



15TH ANNUAL

Reach the Peak Asthma and Allergy Overview and Update

April 12-13, 2023

Children's Hospital Colorado
Anschutz Medical Campus
Virtual Course

Provided by:

Children's Hospital Colorado Breathing Institute



Children's Hospital Colorado

Affiliated with
 **University of Colorado**
Anschutz Medical Campus

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✓ Medication Assistance Programs	✓ NIH Asthma Action Plan
✓ Spirometry Interpretation reference	✓ Asthma Control Test (ACT)
✓ Asthma & Your Airways	✓ Single Maintenance and Reliever Therapy (SMART)

Children's Hospital Colorado Patient Handouts.....

- ✓ What is Asthma?
- ✓ Asthma Triggers
- ✓ What is an Asthma Action Plan?
- ✓ Choosing the Correct Inhaler Device
- ✓ Inhaled Steroids
- ✓ Oral Steroid Bursts
- ✓ Inhaled Bronchodilators
- ✓ Combination Controller Medicines
- ✓ Metered Dose Inhalers (MDI)
- ✓ Diskus
- ✓ Ellipta Inhaler
- ✓ Flexhaler
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- ✓ QVAR RediHaler
- ✓ RespiClick Inhaler
- ✓ Respimat Soft Mist Inhaler
- ✓ Twisthaler
- ✓ Home "Acorn" Nebulizers
- ✓ How to Use a Peak Flow Meter
- ✓ Nasal Steroid Spray Technique

Asthma Resources.....

- ✓ Children's Hospital Colorado Enduring Educational Activities
- ✓ CHCO Breathing Institute Program Information
- ✓ Patient assistant programs

Overview and Target Audience

The Children's Hospital Colorado Annual Reach the Peak Conference is our annual interdisciplinary educational conference for health team members managing patients with asthma. Facilitated by leading experts in their field, Reach the Peak incorporates problem-based learning methods with a combination of lectures, small group case scenarios, networking, and comprehensive collaboration strategies. The information presented helps provide updates in current asthma management guidelines, practice challenges and discussion on addressing social determinants impacting asthma care.

Target audience includes MDs, advanced practice providers, nurses, respiratory therapists, pharmacists, clinical social workers, certified health educators and other asthma care professionals.

Learner Outcome

As a result of this activity, the participant will report increased knowledge and intent to change practice related to evidence-based asthma guidelines and protocols for pediatric asthma patients.

Learning Objectives

- Describe the pathophysiology and contributing factors of asthma diagnosis.
- Develop an Asthma Action Plan that includes prescribed medications and behavioral and environmental modifications.
- Integrate newly acquired knowledge into clinical practice.
- Conduct a patient and family assessment addressing the medical history, objective measures of asthma severity and educational needs.
- Assess community needs, develop programs to address identified needs and measure outcomes related to program effectiveness.

Continuing Education Credit

Nursing: Children's Hospital Colorado is approved with distinction as a provider of nursing continuing professional development by Colorado Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation. This education activity for 10.75 nursing contact hours is provided by Children's Hospital Colorado.

Respiratory Care: This program has been approved for 9.25 contact hours Continuing Respiratory Care Education (CRCE) credit by the American Association for Respiratory Care, 9425 N. MacArthur Blvd, Suite 100, Irving, TX 75063.

Others: A general certificate of attendance will be given to all other care providers.

Note: A certificate of attendance will be available upon completion of the online evaluation. Claim only credit commensurate of your conference attendance.

Conference Agenda

Wednesday, April 12, 2023

- 7:30am Welcome and Course Overview
Bridget Raleigh, MSN, FNP-BC, AE-C
- 8:00am Guidelines for the Diagnosis and Management of Asthma
Monica Federico, MD
- 8:45am Allergic and Environmental Factors Contributing to Acute and Chronic Asthma
William C. Anderson III, MD
- 9:30am Spirometry for the Asthma Educator
Deborah Liptzin, MD
- 10:15am Break
- 10:30am Pharmacologic Therapy of Asthma
Laney Brennan, PharmD
- 11:15pm Social Determinants of Health
Emily Skeen, MD
- 12:00pm Break
- 12:15pm Adherence and Motivation
Heather De Keyser, MD
- 1:00pm Small Group Sessions
- 1:30pm Adjourn

Thursday, April 13, 2023

- 7:45am Key Messages in Asthma Education and the Asthma Action Plan
Kate Michalek, MS, PA-C, AE-C
- 9:00am Program Development, Implementation and Outcomes
Joyce A. Baker, MBA, RRT-NPS, AE-C, FAARC
- 10:00am Break
- 10:15am Panel Presentation: Comprehensive Asthma Care, Complicated Cases & Case Reviews
- 11:30am Break & Wellness Moment
- 11:45am Small Group Sessions
- 1:15pm Evaluation
- 1:30pm Adjourn



13123 E 16th Ave, Aurora, CO 80045
720-777-1234 | childrenscolorado.org

Faculty & Committee

William C. Anderson III, MD

Assistant Professor, Pediatric Allergy
And Immunology
Co-Director Multidisciplinary
Asthma Clinic (MAC)
University of Colorado
Associate Program Director
Allergy and Immunology Fellowship

Joyce Baker, MBA, RRT-NPS, AE-C, FAARC[†]

Asthma Clinical
Program Coordinator
Children's Hospital Colorado

Allyson Barsanti, MSN, RN, OCN[†]

Clinical Education Specialist
Ambulatory Nursing
Children's Hospital Colorado

Laney Brennan, PharmD

Clinical Pharmacist
Children's Hospital Colorado

Heather De Keyser, MD

Associate Professor, Pediatrics-Pulmonary
University of Colorado

Monica Federico, MD[†]

Associate Professor, Pediatrics
Director, Asthma Program
University of Colorado
Pediatric Pulmonologist
Breathing Institute
Children's Hospital Colorado

Melanie Gleason, MS, PA-C, AE-C[†]

Senior Instructor
University of Colorado
Associate Director School Centered Asthma
Programs
Breathing Institute
Children's Hospital Colorado

Deborah R. Liptzin, MD, MS

Associate Clinical Professor
University of Colorado
Pediatric Pulmonologist
Children's Hospital Colorado

Kate Michalek, MS, PA-C, AE-C[†]

Senior Instructor
University of Colorado
Breathing Institute
Children's Hospital Colorado

Bridget Raleigh, MSN, FNP-BC, AE-C[†]

Associate Medical Director
Asthma Programs
Senior Instructor
University of Colorado
Breathing Institute
Children's Hospital Colorado

Emily Skeen, MD

Pediatric Pulmonologist
Children's Hospital Colorado

Matthew Stern, MS[†]

Manager
Continuing Medical Education Children's
Hospital Colorado

[†] Indicates a planning committee member

Attendance Sign-In

Thank you for attending the **15th Annual Reach the Peak Asthma & Allergy Overview**. We hope you will enjoy the course and learn something new!

Signing-in

You will be able to sign-in 30 minutes prior to the event. There are two options to sign-in for the session.

1. Send a **text message** – Text this code: BOFSUW to 720-790-4423 or
2. Through a **web browser**: In your web browser, go to www.ce.childrenscolorado.org/code and enter the code: BOFSUW

Course Evaluation and CE Credit

To obtain your continuing education certificate, you must complete the online evaluation by midnight, Thursday, **April 27, 2023**. After completing the evaluation, you will be promoted to claim your CE credits.

Any questions or concerns with access should be directed to ce@childrenscolorado.org.



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Disclosure of Relevant Financial Relationships

Title of Continuing Education: 15th Annual Reach the Peak Asthma & Allergy Overview & Update

Date and Location: April 12-13, 2023, hosted virtually from Children's Hospital Colorado

As a provider of continuing medical education (CME) by the Accreditation Council for Continuing Medical Education and nursing continuing professional development (NCPD) by Colorado Nurses Association, Children's Hospital Colorado ensures balance, independence, objectivity and scientific rigor in all its CME/NCPD activities.

To comply with CME and NCPD accreditation guidelines, each planner, faculty, content expert and content reviewer in a position to control content of this educational activity are required to disclose all relevant financial relationships.

- *William Anderson, MD, faculty for this educational activity, is an advisory board member for Sanofi and Genentech.*
- *Heather De Keyser, MD, faculty for this educational activity, participates in research with ResMed.*

All of the relevant financial relationships listed have been mitigated.

All other planners, faculty, and others in control of content (either individually or as a group) have no relevant financial relationships with ineligible companies.

Relevant Financial Relationship	Ineligible Company	Off-Label Use of Products
Financial relationships are relevant if the following three conditions are met for the prospective person who will control content of the education. 1. A financial relationship, in any amount, exists between the person in control of content and an ineligible company. 2. The financial relationship existed during the past 24 months . 3. Content of the education is related to the products of an ineligible company with whom the person has a financial relationship.	is any entity whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.	Faculty are asked to inform the audience when they are discussing the use of a product (medication, device, etc.) other than for which it was approved by the Food and Drug Administration.

Criteria for Verifying Participation in this CE Activity

Participants are required to sign-in for this CE activity to verify their participation in the educational program.

Criteria for Successful Completion of this CE Activity

Registration, attendance, sign-in and submission of the online evaluation are required for CE certificate of attendance. Claim only those hours you attend. Evaluation instructions will be emailed utilizing your registered email profile.



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Reach the Peak Asthma and Allergy Overview and Update

Presentations - Day 1

- ✓ Welcome
- ✓ Guidelines for the Diagnosis and Management of Asthma
- ✓ Allergic and Environmental Factors Contributing to Acute and Chronic Asthma
- ✓ Spirometry 101
- ✓ Pharmacologic Therapy of Asthma
- ✓ Social Determinants of Health
- ✓ Adherence and Motivation
- ✓ Small group case studies workbook



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WELCOME

2023 Reach the Peak *Asthma & Allergy Overview & Update*

Bridget Raleigh, MSN, FNP-BC, AE-C

1

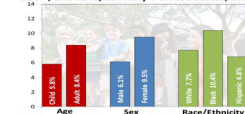
No financial disclosures



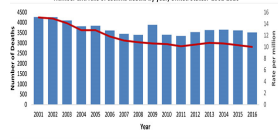
2

Why are we here today?

Percentage of People With Current Asthma by Age¹, Sex^{2,3}, and Race/Ethnicity³; United States, 2020



Number and rate of asthma deaths by year, United States: 2001-2016



- Asthma is the most common chronic illness in childhood, accounting for 13.8 million missed school days each year.
- Asthma accounts for 14.2 million lost work days for adults.
- More than 3,500 people die of asthma each year, nearly half of whom are age 65 or older. Recent statistics show that half of people with asthma have at least one asthma attack each year, with children (53 percent) more likely to have an attack than adults (44.9 percent).
- Asthma results in 439,000 hospitalizations and 1.3 million emergency room visits annually.
- CDC Study Puts Economic Burden of Asthma at More Than \$80 Billion Per Year

January 12, 2018

3

- Approximately 25 million people in the U.S. have asthma. This equals about 1 in 13 people.
- Asthma is the most common chronic respiratory disease in children and the most racially and ethnically disparate of all health conditions.
- Currently, there are about 4.8 million children under the age of 18 with asthma
- Asthma can be controlled but control is often complex

Asthma and Allergy Foundation of America. Asthma facts and figures. 2021

4

As we emerge from the pandemic, can we reimagine asthma care?

Focusing on building strong communities to support individuals living with asthma to prevent exacerbations and maximize health.



5

Community Based Asthma Care

- Each of us encounter children and adults with asthma daily → school, work, grocery stores, social groups, our neighborhoods.
- Through education, we build strong communities to support these individuals.
- By working together, we transform homes and neighborhoods into healthy environments.
- Becoming a community of shared knowledge, resources and skills, promotes optimal outcomes.

6

Building communities



CDC 2023

7

Goals of Asthma Management/Control



Provider View

- Normal lung function (Spirometry most common testing after 4 years of age)
- Infrequent symptoms and rare need for quick relief inhaler, ED visits, oral steroids, no hospitalizations.
- No school loss from asthma
- Parents aren't missing work
- Avoidance of triggers, takes medications as instructed
- Child can participate in sports, games without limitations

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Parent View




- ▶ Wants asthma to be 'fixed' or child to 'outgrow it'.
- ▶ Wants child to breathe better, not be 'sick all of the time'.
- ▶ Wants their child to be 'normal' - like other kids.
- ▶ Wants child to be responsible for their medications.
- ▶ Change is hard, sometimes feels impossible in chaos.
- ▶ Parent wants to be heard, not judged.
- ▶ Multiple care-givers- not everyone is onboard with the plan.
- ▶ Medications affordable, available and easy to take.

9


SM3

Child's view



- ▶ I want to have a dog and 2 cats
- ▶ I hate taking medications
- ▶ I can't play like the other kids
- ▶ I don't want to be different.
- ▶ Sometimes I am scared when I can't breathe
- ▶ I want my asthma to go away
- ▶ What did I do to make this happen?
- ▶ My asthma makes me feel sad

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...Community view

- ▶ Kids not missing school and able to keep up with their friends.
- ▶ Colleagues not missing work
- ▶ Decreased need for emergency room and hospitalizations
- ▶ Improving neighborhood air quality to improve breathing for all
- ▶ Working together to decrease the spread of viruses and respiratory illnesses through good hygiene practices and vaccination programs.

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Reach the Peak Conference Virtual Notebook

- ▶ Presentations
- ▶ Asthma management tools
- ▶ Educational Tools
- ▶ Resources

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Reach the Peak Case Studies Workbook

- ▶ Case studies to independently review and apply tools and concepts from the course.
- ▶ Day 2 provides an opportunity to discuss the case studies in your small group.

Guidelines for the Diagnosis and Management of Asthma

Monica Federico, MD
Medical Director of the Asthma Program at
CHCO
University of Colorado Denver School of
Medicine
Denver Health Medical Center
2023



1

Monica Federico, MD

Financial Disclosure

- No relevant financial relationships with any commercial interests.



2

Objectives

- Improve your understanding of asthma diagnosis
- Elevate your comfort with asthma diagnosis and deciding treatment
- Increase your awareness of tools available to support the care of asthma



3

The patient

- Miguel is a 7 year old with a history of eczema who comes in for a regular visit and he is doing well but on ROS mom says that ever since last year he always seems to have a cough.
- The cough
 - The cough is RECURRENT (worst in the evenings and he coughs 3 evenings/week)
 - Triggers: His cough is REACTIVE to colds and exercise. He stops activities because he often gets out of breath
 - Mom has tried some of his brother's medicine from a machine and he RESPONDS



4

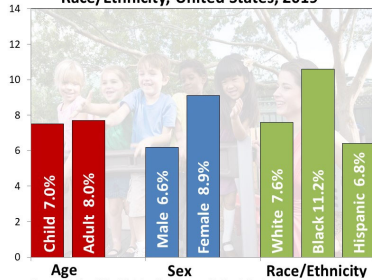
DOES HE HAVE ASTHMA?



5

Asthma is common

Current Asthma Prevalence Percents by Age, Sex, and Race/Ethnicity, United States, 2019



Source: National Health Interview Survey, National Center for Health Statistics, Centers for Disease Control and Prevention



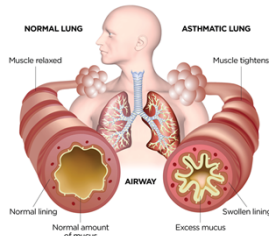
6

What is asthma?

- RECURRENT cough, wheeze, chest tightness, or shortness of breath
- REVERSIBLE (gets at least partially better) with a bronchodilator (inhaled medicine like albuterol)
- REACTIVE Symptoms often have specific triggers like exercise or allergies ****
- Rule out other causes



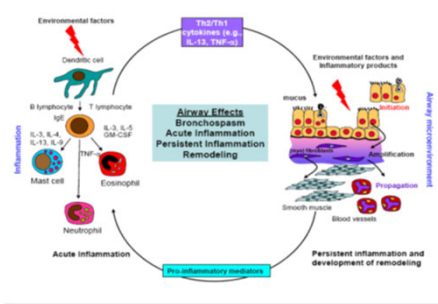
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Asthma is an inflammatory disease (NAEPP 2007)

FIGURE 2-2. FACTORS LIMITING AIRFLOW IN ACUTE AND PERSISTENT ASTHMA

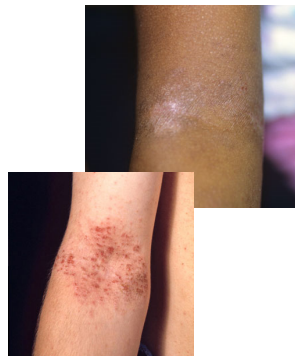


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Who is at risk to develop asthma?

1. Children with allergies/atopy
2. Children with atopic dermatitis or eczema (see pictures) that is severe enough to require treatment with a topical ointment or cream
3. Children whose parents (either mom or dad) have asthma



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[CDC Conditions and Syndromes - Eczema](#)

9

Asthma can be controlled so children can Play, Sleep, and Learn every day



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M Moby

VOLUME 130 No. 5
November 2007

2020 FOCUSED UPDATES TO THE Asthma Management Guidelines



11

Hospitalization Rates

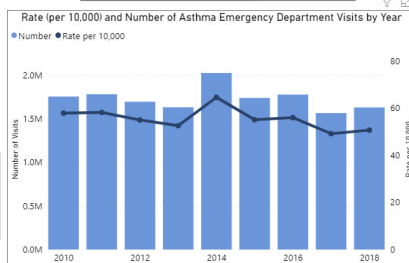
Current Asthma Asthma Attacks Healthcare Use Mortality

Emergency Department Visits Hospitalizations

Select Indicator:

Year
Age Groups
Gender
Race & Ethnicity

• Rate of asthma emergency department visits did not significantly change since 2010.



Data Table




<https://www.cdc.gov/asthma/data-visualizations/default.htm>

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2020 Expert Panel Report Updates in the Management of Asthma

<https://www.nhlbi.nih.gov/health-topics/asthma-management-guidelines-2020-updates>



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Asthma Care Quick Reference

DIAGNOSING AND MANAGING ASTHMA

Guidelines from the National Asthma Education and Prevention Program

The goal of this asthma care quick reference guide is to help clinicians provide quality care to people who have asthma.

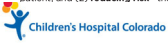
Quality asthma care involves not only initial diagnosis and treatment to achieve asthma control, but also long-term, regular follow-up care to maintain control.

Asthma control focuses on two domains: (1) **reducing impairment**—the frequency and intensity of symptoms and functional limitations currently or recently experienced by a patient; and (2) **reducing risk**—the likelihood of future asthma

INITIAL VISIT


```

graph TD
    A[Diagnose asthma] --> B[Assess asthma severity]
    B --> C[Initiate medication & demonstrate use]
    C --> D[Develop written asthma action plan]
    D --> E[Schedule follow-up appointment]
  
```



14

DOES MIGUEL HAVE ASTHMA?



15

The patient

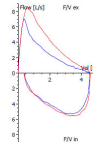
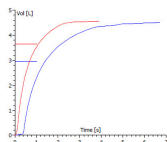
- Miguel is a 7-year-old with a history of eczema who comes in for a regular visit and he is doing well but on ROS mom says that he coughs 3 evenings/week and limits his activity due to cough



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The test: spirometry

	Pred	Pre	% Pred	Post	% Pred	%Change
FVC(L)	4.33	4.50	104	4.55	105	1
FEV1(L)	3.71	2.94	79	3.64	98	24
FEV1/FVC		65.47		79.94		



17

What is asthma?

- RECURRENT cough, wheeze, chest tightness that is
- REVERSIBLE (at least partially) to a bronchodilator (inhaled medicine like albuterol)
- REACTIVE airways often have specific triggers like exercise ****
- Rule out other causes

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Asthma Care Quick Reference

DIAGNOSING AND MANAGING ASTHMA

Guidelines from the National Asthma Education and Prevention Program

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Asthma control focuses on two domains: (1) **reducing impairment**—the frequency and intensity of symptoms and functional limitations currently or recently experienced by a patient; and (2) **reducing risk**—the likelihood of future asthma

INITIAL VISIT

Diagnose asthma

Assess asthma severity

Initiate medication & demonstrate use

Develop written asthma action plan

Schedule follow-up appointment

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EPR 2007Guidelines Key Definitions Asthma Assessment

IMPAIRMENT	RISK
<ul style="list-style-type: none">• Quality of daily life	<ul style="list-style-type: none">• Risk of illness of asthma exacerbation

20

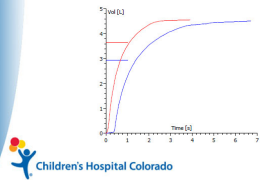
Details: Severity

Components of Severity		Classification of Asthma Severity (Children 5–11 years of age)			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	• Normal FEV ₁ between exacerbations • FEV ₁ >80% predicted • FEV ₁ /FVC >85%	• FEV ₁ = ~80% predicted • FEV ₁ /FVC >80%	• FEV ₁ = 60–80% predicted • FEV ₁ /FVC = 75–80%	• FEV ₁ <60% predicted • FEV ₁ /FVC <75%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year (see note) → ≥2 in 1 year (see note) → Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. → Relative annual risk of exacerbations may be related to FEV ₁			

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Miguel's spirometry

	Pred	Pre	% Pred	Post	% Pred	%Change
FVC(L)	4.33	4.50	104	4.55	105	1
FEV1(L)	3.71	2.94	79	3.64	98	24
FEV1/FVC		65.47		79.94		



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Components of Severity	Intermittent			Persistent					Severe	
	Ages 0-4 years	Ages 5-11 years	Ages 12 years	Ages 0-4 years	Ages 5-11 years	Ages 12 years	Ages 0-4 years	Ages 5-11 years	Ages 12 years	Ages 0-4 years
Symptoms	<2 days/week	<2 days/week	<2 days/week	<2 days/week but not daily	<2 days/week but not daily	<2 days/week but not daily	>2 days/week but not nightly	>2 days/week but not nightly	>2 days/week but not nightly	>2 days/week but not nightly
Nighttime awakenings	0	<2x/month	<2x/month	1-2x/month	3-4x/month	3-4x/month	>4x/month but not nightly	>4x/month but not nightly	>4x/month but not nightly	>4x/month but not nightly
Interference with normal activity	None	None	None	Minor limitation	Minor limitation	Minor limitation	Some limitation	Some limitation	Some limitation	Extremely limited
Lung function	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations	Normal FEV1, normal expirations
FEV1 (% predicted)	Not applicable	>80%	>80%	Not applicable	>80%	>80%	Not applicable	60-80%	60-80%	<60%
FEV1/FVC*	Not applicable	>80%	>80%	Not applicable	>80%	>80%	Not applicable	75-80%	75-80%	<75%
Asthma exacerbations requiring oral systemic corticosteroids	0-1/year	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma	<2 exacerbations in 12 months, or 1 exacerbation in 12 months AND risk factors for persistent asthma

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Moderate Persistent

WHAT IS HIS ASTHMA SEVERITY?

