol CFC and Pirbuterol CFC are no longer available as of 2014

*Chart from NHLBI: Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report 3: 2007

Pediatric Asthma Toolkit

For the Primary Care Provider

FIGURE 19. USUAL DOSAGES FOR QUICK-RELIEF MEDICATIONS* (continued)

Medication	<5 Years of Age	5–11 Years of Age	≥12 Years of Age and Adults	Potential Adverse Effects	Comments (not all inclusive)
Anticholinergics					
Ipratropium HFA					
MDI					
17 mcg/puff, 200 puffs/canister	NA	NA	2–3 puffs q 6 hours	■ Drying of mouth and respiratory secretions, increased wheezing in some individuals, blurred vision if sprayed in eyes. If used in the ED, produces less cardiac stimulation than SABAs.	■ Multiple doses in the emergency department (not hospital) setting provide additive benefit to SABA. ■ Treatment of choice for bronchospasm due to beta-blocker medication. ■ Does not block EIB. ■ Reverses only cholinergically mediated bronchospasm; does not modify reaction to antigen. ■ May be an alternative for patients who do not tolerate SABA. ■ Has not proven to be efficacious as long-term control therapy for asthma.
Nebulizer solution					
0.25 mg/mL (0.025%)	NA	NA	0.25 mg q 6 hours		
Ipratropium with albuterol					
MDI					
18 mcg/puff of ipratropium bromide and 90 mcg/puff of albuterol 200 puffs/canister	NA	NA	2–3 puffs q 6 hours		
Nebulizer solution					
0.5 mg/3 mL ipratropium bromide and 2.5 mg/3 mL albuterol	NA	NA	3 mL q 4–6 hours		■ Contains EDTA to prevent discoloration of the solution. This additive does not induce bronchospasm.
Systemic Corticosteroids					
Methylprednisolone 2, 4, 6, 8, 16, 32 mg tablets Prednisolone 5 mg tablets, 5 mg/5 cc, 15 mg/5 cc Prednisone 1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/cc, 5 mg/5 cc	***Dosages apply to first three corticosteroids.***				***(Applies to the first three corticosteroids.)***
	Short course "burst:" 1–2 mg/kg/day, maximum 60 mg/day, for 3–10 days	Short course "burst": 1-2 mg/kg/day maximum 60 mg/day for 3–10 days	Short course "burst": 40–60 mg/day as single or 2 divided doses for 3–10 days	■ Short-term use: reversible abnormalities in glucose metabolism, increased appetite, fluid retention, weight gain, facial flushing, mood alteration, hypertension, peptic ulcer, and rarely aseptic necrosis. ■ Consideration should be given to coexisting conditions that could be worsened by systemic corticosteroids, such as herpes virus infections, varicella, tuberculosis, hypertension, peptic ulcer, diabetes mellitus, osteoporosis, and *Strongyloides*.	■ Short courses or "bursts" are effective for establishing control when initiating therapy or during a period of gradual deterioration. Action may begin within an hour. ■ The burst should be continued until patient achieves 80 percent PEF personal best or symptoms resolve. This usually requires 3–10 days but may require longer. There is no evidence that tapering the dose following improvement prevents relapse in asthma exacerbations. ■ Other systemic corticosteroids such as hydrocortisone and dexamethasone given in equipotent daily doses are likely to be as effective as prednisolone.

*Chart from NHLBI: Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report 3: 2007

Pediatric Asthma Toolkit
For the Primary Care Provider

Asthma Medications & Possible Side Effects

(Not a complete list of asthma medications)

Types of Medications	Examples	Possible Side Effects
Steroidal Anti-Inflammatories **-prevent and reduce airway inflammation** **-protect the airways form irritants and allergens**	**Inhaled:** •beclamethasone dipropiaonate (QVAR) •budesonide (Pulmicort) •fluticasone propionate (Flovent HFA) •fluticasone propionate + salmeterol xinafoate (Advair)	Hoarseness Dry mouth Thrush (yeast infection in mouth) Headache **After inhaling, rinse mouth out with water; then gargle, and spit**
Long-Acting Bronchodilators **-relax muscles that tighten around airways** **-not to be used as a quick relief** **-use along with a corticosteroid inhaler** **-helps prevent nighttime flare-ups or exercise induced flare-ups**	**Inhaled:** •budesonide + formoterol fumarate (Symbicort) •salmeterol xinafoate (Serevent) **Swallowed:** •theophylline (Elixophyllin, Theo-24, Theochron, Theolair)	Headache Dizziness Insomnia Nervousness Nausea Muscle twitches Muscle cramps Fast or irregular heartbeat
Other Long-Term Controllers **-help prevent asthma symptoms caused by exercise** **-Often used with a corticosteroid** **-Block the asthma response to some triggers**	**Inhaled:** cromolyn sodium **Swallowed:** montelukast sodium (Singuair), zafirlukast (Accolate), zileuton (Zyflo) **Injected:** omalizumab (Xolair)	**Inhaled:** dry throat, nausea, headache **Swallowed:** headache, nausea, dizziness, depression, psychedelic dreams **Injected:** Anaphylaxis (severe allergic reaction)
Short-Acting Bronchodilators **-Relax muscles that tighten around airways** **-Help stop flare-ups** **-Help prevent asthma symptoms caused by exercise**	•albuterol sulfate (ProAir HFA, Proventil HFA, Ventolin HFA) •levalbuterol HCL (Xopenex HFA)	Shakiness Nervousness Dizziness Fast or irregular heartbeat
Anticholinergics **-can be added to a short-acting bronchodilator to stop a severe flare-up** **-relax muscles around airways**	•ipratropium bromide (Atrovent HFA)	Dry mouth Headache Blurred Vision
Swallowed Corticosteroids **-used for flare-ups or severe episodes** **-help reduce swelling and mucous production in airways** **-usually short courses of 3-10 days (rare long-term therapy)**	•Methylprednisolone (Medrol) •Prednisolone (Prelone) •Prednisolone sodium phosphate (Orapred, Pediapred) •Prednisone (many brand names)	Short-term use: few side effects. Long term use: acne, increased appetite, weight gain, mood changes, high blood pressure, fluid retention, sleep, stomach, eye and bone problems.

Chart Adapted from Krames Patient Education: A Self-Care Guide: Living Well with Asthma: 2012

Pediatric Asthma Toolkit
For the Primary Care Provider

Aerosol Delivery Devices

Device/Drugs	Age	Optimal Technique	Therapeutic Issues
Metered-Dose Inhaler (MDI) Beta-2-Agonists Corticosteroids Anticholinergics	**≥ 5 years** **< 5 years with spacer, VHC, or mask**	• Actuation during a **slow**, 3-5 sec., deep inhalation • Hold breath for 10 sec. • Wait 1 minute between puffs • Rinse Mouth out with water and spit after last dose of medicine • Take metal canister out of plastic container of MDI and rinse plastic container with warm water once per week.	• Slow inhalation and coordination of actuation during inhalation may be difficult in young children. • Patients may incorrectly stop inhalation at actuation. • Deposition of 50-80% of dose in oropharynx. • Lung delivery varies among MDIs depending on formulation, propellant and valve design.
Dry Powder Inhaler (DPI) **ICS/LABA** Beta-2-Agonists Corticosteroids Anticholinergics	**≥ 4 years**	• **Rapid**, over 1-2 sec., deep inhalation • Hold breath for 10 sec. • Wait 1 minute between puffs • Rinse Mouth out with water and spit after last dose of medicine	• Most children < 4 years old may not generate sufficient inspiratory flow to activate inhaler • Dose is lost if patient exhales through device after actuating. • Rapid inhalation promotes greater deposition in larger central airways. • Delivery is more flow dependent in devices with highest internal resistance.
Spacer or Valved Holding Chamber (VHC)	**≥ 4 years** **< 4 years with VHC and mask**	• **Slow**, over 3-5 sec., deep inhalation • Inhalation followed by immediate 10 sec. breath holding • Actuate only **once** into the spacer/VHC per inhalation • If face mask is used, it should fit **tightly** and allow child 3-5 inhalations per actuation. • Rinse mouth out with water and spit after last dose of medicine. • Rinse plastic VHCs once a month with warm water and drop of household dishwashing detergent. Let air dry in vertical position. • Patient may also be using non-static VHC.	• Indicated for patients who have difficulty performing MDI technique. • May be bulky and hard to manipulate while coordinating actuation and inhalation. VHCs are preferred. • Face mask allows MDIs to be used with small children. However, use of a face mask reduces delivery to lung by 50%. • The VHC improves lung delivery and response in patients who have poor MDI technique. • Spacers and VHCs decrease oropharyngeal deposition of medication and thus decrease risk of topical side effects (e.g. thrush). • Spacers will also reduce the potential systemic availability of ICSs with higher oral

Device/Drugs	Age	Optimal Technique	Therapeutic Issues
			absorption. However, spacers/VHC may increase systemic availability of ICSs that are poorly absorbed orally by enhancing delivery to lungs. • No clinical data are available on use of spacers or VHCs with ultrafine-particle-generated HFA MDIs. • As effective as nebulizer for delivering SABAs and anticholinergics in mild to moderate exacerbations; data in severe exacerbations are limited.