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Asthma Care Quick Reference

DIAGNOSING AND MANAGING ASTHMA

Guidelines from the National Asthma Education and Prevention Program

The goal of this asthma care quick reference guide is to help clinicians provide quality care to people who have asthma.

Quality asthma care involves not only initial diagnosis and treatment to achieve asthma control, but also long-term, regular follow-up care to maintain control.

Asthma control focuses on two domains: (1) **reducing impairment**—the frequency and intensity of symptoms and functional limitations currently or recently experienced by a patient; and (2) **reducing risk**—the likelihood of future asthma

INITIAL VISIT

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graph TD
    A[Diagnose asthma] --> B[Assess asthma severity]
    B --> C[Initiate medication & demonstrate use]
    C --> D[Develop written asthma action plan]
    D --> E[Schedule follow-up appointment]
    subgraph Circle
        A
        B
        C
    end
  
```

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PERSISTENT ASTHMA MUST BE TREATED WITH A CONTROLLER

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Controller use decreases asthma deaths

Saskatchewan health data 1975-91. Regular use of low dose ICS assoc. with decreased risk of death. Suissa et al, NEJM 2000;343:332.

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AGES 5-11 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 5-11 Years					
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol [▲]	Daily and PRN combination medium-dose ICS-formoterol [▲]	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA	
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA, or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS + Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA, or Daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* + oral systemic corticosteroid or daily high-dose ICS + Theophylline* + oral systemic corticosteroid, and PRN SABA	
		Steps 2-4: Conditional therapy as an adjunct to treatment to allow individuals 5-11 years of age to achieve asthma control at the maintenance phases of	Assess	Control		Consider Omalizumab,** [▲]	

- First check adherence, inhaler technique, environmental factors, [▲] and comorbid conditions.
- **Step up** if needed; reason **to be stepped up**.
- **Step down** if possible (if asthma is well controlled for at least 3 consecutive months).

Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

2020: Treatment Recommendations

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2

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Treatment includes Asthma Education

- Education Includes:
 - A:** What is asthma? AND treatment goals (CONTROL)
 - E:** Environment and Triggers
 - D:** Medication and device teaching
 - Action Plan:** What to do when the patient gets sick (Action Plan)
- Occurs at all points of care

NHLBI, National Asthma Education and Prevention Program. Full report of the Expert Panel: Guidelines for the Diagnosis and Management of Asthma (EPR-3). Available at: <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>. Accessed August 31, 2007.

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Asthma Care Quick Reference

DIAGNOSING AND MANAGING ASTHMA

Guidelines from the National Asthma Education and Prevention Program

The goal of this asthma care quick reference guide is to help clinicians provide quality care to people who have asthma.

Quality asthma care involves not only initial diagnosis and treatment to achieve asthma control, but also long-term, regular follow-up care to maintain control.

Asthma control focuses on two domains: (1) **reducing impairment**—the frequency and intensity of symptoms and functional limitations currently or recently experienced by a patient; and (2) **reducing risk**—the likelihood of future asthma.

```

graph TD
    A[INITIAL VISIT] --> B[Diagnose asthma]
    B --> C[Assess asthma severity]
    C --> D[Initiate medication & demonstrate use]
    D --> E[Develop written asthma action plan]
    E --> F[Schedule follow-up appointment]
    F --> A
  
```

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EPR Key Concepts: Following Control



*Evaluate control 4-6 weeks after starting therapy
and then every 3-6 months depending on the
level of control*



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The goal is the same regardless of severity.

Components of Control		Classification of Asthma Control (Children 5–11 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
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	≥2x/month	≥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 or peak flow • FEV ₁ /FVC	>80% predicted/ personal best >80%	60–80% predicted/ personal best 75–80%	<60% predicted/ personal best <75%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year (see note)	
	Reduction in lung growth	Consider severity and interval since last exacerbation Evaluation requires long-term followup.		
	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.		



32

Miguel

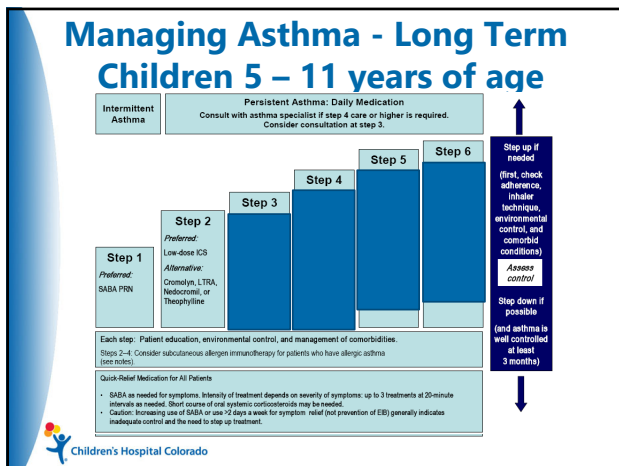
- Diagnosed with moderate persistent asthma on budesonide/formoterol 2 puffs twice a day. He was back at 6 weeks and reported no symptoms.
- After 3 months he comes in with exercise symptoms with vigorous activity and 3x/week nighttime cough. He has no allergy symptoms.



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Components of Control		Well Controlled			Not Well Controlled			Very Poorly Controlled		
		Age 0-4 years	Age 5-11 years	Age ≥12 years	Age 0-4 years	Age 5-11 years	Age ≥12 years	Age 0-4 years	Age 5-11 years	Age ≥12 years
Intermittent	Symptoms	≤2 days/week	≤2 days/week but not more than once on each day	≤2 days/week	≥2 days/week	≥2 days/week or multiple times on ≥2 days/week	≥2 days/week	Throughout the day		
	Nighttime awakenings	≤1/month	≤2/month	≤1/month	≥2/month	≥2/month	≥2/month	≥2/month	≥2/month	≥2/month
	Interference with normal activity	None	None	None	Some limitation	Some limitation	Some limitation	Extensive limitation	Extensive limitation	Extensive limitation
	SABA use for symptom control (not to prevent EBB)	≤2 days/week	≤2 days/week	≤2 days/week	≥2 days/week	≥2 days/week	≥2 days/week	Several times per day	Several times per day	Several times per day
	Lung function	FEV ₁ /FVC predicted or peak flow (if personal best) ≥80%	FEV ₁ /FVC ≥80%	FEV ₁ /FVC ≥80%	Not applicable	60-80%	60-80%	Not applicable	≤60%	≤60%
Risk	Validated questionnaire	Not applicable	Not applicable	0-40	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	ATAD ^a	Not applicable	Not applicable	0	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	ACQ ^b	Not applicable	Not applicable	0-1	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	ACT ^c	Not applicable	Not applicable	20-25	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	Asthma exacerbations requiring oral systemic corticosteroids	≤1/year	≤1/year	≤1/year	≥2/year	≥2/year	≥2/year	≥2/year	≥2/year	≥2/year
Risk	Reduction in lung growth/Progressive loss of lung function	Not applicable	Evaluation requires long-term follow-up care.	Not applicable	Evaluation requires long-term follow-up care.	Evaluation requires long-term follow-up care.	Evaluation requires long-term follow-up care.	Evaluation requires long-term follow-up care.	Evaluation requires long-term follow-up care.	Evaluation requires long-term follow-up care.
	Treatment-related adverse effects	The level of intensity does not correspond to specific levels of control but should be considered in the overall assessment of risk.								
	Recommended Action for Treatment	Maintain current step. Re-evaluate every 3-6 months. Consider step down if well controlled for at least 3 months.			Step up 1 step. Step up at least 1 step. Re-evaluate in 2-4 weeks to achieve control. For children 0-4 years, if no clear benefit observed in 4-6 weeks, consider adjusting therapy or alternative diagnosis.			Consider short course of oral systemic corticosteroids. Step up 1-2 steps. Re-evaluate in 2 weeks to achieve control.		

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Always reassess adherence, device use and environment as you step up and down

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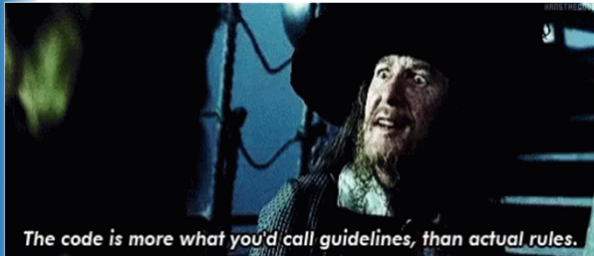
Summary

- Diagnose asthma
- Use the Expert Panel Report National Guidelines for asthma care
- Assess risk, impairment and triggers
- Reinforce/Repeat the key messages of asthma care



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Despite the updated NHLBI EPR and Global Asthma Initiative Guidelines.....



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Asthma guideline updates

1. 0-4 year old treatment
2. SMART therapy
3. Only change the environment for kids who are allergic to the environment
4. Allergy shots can be helpful in asthma



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Intermittent Asthma		Management of Persistent Asthma in Individuals Ages 0-4 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA and At the start of RTI: Add short course daily ICS*	Daily low-dose ICS and PRN SABA	Daily medium-dose ICS and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily montelukast* or Cromolyn,* and PRN SABA		Daily medium-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast* + oral systemic corticosteroid and PRN SABA
For children age 4 years only, see Step 3 and Step 4 on Management of Persistent Asthma in Individuals Ages 5-11 Years diagram.						

Assess Control

- First check adherence, inhaler technique, environmental factors, and comorbid conditions.
- Step up** if needed; reassess in 4-6 weeks
- Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 3 or higher is required. Consider consultation at Step 2.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; SABA, inhaled short-acting beta₂-agonist; RTI, respiratory tract infection; PRN, as needed

* Updated based on the 2020 guidelines.

* Cromolyn and montelukast were not considered for this update and/or have limited availability for use in the United States. The FDA issued a Boxed Warning for montelukast in March 2020.

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Figure 1c: Stepwise Approach for Management of Asthma in Individuals Ages 5-11 Years

Intermittent Asthma		Management of Persistent Asthma in Individuals Ages 5-11 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol*	Daily and PRN combination medium-dose ICS-formoterol*	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA or Daily medium-dose ICS + LTRA* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* + oral systemic corticosteroid or daily high-dose ICS + Theophylline* + oral systemic corticosteroid, and PRN SABA
Steps 2-4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build up, or maintenance phase of desensitization.*						
Consider Omalizumab**						

Assess Control

- First check adherence, inhaler technique, environmental factors, and comorbid conditions.
- Step up** if needed; reassess in 2-6 weeks
- Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta₂-agonist

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Medications with Fomoterol

Symbicort
(Budesonide/Formoterol)



Dulera
(Mometasone/Formoterol)



- Dosing is every 2 puffs 4 hours as needed
- Max Puffs 12/day for 12 and older
- Max Puffs 8/day for 6-12

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BREATHE BETTER*

SYMBICORT will not replace a rescue inhaler for sudden symptoms.

*Results may vary.

For asthma patients 12 years of age and older... [READ MORE](#)

SYMBICORT 160/4.5 for maintenance treatment of COPD... [READ MORE](#)

ASTHMA >

COPD >

IMPORTANT SAFETY INFORMATION

- SYMBICORT combines an ICS, budesonide and a LABA medicine, formoterol. LABA medicines, such as formoterol, when used alone can increase the risk of hospitalizations and death from asthma problems. When an ICS and LABA are used together, this risk is not significantly increased.
- Do not use SYMBICORT for sudden severe symptoms of COPD or asthma.
- Before you use SYMBICORT, tell your healthcare provider about all of your medical conditions, including if you have heart conditions or high blood pressure, and all the medicines you may be taking. Some patients taking SYMBICORT may experience increased blood pressure, heart rate, or change in heart rhythm.
- Do not use SYMBICORT more often than prescribed. SYMBICORT should be taken as 2 puffs 2 times each day.

<https://www.mysymbicort.com/asthma/about-symbicort.html>

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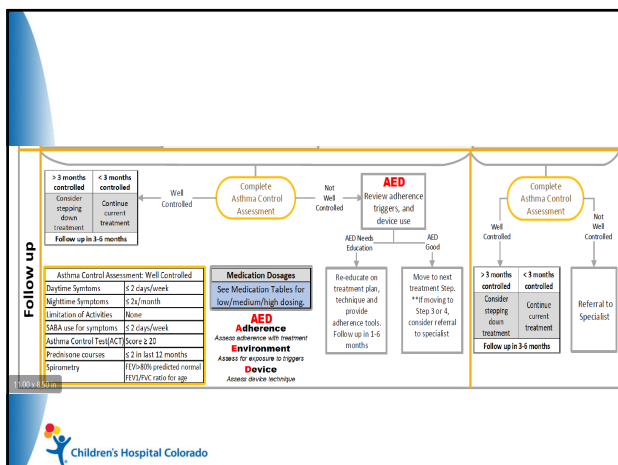
Figure 1d: Stepwise Approach for Management of Asthma in Individuals Ages 12 Years and Older

Intermittent Asthma		Management of Persistent Asthma in Individuals Ages 12+ Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6*
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA or PRN concomitant ICS and SABA	Daily and PRN combination low-dose ICS-formoterol	Daily and PRN combination medium-dose ICS-formoterol	Daily medium-high dose ICS-LABA + LAMA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroids + PRN SABA
Alternative		Daily LTRA* and PRN SABA or Cromolyn,* or Nedocromil,* or Zileuton,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS + LAMA,* or daily low-dose ICS + LTRA,* and PRN SABA or Daily low-dose ICS + Theophylline* or Zileuton* and PRN SABA	Daily medium-dose ICS-LABA or daily medium-dose ICS + LAMA,* or daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* or daily medium-dose ICS + Zileuton* and PRN SABA	Daily medium-high dose ICS-LABA or daily high-dose ICS + LTRA,* and PRN SABA	
		Steps 2-4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build-up, and maintenance phases of immunotherapy.			Consider adding Asthma Biologics (e.g., anti-IgE, anti-IL5, anti-IL5Rα, anti-IL4/13)	

Assess Control

- First check adherence, inhaler technique, environmental factors, and comorbid conditions.
- Step up** if needed; reassess in 2-6 weeks.
- Step down** if possible (if asthma is well controlled for at least 3 consecutive months).
- Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

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QUESTIONS?

Monica Federico, MD

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APRIL 12, 2023

Allergic and Environmental Factors Contributing to Acute and Chronic Asthma

William C. Anderson III, MD
Co-Director, Multidisciplinary Asthma Clinic
Associate Professor of Pediatrics



1

Disclosures

- Served on advisory boards for Sanofi, Regeneron, and Genentech
- Received clinic/research support from CO Medicaid UPL Program and COPIC Medical Foundation
- I actually do love dogs (but not cats....sorry)



2

Objectives

- Identify allergens and irritants that are most likely to trigger asthma
- Explain how to mitigate allergens and irritants



3

ALLERGENS

Pollens
Animals
Dust Mites
Cockroaches
Molds

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4

AGES 5-11 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 5-11 Years					
		STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Treatment		PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol ⁴	Daily and PRN combination medium-dose ICS-formoterol ⁴	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Preferred			Daily LTRA, ² or Cromolyn, ³ or Nedocromil, ³ or Theophylline, ¹ and PRN SABA	Daily medium-dose ICS and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA	Daily high-dose ICS + LTRA ² or daily high-dose ICS + Theophylline, ¹ and PRN SABA	Daily high-dose ICS + LTRA ² + oral systemic corticosteroid or daily high-dose ICS + Theophylline, ¹ + oral systemic corticosteroid, and PRN SABA
Alternative			Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA, ² or daily low-dose ICS + Theophylline, ¹ and PRN SABA	Daily medium-dose ICS + LTRA ² or daily medium-dose ICS + Theophylline, ¹ and PRN SABA			
			Steps 3-4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals >5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy				Consider Omalizumab ^{5,6}

Assess Control

• First check adherence, inhaler technique, environmental factors,⁷ and comorbid conditions.
 • **Step down** if possible (if asthma is well controlled for at least 3 consecutive months).
 • Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

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EPWG of the NHLBI. J Allergy Clin Immunol 2020.

5

Investigating an Allergic Trigger

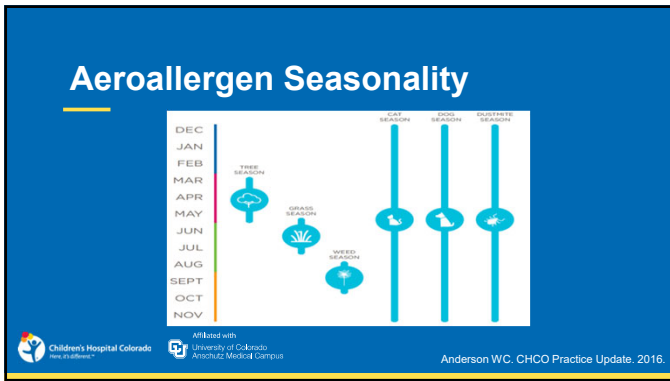
- Perennial or seasonal symptoms?
- Rhinitis symptoms?
- Consistent trigger for symptoms?
- Pets? Indoors or outdoors?
- Moisture or dampness in the home? Water damage?
- Visible mold in the home?
- Cockroaches or rodents in the home?

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NAEPP. EPR3 Report. 2007.

6



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Types of Testing Available

Skin Prick Testing

Serum IgE blood test

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Google Images (and me)

8

Allergy Sensitization in Children

- 88% had at least 1 positive SPT
- 56% were exposed to at least one indoor allergen to which they were sensitive

Allergen	% Positive
Grass	49%
Cat	49%
Weeds	48%
Dust Mites	48%
Trees	44%
Alternaria	37%
Cockroach	34%
Indoor Molds	31%
Dog	23%

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Nelson HS, et al. JACI 1999;104:775-85.

9

Impact of Pet Dander on Asthma

- Effect found when sensitized + exposed
- Increased wheezing episodes
- Increased bronchial hyperreactivity (methacholine)
- Reduced lung function (FEV₁)
- Increased fractional exhaled nitric oxide (FeNO)
- Increased need for inhaled corticosteroids



Konradsen JR, et al. JACI 2015;135:616-25.
Langley SJ, et al. JACI 2003;112:362-8.
Shirai T, et al. Chest 2005;127:1565-71.

10

Impact on Hospitalizations with Viruses

	Multivariate analysis	
	OR (95% CI)	p value
Sensitized only	1.75 (0.3 to 11.7)	0.56
Virus only	3.2 (0.5 to 19.1)	0.20
Sensitized and exposed only	2.6 (0.7 to 9.3)	0.13
Sensitized and virus only	8.9 (0.3 to 254.2)	0.20
Sensitized and exposed and virus detected	19.4 (3.7 to 101.5)	<0.001



Murray CS, et al. Thorax 2006;61:376-82.

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RECOMMENDATIONS

- In individuals with asthma who have symptoms related to exposure to identified indoor allergens, confirmed by history taking or allergy testing, the Expert Panel conditionally recommends a multi-component allergen-specific mitigation intervention.
- In individuals with asthma who do not have sensitization to specific indoor allergens or who do not have symptoms related to exposure to specific indoor allergens, the Expert Panel conditionally recommends *against* allergen mitigation interventions as part of routine asthma management.



EPWG of the NHLBI. J Allergy Clin Immunol 2020.

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Indoor Allergy Mitigation

- Single-component mitigation strategy → 1 intervention that targeted 1 specific allergen
- Multicomponent mitigation strategy → multiple interventions targeting 1 specific or multiple allergens
- Using only one strategy often does not improve asthma outcomes



EPWG of the NHLBI. J Allergy Clin Immunol 2020.

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Indoor Allergy Mitigation

- Low or very low strength of evidence but low cost and low risk of harms and importance in public health led to recommendations
- Allergen mitigation interventions may be expensive or difficult for individuals to use or maintain
- Consider the severity of an individual's asthma, the small benefit, and the extent of previous symptoms and exacerbations when recommending allergen mitigation interventions



EPWG of the NHLBI. J Allergy Clin Immunol 2020.

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Best Strategy for Animal Dander



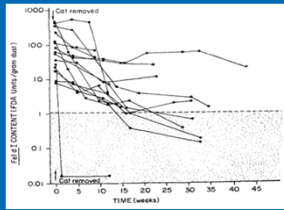
REMOVAL!



Google Images

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Cat Dander Sticks Around

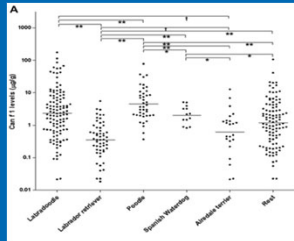


- Took 5-6 months after cat removal for 8 of 15 homes to reach “cat-free home” allergen levels

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Hypoallergenic Dogs

- Can f 1 concentrations were **HIGHER** for some hypoallergenic breeds
- Environmental exposure to Can f 1 did not differ



17

Bo Obama

No such thing as a hypoallergenic dog!



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Animal Dander Reduction Strategies

- Keep the pet out of the bedroom
- Remove upholstered furniture/carpets
- Frequently vacuum the home
- Isolate the pet within the home
- Bathe the pet
- Change clothes after exposure



Matsui EC, et al. Pediatrics 2016;138:e20162589.
NAEPP EPR3 Report, 2007.
Portnoy J, et al. Ann Allergy Asthma Immunol 2012;108:223.e1-15

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Outdoor Allergen Reduction Strategies

- Stay indoors during peak pollen season
- Keep windows closed and run air-conditioning
- Avoid mowing lawns/raking leaves
- Bathe after outdoor activity
- Wash pets that have been outdoors



NAEPP EPR3 Report, 2007
Google Images

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Mold Reduction Strategies

- Keep home well ventilated
- Dehumidify home and eliminate dampness
 - Ideally keep humidity less than 50%
 - Empty water drainage pans from humidifier
- Repair leaking roofs/pipes
- Avoid raking/mowing/mulching
- Treat directly with bleach and clean with soapy water



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Dust Mite Reduction Strategies

- Allergen-impermeable mattress and pillow cases
- Wash the sheets and blankets weekly in hot water (greater than 130 degrees F)
- Reduce indoor humidity to or below 60%
- Avoid swamp coolers and humidifiers
- Remove carpets from the bedroom
- Minimize stuffed toys and wash them



Matsui EC, et al. Pediatrics 2016;138:e20162589.
NAEPP, EPR3 Report, 2007.
Portnoy J, et al. Ann Allergy Asthma Immunol 2013;111:465-507.
Google Images

22

Cockroach Reduction Strategies



- Professional exterminator
- Put away food - do not leave it out!
- Take out the garbage often
- Eliminate moisture and repair leaks
- Poison baits, boric acid, and traps are preferred over other chemical agents



Google Images

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Are HEPA/Air Filters Helpful?

- Environmental effects
 - Reduces airborne dander
 - Animal dander, spores; NOT dust mite, cockroach
 - Does not affect settled dander
- Conflicting clinical benefit
 - ?Bronchial hyperresponsiveness
 - ?Medication use
- Insufficient evidence to recommend



Matsui EC, et al. Pediatrics 2016;138:e20162589.
NAEPP, EPR3 Report, 2007.
Portnoy J, et al. Ann Allergy Asthma Immunol 2012;108:223.e1-15.
Google Images

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Indoor Interventions

Recommended	Insufficient Evidence	Not Recommended
<ul style="list-style-type: none"> • Vacuuming • Air conditioning • Dehumidifier 	<ul style="list-style-type: none"> • HEPA filters • Air duct cleaning 	<ul style="list-style-type: none"> • Humidifiers • Swamp coolers