Chart adapted from NHLBI: Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report 3: 2007

Pediatric Asthma Toolkit

For the Primary Care Provider

How To Take Asthma Medicines

Many asthma medicines come as sprays and powders that are used in an inhaler. When you breathe in the medicine through the inhaler, it goes right to the airways in the lungs where it is needed. Ask your provider to help you learn how to use an inhaler.

How to use a metered-dose inhaler (MDI)



STEP 1:
Take off the cap, and shake the inhaler with the metal canister inserted.



STEP 2:
Hold the inhaler like this—stand up, take a deep breath, and breathe out as much as you can. Tilt head back slightly.



STEP 3:
Hold the inhaler in your mouth or 2 fingers away from your mouth (the best method). As you start to breathe in, push down on the top of the inhaler, and keep breathing in slowly and deeply, keeping mouth open until breathing is complete.



STEP 4:
Hold your breath for 5 to 10 seconds with your mouth closed, then breathe out slowly. If you use more than one puff, wait 1 minute before inhaling again.



STEP 5:
If using inhaled corticosteroids, rinse your mouth with water, but don't swallow.



STEP 6:
Once a day, remove the cap and the canister from plastic holder, and wash them with mild soap and water. Rinse with running water. Let dry.

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Patient Handout from The American College of Chest Physicians: 2004

Pediatric Asthma Toolkit

For the Primary Care Provider

Using Your MDI With a Spacer and Mask—Pediatric

Patient Education Guide

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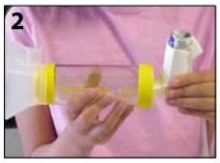
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To make your child's breathing better, you MUST give your child the medicine as explained below. Following these instructions puts more of the medicine in your child's lungs. This will help open the air passages in your child's lungs and help him or her breathe easier and feel better. You need to ask your child's health-care provider or pharmacist how many puffs the metered-dose inhaler (MDI) has when it is full. You need to keep track of how many puffs of medicine your child takes every day, so you can have the MDI refilled before your child runs out of medicine. Before using the MDI, please read the separate sheet on priming or preparing your MDI. The MDI and spacer should be cleaned once a week. See instructions on cleaning your MDI.



Take cap off MDI. Check for and remove any dust, lint, or other objects . Shake MDI well.



Attach MDI to spacer.



Have the child sit up straight or stand. Place the mask over the child's nose and mouth. The mask should be held on the face firmly enough so none of the medicine can escape.



Press down on the MDI. This puts one puff of medicine in the spacer.



To breathe in that one puff of medicine, the child should **BREATHE IN AND OUT NORMALLY FOR SIX BREATHS.** Do not remove the mask until the sixth breath is complete.



Remove the mask from the child's face.



If your child needs to take another puff of medicine, wait 1 minute. After 1 minute repeat steps 3-6.



Have your child rinse his or her mouth out with water after the last puff of medicine. Make sure the child spits the water out. Do not allow the child to swallow the water. *Rinsing is only necessary if the medicine you just took was a corticosteroid, such as Flovent®, Beclovent®, Vanceril®, Aerobid®, or Azmacort®.* Recap the MDI.

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Handout from The American College of Chest Physicians; 2006

Pediatric Asthma Toolkit

For the Primary Care Provider

Dry Powder Inhalers (DPIs)

Flexhaler Techniques and Tips



- Follow the manufacturer's instructions to load your dose of medication.
- Hold inhaler upright after loading medicine.
- Hold the inhaler away from the mouth, take a deep breath in, and blow out slowly and completely.
- Put your mouth around the mouthpiece and inhale deeply and forcefully.
- Hold your breath and count to 10.
- Breathe out slowly.
- Repeat these steps for the number of doses that your doctor has prescribed.
- Rinse your mouth with water, but don't swallow.
- The red line appearing on the window of your turbuhaler indicates only 20 doses left. Order refill at this time.



Diskus Technique and Tips

- Hold Diskus in left hand and place thumb on the thumb grip, pushing it forward away from you as far as it will go.
- Holding the Diskus in a level horizontal position, push the lever forward away from you until it clicks or as far as it can go.
- Holding the Diskus level but away from your mouth, take a deep breath, and blow out as deeply and completely as possible.
- Put the mouthpiece to your lips and breathe in steadily and deeply through your mouth.
- Remove the Diskus from your mouth.
- Hold your breath and count to 10.
- Breathe out slowly.
- To close Diskus, put your thumb on the thumb piece and slide the thumb grip back toward you until it clicks shut. The lever will automatically return with the thumb grip and reset itself.
- Repeat procedure for the number of doses the doctor has prescribed.
- If using inhaled corticosteroids, rinse your mouth with water, but don't swallow.

Never wash the mouthpiece or any part of the Diskus device. It must always be kept dry.

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Pediatric Asthma Toolkit

For the Primary Care Provider

Priming and Cleaning Your MDI and Spacer

Patient Education Guide

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Priming Your Metered-Dose Inhaler (MDI)

Preparing your MDI will need to be done for every new MDI before it is used or if it has been a long time since you last used your MDI. There are two types of MDIs. You need to ask your health-care provider or pharmacist if your MDI is a HFA or a CFC. The type of MDI you have will dictate how you prepare your MDI before use.

HFA MDIs: If your MDI is new or has not been used in 2 weeks shake, the MDI very well then press down on the MDI four times wasting four puffs into the air. After this is done, you are ready to take your medicine. See instructions on using your MDI (separate sheet).

CFC MDIs: If your MDI is new or has not been used in 12 hours, shake the MDI very well, then press down on the MDI once, wasting one puff of medicine into the air. After this is done, you are ready to take your medicine. See instructions on using your MDI (separate sheet).

Cleaning Your MDI



Take metal canister out of plastic container.



Rinse plastic container with warm water at least once a week.



Let plastic container air dry.



Replace metal canister in plastic container.

Cleaning Your Spacer



Remove rubber end where MDI fits.



Fill a sink or deep bowl with warm water. Add one drop of liquid detergent.



Place both pieces in the warm soapy water, and gently shake both pieces back and forth.



Rinse only the mouthpiece in running water.



Shake to remove the water.



Let air dry in vertical position. Do not dry with towels.



Put rubber end back on spacer when completely dry.

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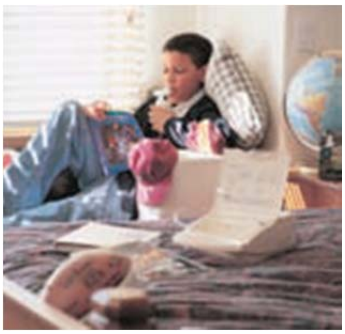
Handout from The American College of Chest Physicians; 2006

Pediatric Asthma Toolkit

For the Primary Care Provider

Using a Nebulizer

- If using a face mask, the mask **must fit properly and tightly** over nose and mouth (right size).
- If using a mouthpiece, it must be between the teeth with lips closed tightly around it.
- Waving the mouthpiece or mask in front of the mouth will NOT get the medicine into the lungs.
- Breathe in slowly and deeply over 3-5 seconds with each breath.
- Rinse mouth out or wipe mouth out with wash cloth after nebulizing.
- Give infants a drink of water.
- If a face mask was used, wash face with soap and water to avoid skin irritation.