Increased humidity encourage growth of molds and dust mites!

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IRRITANTS

Tobacco Smoke
Air Pollution
Formaldehyde
Organic Compounds
Sprays and Strong Odors

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Tobacco Smoke – Active Use

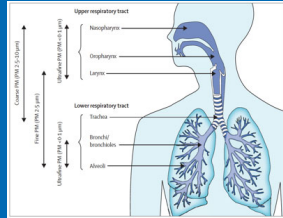
- Increased unscheduled health care visits
- Increased oral corticosteroid use
- More rapid decline in lung function
- More refractory to oral and inhaled corticosteroids
- Increases asthma severity



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Pollutants

- Particulate matter (PM) 2.5 deposits throughout the respiratory tract
- Includes combustion particles, organic compounds, metals
- Associated with asthma symptoms, poor asthma control, reduced lung function, increased health care use



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Pollutants

	Ozone	Nitrogen dioxide	Sulphur dioxide
Bronchoconstriction	+/-	-	+
Decreased FEV1 and FVC	+	-	-
Increased airway responsiveness	+	+	-
Airway inflammation	+	+	-
Enhanced responses to inhaled allergen	+	+	+

FEV1=forced expiratory volume in 1 s. FVC=forced vital capacity.

Table 1: Acute effects of short-term exposures to pollutant gases in asthmatic adults

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Mitigating Effects of Air Pollution



- Follow air pollution/quality alerts
- Stay inside on high air pollution days
- Avoid vigorous activity on high pollution days
- Live at least 300 m from major roadways

30

Features of Occupational Asthma

- Symptoms occur during work exposure
- May worsen during the day or even last into evening after exposure
- Symptoms remit over weekends/holidays
- Rhinitis precedes or accompanies symptoms



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Diagnosis of Occupational Asthma

- Identification of trigger at work
- Serial peak flow measurements after exposure and after 2 weeks of no exposure
- Serial charting of symptoms
- Allergy testing
- Bronchial challenges (if feasible)

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Treatment of Occupational Asthma

- COMPLETE removal from further exposure to trigger
- Best outcomes with early diagnosis
 - Asthma may persist in up to 70% of patients even years after removal of trigger
- Pharmacologic management

33

Co-Morbidities

Vocal Cord Dysfunction/Exercise-Induced Laryngeal Obstruction

Allergic Bronchopulmonary Aspergillosis
Rhinitis/Sinusitis

Gastroesophageal Reflux Disease
Aspirin Exacerbated Respiratory Disease

Obesity
Sleep Apnea
Stress/Depression

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Rhinitis

- Unified airway hypothesis
- Impact on asthma:
 - Negative impact on quality of life
 - Increased asthma-related hospitalizations/ED visits
 - Incomplete asthma control
- Treatment: Nasal corticosteroids, consideration for SCIT/SLIT



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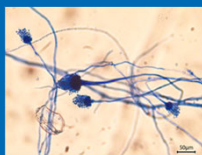
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Boulay ME, et al. Curr Opin Allergy Clin Immunol 2012;12:449-54.
Google Images

35

Allergic Bronchopulmonary Aspergillosis (ABPA)

- T_H2 hypersensitivity lung disease caused by bronchial colonization with *Aspergillus fumigatus*
- Characterized by
 - Exacerbations of asthma
 - Thick mucous plugs
 - Recurrent transient CXR infiltrates
 - Elevated IgE
 - Peripheral and pulmonary eosinophilia



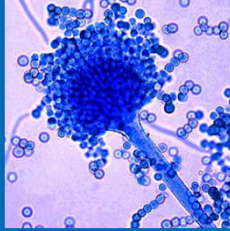
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Knutsen AP, et al. J Allergy Clin Immunol 2012;129:280-91.

36

Aspergillum → Aspergillus



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37

Schwartz and Greenberger Criteria^{b,c}

ABPA-CB: Minimal Essential Criteria

1. Asthma
2. Immediate skin test reactivity to *Aspergillus*
3. Elevated *Aspergillus*-specific IgE and/or IgG
4. Elevated total IgE (>1000 ng/mL)
5. Proximal bronchiectasis

ABPA-S: Minimal Essential Criteria

1. Asthma
2. Immediate skin test reactivity to *Aspergillus*
3. Elevated total IgE (1000 ng/mL)
4. Elevated *Aspergillus*-specific IgE and/or IgG

Additional Criteria

1. Current or previous pulmonary infiltrates
2. Mucus plugs
3. Presence of *Aspergillus* in sputum
4. Precipitins to *Aspergillus*
5. Delayed skin test positive
6. Eosinophilia (>1000/ μ L)

ISHAM Criteria^d

Predisposing Conditions Asthma, CF

Obligatory Criteria (Both Should Be Present)

1. Immediate skin test reactivity to *Aspergillus* or elevated *Aspergillus*-specific IgE
2. Elevated total IgE (>1000 IU/mL)

Other Criteria (at Least 2 of 3)

1. Presence of precipitating or IgG antibodies against *Aspergillus* in serum
2. Radiographic pulmonary opacities consistent with ABPA
3. Total eosinophil count >500 cells/ μ L in steroid naive patients

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Hew M et al. Chapter 58. Middleton's Allergy. Ninth Ed. 2020.

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ABPA Treatment and Monitoring

• Treatment

- Prolonged course of oral steroids with taper
- Adjunctive oral antifungals (itraconazole)
 - May reduce requirement for prolonged high-dose systemic corticosteroids

• Monitoring

- Monitor total serum IgE every 6-8 weeks
 - Goal to achieve 35-50% reduction of total IgE
- Considered remission without pulmonary infiltrates and/or eosinophilia for 6 months after steroid withdrawal

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Greenberger PA, et al. J Allergy Clin Immunol Pract 2014;2:703-8.
Knutson AP, et al. J Allergy Clin Immunol 2012;129:280-91.

39

Changing Your Practice

- Consider evaluation for environmental allergies in patients with asthma, especially if uncontrolled
- Employ mitigation strategies directed specifically to allergens to which they are sensitized
- Environmental exposures outside of allergies can worsen asthma control through irritation or other inflammatory processes

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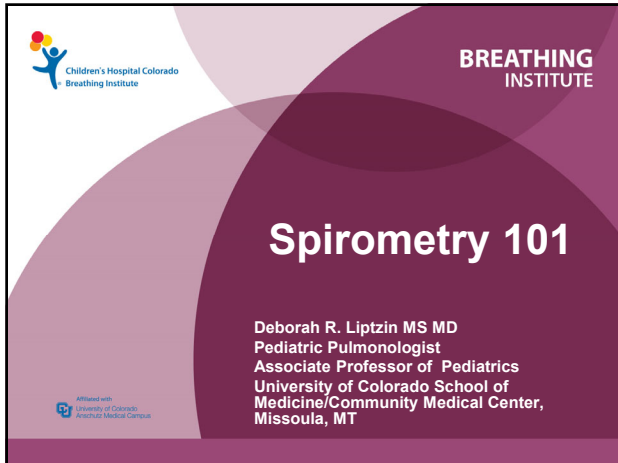


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Thank You!

Questions? Contact me!
720-777-2575
william.anderson@childrenscolorado.org

42



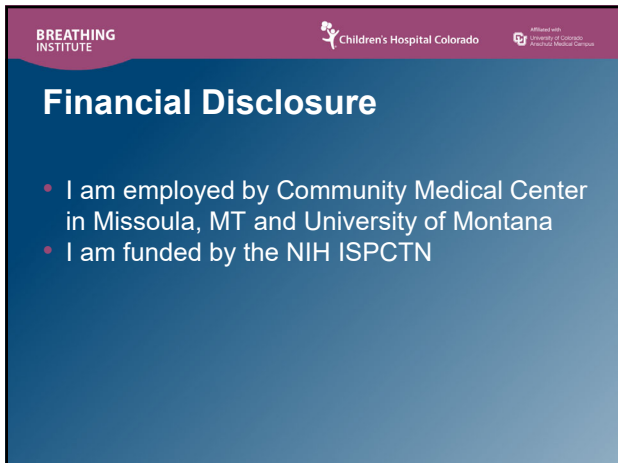
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Spirometry 101

Deborah R. Liptzin MS MD
Pediatric Pulmonologist
Associate Professor of Pediatrics
University of Colorado School of Medicine/Community Medical Center,
Missoula, MT

Affiliated with
University of Colorado
Anschutz Medical Campus

1



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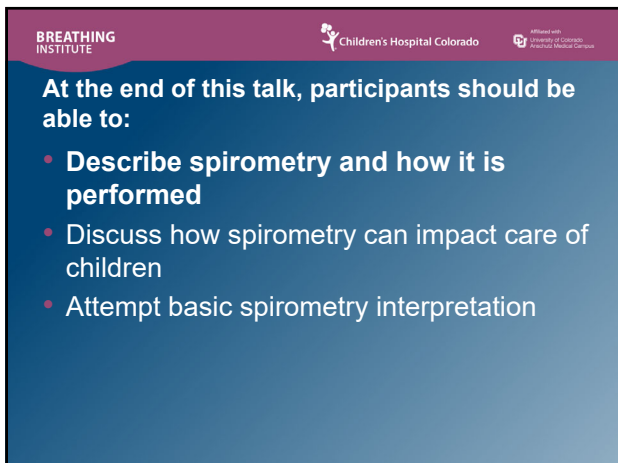
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Financial Disclosure

- I am employed by Community Medical Center in Missoula, MT and University of Montana
- I am funded by the NIH ISPCTN

2



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At the end of this talk, participants should be able to:

- Describe spirometry and how it is performed
- Discuss how spirometry can impact care of children
- Attempt basic spirometry interpretation

3

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Definition of Spirometry

- The measurement of air into and out of the lungs (volume and flow)

4

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Why measure Spirometry?

- Objective** information
- More reliable than peak flows
- Diagnosing asthma
 - Recurrent episodes of wheezing
 - Airway obstruction with reversibility:
 - > 12% improvement in FEV1 after albuterol
 - Exclusion of alternative diagnoses
- Assessing response to therapy
- Following disease course over time


5

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You Don't Know What You Don't Know




6

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What Does Spirometry Measure?

- **Forced Vital Capacity (FVC)**
 - The maximum volume of air that can be expired when the patient exhales as forcefully and rapidly as possible after a maximal inspiration.
 - Liters
- **Forced Expiratory Volume (FEV₁)**
 - The volume of air exhaled in the first second of the FVC.
 - Liters.
- **FEV₁/FVC**
 - Ratio of FEV₁/FVC.
 - Low (<80) = airflow obstruction.


7

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What Does Spirometry Measure...

- **Forced Expiratory Flow_{25%-75%} (FEF_{25%-75%})**
 - Flow measured over 25% to 75% of the FVC.
 - Status of the small airways.
- **% predicted/z score**
 - for that patient's age, sex (assigned at birth, not gender!), height and race

8

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What Does Spirometry Measure...


- **Peak Expiratory Flow Rate (PEFR)**
 - Maximum flow during an FVC maneuver.
 - Effort Dependent
 - Liters/second (L/S).
 - Note: peak flow meters report in liters/minute (L/M) To convert L/S to L/M, multiply L/S by 60.

9

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Instruct Patient On Correct Technique

- Make instructions easy to understand
 - Example: "Take a DEEP breath, as big as you can, then put the mouthpiece in your mouth and blow as hard, fast and as long as you can."
- Coach patient throughout test. (Think Labor and Delivery nursing)
- Incentives
- Children typically stand
- Nose clips
- http://www.youtube.com/watch?v=EkDCBCIk_8E

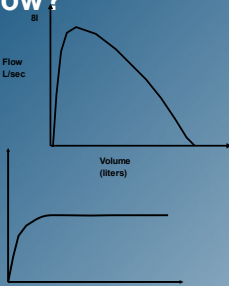


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What are the characteristics of a good blow?

- Rapid rise to peak flow
- A nice smooth curve
- Repeatable
- Back extrapolation <5% FVC



- For Time/Volume curve:
 - Duration of 6 seconds (3 in children) or reached plateau


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Reporting Best Effort

- Repeatability Criteria
 - Minimum 3 Acceptable efforts
 - Two largest FVC values agree within 150ml (0.15L)
 - Two largest FEV₁ values agree within 150ml (0.15L)
 - Highest sum of FVC and FEV₁ with highest repeatable peak expiratory flow rate (PEFR)


12

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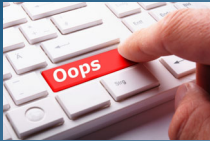
Pitfalls in Performance

- Poor effort
- Air leaks
- Pursed lips or puffed cheeks
- Starting slowly
- Stopping too soon
- Coughing or breathing in
- Glottic closure (gurgles or rumble in the throat)


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Another Pitfall: Data Entry Error

Height?  Sex?!?! Race?!?

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When can children reliably perform spirometry?

- Ability to follow directions
- Ability to make seal around mouthpiece
- Earliest I've seen is 3, typically 5-6 years
- Sometimes never

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Outcomes of spirometry

- Normal
- Obstruction
- Restriction
- Mixed obstruction-restriction

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Variability and significant change

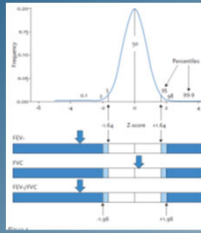
	Normal Range (% predicted)	Significant Change (%)
FVC (L)	80-120	>10
FEV1 (L)	80-120	>12
FEV1/FVC	>80? >85?	
FEF25-75 (L/s)	60-140	>32

17

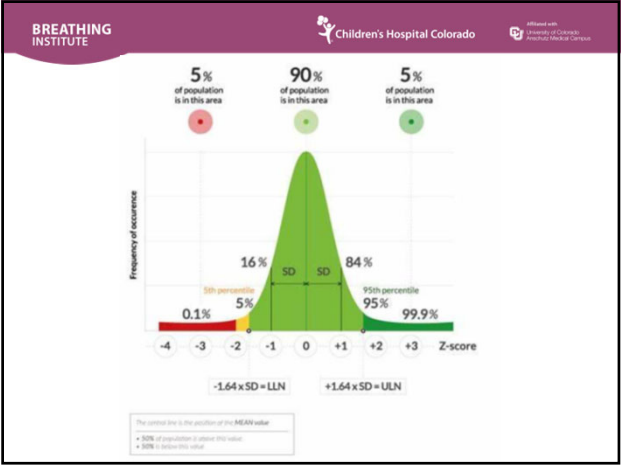
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Z scores (standard deviations from the mean)

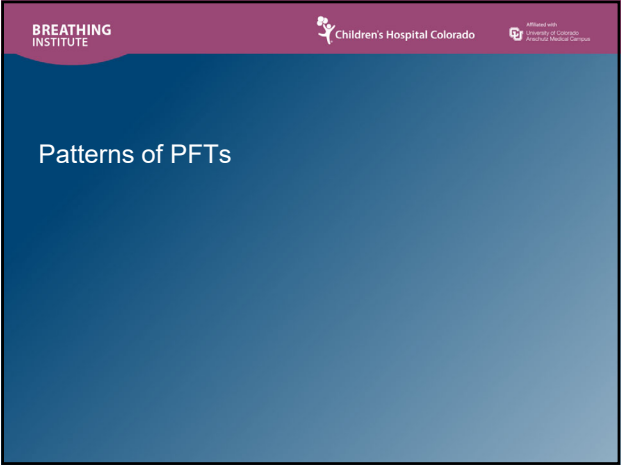
- Standardize scores
- +/- 1.64 standard deviations
90% of the normal population
- Global Lung Function Initiative:
 - International pool of 100,000 PFTs
 - Age 3-95 years
 - Caucasian, N East Asian, S East Asian, African American
 - (over 300 reference equations exist!)



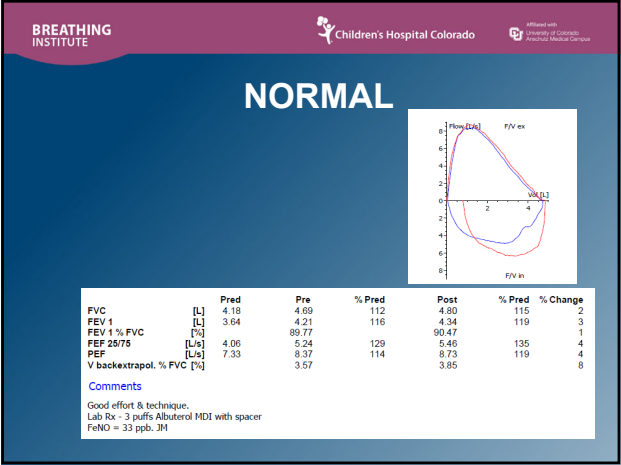
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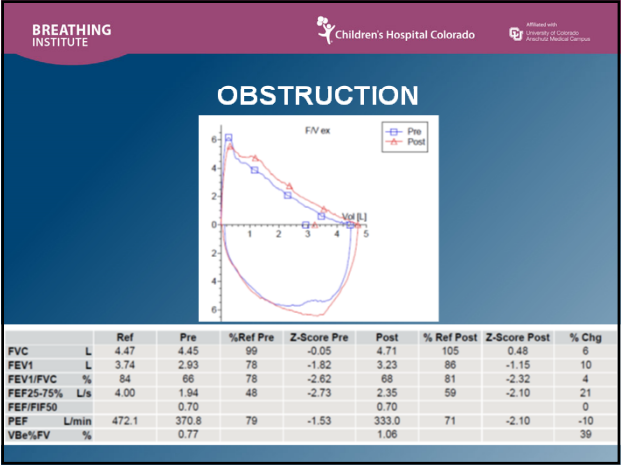
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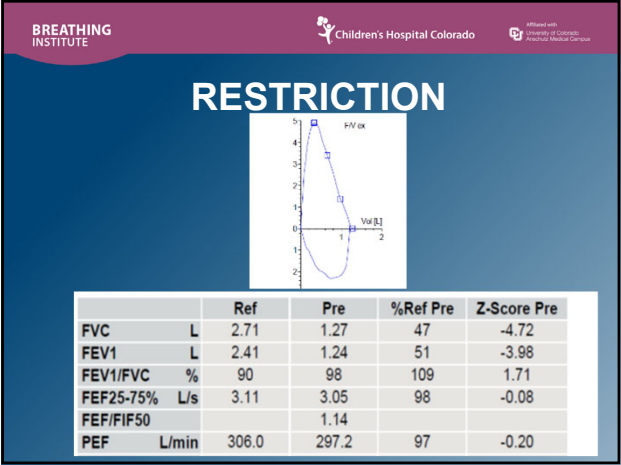
22

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What are the causes of obstruction?

- Difficulty getting air OUT, airways disease
 - Asthma
 - Cystic Fibrosis
 - Primary Ciliary Dyskinesia
 - Allergic Bronchopulmonary Aspergillosis
 - Bronchiolitis obliterans

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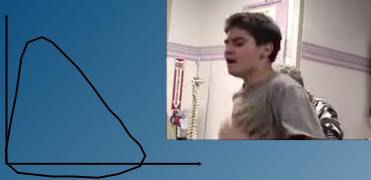
What are the causes of restriction?

- Functional restriction
 - Poor effort
 - Thoracic pain or anxiety
 - Neuromuscular disease
- Squished lungs
 - Obesity
 - Pleural disease (effusion, fibrosis, pneumothorax)
 - Kyphoscoliosis
- Stiff lungs:
 - Interstitial lung disease
 - CHF/pulmonary edema

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Other Flow Patterns to Look For:



vocal cord dysfunction/inducible laryngeal obstruction

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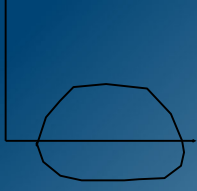
Vocal cord dysfunction

- Perceived threat to vocal cords
- Triggers
 - Strong smells
 - Cold
 - Exercise
 - Stress
- Treatment
 - Diaphragmatic breathing
 - Pant like a dog
 - Yawn/Sign

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Other Flow Patterns to Look For:



Fixed airway obstruction:

- Stenosis
- Mass
- Vocal cord paralysis
- Foreign body

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Spirometry and pediatric lung disease

- Diagnose disease
- Follow disease over time
- "Objective" measure of disease state

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Interpreting spirometry

1. Is the entry data correct?
 - Age, height, sex, and race
 - Evaluate the quality
 - Good effort with rapid rise to peak flow
 - Is the curve smooth?

30

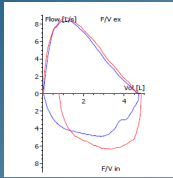
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Interpreting spirometry

- What is the shape?
 - Normal, obstructive, restrictive, or mixed
- Look at the values
 - FVC
 - FEV1
 - FEV1/FVC
 - FEF 25-75

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		Pred	Pre	% Pred	Post	% Pred	% Change
FVC	[L]	4.18	4.89	112	4.90	115	2
FEV 1	[L]	3.64	4.21	116	4.34	119	3
FEV 1 % FVC	[%]		89.77		90.47		1
FEF 25/75	[L/s]	4.06	5.24	129	5.46	135	4
PEF	[L/s]	7.33	8.37	114	8.73	119	4
V backextrapol. % FVC	[%]		3.57		3.85		8

Comments
Good effort & technique.
Lab Rx - 3 puffs Albuterol MDI with spacer
FeNO = 33 ppb, 3H

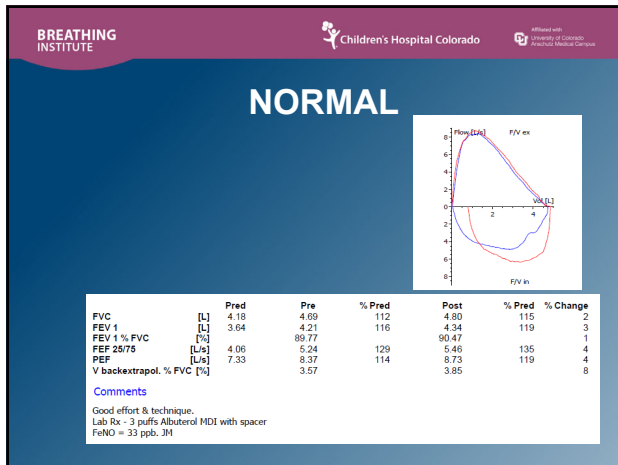
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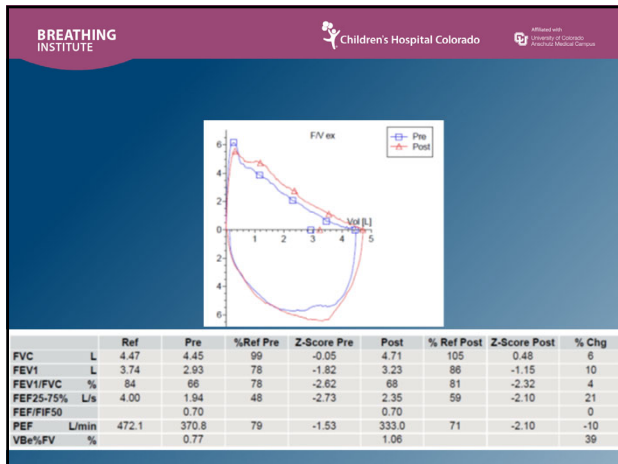
What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue

33



34



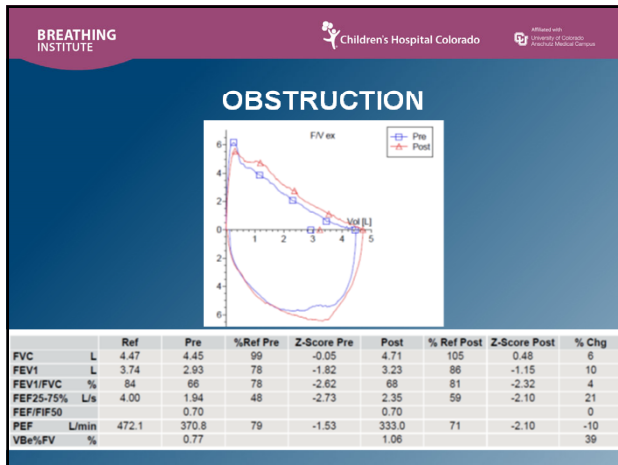
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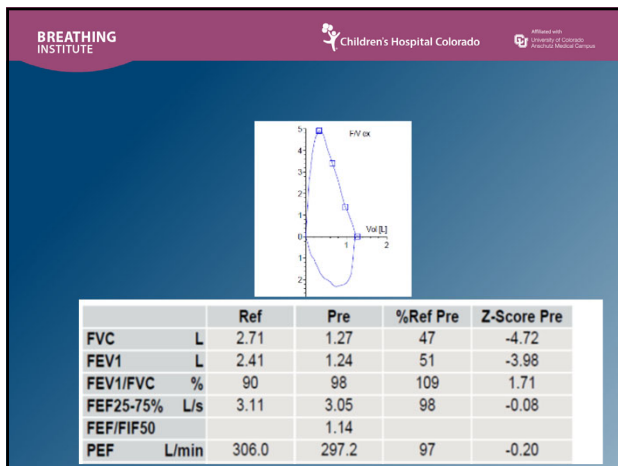
What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue

36



37



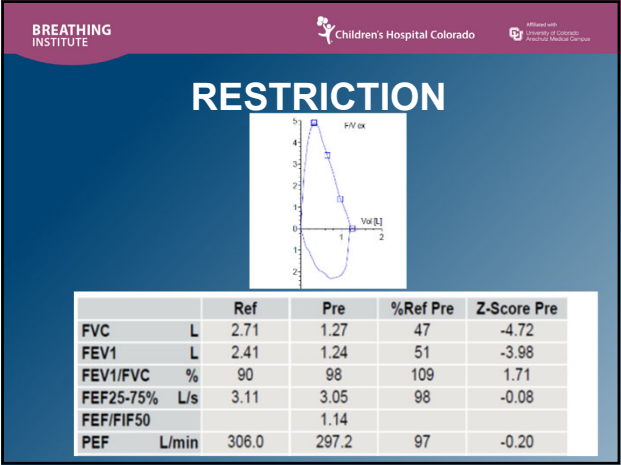
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What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue

39



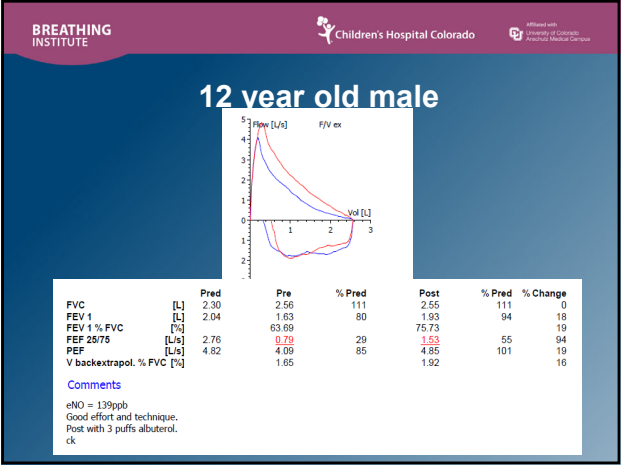
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12 Yr Old Male

- Chief Complaint: "I want to play basketball without coughing or wheezing"

41




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What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue

43

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What are you going to do next?

- Start albuterol as needed
- Start a controller medicine
- Phone a friend
- Do something else

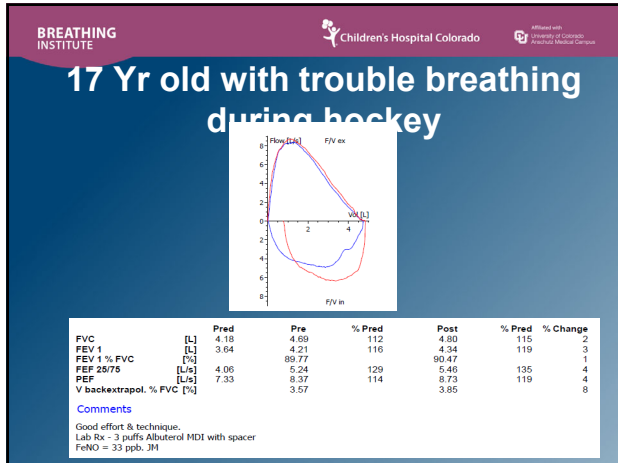
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17 year old female

- Chief Complaint: dyspnea on exertion (playing and training for elite hockey)

45



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What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue

47

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What are you going to do next?

- Start albuterol as needed
- Start a controller medicine
- Phone a friend
- Make her switch to basketball
- Do something else

48

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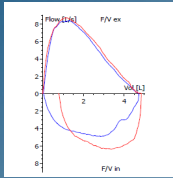
17 year old straight A student

- Stressed out about applying to colleges
- Exercise induced asthma, competitive runner

49

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17 year-old female who gets straight A's



		Pred	Pre	% Pred	Post	% Pred	% Change
FVC	[L]	4.18	4.69	112	4.90	115	2
FEV 1	[L]	3.64	4.21	116	4.34	119	3
FEV 1 % FVC	[%]		89.77		90.47		1
FEF 25/75	[L/s]	4.06	5.24	129	5.46	135	4
PEF	[L/s]	7.33	8.37	114	8.73	119	4
V backextrapol. % FVC	[%]		3.57		3.85		8

Comments
Good effort & technique.
Lab Rx - 3 puffs Albuterol MDI with spacer
FeNO = 33 ppb, 3M


50

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What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue


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What are you going to do next?

- Start albuterol as needed
- Start a controller medicine
- Phone a friend
- Do something else


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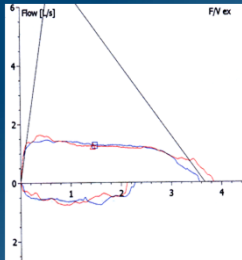
12 Year old boy:

- Asthma since birth
- Symptoms: cough, wheeze, dyspnea

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12 year old boY...



$FVC = 3.54 \text{ L (96\%)}$
 $FEV1 = 1.47 \text{ L (43\%)}$
 $Ratio = 0.41$
 $PEFR = 1.47 \text{ L/s (20\%)}$
 $FEF_{25-75} = 1.27 \text{ L/s (33\%)}$


54

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What does this spirometry show?

- Normal
- Obstruction
- Restriction
- Mixed restriction and obstruction
- I have no clue

55

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What are you going to do next?

- Start albuterol as needed
- Start a controller medicine
- Phone a friend
- Do something else

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Bronchoscopy



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Challenge Testing

- Exercise
- Cold air
- Methacholine
- Mannitol

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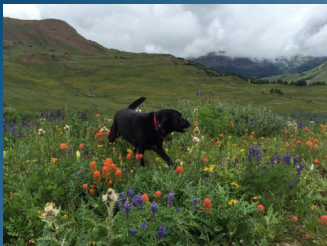
Final Points

- Additional tool in evaluation of asthmatics: worried well, poor perceivers
- Normal spirometry does not rule out asthma.

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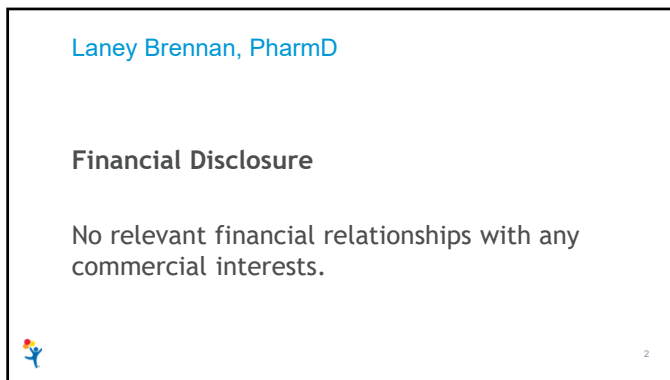
Thank you!



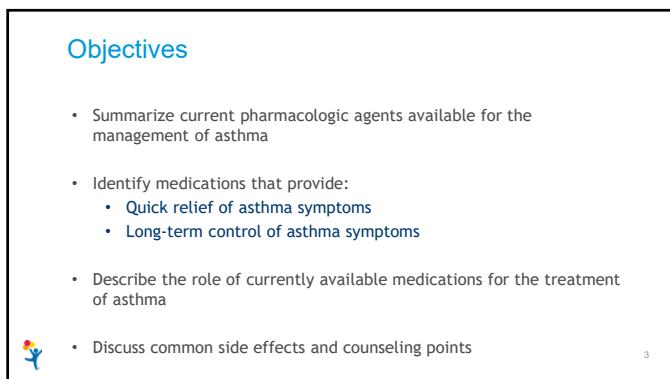
60



1



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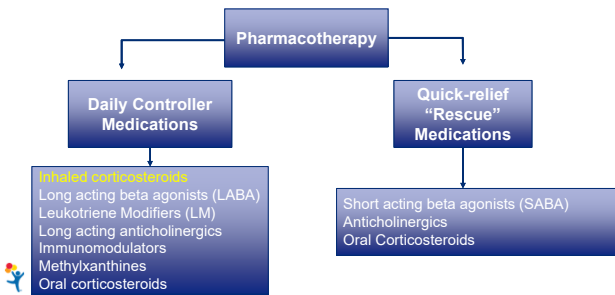
- **Daily: Used for Long-Term Control (CONTROLLERS)**
 - Inhaled Corticosteroids (ICSs)
 - Long-acting Beta₂-agonists (LABAs)
 - Leukotriene Modifiers
 - Long-acting Anticholinergics
 - Methylxanthines
 - Immunomodulators
- **As needed: Used for Quick Relief (RESCUE)**
 - Short-acting Beta₂-agonists (SABAs)
 - Short acting Anticholinergics
 - Systemic corticosteroids

5

[illegible]

6

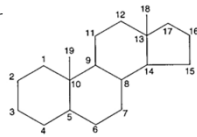
Pharmacologic Management



7

Controllers: Inhaled Corticosteroids (ICSs)

- Mechanism of action: Prevents and reduces inflammation/swelling in the airways
- Most potent and effective long-term controller medications currently available
- Preferred first line treatment for persistent asthma at ALL levels of severity in ALL ages
- Do **NOT** provide quick relief of symptoms



8

8

Controllers: Inhaled Corticosteroids

Metered Dose Inhalers (MDIs)

Brand Name	Generic Name	Available Strengths
Flovent	fluticasone	44, 110, 220 mcg/actuation
Alvesco	ciclesonide	80 & 160 mcg/actuation
Asmanex	mometasone	50, 100, & 200 mcg/actuation

Breath actuated MDI

Brand Name	Generic Name	Available Strengths
QVAR Redihaler	beclomethasone	40 & 80 mcg/actuation

9

9

Controllers: Inhaled Corticosteroids

Dry Powder Inhalers (DPIs)

Brand Name	Generic Name	Available Strengths
Pulmicort Flexhaler	budesonide	90 & 180 mcg/inhalation
Asmanex Twisthaler	mometasone	110 & 220 mcg/inhalation
Flovent Diskus	Fluticasone propionate	50, 100 & 250 mcg/inhalation
ArmonAir RespiClick	Fluticasone propionate	55, 113, 232 mcg/inhalation
Arnuity Ellipta	Fluticasone furoate	100 & 200 mcg/inhalation

Suspension for nebulization

Brand Name	Generic Name	Available Strengths
Pulmicort Respules	budesonide	0.25, 0.5 & 1 mg/ampules



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Controllers: ICS/LABA combinations

MDIs

Brand Name	Generic Name	Available Strengths
Advair HFA	Fluticasone/salmeterol	45/21, 115/21 & 230/21 mcg/actuation
Symbicort	Budesonide/formoterol	80/4.5 & 160/4.5 mcg/actuation
Dulera	Mometasone/formoterol	50/5, 100/5, 200/5 mcg/actuation

DPIs

Brand Name	Generic Name	Available Strengths
Advair Diskus	Fluticasone/salmeterol	100/50, 250/50, 500/50 mcg/inhalation
AirDuo RespiClick	Fluticasone/salmeterol	55/14, 113/14 & 232/14 mcg/inhalation
Breo Ellipta	Fluticasone/vilanterol	100/25 & 200/15 mcg/inhalation



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Do the benefits
from chronic use of
inhaled
corticosteroids
outweigh the risks
in children??



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CAMP Study

- Budesonide vs. nedocromil for asthma control in children. Growth velocity reduction was noted in the ICS group (budesonide) in the first year, but growth velocities were the same in all groups by the end of the 4 year study
 - The ICS group had a 1.1 cm lower mean increase in height compared with placebo at the end of the study
- In a follow up to the CAMP trial, mean adult height was 1.2 cm lower in the ICS group than in the placebo group
- Multiple publications since this hallmark trial - Dose related!



N Engl J Med. 2000 Oct 12;343(15):1054-63.

N Engl J Med. 2012 Sept 12;367:905-912

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Role of ICSs in Pediatric Patients

- ICS are the preferred first-line treatment for children of all ages at all levels of severity
 - Children should be maintained on the lowest ICS dosage needed to maintain asthma stability and control
- Uncontrolled asthma alone can cause decreased growth velocity in children
- Take home message:** Evidence from the literature demonstrates that improved outcomes by utilizing ICS in mild to moderate persistent asthma greatly outweigh the small risk of delayed growth



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New Recommendations

- EPR4 guidelines recommend short courses of ICS, initiated at the start of viral respiratory illness, in patients < 4 years of age with viral induced wheeze or intermittent asthma

AGES 0-4 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

Intermittent Asthma		Management of Persistent Asthma in Individuals Ages 0-4 Years					
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	
Preferred	PRN SABA <div>or as the start of the first severe episode, daily ICS*</div>	Daily low-dose ICS and PRN SABA	Daily low-dose ICS and PRN SABA* or Daily low-dose ICS + montelukast* or daily medium-dose ICS and PRN SABA	Daily medium-dose ICS, LABA and PRN SABA	Daily high-dose ICS, LABA and PRN SABA	Daily high-dose ICS, LABA + oral systemic corticosteroids, PRN SABA and PRN SABA	
Alternative		Daily montelukast* or Chantrel* and PRN SABA		Daily medium-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast* + oral systemic corticosteroids and PRN SABA	

For children age 4 years and up, use Step 1 and Step 2 as the starting point for treatment.



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Adverse Drug Effects of ICSs

- Common ADEs
 - Oral candidiasis (thrush)
 - Dysphonia (hoarseness)
 - Minor growth suppression
- Reduction of ADEs
 - Valved holding chamber (VHC)/spacer
 - MDIs only (QVAR Redi-Haler being the exception)
 - Rinse mouth after use
 - Lowest dose possible to maintain control
 - Monitor growth



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Counseling Patients on ICSs

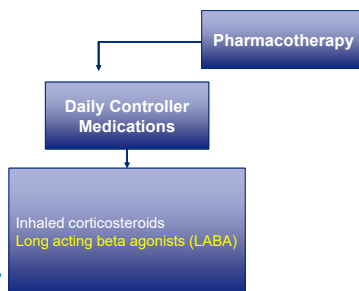
- Importance of consistent use
 - Assess for "steroid phobia"
- Delayed onset of action
 - **2 - 4 weeks to see full effect**
- Inhaler technique at every visit
- Rinse and spit after each use
- How long canister will last
 - (Teach patient/caregiver where counter and expiration date are.)



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Pharmacologic Management



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Long-acting Beta₂-agonists (LABAs)

- Mechanism of Action: Opens the airways in the lungs by relaxing smooth muscle around the airway lumen
- For asthma - always used in combination with ICS, as add on therapy, for long term control.
 - Very beneficial in patients with nighttime symptoms
- Duration of Action: ~12 hours



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Long-acting Beta₂-agonists (LABAs)

Available Single Agent Products

Brand Name	Generic Name	Strengths
Serevent Diskus	salmeterol	50 mcg/inhalation
Foradil Aerolizer**	formoterol	12 mcg/capsule

** no longer available in United States

Nebulized formulations - *COPD Indication only!

Brand Name	Generic Name	Strengths
Perforomist	formoterol	20 mcg/ampule
Brovana	arformoterol	15 mcg/ampule



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Controllers: ICS/LABA combinations

MDIs

Brand Name	Generic Name	Available Strengths
Advair HFA	Fluticasone/salmeterol	45/21, 115/21 & 230/21 mcg/actuation
Symbicort	Budesonide/formoterol	80/4.5 & 160/4.5 mcg/actuation
Dulera	Mometasone/formoterol	50/5, 100/5, 200/5 mcg/actuation

DPIs

Brand Name	Generic Name	Available Strengths
Advair Diskus	Fluticasone/salmeterol	100/50, 250/50, 500/50 mcg/inhalation
AirDuo RespiClick	Fluticasone/salmeterol	55/14, 113/14 & 232/14 mcg/inhalation
Breo Ellipta	Fluticasone/vilanterol	100/25 & 200/15 mcg/inhalation
Trelegy Ellipta	Fluticasone/umeclidinium/vilanterol	200/62.5/25 mcg/inhalation



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Adverse Effects of LABAs

- Tachycardia/tremor
- Neuromuscular/skeletal pain (RARE)
- Muscle cramps (RARE)
- Well tolerated therapy!



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Former Controversy with LABA therapy

- Former Black Box warning on all products with LABAs for an increase in asthma related deaths
 - Based on results from the SMART trial - salmeterol only
 - In 2011, FDA mandated trials on the efficacy and safety of combination ICS/LABA therapy
- In 12/2017 the FDA removed Black Box warning from combination ICS/LABA products
 - Four completed trials showed no increased risk of asthma related deaths, hospitalizations or need for intubation with ICS/LABA therapy vs. ICS therapy alone
- Warning remains on single ingredient LABA products



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ICS/LABA considerations

- The use of LABAs is contraindicated without the use of an asthma controller medication such as an ICS
 - Single-ingredient LABAs should only be used in combination with an asthma controller medication; they should not be used alone.
- Pediatric and adolescent patients who require the addition of a LABA should use a combination product containing both an ICS and a LABA, to ensure compliance with both medications.
- Addition of a LABA is considered "step up therapy" and ICS/LABA are the preferred therapy in Step 3 of the EPR4 guidelines for all age groups



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New Recommendations

- In the EPR4 guidelines the use of daily ICS/formoterol combination therapy PLUS as needed ICS/formoterol combination therapy for symptom relief in patients > 5 years of age is now preferred in Step 3 and above
 - “SMART” therapy - recommended in GINA guidelines
 - Formoterol containing combinations only!
 - Salmeterol has not been studied, has different pharmacokinetics and onset of action



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AGES 5-11 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

		Management of Persistent Asthma in Individuals Ages 5-11 Years					
		STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Treatment	Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol*	Daily and PRN combination medium-dose ICS-formoterol*	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
	Alternative	Daily LTRA,* or Cromolyn* or Nedocromil* or PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS + Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA or Daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA,* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA,* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA,* or daily high-dose ICS + Theophylline,* and PRN SABA
		Steps 2-4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals > 5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy*					Consider Omalizumab**



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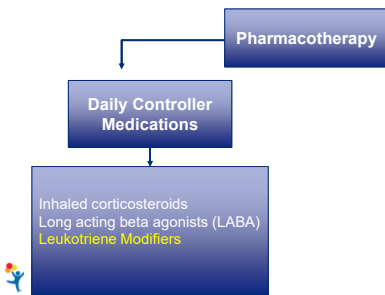
Why is education so important?



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Pharmacologic Management



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Leukotriene Modifiers

- Leukotriene-receptor antagonists (LTRAs)
 - Mechanism of action: Prevents and reduces swelling inside the airways
- Demonstrate modest improvements in lung function
 - Controlled, clinical trials favor ICS on most outcome measures
 - Observational studies suggest comparable effectiveness to ICS for mild-persistent asthma in "real-world", uncontrolled conditions
 - These findings are thought to be a result of improved adherence with oral montelukast compared to ICS therapy
- Adverse Drug Effects
 - Neuropsychiatric adverse effects:
 - Agitation, aggression, anxiousness, dream abnormalities, hallucinations, depression, insomnia, irritability, restlessness, suicidal thinking and behavior (including suicide) and tremor - **BLACK BOX WARNING** for montelukast

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Leukotriene-receptor antagonists

- Singulair® (montelukast) **GENERIC**
 - Once daily dosing
 - FDA Approved for asthma in 12 months of age and older
 - Available in:
 - 4 mg granules & chewables
 - 5 mg chewables
 - 10 mg tablets
 - Also has FDA indication for exercise-induced asthma and allergic rhinitis
- Accolate® (zafirlukast) **GENERIC**
 - Twice daily dosing
 - FDA Approved for 5 years of age and older
 - Available in 10 mg & 20 mg tablets
 - Monitor for signs/symptoms of hepatotoxicity
 - Periodic monitoring of LFTs may be considered

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Leukotriene Modifiers

- 5-lipoxygenase (5-LO) inhibitor:
 - Zylflo CR® (zileuton)
- Mechanism of action: Prevents and reduces swelling inside the airways
- Hepatotoxicity
 - Monitor liver function tests
 - Baseline
 - Monthly for first 3 months followed by every 2 to 3 months for 1st year then periodically thereafter
- Multiple drug Interactions and very \$\$\$\$\$!!



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Leukotriene Modifiers - Role in Therapy

Clinical Recommendation	Evidence Rating
Leukotriene inhibitors are effective in the treatment of asthma but are less effective than an ICS	A
Leukotriene inhibitors added to an ICS are less effective than LABAs added to an ICS in the treatment of asthma	A
Leukotriene inhibitors are effective in the treatment of allergic rhinitis but are less effective than intranasal corticosteroids	A

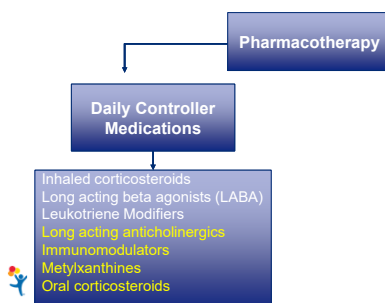


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Evidence level A = rich body of data

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Pharmacologic Management



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Long Acting Anticholinergic therapy

- Mechanism of Action: opens up the airways by blocking bronchoconstriction pathways

Brand Name	Generic	Strengths
Spiriva Respimat MDI	tiotropium	1.25 & 2.5 mcg/actuation
Spitica Handihaler DPI*	tiotropium	18 mcg/capsule

*Only indicated in COPD

- ADD-on maintenance therapy for patients on ICS or other controllers
 - FDA approved in asthma for ages > 6 years
 - Studies revealed improved lung function and asthma control
 - Once daily dosing!



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Immunomodulators

- Xolair® (omalizumab) - monoclonal antibody that blocks IGE and the body's subsequent allergic response to allergens
- Subcutaneous administration Q 2 to 4 weeks
 - ≥ 6 years of age
 - Dosing recommendations dependent on:
 - Baseline IgE and patients weight
- Only recommended for patients not able to achieve symptom control on standard therapies - very delayed onset of action



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Omalizumab Dosing

Pre-Treatment Serum IgE	Body Weight 30-60 kg	>60 – 70 kg	>70 – 90 kg	>90 – 150 kg
30 – 100 units/mL	150 mg q 4 wk	150 mg q 4 wk	150 mg q 4 wk	300 mg q 4 wk
>100 – 200 units/mL	300 mg q 4 wk	300 mg q 4 wk	300 mg q 4 wk	225 mg q 2 wk
>200 – 300 units/mL	300 mg q 4 wk	225 mg q 2 wk	225 mg q 2 wk	300 mg q 2 wk
>300 – 400 units/mL	225 mg q 2 wk	225 mg q 2 wk	300 mg q 2 wk	Do not use
>400 – 500 units/mL	300 mg q 2 wk	300 mg q 2 wk	375 mg q 2 wk	Do not use
>500 – 600 units/mL	300 mg q 2 wk	375 mg q 2 wk	Do not use	Do not use
>600 – 700 units/mL	375 mg q 2 wk	Do not use	Do not use	Do not use



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Immunomodulators – omalizumab

- Adverse Drug Effects:
 - Injection Site Reaction
 - Potential for delayed anaphylaxis
 - Black Box Warning
 - EpiPen is required
 - Patient should be monitored for 2 hours following the first three doses and 30 minutes for all subsequent doses
- \$\$\$\$. Historically given in the healthcare setting - shifting to at home administration for some patients



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Immunomodulators – Newer Agents

- IL-5 is the major cytokine responsible for the growth and differentiation, recruitment, activation, and survival of eosinophils
 - FDA approved for add on maintenance therapy in severe asthma with an eosinophilic phenotype
 - Nucala® (mepolizumab) IL-5 antagonist (approved in > 6 years)
 - Fesena® (benralizumab) IL-5 receptor antagonist (approved in > 12 years)
- Dupixent® (dupilumab) - IL-4 alpha receptor antagonist, blocks IL-4 and IL-13 pathways (approved > 6 years of age)
- Tezspire® (tezepelumab) - monoclonal antibody that binds to human thymic stromal lymphopoietin (TSLP), an epithelial cytokine involved in the inflammatory cascade (approved > 12 years)



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Summary of biologics approved for pediatric asthma					
Biologic	Mechanism of Action	FDA approval age for asthma	Indications	Dose, route and dosing interval	Predictors of Response
Omalizumab	Humanized, monoclonal anti-IgE binding free IgE	≥6 years old	Moderate-to-severe persistent asthma, symptoms inadequately controlled with ICS, perennial aeroallergen sensitization	Based on age, weight, and IgE levels; SQ	<ul style="list-style-type: none"> Elevated FcENO Elevated serum eosinophils BMI ≥ 25 Exacerbations on NHLBI Step 5 therapy
Mepolizumab	Humanized, monoclonal antibody binding to IL-5	≥12 years old	Severe persistent asthma, eosinophilic phenotype	100 mg SQ every 4 weeks	<ul style="list-style-type: none"> Elevated serum eosinophils Frequent exacerbations
Benralizumab	Humanized, monoclonal antibody against the IL-5 receptor leading to antibody-dependent cell-mediated cytotoxicity	≥12 years old	Severe persistent asthma, eosinophilic phenotype	30mg SQ every 4 weeks for the first three doses, then spaced to every 8 weeks thereafter	<ul style="list-style-type: none"> Elevated serum eosinophils Frequent exacerbations
Dupilumab	Fully humanized, monoclonal antibody against the IL-4 α receptor blocking both the IL-4 and IL-13 receptors	≥12 years old	Moderate-to-severe persistent asthma, eosinophilic phenotype, or with oral corticosteroid dependent asthma	Initial dose: 400mg or 600mg SQ. Maintenance dose: 200mg or 300mg SQ every 2 weeks	<ul style="list-style-type: none"> Elevated serum eosinophils Frequent exacerbations Elevated FcENO



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Methylxanthines (theophylline)

- Mechanism of Action: Opens the airways in the lungs by relaxing smooth muscle around the airways
- Narrow therapeutic index requiring serum drug level monitoring
 - 5 - 15 mcg/mL
 - Symptoms of toxicity:

• N/V/D	Tremor
• Nervousness	Tachycardia/arrhythmias
• Agitation	Seizure
• Insomnia	
- Multiple drug interactions and drug disease interactions
- Available in extended and sustained released capsules, tablets and an oral suspension



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Oral Corticosteroids

- Mechanism: Reduces inflammation inside the airways
- Adverse drug effects - MULTIPLE!!

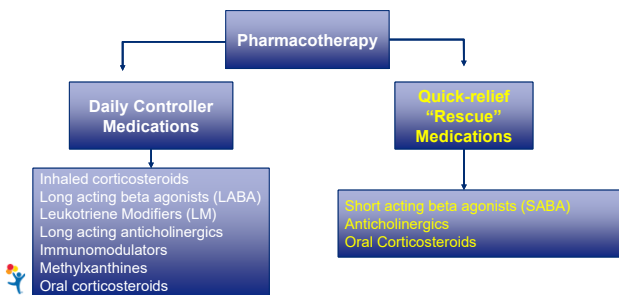
• Growth suppression	Adrenal suppression
• Osteoporosis	Increased appetite
• Cataracts	Weight gain
• Myopathy	Glucose intolerance
• Cushingoid habitus	** Behavioral changes
- Use the lowest effective dose!
 - Consider alternate day dosing w/ long term use
- Only recommended in severe persistent asthma not responding to other therapies



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Pharmacologic Management



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Short-acting beta₂-agonists (SABAs)

- Mechanism: Opens the airways in the lungs by relaxing smooth muscle around the airway lumen
- Dosed every 4 to 6 hours as needed, more frequently in status asthmaticus
- Available agents:
 - Albuterol MDI, nebulers, DPI
 - Proventil® HFA, Ventolin® HFA, ProAir® HFA - multiple generics!!
 - Xopenex® (levalbuterol) MDI and nebulers



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SABA Overuse

- Frequency of SABA use can be clinically useful as a barometer of disease control and severity
- Frequent use most likely indicates over reliance on these drugs and suggests inadequate asthma control
- Potential consequences:
 - Bronchial Hyperresponsiveness
 - Tolerance/tachyphylaxis
 - Reduced protection against bronchoconstriction stimuli
 - Increased allergen load
 - Masking of deteriorating asthma



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SABA Overuse

- Linear relationship exists between increasing SABA use and:
 - Decreased asthma control and increased symptoms
 - Increased oral corticosteroid use
 - Increased ED visits
 - Increased hospitalizations
- Crucial question to ask on every asthma visit - "How often are you using your albuterol?"



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Anticholinergics and oral corticosteroids

- Anticholinergics
 - Mechanism: Opens the airways in the lungs by blocking bronchoconstriction pathways
 - Atrovent® (ipratropium) - mainly utilized in acute settings, in combination with albuterol
 - Available as MDI and nebule
 - DO NOT replace SABAs for rescue therapy
- Oral corticosteroids
 - Prednisone 20 to 40 mg BID or 1 mg/kg/DOSE BID for 3 to 7 days
 - Dexamethasone 0.6 mg/kg QD (max 16 mg) for 2 days



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Complementary & Alternative Medicine (CAM)

- Evidence is insufficient to recommend for or against the use of most CAMs or treatments for asthma
- CAMs may include:
 - Chiropractic therapy