Cleaning Nebulizer

- Take nebulizer attachments apart to wash. The cup and mouthpiece/mask should be washed daily with mild soap and water, rinsed, and air-dried. The tubing should never be washed.
- Each nebulizer machine is different. Depending on instructions from the manufacturer, some nebulizers are disposable and some are reusable. Always follow the manufacturer's instructions for cleaning the nebulizer device. Make sure the device is not plugged in or powered on when cleaning the device.
- Check with your provider about cleaning solutions to use on the device if you are barrowing from an office. Check instructions for cleaning from the manufacturer if you have purchased your own nebulizer. Remember to have the filter replaced on the nebulizer if the device is in need of service. You may notice that the device is taking longer and longer to complete a nebulizer treatment. This is an indication that the filter may need to be replaced.

Handout adapted from The American College of Chest Physicians; 2008 and Asthma and Allergy Foundations of America; 2012

Pediatric Asthma Toolkit

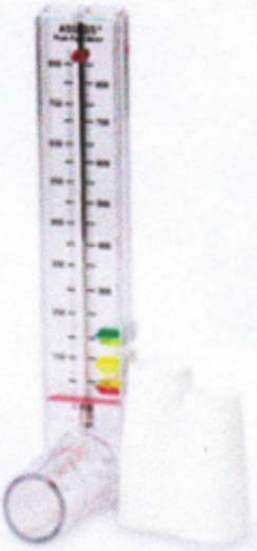
For the Primary Care Provider

Peak Flow Meters – Information for the Provider

Why are They Important?

- Peak flow meters help provide a simple objective measure of airway obstruction.
- When combined with symptom assessment, peak flow meters help identify the severity of the symptoms, effectiveness of interventions, and early detection of airway obstruction (even before symptoms occur).
- **Limitations:** Peak flow measures are effort dependent and measure only large airway function. Peak flow measures are not sufficient for diagnosis of to fully evaluate physiological function. You must perform spirometry for this. Short-term and periodic use is often more successful with home monitoring.
- They can be used at home, school, primary care office, or emergency department.
- Most insurers will cover the cost of a peak flow meter. It is recommended for all moderate and severe asthma patients but can be helpful for mild asthma as well.

Use in the Office



- Obtain a peak flow meter reading (or spirometry) upon rooming all asthma patients ages 5 and up for acute asthma flare-up, asthma follow-up and preventative asthma visits.
- Obtain a peak flow reading 5-10 minutes after a quick-relief nebulizer treatment to evaluate effectiveness.
- Use measurements during preventative visits (or from home) to establish a personal best (child's "normal" value). These readings should be over at least a two week period when the child is feeling well and asthma is under control.
- Use these measurements to determine "zones" for asthma action plan.

Adapted from Fight Asthma Milwaukee Allies Clinical Asthma Toolkit, 2004

Pediatric Asthma Toolkit

For the Primary Care Provider

Peak Expiratory Flow Rates

Child and adolescent female: 6 - 20 years of age

Height (in)	42	46	50	54	57	60	64	68	72
Age: 6	134	164	193	223	245	268	297	327	357
8	153	182	212	242	264	287	316	346	376
10	171	201	231	261	283	305	335	365	395
12	190	220	250	280	302	324	354	384	414
14	209	239	269	298	321	343	373	403	432
16	228	258	288	318	340	362	392	421	451
18	247	277	306	336	358	381	411	440	470
20	266	295	325	355	377	400	429	459	489

Child and adolescent male: 6 - 25 years of age

Height (in)	44	48	52	56	60	64	68	72	76
Age: 6	99	146	194	241	289	336	384	431	479
8	119	166	214	261	309	356	404	451	499
10	139	186	234	281	329	376	424	471	519
12	159	206	254	301	349	396	444	491	539
14	178	226	274	321	369	416	464	511	559
16	198	246	293	341	389	436	484	531	579
18	218	266	313	361	408	456	503	551	599
20	238	286	333	381	428	476	523	571	618
22	258	306	353	401	448	496	543	591	638
24	278	326	373	421	468	516	563	611	658
25	288	336	383	431	478	526	573	621	668

*Tables imported from Louisiana State University: found at:
http://www.sh.lsuhsc.edu/fammed/outpatientmanual/PeakFlowTables.htm

Pediatric Asthma Toolkit

For the Primary Care Provider

Peak Flow Meters

Use your peak flow meter:
- Every morning when you wake up, before you take medicine.
- When you are having asthma symptoms.
- After taking medicine.
- Any other time your doctor suggests.

USING A PEAK FLOW METER

1  Stand up or sit up straight.

2  Move the marker to the bottom of the numbered scale.

3  Take a deep breath. Fill your lungs with air all the way.

4  Hold your breath while you place the mouthpiece in your mouth, between your teeth. Close your lips around it. Do not put your tongue inside the hole.

5  Blow out as hard and as fast as you can.

6  Read the number on the peak flow meter. Write it down. If you cough or make a mistake, do not write down the number. Do it over again.

7 Repeat steps 1 through 6 two more times.

8  Write down the highest of the three numbers in an asthma diary.

9  Check to see which peak flow zone your peak flow number is in.

N. Schinel

10 Follow the instructions on your action plan for each zone.

Continued on the other side

Adapted from Fight Asthma Milwaukee Allies Clinical Asthma Toolkit, 2004

Pediatric Asthma Toolkit

For the Primary Care Provider

Peak Flow Meters

Peak flow meters are most useful when you find your personal best peak flow number:
- Take your peak flow each day for 2 to 3 weeks when your asthma is under good control.
- The highest repeating peak flow number you had during those 2 to 3 weeks is your personal best.

NOTE: Your personal best can change over time. It can increase with age and height.

With a personal best peak flow number, your health care provider can mark asthma control zones on your peak flow meter that match the control zones on your care plan.

ZONES

If your peak flow number is in the:

Green Zone = GO

Your asthma is in good control!
- Breathing is good.
- Can work and play.
- No coughing.
- No symptoms.

Take your usual daily long-term control medicines, if you take any. Keep taking these medicines every day as prescribed by your health care provider, even when you feel OK.



Yellow Zone = CAUTION

Be careful; your asthma is flaring up!
You may be having:
- Early warning signs such as coughing.
- Asthma attack signs such as shortness of breath, tight chest and wheezing.

Take the quick relief medicines your health care provider writes into the yellow zone of your care plan.



Red Zone = DANGER

Medicine is not helping. You are having emergency symptoms such as:
- Breathing is hard and fast.
- Trouble walking and talking.

GET HELP NOW!

Take the quick relief medicines your health care provider writes into the red zone of your care plan, **and** call your doctor for an emergency appointment or other directions.



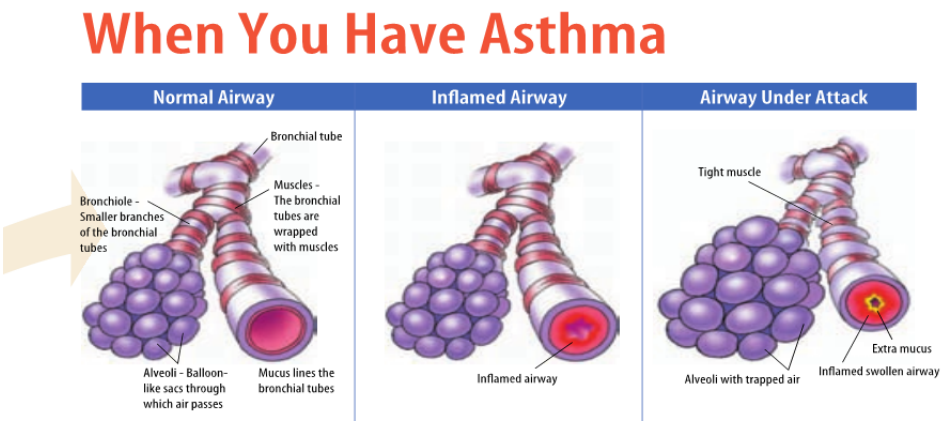
Adapted from Fight Asthma Milwaukee Allies Clinical Asthma Toolkit, 2004

Pediatric Asthma Toolkit

For the Primary Care Provider

Asthma Information

What Is Asthma?	What are Symptoms of Asthma?
□ A chronic (long-term) disease of airways in the lungs involving:	□ Recurrent Cough
□ airway inflammation	□ Wheezing
□ airway constriction and narrowing	
□ swelling of the lining of the airways	□ Shortness of Breath
□ over production of airway mucus	
□ airways are hyper-reactive, "twitchy"	□ Chest Tightness



What Triggers Asthma?	How Diagnosed?	How Treated?
• Respiratory virus or infection • Sinus infections • Exercise • Allergies (e.g. pollen, dust, pets, mold) • Smoke, air pollution, strong odors • Medications like Aspirin, NSAIDs (ibuprofen) or beta-Blockers • Weather changes • Anxiety, stress, strong emotions • Occupational exposures	• Spirometry (Lung Function Tests) • Lung inflammation test (FeNO) • Symptoms, timing/triggers • Response to asthma medications • Chest x-ray (rule out other lung conditions)	• Avoiding triggers • Medications: quick relief and daily controller • Allergy Injections • Vaccines: influenza & pneumococcal

Goals of Successful Asthma Treatment: use the least amount of medication possible in order to: have the best lung function, stay active/exercise/play, stay at school/work, sleep at night, stay out of the hospital, emergency department or urgent care, and stay off prednisone.