 - Homeopathy and herbal medicine
 - Breathing / relaxation techniques
- Acupuncture is not recommended for the treatment of asthma



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Complementary & Alternative Medicine (CAM)

- Patients who use herbal treatments for asthma should be cautioned about the potential for harmful ingredients and for potential interactions with recommended asthma medications
 - These products are not regulated by the FDA
 - They do NOT have to demonstrate safety or efficacy
 - There is no assurance that product contents are as labeled
- Possible herbal/supplements you may see in patients with asthma

• Beta-Carotene	Caffeine	Choline
• Fish Oil	Forskolin	Pycnogenol
• Thymus extract	Eucalyptus	Perilla
• Eicosapentaenoic acid	Picrorrhizaacid (EPA)	Kiwi
• Grapefruit	Indian frankincense	Soy
• New Zealand	Butterbur	Sweet Orange
• Green-Lipped	Tomato extract	AND MANY MORE....
• Mussel		



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- Advise patients that alternative healing methods are NOT substitutes for recommended therapeutic approaches

Additional Therapies/Comorbidities – Allergic Rhinitis

Intranasal corticosteroids

Brand	Generic	Brand	Generic
Flonase (OTC)	Fluticasone	Beconase AQ	beclomethasone
Rhinocort AQ	budesonide	Omnaris/Zetonna	ciclesonide
Nasarel	flunisolide	Nasonex	mometasone
Nasacort AQ (OTC)	triamcinolone		

Oral Antihistamines

Brand	Generic
Claritin (OTC)	loratadine
Clarinex	desloratadine
Zyrtec (OTC)	cetirizine
Xyzal	levocetirizine
Allegra (OTC)	fexofenadine



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Additional Therapies/Comorbidities – Gastroesophageal Reflux Disease (GERD)

Histamine type-2 receptor antagonists

Brand	Generic	Brand	Generic
Pepcid (OTC)	Famotidine	Tagament (OTC)	cimetidine
		Axid (OTC)	nizatidine

Proton Pump Inhibitors

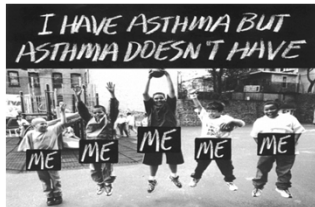
Brand	Generic	Brand	Generic
Prilosec (OTC)	omeprazole	Nexium (OTC)	esomeprazole
Protonix	pantoprazole	Prevacid (OTC)	lansoprazole
Aciphex	rabeprazole	Kapdiex/Dexilant	dexlansoprazole

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Therapy Pearls – CONTROL IS THE GOAL!!

Successful asthma treatment is dependent on the right dose of the medication, taken the right way (proper technique) - and taken consistently!!!



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Conclusion

- Drug therapy is an important component to the long term management of asthma
 - Should always be coupled with appropriate assessment and monitoring strategies, environmental control, and patient education
- Inhaled anti-inflammatory (ICSs) therapy is preferred over other available treatment options - many patients will require more than one medication to achieve control
- Variety of inhaler devices can be overwhelming to providers and patients
- Proper inhaler technique is essential for appropriate dosing and to achieve optimal control of asthma symptoms



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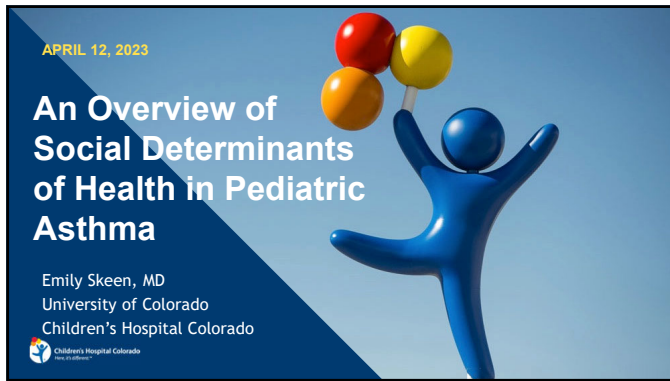
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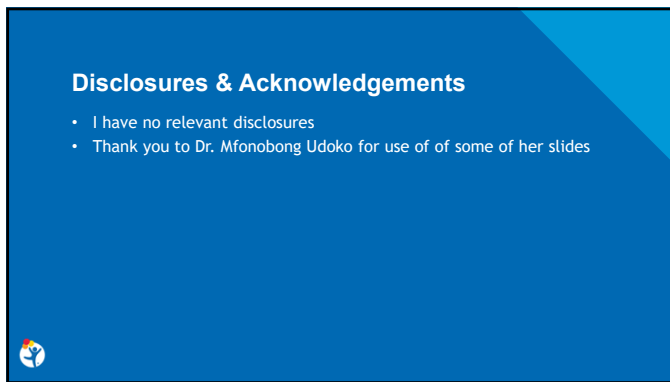
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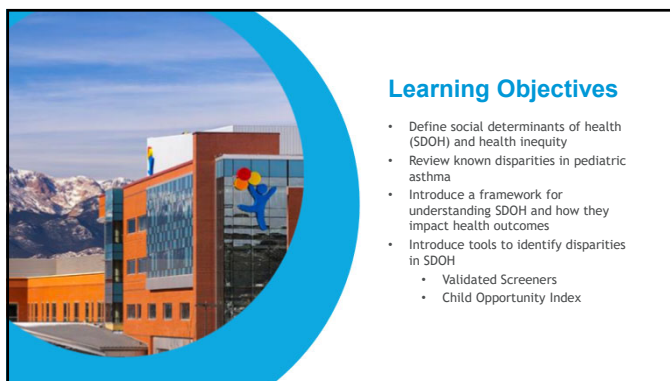
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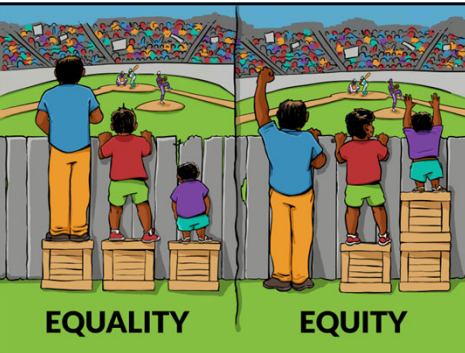
SDOH and Health Inequities

Social determinants of health (SDOH): the non-medical factors that influence health outcomes. They are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life.

Social inequities in health: the unfair and avoidable differences in health status across groups in society that result from the uneven distribution of social determinants



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EQUALITY

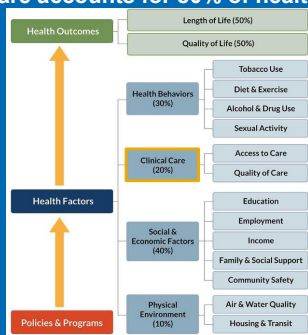
EQUITY

"Interaction Institute for Social Change | Artist: Angus Maguire."



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Non-clinical care accounts for 80% of health outcomes



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- Economic Stability (income, cost of living, socioeconomic status)
- Social and Community Context (Discrimination, social cohesion, family chaos)
- Education (literacy, early childhood education and development)

Social Determinants of Health

Education Access and Quality

Health Care Access and Quality

Neighborhood and Built Environment

Social and Community Context

Economic Stability

Social Determinants of Health
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Healthy People 2030

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Social Determinants of Health

Education Access and Quality

Health Care Access and Quality

Neighborhood and Built Environment

Social and Community Context

Economic Stability

Social Determinants of Health
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- Neighborhood and Built Environment (quality housing, safety, food/eating patterns, access to transportation)
- Health and healthcare (access to health care, primary care, health literacy, insurance coverage)

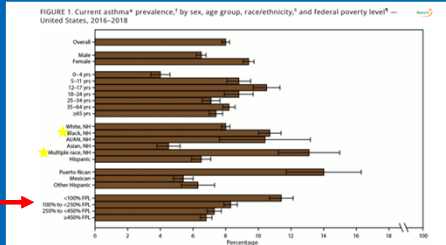
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Understanding Disparities in Asthma

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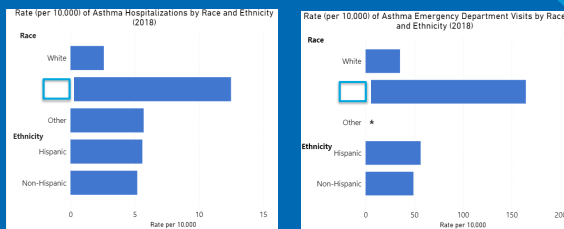
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Health disparities are evident in pediatric asthma – disparities in Asthma Prevalence



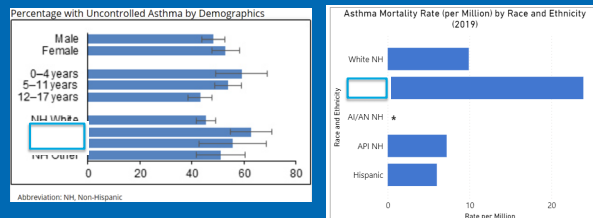
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Disparities exist in health care utilization

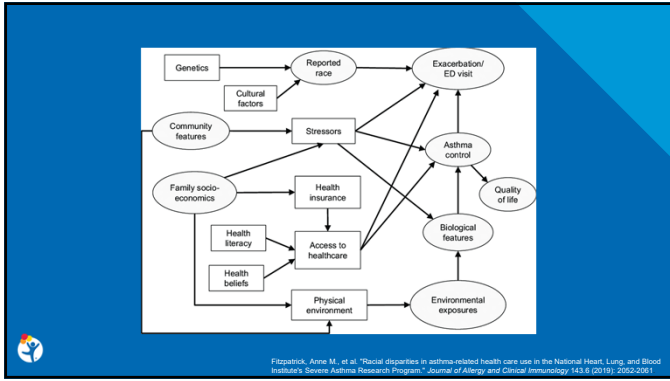


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Disparities exist in rates of uncontrolled asthma and asthma mortality



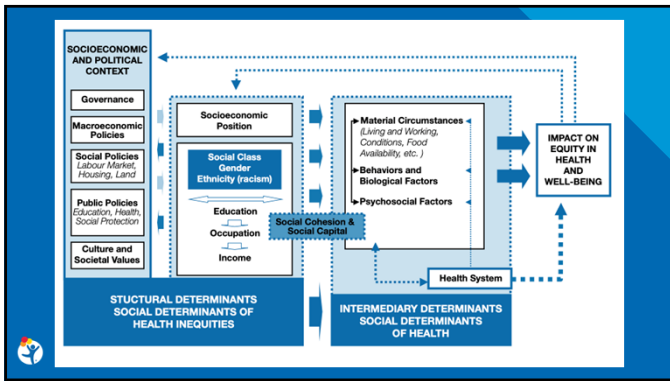
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Structural SDOH that influence asthma

- **Socioeconomic-Political Context:** include culture, public policies, and more
 - **Housing** -> Children living in the highest quartile of housing code violations had 1.84 times more asthma-related hospitalizations compared with children in the lowest quartile
 - **Tobacco exposure** -> Smoke free public housing in 15 states including Colorado showed improvement in respiratory symptoms. Other studies with decrease in asthma exacerbations and ED visits.
- **Interventions:**
 - Housing remediation (pest control, mold, etc), Home visit asthma programs
 - "Green Housing" policies, (ie weatherization, ventilation, smoke free housing, etc)



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Structural SDOH that influence asthma

- **Socioeconomic position:** Income, Education and Occupation are the most frequently evaluated measures. Influences exposures -> gene expression (ie increased Type 2 inflammation)
- **Race/Ethnicity:** Racism/Discrimination, Mistrust with the healthcare system, psychosocial stressors
- **Social Cohesion/Social Capital:**
 - Social cohesion: sense of community and solidarity between individuals
 - Social capital: control over one's circumstances
- **Interventions:**
 - Individualized education, Provider education, Facilitation of increased social cohesion/capital via community health workers



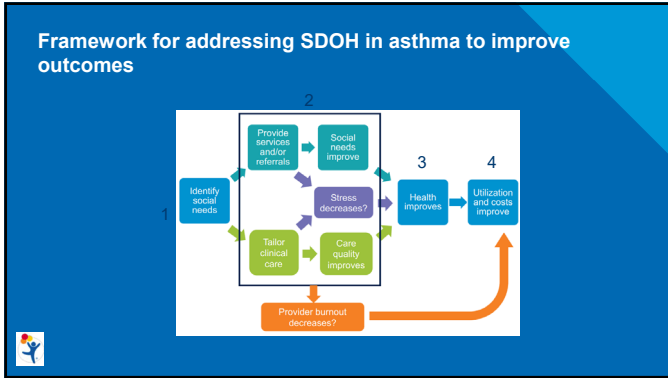
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Intermediary SDOH that influence asthma

- **Housing Conditions/Neighborhood**
 - Indoor pollution, Mold, Allergen exposures
 - Neighborhood: Outdoor pollution, Greenspace
- **Food Insecurity and Nutrition**
 - Ex: Households receiving Supplemental Nutrition Assistance Program (SNAP) benefits have shown reduction in ED visits for asthma compared to similar low-income households
- **Psychosocial Stress: Adverse Childhood Events, Community Violence**
 - Ex: Mindfulness based stress reduction, family and community based multi-system approaches



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Screening for SDOH using Validated Tools

- There are numerous validated pediatric screeners for SDOH such as:
 - Ex. Boston Medical Thrive Screening (RIGHT)
- Typical settings: PCP office, ED
- Screening Methods: Paper and Pencil, Computer or tablet, face-to-face interview, phone interview
- Informant: Parent or Caregiver; +/- Social Worker or Physician
- Average time to complete screener: 4-5 minutes

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An example of a SDOH Screener being utilized at CHCO:

1. Do you have any concerns or problems that make it hard for you to keep your child's health appointments or manage your child's health care? Please circle all that apply: job, transportation, childcare, insurance, money, relationship difficulties, work or school stress, chronic illness, or legal problems	YES	NO
2. Do you ever worry about not being able to fill your child's prescriptions or buy their medicine?	YES	NO
3. In the last 3 months, did you ever worry that your food would run out before you had money to buy more?	YES	NO
4. Are you worried about your benefits right now? For example, have your benefits been denied, reduced, or eliminated or do you need help renewing your benefits? Please circle all that apply: Medicaid/CHIP, Food Stamps (SNAP), Temporary Assistance for Needy Families (TANF), WIC, Child Care Assistance Program (CCAP), Unemployment Insurance, Social Security Disability (SSI/SSDI), Other:	YES	NO
5. Do have concerns about your housing or becoming homeless?	YES	NO

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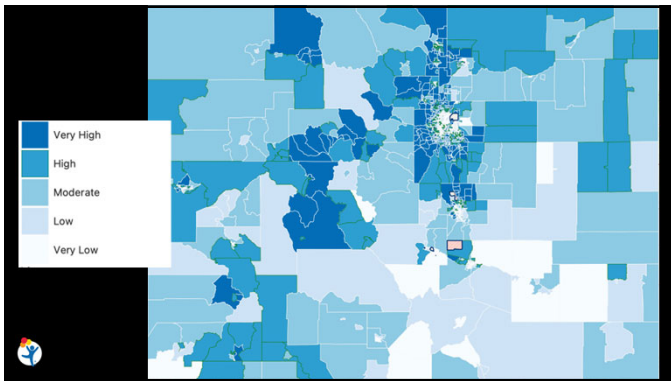
Interventions following SDOH Screening

1. Physicians utilizing motivational interviewing to engage caregivers
2. Referral to resources - health care navigators, social workers, written handouts
3. Tailoring clinical care based on identified needs
4. Policy changes to address identified structural SDOH

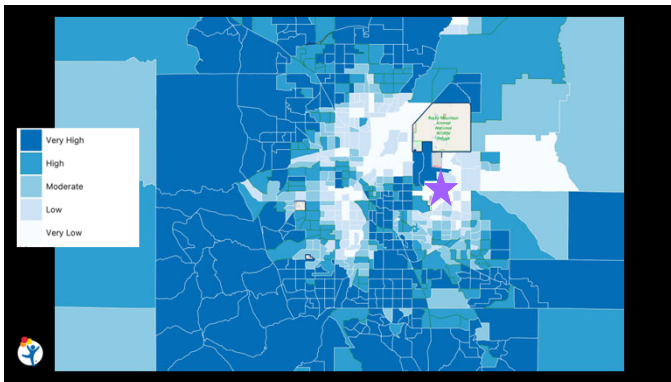
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Screening for SDOH at the Community Level

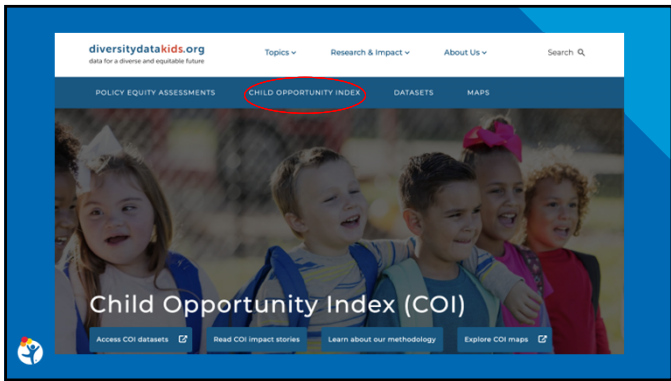
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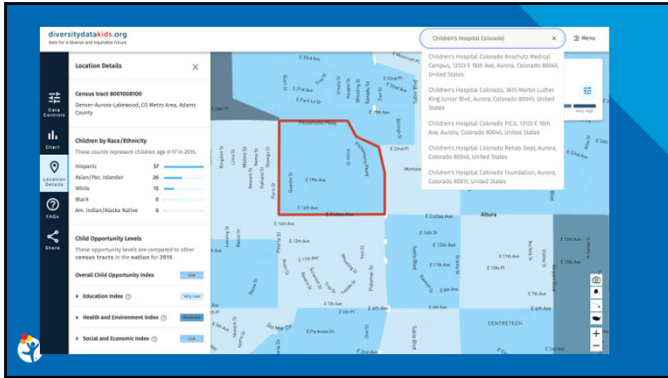
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Take-Home Points

- Health disparities and inequities are largely driven by complex and integrated social, economic, and environmental factors
- To address SDOH and health inequities in asthma:
 1. Identify underlying factors via validated screening relevant to the populations and communities of our patients
 2. Tailor clinical care and provide services with a focus on community engagement
 3. Understand the neighborhoods our patients live in and advocate for policies that target areas most in need.

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Questions?

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Asthma Medication Adherence: why does it matter and what can we do?

Heather De Keyser MD MS
Reach the Peak Conference
April 12, 2023

1

What is adherence?

*“the extent to which a person’s behavior
– taking medication, following a diet,
and/or executing lifestyle changes,
corresponds with agreed
recommendations from a health care
provider”*

Adherence To Long Term Therapies, Evidence For Action (2003) World Health Organization

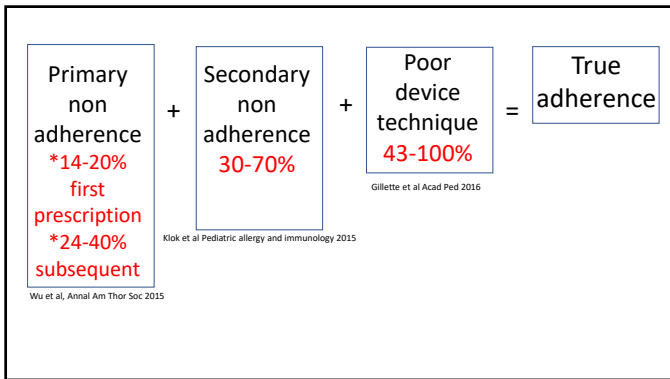
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Costs of non-adherence

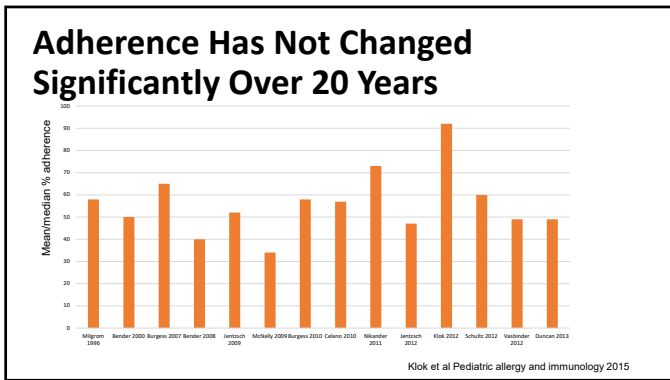
- 9/10 studies in one systematic review showed a relationship between non-adherence and increased healthcare related costs
- 43,156 children with Medicaid and asthma (14 states)
 - Average % with high adherence to inhaled steroids-33.35%
 - Increase to 40%→~\$8 million per year costs savings
 - Increase to 80%→~\$57 million per year cost savings

McGrady and Hommel, Medication Adherence and Health
Care Utilization in Pediatric Chronic Illness Pediatrics 2013

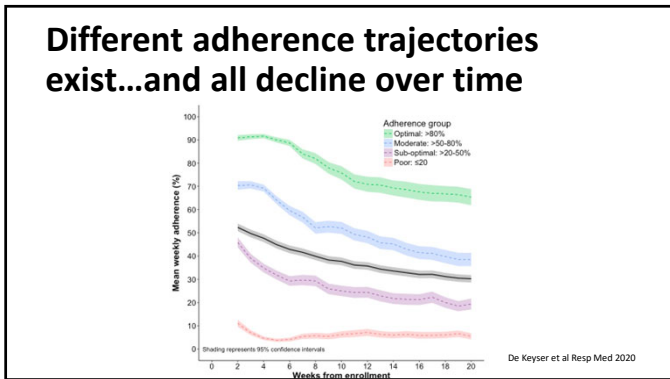
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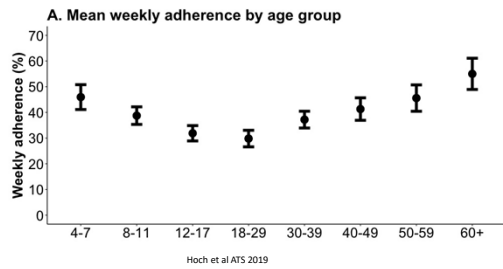


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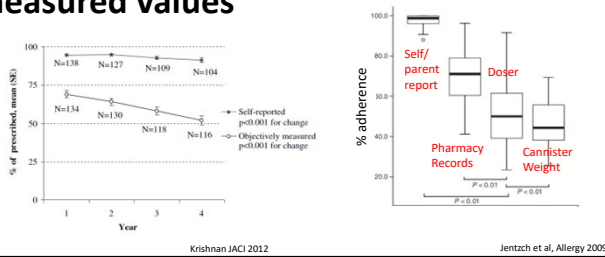
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Adherence is worst in teens and young adults



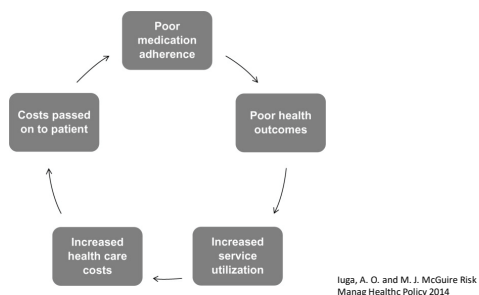
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Self reported adherence overestimates objectively measured values



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Vicious Cycle Of Non-adherence



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Asthma Exacerbations Are Associated With Non-adherence

- Exacerbation risk is 21-68% lower in adherent children

• Englekes et al ERJ 2015

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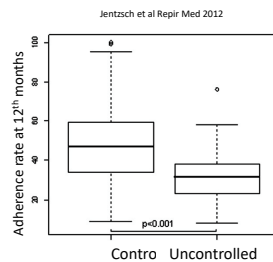
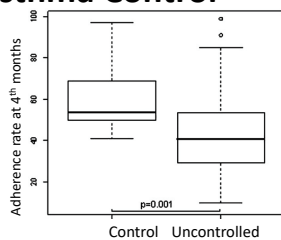
Asthma Exacerbations Are Associated With Non-adherence

- >75% adherence → threshold for significant reduction in exacerbations
- For every 25% increase in ICS adherence, 11% decreased risk of exacerbation
- Estimated 24% of asthma exacerbations were attributable to ICS non-adherence

Williams et al JACI 2010

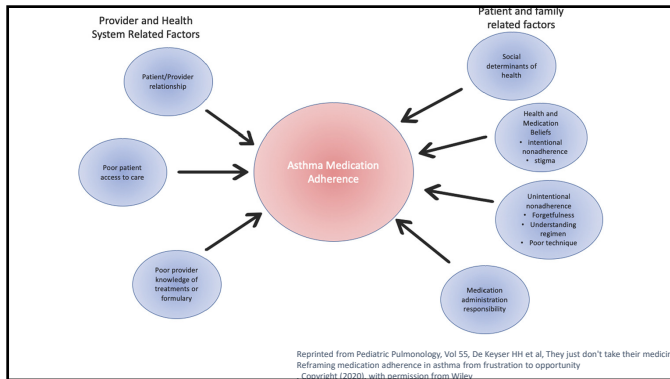
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Improving Medication Adherence Can Improve Asthma Control

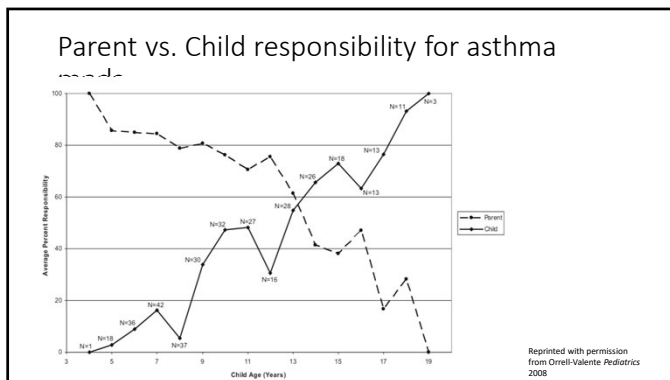


Jentzsch et al Respir Med 2012

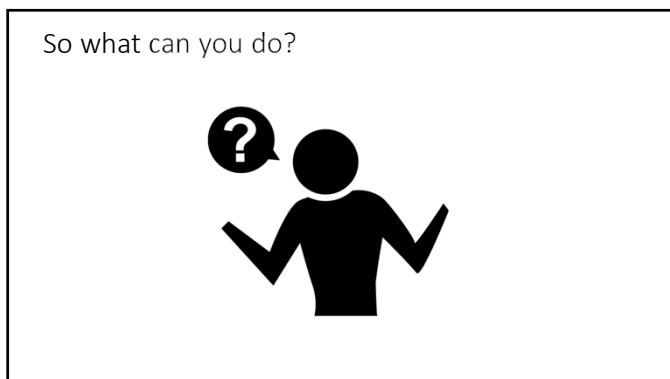
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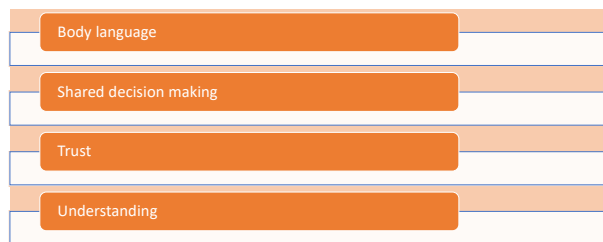
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Step 1: Ask about adherence

- Ask all patients on chronic medications about adherence
- Verify with objective data (particularly if disease is not well controlled)
 - Pharmacy fill data
 - Monitor treatment levels
 - Use technology

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It starts with a good relationship



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TABLE 1 How to talk to patients and families about treatment adherence





Strategy	Examples
Use simple language	"I would like to talk about what it's like for you to take your medication the way your doctor has prescribed." "One thing I do is to help patients follow the treatment plans that their medical team creates for them."
Normalize adherence challenges	"Most of us miss doses at times. What has been your experience?" "A lot of teens tell me they have a hard time remembering their inhalers. What things get in the way or make it hard for you?"
Be specific	"Please tell me the last time you took this medication." "How many doses do you think you missed this week?"
Ask about the treatment's effect on quality of life	"Tell me how you feel about taking these pills." "How do you feel about having to give up foods with gluten?"
Ask about side effects	"What kind of side effects have you experienced?"
Identify the problem	"What medications do you find the most difficult to take?" "When do you struggle most to take your medications?"
Use data to facilitate an open conversation about adherence	"It looks like the last time you requested a three-month refill for your child's medicine was six months ago. This information often shows me that families might be having some difficulty making sure their child is taking their medication when they're supposed to. This is a really common issue that we see with families in the hospital. I would like to talk more about this with you to see how we can best support you to manage your child's health."
Discuss medication and health beliefs	"Do you think these medicines are going to help you?" "Why do you think your [asthma] is going well/poorly?"

Note: Table adapted from Medication Adherence Promotion Resources ©CCHMC (<https://www.cincinnatichildrens.org/research/divisions/c/adherence/map>)

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Concrete strategies for improving medication adherence

PLACE BASED CUES

TIME BASED CUES


HABIT STACKING

TECHNOLOGY


Stawarz et al Digital Health 2016

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Place based cues



Purse or backpack




Bathroom near the sink




On the dinner table

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Time based cues



Right before leaving for school



Right before going to bed



At breakfast/dinner time

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Habit stacking-link with other activities you do regularly



Waking up



Brushing teeth



Eating a meal

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Technology



TIMERS AND
REMINDERS



SMARTPHONE APPS



ELECTRONIC
MEDICATION MONITORS

23

Reach the Peak Asthma and Allergy Course

-Small Group Case Scenario Discussion Guide-

What is expected of conference participants in preparation for the small group session:

1. You have been preassigned to a virtual or in-person small group.
2. Day 1:
 - a. Attend the 30-minute meet and greet small group session. During this time you will get to know other members of your small group; be able to ask your small group leader any questions about the first day's presentations; and your small group leader will briefly walk through virtual workbook.
 - b. Each participant is encouraged to work independently through all the case scenarios within the virtual workbook. (link is below)
 - c. Links to the tools to use when reviewing the cases are in the virtual notebook and will also be highlighted in an instructional email sent to attendees and small group leaders.
 - d. Pick one or two cases to discuss during day 2's small group session

[2023 Reach the Peak Virtual Workbook | Review 360 \(articulate.com\)](#)

3. Day 2: small groups will meet in virtual rooms or in-person. During this 1.5 hours your small group leader (facilitator) will go over the different inhaled delivery device; review some of the case studies; and answer any questions you may have that may have come up from the presenters' topics.

5. Below is suggested content to use when reviewing the cases and to help prompt discussions during the small group session.

THE ASTHMA CONDITION—the questions below will help attendees apply RTP conference content:

1. How would you classify your patient's **Severity Rating**? Why?
Severity – Severity: the intrinsic intensity of the disease process.
Symptom frequency, nighttime awakenings, SABA use (outside of prevention of EIB,) interference with normal activity, lung function (spirometry)
2. How would you classify your patient's **Control Rating**? Why?

Control – the degree to which the manifestations of asthma (symptoms, functional impairments, and risks of untoward events) are minimized, and the goals of therapy are met.

Symptom frequency, nighttime awakenings, SABA use (outside of prevention of EIB), spirometry or peak flow, validated questionnaire results (ACT), frequency of exacerbations

Factors Contributing to Acute and Chronic Asthma

1. What are the factors (triggers) contributing to your patient's acute and chronic asthma? Classify each trigger as an allergen or an irritant.
2. Are there any other co-morbidities making your patient's asthma more difficult to control or that mimic asthma?
3. What further testing may be warranted for your patient, and why?

PATIENT AND FAMILY ASSESSMENT

DISCUSSION: What do you want to know about your patient's medical history?