Adapted from American College of Chest Physicians, Controlling Your Asthma: Patient Education Guide, 2008 & Patient handout by Dr. Zacharisen of Family Allergy & Asthma Care of Montana, 2013

Montana Asthma Action Plan

Montana Asthma Control Program
Chronic Disease Prevention & Health Promotion Bureau

Name_____ Age____ Visiting nurse_____ Phone_____

Parent/guardian_____ Phone 1_____ Phone2_____

Healthcare provider_____ Phone_____ Fax_____

Green Zone	**Child is feeling well** • No difficulty participating in usual activities • No chest tightness, shortness of breath, wheezing, or coughing during the day or night Take these controller medications every day: Name Dose When to take it _____ _____ Before exercise: Medication _____Dosage _____ ___minutes prior to activity
Yellow Zone	**Child is not feeling well** • Chest tightness, shortness of breath, wheezing, or coughing with usual activities • Waking at night due to asthma symptoms Continue taking controller medication(s) and add these quick-relief medications: Name Dose When to take it _____ _____ Call child's healthcare provider if: _____ _____
Red Zone	**Alert! Contact child's healthcare provider or call 911 if:** • Quick-relief medication is not helping • Breathing is hard and fast • Ribs are showing and nostrils are flaring • Can't walk or talk well Take the following medications, and call the child's healthcare provider or 911 right away: Medicine Dose When to Take it _____ _____

Other key medical information

Child's asthma triggers, and other useful information:_____

_____

Reviewed by parent/guardian _____ Date_____

Reviewed by home visiting nurse_____ Date_____

Reviewed by child's healthcare provider _____ Date_____

Montana Student Asthma Action Plan

Student_____ School Nurse/Emergency Staff Phone_____ Fax _____
Teacher_____ Parent/Guardian_____ Phone_____
Student's Healthcare Provider_____ Phone_____ Fax_____

Green Zone	**Student is feeling well** • No difficulty participating in usual activities • No chest tightness, shortness of breath, wheezing, or coughing during the day or night Take these controller medications every day: Medicine _____ Dosage _____ When to Take it _____ _____ _____ _____ _____ _____ _____ Before exercise: Medication _____ Dosage _____ ____minutes prior to activity
Yellow Zone	**Student is not feeling well** • Chest tightness, shortness of breath, wheezing, or coughing with usual activities • Waking at night due to asthma symptoms Continue taking controller medication(s) and add these quick-relief medications:: Medicine _____ Dosage _____ When to Take it _____ _____ _____ _____ Call student's healthcare provider if: _____ _____
Red Zone	**Alert! Contact student's healthcare provider or call 911 if:** • Quick-relief medication is not helping • Breathing is hard and fast • Ribs are showing and nostrils are flaring • Can't walk or talk well Take the following medications, and call the healthcare provider or contact EMS right away: Medicine _____ Dosage _____ When to Take it _____ _____ _____ _____

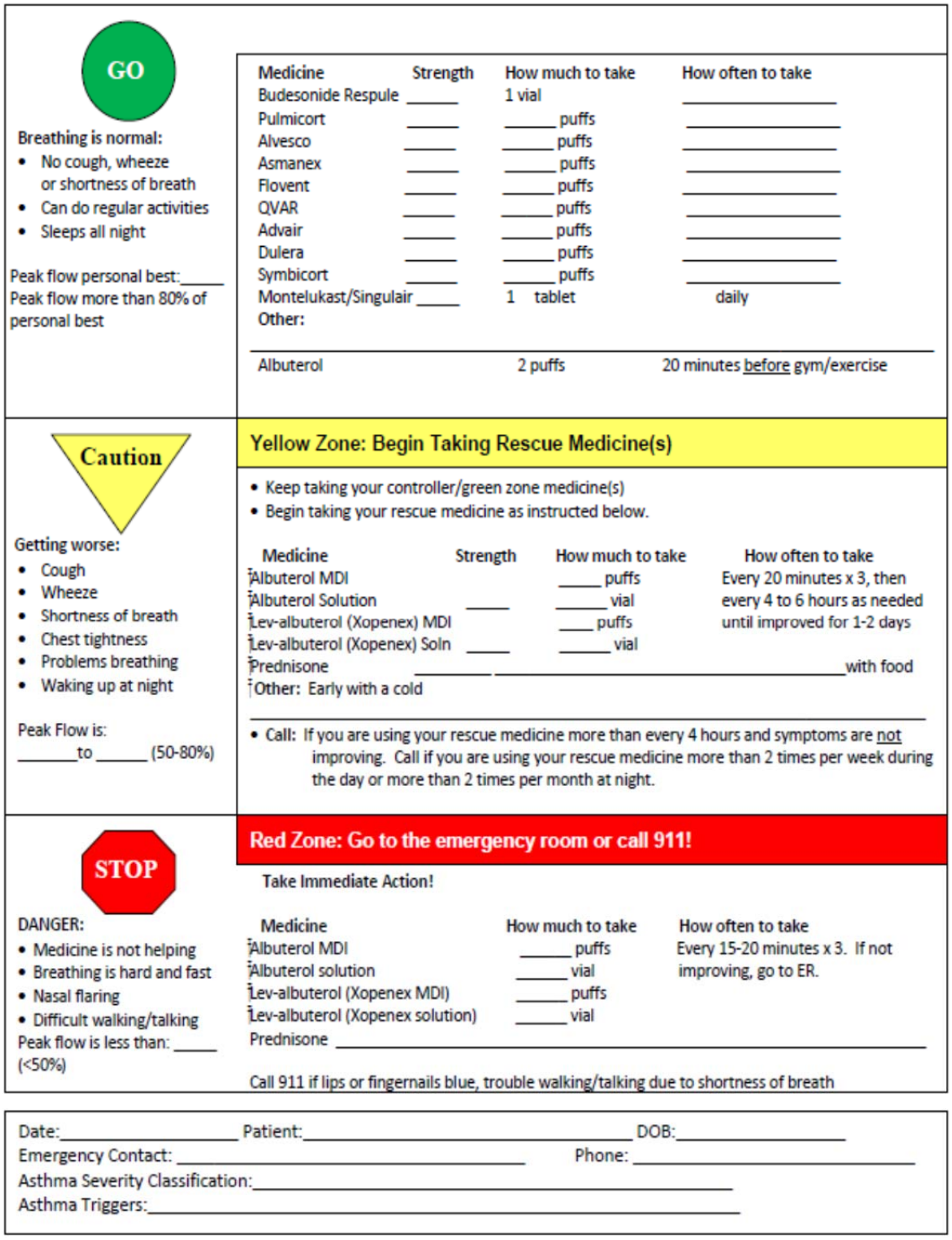
Other key medical information

☐ Student self-carries rescue medication ☐ Rescue medication is stored _____
The student's asthma triggers are _____
_____

Reviewed by parent/guardian _____ Date _____
Reviewed by school nurse/emergency staff _____ Date _____
Reviewed by student's healthcare provider _____ Date _____

MONTANA
ASTHMA CONTROL PROGRAM

Asthma Action Plan



GO

Breathing is normal:
- No cough, wheeze or shortness of breath
- Can do regular activities
- Sleeps all night

Peak flow personal best:_____
Peak flow more than 80% of personal best

Medicine	Strength	How much to take	How often to take
Budesonide Respule	_____	1 vial	_____
Pulmicort	_____	_____ puffs	_____
Alvesco	_____	_____ puffs	_____
Asmanex	_____	_____ puffs	_____
Flovent	_____	_____ puffs	_____
QVAR	_____	_____ puffs	_____
Advair	_____	_____ puffs	_____
Dulera	_____	_____ puffs	_____
Symbicort	_____	_____ puffs	_____
Montelukast/Singulair	_____	1 tablet	daily
Other:			
Albuterol		2 puffs	20 minutes before gym/exercise

Caution

Getting worse:
- Cough
- Wheeze
- Shortness of breath
- Chest tightness
- Problems breathing
- Waking up at night

Peak Flow is:
_____to _____ (50-80%)

Yellow Zone: Begin Taking Rescue Medicine(s)

- Keep taking your controller/green zone medicine(s)
- Begin taking your rescue medicine as instructed below.

Medicine	Strength	How much to take	How often to take
Albuterol MDI		_____ puffs	Every 20 minutes x 3, then every 4 to 6 hours as needed until improved for 1-2 days
Albuterol Solution	_____	_____ vial	
Lev-albuterol (Xopenex) MDI		_____ puffs	
Lev-albuterol (Xopenex) Soln	_____	_____ vial	
Prednisone	_____	_____	with food
Other: Early with a cold			

- Call: If you are using your rescue medicine more than every 4 hours and symptoms are not improving. Call if you are using your rescue medicine more than 2 times per week during the day or more than 2 times per month at night.

STOP

DANGER:
- Medicine is not helping
- Breathing is hard and fast
- Nasal flaring
- Difficult walking/talking

Peak flow is less than: _____ (<50%)

Red Zone: Go to the emergency room or call 911!

Take Immediate Action!

Medicine	How much to take	How often to take
Albuterol MDI	_____ puffs	Every 15-20 minutes x 3. If not improving, go to ER.
Albuterol solution	_____ vial	
Lev-albuterol (Xopenex MDI)	_____ puffs	
Lev-albuterol (Xopenex solution)	_____ vial	
Prednisone	_____	

Call 911 if lips or fingernails blue, trouble walking/talking due to shortness of breath

Date:_____ Patient:_____ DOB:_____
Emergency Contact: _____ Phone: _____
Asthma Severity Classification:_____
Asthma Triggers:_____

Adapted from Dr. Zacharisen of Family Allergy & Asthma Care of Montana, 2013.

Asthma Action Plan

For: _____ Doctor: _____ Date: _____

Doctor's Phone Number _____ Hospital/Emergency Department Phone Number _____

GREEN ZONE

Doing Well

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

And, if a peak flow meter is used,

Peak flow: more than _____
(80 percent or more of my best peak flow)

My best peak flow is: _____

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

Medicine	How much to take	When to take it
Before exercise	❒ _____	❒ 2 or ❒ 4 puffs _____	5 to 60 minutes before exercise

YELLOW ZONE

Asthma Is Getting Worse

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

-Or-

Peak flow: _____ to _____
(50 to 79 percent of my best peak flow)

First

Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.

_____ (short-acting beta$_2$-agonist)
❒ 2 or ❒ 4 puffs, every 20 minutes for up to 1 hour
❒ Nebulizer, once

Second

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

-Or-

If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:
❒ Take: _____ (short-acting beta$_2$-agonist) ❒ 2 or ❒ 4 puffs or ❒ Nebulizer
❒ Add: _____ (oral steroid) mg per day For _____ (3–10) days
❒ Call the doctor ❒ before/ ❒ within _____ hours after taking the oral steroid.

RED ZONE

Medical Alert!

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

-Or-

Peak flow: less than _____
(50 percent of my best peak flow)

Take this medicine:

❒ _____ (short-acting beta$_2$-agonist) ❒ 4 or ❒ 6 puffs or ❒ Nebulizer

❒ _____ (oral steroid) mg

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

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

- **Take ❒ 4 or ❒ 6 puffs of your quick-relief medicine AND**
- **Go to the hospital or call for an ambulance _____ (phone) NOW!**



NATIONAL HEART, LUNG AND BLOOD INSTITUTE
National Asthma Education and Prevention Program
NAEPP School Asthma Education Subcommittee

How Asthma-Friendly Is Your Child-Care Setting?

Children with asthma need proper support in child-care settings to keep their asthma under control and be fully active. Use the checklist below to find out how well your child-care setting assists children with asthma:

- ☐ Is the child-care setting **free of tobacco smoke** at all times?
- ☐ Is there **good ventilation** in the child-care setting? Are **allergens and irritants that can make asthma worse reduced or eliminated?** Check if any of the following are present:
  - ☐ *Cockroaches*
  - ☐ *Dust mites (commonly found in humid climates in pillows, carpets, upholstery, and stuffed toys)*
  - ☐ *Mold*
  - ☐ *Furry pets*
  - ☐ *Strong odors or fumes from art and craft supplies, pesticides, paint, perfumes, air fresheners, and cleaning chemicals*
- ☐ Is there a **medical or nursing consultant** available to help child-care staff write policy and guidelines for managing medications in the child-care setting, reducing allergens and irritants, promoting safe physical activities, and planning field trips for students with asthma?
- ☐ Are child-care **staff prepared to give medications as prescribed** by each child's physician and authorized by each child's parent? May **school-aged children carry their own asthma medicines** when appropriate? Is there someone available to supervise children while taking asthma medicines and monitor correct inhaler use?
- ☐ Is there a written, **asthma action plan** for each child in case of a severe asthma episode (attack)? Does the plan make clear what action to take? Whom to call? When to call?
- ☐ Does a nurse, respiratory therapist, or other knowledgeable person **teach child-care staff about asthma,** asthma management plans, reducing allergens and irritants, and asthma medicines? Does someone teach all the older children about asthma and how to help a classmate who has it?
- ☐ Does the child-care provider help children with asthma participate safely in **physical activities?** For example, are children encouraged to be active? Can children take or be given their medicine before exercise? Are modified or alternative activities available when medically necessary?

If the answer to any question is "no," children in your child-care setting may be facing obstacles to controlling their asthma. Uncontrolled asthma can hinder a child's attendance, participation, and progress in school. Child-care staff, health professionals, and parents can work together to remove obstacles and promote children's health and development.

Contact the organizations listed for information about asthma and helpful ideas for making school policies and practices more asthma-friendly. Federal and State laws are in place to help children with asthma.

Asthma can be controlled; expect nothing less.

October 2008

Pediatric Asthma Toolkit

For the Primary Care Provider

PEDIATRIC ASTHMA

Environmental History Form for Pediatric Asthma Patient

Specify that questions related to the child's home also apply to other indoor environments where the child spends time, including school, daycare, car, school bus, work, and recreational facilities.

		Follow up/ Notes
Is your child's asthma worse at night?	❑ Yes ❑ No ❑ Not sure	
Is your child's asthma worse at specific locations? If so, where? _____	❑ Yes ❑ No ❑ Not sure	
Is your child's asthma worse during a particular season? If so, which one? _____	❑ Yes ❑ No ❑ Not sure	
Is your child's asthma worse with a particular change in climate? If so, which?_____	❑ Yes ❑ No ❑ Not sure	
Can you identify any specific trigger(s) that makes your child's asthma worse? If so, what? _____	❑ Yes ❑ No ❑ Not sure	
Have you noticed whether dust exposure makes your child's asthma worse?	❑ Yes ❑ No ❑ Not sure	
Does your child sleep with stuffed animals?	❑ Yes ❑ No ❑ Not sure	
Is there wall-to-wall carpet in your child's bedroom?	❑ Yes ❑ No ❑ Not sure	
Have you used any means for dust mite control? If so, which ones? _____	❑ Yes ❑ No ❑ Not sure	
Do you have any furry pets?	❑ Yes ❑ No ❑ Not sure	
Do you see evidence of rats or mice in your home weekly?	❑ Yes ❑ No ❑ Not sure	
Do you see cockroaches in your home daily?	❑ Yes ❑ No ❑ Not sure	
Do any family members, caregivers or friends smoke?	❑ Yes ❑ No ❑ Not sure	
Does this person(s) have an interest or desire to quit?	❑ Yes ❑ No ❑ Not sure	
Does your child/teenager smoke?	❑ Yes ❑ No ❑ Not sure	
Do you see or smell mold/mildew in your home?	❑ Yes ❑ No ❑ Not sure	
Is there evidence of water damage in your home?	❑ Yes ❑ No ❑ Not sure	
Do you use a humidifier or swamp cooler?	❑ Yes ❑ No ❑ Not sure	
Have you had new carpets, paint, floor refinishing, or other changes at your house in the past year?	❑ Yes ❑ No ❑ Not sure	
Does your child or another family member have a hobby that uses materials that are toxic or give off fumes?	❑ Yes ❑ No ❑ Not sure	
Has outdoor air pollution ever made your child's asthma worse?	❑ Yes ❑ No ❑ Not sure	
Does your child limit outdoor activities during a Code Orange or Code Red air quality alert for ozone or particle pollution?	❑ Yes ❑ No ❑ Not sure	
Do you use a wood burning fireplace or stove?	❑ Yes ❑ No ❑ Not sure	
Do you use unvented appliances such as a gas stove for heating your home?	❑ Yes ❑ No ❑ Not sure	
Does your child have contact with other irritants (e.g., perfumes, cleaning agents, or sprays)?	❑ Yes ❑ No ❑ Not sure	