Family history, history of asthma symptoms, diagnosis date, frequency of exacerbations, severity of exacerbations, co-morbidities, medications (including prescribed and over the counter/herbal), activity level, number of prednisone bursts in the last year, number of ED visits and hospitalizations in the last year, ICU, known allergies and triggers, tobacco use and exposure

1. Does your patient have any high-risk asthma signs and symptoms?
(High risk includes 1 admission in the past year, 2 or more ED visits in the past year, ICU or intubation ever)
2. Is there a pattern to your patient's current symptoms?

Physical exam

DISCUSSION: What are the key components to assess in a patient's physical exam?

Spirometry, respiratory rate, breath sounds (crackles, wheezing, cough), signs of physical distress, nasal secretions, nasal mucosal swelling, nasal polyps, mouth breathing, nasal voice, allergic "shiners", allergic "salute", eczema/atopic dermatitis, obesity, retractions, nasal flaring

1. What are the pertinent findings of your patient's physical exam?

2. Is your patient at their baseline or are they having an exacerbation? Why?

Objective measures

DISCUSSION: What do the following spirometry values measure?

- FEV1 = forced expiratory volume in first second
- FVC = forced vital capacity
- FEV1/FVC = ratio of forced expiratory volume in first second to forced vital capacity

1. If available, list your patient's spirometric values (absolute values and percent predicted)

FEV1 Pre:	FEV1 post:	FEV1 %change:
FVC Pre:	FVC Post	FVC %change:
FEV1/FVC Pre:	FEV1/FVC Post	FEV1/FVC %change:

Is your patient's spirometry normal?

What does their flow volume loop show?

How would you interpret this measure of pulmonary function?

DISCUSSION: What might be some barriers to obtaining accurate spirometry for your patient? How would you address them?

Age, cognitive ability, physical impairment, anatomic abnormality, anxiety, coughing, dyspnea

ASTHMA MANAGEMENT

Medications and delivery devices

- What medication(s) is your patient taking?
- List the common side effects, interactions and contraindications for each medication.
- List 1-2 alternative medications for each class of your patient's current medications

Medication	Class	Device type	Dose	Frequency	Duration

- Based on EPR-3 guidelines, does your patient need to Step Up, Step Down, or remain on the current regimen? Why?
- What, if any co-morbid conditions does your patient have that could require other types of medications?

Condition	Type of Medication

Identifying the conditions that impact asthma control and the type of medication that can treat these conditions with would suffice. Consider GERD, obesity, pregnancy, cardiac disease, eczema, and allergic rhinitis as co-morbid conditions.

- Is your patient taking any other medications or supplements? (List any that apply) If so, also list any possible contraindications or precautions for patients with asthma. Are there any interactions with the current medications OR other asthma medications?

Behavioral and Environmental Modifications

- Complete the Asthma Control Test (ACT) for your patient. What does this score indicate?

Use ACT in the Management Section of the notebook

- Assess your patient for the following:
 - Adherence barriers regarding self-assessment and self-management.
 - Based on your patient’s description, assess your patient’s readiness to learn.
 - What coping strategies are used by your patient and/or his or her family?
- Based upon your patient’s multi-dimensional assessment, describe strategies for the following:

- a. Identifying potential barriers and adherence issues
- b. Optimizing coping strategies and routines
- c. Improving social support from families and significant others
- d. Identifying solutions to barriers

DISCUSSION: Describe strategies for addressing potential barriers to successful asthma management.

1. Recommend using a dose-scheduling chart or other visual cues (i.e. calendar, sticker chart, Outlook reminders, watch alarm, cell phone alarm) if the patient forgets to take their medication
 2. Recommend an activity cue such as timing medication with tooth brushing in the AM and PM
 3. Recommend using a symptom and peak flow record if the patient is a poor-perceiver of asthma symptoms and at least 8 years of age.
 4. Only prescribe 1 SABA refill at a time for patients that may be over-using or abusing SABA, so you can track how often the pharmacies are calling you for refills.
4. What is the single most important non-pharmacologic change you could promote for your patient to improve their management?

Reduce or eliminate triggers

Education and self-management

DISCUSSION: Assume that one member of the group is your patient or parent and one of you is the Asthma Educator. Role-play an asthma education session for the following. The rest of the group can add feedback or trade off in roles as indicated.

1. Assess your patient's and his or her parent/family's knowledge regarding asthma and treatment:

Ask:

1. What is asthma?
2. What are the signs and symptoms of asthma?
3. What are triggers?

4. What medications are you taking, and why?
 5. How do you take your medications?
 6. Is it difficult for you to take your medicine regularly and if so, what are the reasons?
 7. Do you measure peak flows and if so, what is your personal best?
 8. Do you have a current Asthma Action Plan?
2. If appropriate, determine peak flow zones based upon your patient's personal best (or use symptoms to define the zones).
1. Green zone:
 2. Yellow zone:
 3. Red zone:
3. Develop a personal Asthma Action Plan for your patient

Great patient education resources

Diskus

https://chcopatiented.blob.core.windows.net/documents/ASTHM_Diskus_Eng.pdf

<https://youtu.be/mfiShjE9P-Q>

Ellipta

https://chcopatiented.blob.core.windows.net/documents/ASTHM_ElliptaInhaler_Eng.pdf

Exercise and Asthma

https://chcopatiented.blob.core.windows.net/documents/ASTHM_ExerciseAndAsthma_Eng.pdf

Flexhaler

https://chcopatiented.blob.core.windows.net/documents/ASTHM_Flexhaler_Eng.pdf

Peak Flow Meter

https://chcopatiented.blob.core.windows.net/documents/ASTHM_HowToUseAPeakFlowMeter_Eng.pdf

<https://youtu.be/055fSYXgNKU>

MDI

https://chcopatiented.blob.core.windows.net/documents/ASTHM_MeteredDoseInhalerwithSpacerValveHoldingChamberandMouthpiece%20_Eng.pdf

<https://youtu.be/0bU6fCN44FA?t=1>

Neb

https://chcopatiented.blob.core.windows.net/documents/ASTHM_HomeAcornNebulizer_Eng.pdf

<https://youtu.be/fz2WCNbBDBM>

RediHaler

https://chcopatiented.blob.core.windows.net/documents/ASTHM_Redihaler_Eng.pdf

RespiClick

https://chcopatiented.blob.core.windows.net/documents/ASTHM_RespiClickInhaler_Eng.pdf

Respimat

https://chcopatiented.blob.core.windows.net/documents/ASTHM_RespimatInhaler_Eng.pdf

SMART

https://chcopatiented.blob.core.windows.net/documents/ASTHM_SingleMaintenanceandRelieverTherapySMART_Eng.pdf

Twisthaler

https://chcopatiented.blob.core.windows.net/documents/ASTHM_Twisthaler_Eng.pdf

https://youtu.be/F3u_A0b_O6s

15TH ANNUAL

Reach the Peak Asthma and Allergy Overview and Update

Presentations - Day 2

- ✓ Key Messages in Asthma Education and the Asthma Action Plan
- ✓ Program Development, Implementation and Outcomes
- ✓ Panel Discussion—Asthma Management in Our Communities

APRIL 13, 2023

Key Messages in Asthma Education and the Asthma Action Plan

Kate Michalek PA-C, MS, AE-C
 Senior Instructor Department of Pediatrics/ Breathing Institute
 Medical Director Just Keep Breathing asthma home visit program



1

Tell me and I forget. Teach
 me and I remember. Involve
 me and I learn.
 Benjamin Franklin



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Financial disclosures

No relevant financial relationships
 with any commercial interests.



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Objectives

1. Review important patient education topics to encourage self management : asthma basics, medications, patient skills
2. Learn how to create an Asthma Action Plan
3. Learn effective patient education skills

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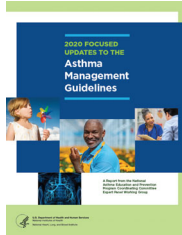
Guidelines for the Diagnosis and Management of Asthma

National Asthma Education and Prevention Program
Expert Panel Report 3
2007

Reference:

<https://www.nhlbi.nih.gov/health-topics/guidelines-for-diagnosis-management-of-asthma>

<https://www.nhlbi.nih.gov/resources/2020-focused-updates-asthma-management-guidelines>



5

Four Components of Asthma Care

- Assessing and Monitoring Asthma Severity and Asthma Control
- Education for a Partnership
- Control of Environmental Factors and Comorbid Conditions That Affect Asthma
- Medications

6

Education for a Partnership

- Required for effective asthma management
- Healthcare Team
 - Asthma Educators
 - Providers: MDs, APPs
 - RNs
 - MAs
 - Front desk, Schedulers
 - Social Worker, Registered Dietitian
 - Pharmacists
 - Respiratory Therapists
- Patient
- Caregivers, family



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Education for a Partnership

- Diagnosis through follow up
- Education Standardization: repetition and reinforcement of consistent message
- Occurs at all points of care
 - Clinic setting
 - Pharmacy
 - ED
 - Inpatient units/ICU
 - Schools
 - Community
 - Client's home



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Video #1 Introduction



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What elements of building a **PARTNERSHIP** did you observe?

Add in the chat

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Developing a Partnership

- Establish open communication that considers language, literacy needs, cultural factors, age
- Ask open ended questions, What else?
- **Don't interrupt**
- Identify and address patient and family concerns
- Identify and eliminate barriers to care
- Develop treatment goals and medications together
- Encourage participation with self-monitoring and self-management

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Self-Management improves patient outcomes

- Reduces urgent care visits
- Reduces hospitalizations
- Reduces limitations on activities
- Improves health status and QOL
- Improves perceived control of asthma
- Cost-effective

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Key Educational Strategies

- Individualized
- Repetitive, consistent message
- Variety of educational tools
 - Models, posters, video, computer/tablets, apps, games, written handouts (at 5th grade level)
 - Limit content to 2-3 key concepts
 - Chunk and Check
 - Repeat demonstration
 - Teach Back
 - Role play
 - Motivational interviewing



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Key Messages for Asthma Education

- Basic Facts About Asthma
- Medications
- Patient Skills
- Asthma Action Plan



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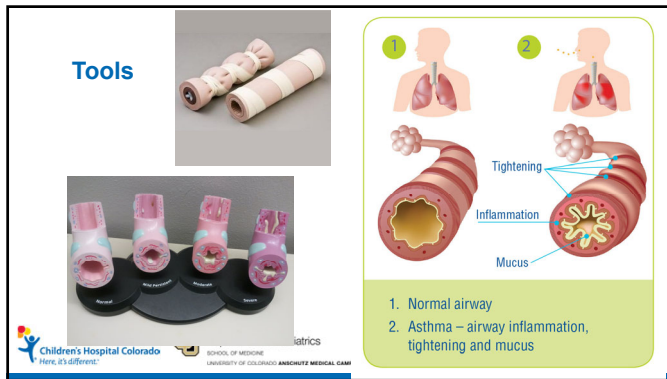
Asthma Basics

- What do you know about asthma? Do you want to know more?
- Asthma is a long-lasting disease that affects the airways in the lungs. They become swollen and narrow and breathing becomes difficult.
- It causes recurrent triggered symptoms (cough, wheeze, chest tightness, shortness of breath) that improve with asthma medicines.
- Asthma can be controlled

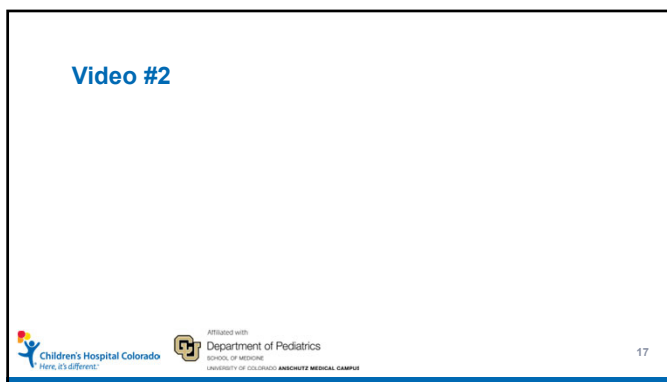


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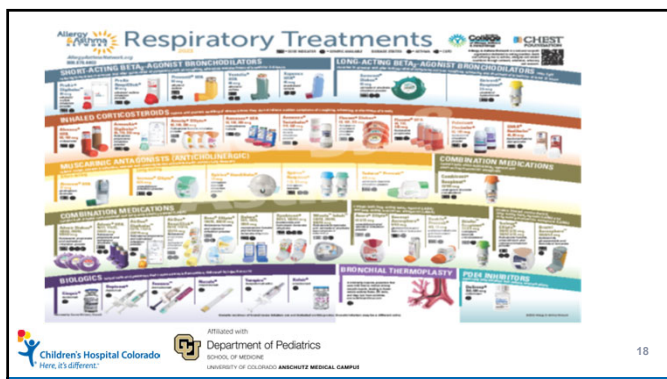
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Video 3.1 Quick Relief




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Quick Relief Medicines

- “Quick relief”, reliever, fast acting, rescue
- **DO NOT** provide long term control, not preventative
- Know name (colors vary)
- Quickly relaxes tight muscles squeezing the airway. Airflow improves. Symptoms improve.
- Don't leave home without it
- Needing >2 days a week indicates poor control




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Video 3.2 Controller and Adherence




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Controller Medicines

- “Controller”, preventor, maintenance
- **DOES NOT** provide quick relief
- Know name (colors for same med vary)
- Must be taken **daily** to work (regardless of how they feel)
- Long term use
- Get refill when device is almost empty, watch counter
- Prevent symptoms by reducing swelling inside the airway
- Work better over time
- Side effects, Oral hygiene



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Patient Skills

Proper
device
technique

Identifying
and avoiding
triggers

Follow
Asthma
Action Plan



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Video #4 Spacer Technique



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BIG TAKE HOME MESSAGE

- Poor medication technique can lead to poor asthma control
- At every visit have the patient demonstrate medication use. Reinforce proper technique
- Have patient bring meds, spacer, peak flow to every visit.
- **SHOW ME YOUR TECHNIQUE**

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Metered Dosed Inhalers are best used with Spacers

Albuterol
Xopenex
Flovent
Asmanex
Alvesco
Advair
Dulera
Symbicort



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Dry Powder Devices don't use spacers

- Diskus (Flovent fluticasone, Advair fluticasone/salmeterol)
- Flexhaler (Pulmicort budesonide)
- Twisthaler (Asmanex mometasone)
- Ellipta (Arnuity fluticasone furoate, Breo fluticasone/vilanterol)
- RespiClick (Pro Air albuterol, Armon Air fluticasone, Air Duo fluticasone/salmeterol)
- Wixela inhaler (fluticasone/salmeterol)
- ***Qvar Redihaler (beclomethasone HFA) not a dry powder but No spacer needed

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Tracking Doses

Counters on inhalers

- Pulmicort and Symbicort count by 20s, 10s

Most albuterol HFA have 200 doses

Most ICS or combo ICS/LABA have 120 doses

*Alvesco (ciclesonide) only have 60, may need disp#2 for 30d supply

Expiration date is on the canister



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Reach The Peak Resources

In your notebook:

Device and medication handouts

Device video links to CHCO YouTube channel

Website for videos: <https://www.childrenscolorado.org/doctors-and-departments/departments/breathing-institute/programs/asthma/>



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Trigger Avoidance

Identify known and potential triggers

Identify environments with triggers

Give tips for avoidance or decreased exposure

- Smoking cessation
- Frequent hand washing
- Flu vaccine
- Keep pets out of bedroom
- Keep windows closed
- Pretreat before exposure

Prepare for unavoidable exposures

RTP Resource handout: Asthma Triggers



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Peak Flow

- Technique
 - 3 blows, take the highest (not average)
- Personal best
 - Same time, at least 2x a day, for 2-3 weeks when asthma well controlled
- Zones on Action Plan (traffic light zones)
 - Green >80% personal best
 - Yellow 50-80%
 - Red <50%
- Special situations: After exercise, during flares
- Poor Perceivers, Recognize early signs of worsening asthma



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Peak Flow Video

<https://www.childrenscolorado.org/doctors-and-departments/departments/breathing-institute/programs/asthma/peak-flow-meter/>



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Asthma Action Plan

- Written plan, zones defined by symptoms and peak flows (if using)
- Patient goal, triggers, allergies
- Exercise pretreatment
- Daily controller and quick relief medications
- When to seek care for worsening asthma
- Includes clinic phone number
- Need to have copy for all caregivers at all residences, school and daycare



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In Care of Kids

ASTHMA ACTION PLAN

My name: _____
 My address: _____
 My phone number: _____
 My email address: _____

Green zone

Doing well

Yellow zone

Caution


Red zone

Medical alert!

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Zones of Asthma Action Plan



Green zone

Yellow zone

Red zone

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Video #5 AAP green zone

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Green Zone “I feel good”



- No cough, wheeze, chest tightness or shortness of breath during day or night
- Active and sleeping well
- Peak flows at least 80% of personal best
- Controller medications listed
- Pretreatment for exercise
- Trigger identification, avoidance

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Video # 6.1 AAP Yellow and Red zones

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Yellow Zone “I don't feel good”



- Some coughing, wheezing, chest tightness, or shortness of breath, or night-time symptoms
- Peak flows 50-80% of personal best
- Give quick relief medication as directed
- Continue daily controller medications
- Monitor closely, if in yellow zone for 24 hours or breathing symptoms worsen contact health care provider
- Home prednisone if recommended

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Red Zone "I feel Bad"

- Go to ER or Call 911
- Quick relief medicine not effective or not available
- Difficulty talking, walking, or drinking
- Skin areas of neck, throat, or chest suck in (retractions)
- May have bluish lips/fingernails or appear pale
- Nasal flaring
- Obvious distress (gasping for air, fearful, etc.)
- Altered level of consciousness/confusion

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Using a Written Asthma Action Plan

- Individualize the plan specific for the patient
- Update and review at every visit
- Role Play and Teach Back to assess comprehension
- Check adherence to plan
- Assess barriers, patient and families social support, involve social work if needed

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Video 6.2 AAP wrap up

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Asthma Control

- Teach the Rules of Two®
 - Do you have **asthma symptoms** or **take your quick-relief inhaler more than two** times a week?
 - Wake up at night with asthma symptoms **more than two** times a month?
 - Refill your quick-relief inhaler **more than two** times a year?
- More than 2 oral steroid bursts in the past year?
- Any asthma symptoms limiting activity, sleep, work or school?
- Use a standardized control test



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The Rules of Two® is a registered trademark of
Baylor Health Care System.

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Conclusion

- Education is a partnership
- Involves all members of the health care team, patient and family
- Repeat and reinforce consistent message
- Emphasis self-management
- Review key messages at every opportunity
 - Demonstrate proper device technique
- Assess comprehension of asthma action plan



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Questions?



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Asthma Program Development, Implementation and Outcomes

Joyce A. Baker MBA, RRT, RRT-NPS, AE-C, FAARC

1

Conflict of Interest

None

2

Objectives

1. Define what is disease management
2. Describe the benefits and key aspects of an asthma program
3. Review processes for implementing an asthma program within various clinical locations
4. Outcomes from an asthma program