What other concerns do you have regarding your child's asthma that have not yet been discussed?

Reference: Environmental Management of Pediatric Asthma: Guidelines for Health Care Providers www.neefusa.org/health/asthma/asthmaguidelines

National Environmental Education Foundation
Knowledge to live by

Health & Environment

Additional resources and Spanish language materials available at www.neefusa.org/health/asthma/asthmaguidelines
health@neefusa.org

Patient Name: Date: Patient ID#: Primary Care Provider:

Childhood Asthma Control Test for children 4 to 11 years.

How to take the Childhood Asthma Control Test

- **Step 1** Let your child respond to **the first four questions (1 to 4).** If your child needs help reading or understanding the question, you may help, but let your child select the response. Complete the remaining **three questions (5 to 7)** on your own and without letting your child's response influence your answers. There are no right or wrong answers.
- **Step 2** Write the number of each answer in the score box provided.
- **Step 3** Add up each score box for the total.
- **Step 4** Take the test to the doctor to talk about your child's total score.

19 or less If your child's score is 19 or less, it may be a sign that your child's asthma is not controlled as well as it could be. No matter what the score, bring this test to your doctor to talk about your child's results.

Have your child complete these questions.

1. How is your asthma today?

0	1	2	3	SCORE
Very bad	Bad	Good	Very good	

2. How much of a problem is your asthma when you run, exercise or play sports?

0	1	2	3	
It's a big problem, I can't do what I want to do.	It's a problem and I don't like it.	It's a little problem but it's okay.	It's not a problem.	

3. Do you cough because of your asthma?

0	1	2	3	
Yes, all of the time.	Yes, most of the time.	Yes, some of the time.	No, none of the time.	

4. Do you wake up during the night because of your asthma?

0	1	2	3	
Yes, all of the time.	Yes, most of the time.	Yes, some of the time.	No, none of the time.	

Please complete the following questions on your own.

5. During the last 4 weeks, how many days did your child have any daytime asthma symptoms?

5	4	3	2	1	0	
Not at all	1-3 days	4-10 days	11-18 days	19-24 days	Everyday	

6. During the last 4 weeks, how many days did your child wheeze during the day because of asthma?

5	4	3	2	1	0	
Not at all	1-3 days	4-10 days	11-18 days	19-24 days	Everyday	

7. During the last 4 weeks, how many days did your child wake up during the night because of asthma?

5	4	3	2	1	0	
Not at all	1-3 days	4-10 days	11-18 days	19-24 days	Everyday	

TOTAL

ASTHMA ACTION AMERICA®

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Patient's Name:_____ Today's Date:_____

Asthma Control Test™ (ACT) is:

- A quick test that provides a numerical score to assess asthma control.
- Recognized by the National Institutes of Health (NIH) in its 2007 asthma guidelines.[1]
- Clinically validated against spirometry and specialist assessment.[2]

PATIENTS:

1. **Answer each question and write the answer number in the box to the right of each question.**
2. **Add your answers and write your total score in the TOTAL box shown below.**
3. **Discuss your results with your doctor.**

1. In the past **4 weeks**, how much of the time did your **asthma** keep you from getting as much done at work, school or at home?

All of the time	1	Most of the time	2	Some of the time	3	A little of the time	4	None of the time	5

2. During the past **4 weeks**, how often have you had shortness of breath?

More than once a day	1	Once a day	2	3 to 6 times a week	3	Once or twice a week	4	Not at all	5

3. During the past **4 weeks**, how often did your **asthma** symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?

4 or more nights a week	1	2 or 3 nights a week	2	Once a week	3	Once or twice	4	Not at all	5

4. During the past **4 weeks**, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?

3 or more times per day	1	1 or 2 times per day	2	2 or 3 times per week	3	Once a week or less	4	Not at all	5

5. How would you rate your **asthma** control during the **past 4 weeks**?

Not controlled at all	1	Poorly controlled	2	Somewhat controlled	3	Well controlled	4	Completely controlled	5

SCORE

TOTAL

If your score is 19 or less, your asthma may not be under control.

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Asthma Control Test is a trademark of QualityMetric Incorporated.
The Asthma Control Test is for people with asthma 12 years and older.

HEALTHCARE PROVIDER:

- **Include the ACT score in your patient's chart to track asthma control.**

References: 1. US Department of Health and Human Services, National Institutes of Health, National Heart, Lung and Blood Institute. *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma (EPR-3 2007).* NIH Item No. 08-4051. http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm. Accessed September 10, 2007. **2.** Nathan RA et al. *J Allergy Clin Immunol.* 2004;113:59-65.

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TRACK™ Test for Respiratory and Asthma Control in Kids

For kids under 5 years of age

What is TRACK?

TRACK is a simple 5-question test that can help assess respiratory and asthma control in patients between the ages of 12 months and 5 years. It addresses both the risk and impairment domains outlined in the NHLBI/NAEPP-3 Asthma Guidelines. TRACK is designed to be used by caregivers and interpreted by medical professionals.

Who should use TRACK?

This simple test can help determine if your child's breathing problems are not under control. The test was designed for children who

- Are under 5 years of age **AND**
- Have a history of 2 or more episodes of wheezing, shortness of breath, or cough lasting more than 24 hours **AND**
- Have been previously prescribed bronchodilator medicines, also known as quick-relief medications (eg, albuterol, Ventolin®, Proventil®, Maxair®, ProAir®, or Xopenex®) for respiratory problems **OR** have been diagnosed with asthma

NOTE: TRACK is an assessment of patients with suboptimal respiratory or asthma control; this is NOT a diagnostic test.

How to take TRACK

Step 1: Make a check mark in the box below each of your selected answers.
Step 2: Write the number of your answer in the score box provided to the right of each question.
Step 3: Add up the numbers in the individual score boxes to obtain your child's total score.
Step 4: Take the test to your child's health care provider to talk about your child's total TRACK score.

					Score
1. During the past 4 weeks, how often was your child bothered by breathing problems, such as wheezing, coughing, or shortness of breath?					
☐ Not at all 20	☐ Once or twice 15	☐ Once every week 10	☐ 2 or 3 times a week 5	☐ 4 or more times a week 0	
2. During the past 4 weeks, how often did your child's breathing problems (wheezing, coughing, shortness of breath) wake him or her up at night?					
☐ Not at all 20	☐ Once or twice 15	☐ Once every week 10	☐ 2 or 3 times a week 5	☐ 4 or more times a week 0	
3. During the past 4 weeks, to what extent did your child's breathing problems, such as wheezing, coughing, or shortness of breath, interfere with his or her ability to play, go to school, or engage in usual activities that a child should be doing at his or her age?					
☐ Not at all 20	☐ Slightly 15	☐ Moderately 10	☐ Quite a lot 5	☐ Extremely 0	
4. During the past 3 months, how often did you need to treat your child's breathing problems (wheezing, coughing, shortness of breath) with quick-relief medications (albuterol, Ventolin®, Proventil®, Maxair®, ProAir®, Xopenex®, or Primatene® Mist)?					
☐ Not at all 20	☐ Once or twice 15	☐ Once every week 10	☐ 2 or 3 times a week 5	☐ 4 or more times a week 0	
5. During the past 12 months, how often did your child need to take oral corticosteroids (prednisone, prednisolone, Orapred®, Prelone®, or Decadron®) for breathing problems not controlled by other medications?					
☐ Never 20	☐ Once 15	☐ Twice 10	☐ 3 times 5	☐ 4 or more times 0	
					Total

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TRACK™ Test for Respiratory and Asthma Control in Kids

For kids under 5 years of age

What does your child's TRACK score mean?

If your child's score is less than 80

Your child's breathing problems may not be under control

- Make sure you are following the treatment recommendations given by your child's health care provider
- Talk with your child's health care provider about reasons why your child's breathing problems may not be under control
- Ask your child's health care provider what steps might be taken to improve your child's respiratory and asthma control in order to reduce daytime and nighttime symptoms and to reduce the need to use quick-relief medications

If your child's score is 80 or more

Your child's breathing problems seem to be under control

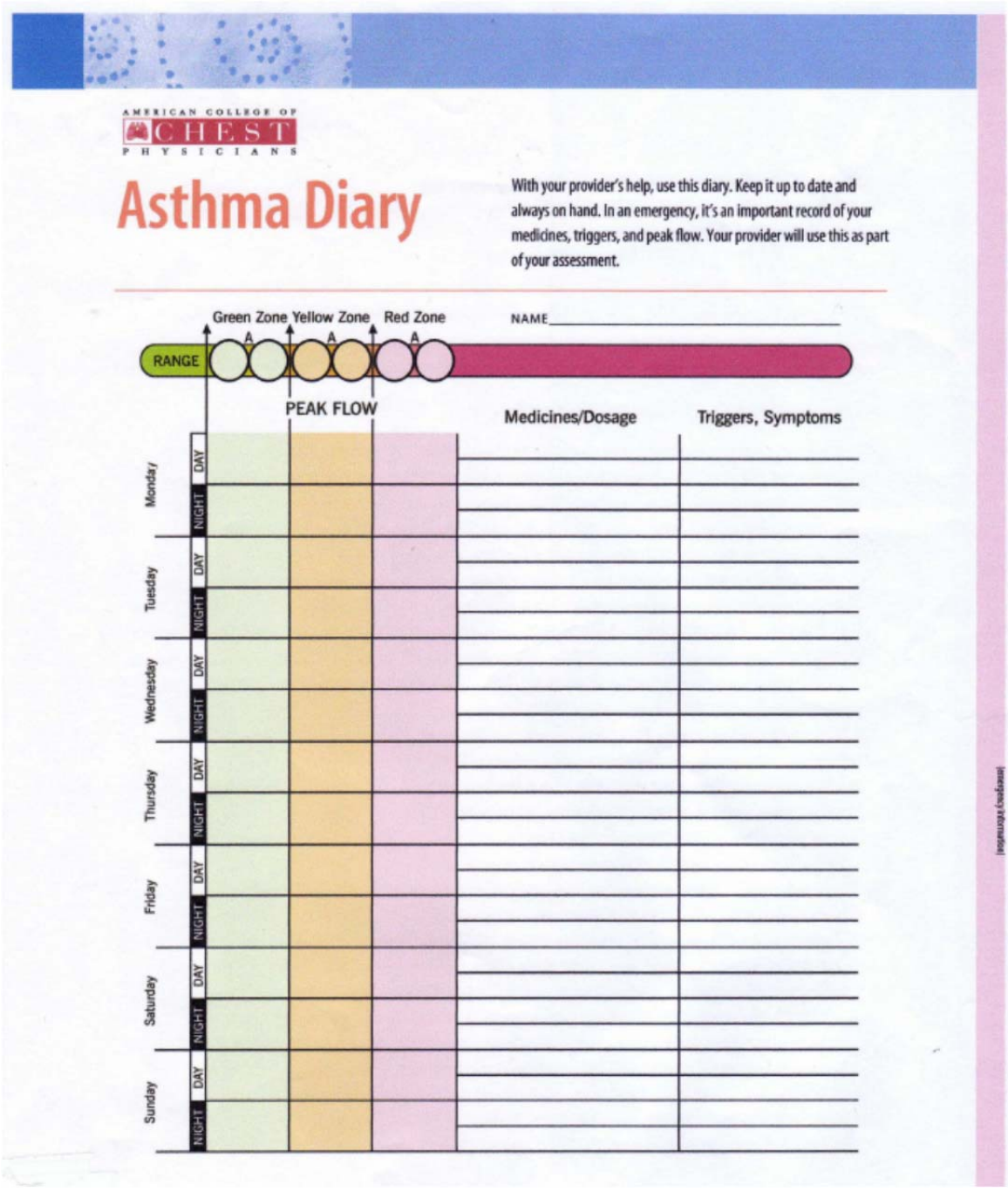
- Monitor your child's breathing problems on a regular basis and bring any concerns to the attention of his or her health care provider. Even though your child may not have breathing problems right now, these can come and go at any time
- Continue talking with the health care provider about your child's progress and which treatment plan is right for your child
- Good respiratory and asthma control can help your child sleep better, participate in everyday activities, and suffer fewer recurring flare-ups of breathing problems

Talk to your child's health care provider about your child's TRACK score

The American Academy of Pediatrics (AAP) Quality Improvement Innovation Network (QuIIN) participated in the validation of this tool.

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AMERICAN COLLEGE OF CHEST PHYSICIANS

Asthma Diary

With your provider's help, use this diary. Keep it up to date and always on hand. In an emergency, it's an important record of your medicines, triggers, and peak flow. Your provider will use this as part of your assessment.

Pediatric Asthma Toolkit

For the Primary Care Provider

FIGURE 12. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN CHILDREN

Components of Control		Assessing Asthma Control and Adjusting Therapy in Children							
		Well Controlled		Not Well Controlled			Very Poorly Controlled		
		Ages 0–4	Ages 5–11	Ages 0–4	Ages 5–11		Ages 0–4	Ages 5–11	
Impairment	Symptoms	≤2 days/week but not more than once on each day		>2 days/week or multiple times on ≤2 days/week			Throughout the day		
	Nighttime awakenings	≤1x/month		>1x/month	≥2x/month		>1x/week	≥2x/week	
	Interference with normal activity	None		Some limitation			Extremely limited		
	Short-acting beta$_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week		>2 days/week			Several times per day		
	Lung function • FEV_1 (predicted) or peak flow personal best • FEV_1/FVC	N/A	>80% >80%	N/A	60–80% 75–80%		N/A	<60% <75%	
Risk	Exacerbations requiring oral systemic corticosteroids	0–1x/year		2–3x/year	≥2x/year		>3x/year	≥2x/year	
	Reduction in lung growth	N/A	Requires long-term followup	N/A			N/A		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.							
Recommended Action for Treatment (See "Stepwise Approach for Managing Asthma" for treatment steps.) The stepwise approach is meant to assist, not replace, clinical decisionmaking required to meet individual patient needs.		• Maintain current step. • Regular followup every 1–6 months. • Consider step down if well controlled for at least 3 months.		Step up 1 step		Step up at least 1 step	• Consider short course of oral systemic corticosteroids, • Step up 1–2 steps		
		• **Before step up:** Review adherence to medication, inhaler technique, and environmental control. If alternative treatment was used, discontinue it and use preferred treatment for that step. • **Reevaluate the level of asthma control in 2–6 weeks to achieve control;** every 1–6 months to maintain control. Children 0–4 years old: If no clear benefit is observed in 4–6 weeks, consider alternative diagnoses or adjusting therapy. Children 5–11 years old: Adjust therapy accordingly. • **For side effects,** consider alternative treatment options.							

Key: EIB, exercise-induced bronchospasm, FEV_1, forced expiratory volume in 1 second; FVC, forced vital capacity; ICU, intensive care unit; N/A, not applicable

Notes:

- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient's or caregiver's recall of previous 2–4 weeks. Symptom assessment for longer periods should reflect a global assessment, such as whether the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control.

Pediatric Asthma Toolkit

For the Primary Care Provider

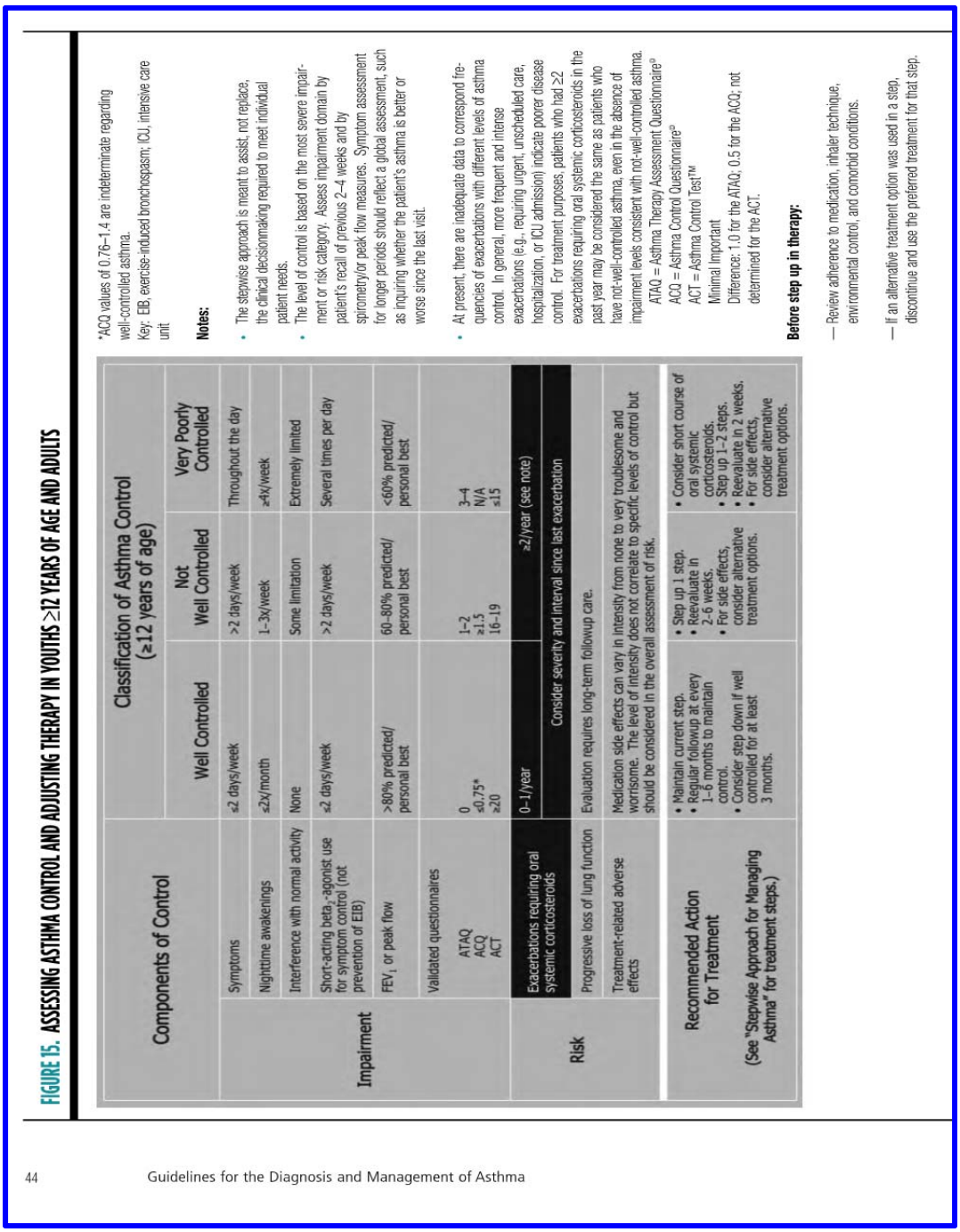


FIGURE 15. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

Components of Control		Classification of Asthma Control (≥12 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta$_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	FEV_1 or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best
	Validated questionnaires ATAQ ACQ ACT	0 ≤0.75* ≥20	1–2 ≥1.5 16–19	3–4 N/A ≤15
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year (see note)	
	Progressive loss of lung function	Consider severity and interval since last exacerbation Evaluation requires long-term followup care.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment (See "Stepwise Approach for Managing Asthma" for treatment steps.)		• Maintain current step. • Regular followup at every 1–6 months to maintain control. • Consider step down if well controlled for at least 3 months.	• Step up 1 step. • Reevaluate in 2–6 weeks. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids. • Step up 1–2 steps. • Reevaluate in 2 weeks. • For side effects, consider alternative treatment options.

*ACQ values of 0.76–1.4 are indeterminate regarding well-controlled asthma.

Key: EIB, exercise-induced bronchospasm; ICU, intensive care unit

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient's recall of previous 2–4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.

ATAQ = Asthma Therapy Assessment Questionnaire[a]
ACQ = Asthma Control Questionnaire[a]
ACT = Asthma Control Test™
Minimal Important Difference: 1.0 for the ATAQ; 0.5 for the ACQ; not determined for the ACT.

Before step up in therapy:

— Review adherence to medication, inhaler technique, environmental control, and comorbid conditions.

— If an alternative treatment option was used in a step, discontinue and use the preferred treatment for that step.

44 Guidelines for the Diagnosis and Management of Asthma

*Chart from NHLBI: Guidelines for the Diagnosis and Management of Asthma; Expert Panel Report 3; 2007

Pediatric Asthma Toolkit

For the Primary Care Provider

Asthma Resources

Name	Website	Phone
Allergy & Asthma Network Mothers of Asthmatics	www.breatherville.org	1-800-878-4403
American Academy of Allergy, Asthma and Immunology	http://www.aaai.org	1-414-272-6071
American Academy of Pediatrics	http://www.aap.org	1-847-434-4000
American Association of Respiratory Care	http://www.aarc.org	1-972-243-2272
American College of Allergy, Asthma and Immunology	http://www.acaai.org	1800-842-7777
American College of Chest Physicians	http://www.chstnet.org	1-847-427-1400
American Lung Association	www.lungusa.org	1-800-586-4872
American School Health Association	http://www.ashaweb.org	1-800-445-2742
Association of Asthma Educators	www.asthmaeducators.org	1-888-988-7747
Asthma and Allergy Foundation of America	www.aafa.org	1-800-727-8462
Centers for Disease Control and Prevention	http://www.cdc.gov/asthma	1-800-232-4636
Food Allergy Research and Education	www.foodallergy.org	1-800-929-4040
Environmental Protection Agency/Asthma Community Network	www.airnow.gov www.asthmacommunitynetwork.org	1-800-490-9198
National Association of School Nurses	www.nasn.org	1-240-821-1130
National Asthma Education and Prevention Program	www.nhlbi.nih.gov/about/naepp/index.htm	
National, Heart, Lung, and Blood Institute Information Center	http://www.nhlbi.nih.gov	1-301-592-8573

Pediatric Asthma Toolkit

For the Primary Care Provider

Asthma Resources for Montana

Montana Asthma Control Program (MACP): http://dphhs.mt.gov/asthma

- This website is invaluable to providers and patients alike in the state of Montana. It contains asthma information, statistics, publications, programs in the state of MT, order forms for asthma materials, and much more.

Asthma and Allergy Specialists in Montana:

Billings
- Billings Clinic Allergy, Asthma & Immunology, http://www.billingsclinic.com/allergy 406-238-2501

- Montana Allergy and Asthma Specialists, http://www.mtallergy.com 406-237-5500

Bozeman
- Allergy & Asthma Consultants of Montana, http://allergymontana.com 406-582-1111

- Family Allergy & Asthma Care, http://www.familyallergyasthmacare.com 406-451-7107

Butte
- Allegy & Asthma Consultants of Montana, http://allergymontana.com 406-782-4060

Great Falls
- Allergy & Asthma Center of Montana, http://www.allergyasthmamt.com 406-771-9050

Helena
- Dr. Summer Monforte, St. Peter's Medical Group, http://www.stpetes.org/staff/doctor/summer-monforte-md 406-457-4180

Kalispell
- The Allergy & Asthma Center, P.C., http://www.montanaallergy.com 1-877-714-8111

Missoula

- The Allergy & Asthma Center, P.C., http://www.montanaallergy.com 1-877-714-8111

- Western Montana Clinic, Dr. Carol Cady, www.westernmontanaclinic.com 406-721-5100

Pediatric Asthma Toolkit



For the Primary Care Provider

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