3

What is disease management?

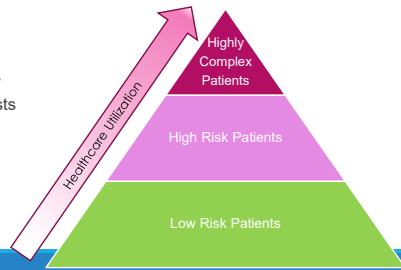
A system of **coordinated and structured interventions** and communication for populations with conditions in which the patient self-care efforts are significant.

Care Continuum Alliance. [Care Continuum Alliance \(CCA\) definition of disease management.](#)

4

Benefits of an asthma program?

Improves quality of life
Improves health outcomes
Decreases health care costs



5

Who can be a champion?

- Clinic nurse
- School nurse
- Respiratory therapist
- Case manager
- Care coordinator
- Health coach
- Community health educator
- Nurse practitioner, physician's assistant, doctor

6

Program leadership


- ▶ Program champion
- ▶ Provider



7

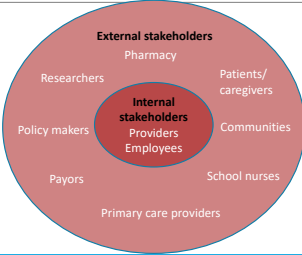
Plan – Do – Study - Act (PDSA)

<ol style="list-style-type: none"> 1. Implement changes 2. Repeat as needed 	<p>Act</p>	<ol style="list-style-type: none"> 1. Assemble the team 2. Population 3. Objectives 4. Current process 5. Identify and collect baseline data
<ol style="list-style-type: none"> 1. Analyze the data 2. Compare before and after 3. Get feedback 4. Summarize 	<p>Study</p>	<ol style="list-style-type: none"> 1. Create new processes 2. Implement new processes 3. Document observations 4. Record data



8

Plan - Identify Stakeholders



9

Plan - Define the Patient Population

1. Disease
2. Pediatrics/adult
3. Language
4. Cultural barriers
5. Reimbursement initiatives
6. Healthcare utilizers



10

Plan - Identify your Objective(s)

- Narrow in scope
- Specific steps
- Associated with a schedule and time
- The means to the end result
- Easy to measure
- Short term or medium term



11

Plan - Literature Review

- Search for studies specific to your program objectives
- Evaluate the sources
- Summarize your findings



12

Plan- Data Collection

- Identify your data sources
- Determine how to compile and store the data
- Always validate your data
- Data analysis



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Plan - Data Collection

Week of	Classroom	Individual Sessions	Conflict	Anger	Family	School	Self-Report	Academics	Other
8/15/17	8	1							
8/22/17	8	16	2		4	2	5	2	
8/29/17	7	20	4		4	3	4	5	
9/5/17	5	20			10	1	8	3	
9/12/17	8	21	5		5	1	7	2	1
9/19/17	4	26	4		2	2	9	5	3
9/26/17	2	21	7		3	2	10	6	
10/3/17	3	22	4		5	10	2	1	
10/10/17	6	20	5		4	1	10	1	2
10/17/17	8	25	6	1			12	1	1
10/24/17	3	17	5	1	6		4	1	
10/31/17	2	20	9		5		7		
11/7/17	2	11	2	1	1		3	2	1
11/14/17	6	10	2		4		6		
11/21/17	5	10	2		4		4		
11/28/17	7	19	4	1	3	1	9	2	
12/5/17	11	25	7		2	2	8	2	1
12/12/17	10	27	11	2	4	3	10	2	
12/19/17	6	20	4	3	5	1	7		
1/5/18	1	20	2		2	3	3	14	
1/12/18									
1/19/18									
1/26/18									

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Plan - Needs Assessment



Success rate questions

- What activities must be done to accomplish our objectives?
- What is the probability our solution is a success?
- What tasks are required to successfully solve our needs?

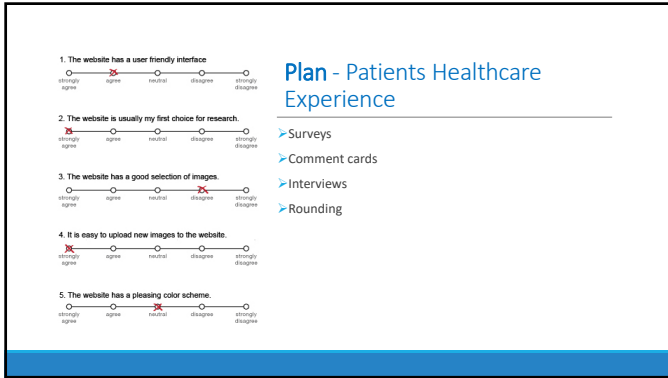
Performance questions

- Which key elements are we using to measure performance?
- What does excellent performance look like?
- What does current performance look like?

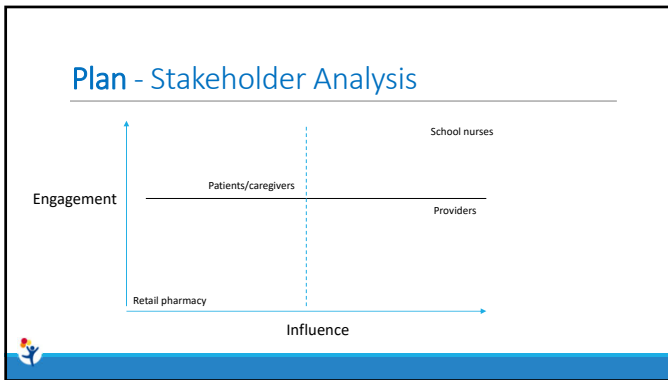
Operational questions

- Which stakeholders are involved?
- Where does the need occur within the process?
- How frequently do we observe the need?

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Do-Current to Future Process

1.	Parents complete school intake and enrollment form	1	Parents complete school intake form and enrollment form. The form includes parents acknowledge authorizing school nurse to contact primary doctor
2.	Asthma is identified: school nurse contacts parents asking for a signed school asthma plan and quick reliever medication with spacer dedicated to the school	2	Asthma is identified: school nurse contact parents and primary doctor asking for a signed school asthma plan and quick reliever medication with spacer dedicated to the school
3.	Parents contact provider for school asthma plan and medications	3	Parent or Primary doctor sends signed school form to the school nurse and parent brings in quick reliever prescription with spacer
4.	Provider completes school form and prescribed medications for school	4.	School nurse notifies parent of prescription refill and asks parent to bring in refill and sign school asthma plan
5.	Parents bring in provider signed school asthma plan and quick relief medication with spacer	5.	Parent brings in medication with spacer and signs school asthma plan
6.	School nurse reviews the school plan and has parent sign		

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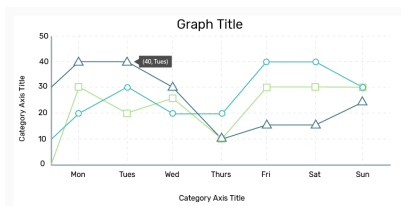
Do – Implementation

- ▶ Develop a roll out check list
- ▶ Identify key owners for each process
- ▶ Role clarity
- ▶ Approval from stakeholders and leadership
- ▶ Educating of providers
- ▶ Communication of providers and parents
- ▶ Set an evaluation period



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Study-Data Trends



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Study – Observational

	Process	Step completed (Y/N)	Comments
1	Parents complete school intake form and enrollment form. The form includes parents acknowledge authorizing school nurse contact primary doctor		
2	Asthma is identified: school nurse contact parents and primary doctor asking for a signed school asthma plan and quick reliever medication with spacer dedicated to the school		
3	Parent or Primary doctor sends signed school form to the school nurse and parent brings in quick reliever prescription with spacer		
4	School nurse notifies parent of prescription refill and asks parent to bring in refill and sign school asthma plan		
5	Parent brings in medication with spacer and signs school asthma plan		

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Study – Rounding

Questions:	Name:	Date:
What is working well ?		
Who would you like for me to recognize for doing a good job?		
What are areas of opportunity?		
Are there any quality or safety concerns?		

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Act - Changes to Process

1. Parents complete school intake forms and provide to the school	1. Parents complete school intake form and provide to the school. Within the school form parents have the option to sign for school nurse to contact primary doctor
2. Asthma is identified and parents are contacted asking for a school asthma plan	2. Asthma is identified: primary doctor is contacted asking for a signed school asthma plan and prescription
3. Parents contact provider for school asthma plan and medications	3. Primary doctor sends signed school form to the school nurse and writes for quick reliever prescription
4. Provider completes school form and prescribed medications for school	4. School nurse notifies parent of prescription refill and asks parent to bring in refill and sign school asthma plan
5. Parents bring in signed school asthma plan and quick relief medication with spacer	5. Parent brings in medication with spacer and signs school asthma plan

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Act-Celebrate Successes

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Sustainability

- ▶ Business plan
- ▶ Long term goals
- ▶ Guiding documents or policies
- ▶ Develop education for new staff
- ▶ Ongoing communication back to key stakeholders
- ▶ Period touch base with stakeholders
- ▶ Program evaluation Ongoing education with key team members



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Business Plan for Sustainability and Funding



- ▶ Objectives
- ▶ Mission
- ▶ Vision
- ▶ Structure
- ▶ Services
- ▶ Processes
- ▶ Budget
- ▶ Metrics
- ▶ Goals




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Primary care disease management program

- ▶ Provides the majority of asthma care
- ▶ Focus on over all care impacts
- ▶ Improve safety and quality of care
- ▶ Efficiency
- ▶ Payment models are shifting

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Specialty care disease management program

- ▶ Manages medically complex patients
- ▶ Small subset of patients who tend to be higher utilizers
- ▶ Access to different diagnostic tools
- ▶ Improve safety and quality of care
- ▶ Payment models are shifting


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Hospital-based disease management program

- ▶ Higher healthcare utilizers
- ▶ Identification of poor disease control
- ▶ Access to different diagnostic tools
- ▶ Improve safety and quality of care
- ▶ Payment models are shifting
- ▶ Opportunity to have multiple interactions
- ▶ Collaboration opportunities across various teams

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School-based disease management program

- ▶ Hospitalizations can be an indication the disease is poorly controlled
- ▶ Hospitalizations and Emergency department visits can be opportunities for interventions
- ▶ Earlier referrals to a specialist
- ▶ Decrease health care utilization

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Community-based disease management outreach program

- ▶ Improve control of a chronic disease
- ▶ Directly assess the environment
- ▶ Educate patient in their direct environment
- ▶ Enhance the quality of life
- ▶ Decrease health care utilization

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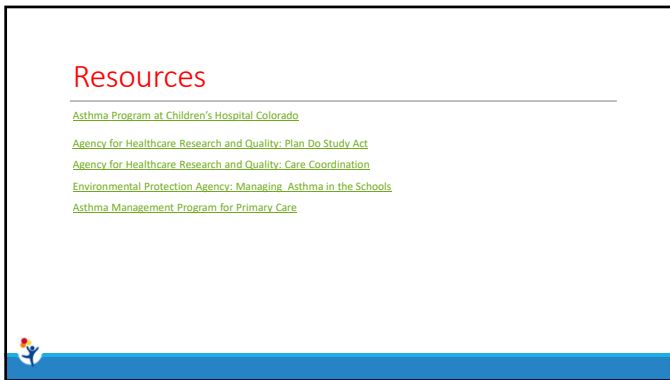
Asthma Opportunities

- ▶ Standardization of education
- ▶ Assessment of asthma control
- ▶ Device technique assessment
- ▶ Care plan
- ▶ Care coordination
- ▶ Health navigation
- ▶ Medication adherence
- ▶ Tobacco cessation counseling
- ▶ School asthma plan
- ▶ Follow-up appointments
- ▶ Social and clinical barriers
- ▶ Equipment and supply needs
- ▶ Referrals
- ▶ Access
- ▶ So Much More.....

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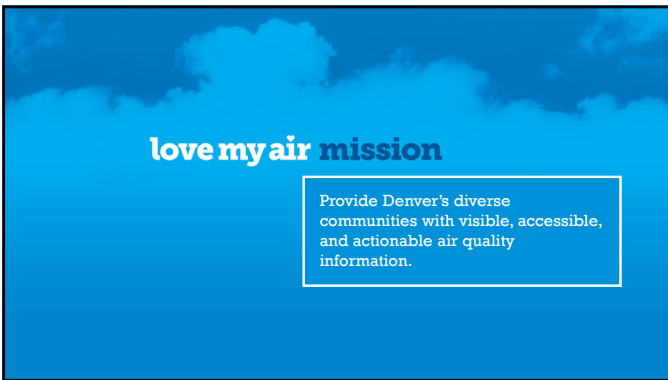
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38



1



2



3

Air Quality and Health

- Sensor network of 40 air sensors around Denver Public Schools
- Collaborate with DPS nurses to help raise awareness of asthma prevalence
- App provides real-time data from our own and reference sites that helps to create push notifications

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Page 4

DENVER

Public Schools

4

Air Quality and Health (cont.)

- Continued partnerships with our Climate Action Sustainability and Resiliency (CASR) department
- Supporting DPS teachers that are creating curriculum around LMA using a project-based learning model

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Page 5

DENVER

Public Schools

5

CASR Needs Assessment Chart

	East Colfax	Florida & Eastman	Glendale	Northglenn	Northwest Park Hill	Sun Valley	Valencia	Vista Park	West Colfax	Westminster
Air Quality, Asthma and Pollution	2.865									
More Food Trucks, Food Maintenance, Plants and Living Soil	1.750	0.824	1.515	0.545	0.188	0.001	0.528	0.301	0.101	0.258
Food Co-ops, Healthy Grocery Store & Fresh Food	1.467	0.181	0.588	0.582	0.484					
Affordable Housing, Renters Protection & Sanitization	1.834	0.542	0.709	0.615	0.449	0.271	0.224	0.381	0.101	0.147
Gun Violence, Violence Offsets, Security and Crime	1.237		0.258	0.228	0.222	0.101	0.200	0.001		
Adult & Youth Resource Centers & Counseling	1.304	0.584					0.402		0.111	0.147
Affordable & Expanded Public Transit, Safe Mobility & Electric Cars	1.108	0.477	0.228	0.228	0.228	0.101	0.101	0.148	0.148	0.148
Climate Change Communication & Education	1.065			0.401	0.001		0.400			
Workability and More and safer sidewalks	1.018	0.211					0.111	0.148	0.400	0.258
More Safe and Usable Green Spaces & Parks & Tree Maintenance	0.884		0.400		0.400			0.148	0.400	0.258
Employment & Career Development for Youth & Adults	0.805				0.200	0.111	0.102			
Elder Needs Maintenance Needs, Weatherization & Efficiency Upgrades	0.794	1.177			0.200		0.148		0.258	
Drinking Water/Clean Water/Water Conservation	0.794	0.700	0.515	0.548	0.148	0.200		0.148	0.111	0.200
Unsafe Roads, Street Closures & Interchanges	0.794	0.114	0.114	0.114	0.114			0.148	0.114	0.147
Homelessness & Homeless shelters	0.794		0.114	0.114	0.114			0.148	0.114	0.147
Drug Abuse/Addiction	0.794		0.114	0.114	0.114			0.148	0.114	0.147
Workshops on, and better Affordable Waste, Recycling, & Compost	0.714		0.114	0.114	0.114			0.148	0.114	0.147
Other/Trash/Unlabeled Right of Way	0.714		0.114	0.114	0.114			0.148	0.114	0.147
Gun Violence	0.505				0.270		0.111			
Community Resources and Government Services (Including Senior Services)	0.495				0.270		0.111			
Accessible Solar & Clean Energy Details for Renters & Homes	0.470	0.148		0.148			0.147		0.114	

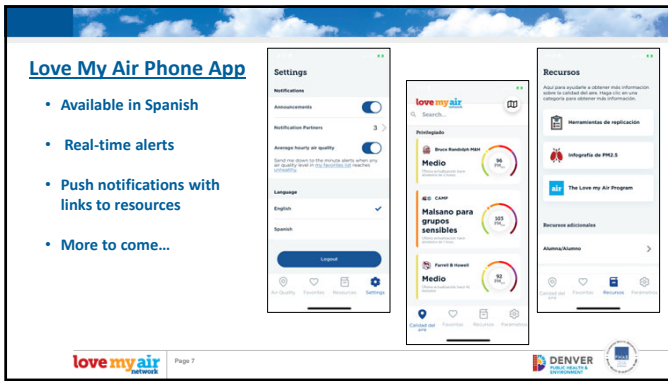
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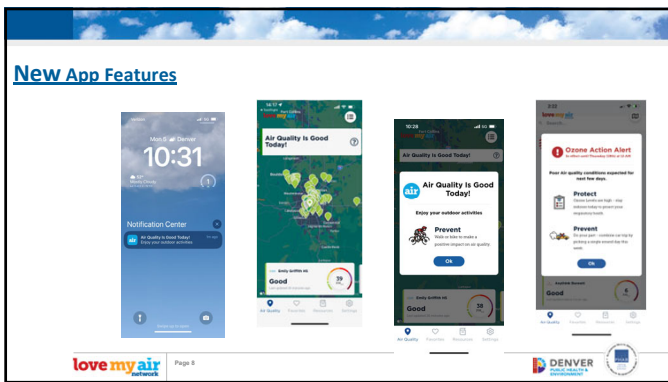
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Public Schools

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15TH ANNUAL

Reach the Peak Asthma and Allergy Overview and Update

Asthma Management Tools

- ✓ Asthma Management Guidelines
- ✓ Asthma Management Outline
- ✓ Device Teaching Worksheet
- ✓ Inhaler Device Priming Table
- ✓ Medication Assistance Programs
- ✓ Spirometry Interpretation Reference
- ✓ Asthma & Your Airways
- ✓ Respiratory Treatment Poster
- ✓ Asthma Care Plan Examples - Home & School
- ✓ Asthma Care Quick Reference
- ✓ Asthma Therapy Assessment Questionnaire (ATAQ)
- ✓ NIH Asthma Action Plan
- ✓ Asthma Control Test (ACT)
- ✓ Single Maintenance and Reliever Therapy (SMART)

AGES 0–4 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 0–4 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA and At the start of RTI: Add short course daily ICS▲	Daily low-dose ICS and PRN SABA	Daily low-dose ICS-LABA and PRN SABA▲ or Daily low-dose ICS + montelukast,* or daily medium-dose ICS, and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily montelukast* or Cromolyn,* and PRN SABA		Daily medium-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast*+ oral systemic corticosteroid and PRN SABA
For children age 4 years only, see Step 3 and Step 4 on Management of Persistent Asthma in Individuals Ages 5–11 Years diagram.						
Assess Control <ul style="list-style-type: none"> First check adherence, inhaler technique, environmental factors, ▲ and comorbid conditions. Step up if needed; reassess in 4–6 weeks Step down if possible (if asthma is well controlled for at least 3 consecutive months) Consult with asthma specialist if Step 3 or higher is required. Consider consultation at Step 2. <p>Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.</p>						

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; SABA, inhaled short-acting beta₂-agonist; RTI, respiratory tract infection; PRN, as needed

▲ Updated based on the 2020 guidelines.

* Cromolyn and montelukast were not considered for this update and/or have limited availability for use in the United States. The FDA issued a Boxed Warning for montelukast in March 2020.



NOTES FOR INDIVIDUALS AGES 0–4 YEARS DIAGRAM

Quick-relief medications

- Use SABA as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed.
- **Caution:** Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and may require a step up in treatment.
- Consider short course of oral systemic corticosteroid if exacerbation is severe or individual has history of previous severe exacerbations.

Each step: Assess environmental factors, provide patient education, and manage comorbidities▲

- In individuals with sensitization (or symptoms) related to exposure to pests‡: conditionally recommend integrated pest management as a single or multicomponent allergen-specific mitigation intervention.▲
- In individuals with sensitization (or symptoms) related to exposure to identified indoor allergens, conditionally recommend a multi-component allergen-specific mitigation strategy.▲
- In individuals with sensitization (or symptoms) related to exposure to dust mites, conditionally recommend impermeable pillow/mattress covers only as part of a multicomponent allergen-specific mitigation intervention, but not as a single component intervention.▲

Notes

- If clear benefit is not observed within 4–6 weeks and the medication technique and adherence are satisfactory, the clinician should consider adjusting therapy or alternative diagnoses.

Abbreviations

EIB, exercise-induced bronchoconstriction; SABA, inhaled short-acting beta₂-agonist.
 ▲Updated based on the 2020 guidelines.
 ‡ Refers to mice and cockroaches, which were specifically examined in the Agency for Healthcare Research and Quality systematic review.

AGES 5–11 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 5–11 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol▲	Daily and PRN combination medium-dose ICS-formoterol▲	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS +Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA or Daily medium-dose ICS + LTRA* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* + oral systemic corticosteroid or daily high-dose ICS + Theophylline* + oral systemic corticosteroid, and PRN SABA
		Steps 2–4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy▲			Consider Omalizumab**▲	

Assess Control

- First check adherence, inhaler technique, environmental factors,▲ and comorbid conditions.
- Step up** if needed; reassess in 2–6 weeks
- Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta₂-agonist

[▲] Updated based on the 2020 guidelines.

* Cromolyn, Nedocromil, LTRAs including montelukast, and Theophylline were not considered in this update and/or have limited availability for use in the United States, and/or have an increased risk of adverse consequences and need for monitoring that make their use less desirable. The FDA issued a Boxed Warning for montelukast in March 2020.

** Omalizumab is the only asthma biologic currently FDA-approved for this age range.



NOTES FOR INDIVIDUALS AGES 5–11 YEARS DIAGRAM

Quick-relief medications	<ul style="list-style-type: none"> • Use SABA as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. • In Steps 3 and 4, the preferred option includes the use of ICS-formoterol 1 to 2 puffs as needed up to a maximum total daily maintenance and rescue dose of 8 puffs (36 mcg).▲ • Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and may require a step up in treatment.
Each step: Assess environmental factors, provide patient education, and manage	<ul style="list-style-type: none"> • In individuals with sensitization (or symptoms) related to exposure to pests‡: conditionally recommend integrated pest management as a single or multicomponent allergen-specific mitigation intervention.▲ • In individuals with sensitization (or symptoms) related to exposure to identified indoor allergens, conditionally recommend a multi-component allergen-specific mitigation strategy.▲ • In individuals with sensitization (or symptoms) related to exposure to dust mites, conditionally recommend impermeable pillow/mattress covers only as part of a multicomponent allergen-specific mitigation intervention, but not as a single component intervention.▲
Notes	<ul style="list-style-type: none"> • The terms ICS-LABA and ICS-formoterol indicate combination therapy with both an ICS and a LABA, usually and preferably in a single inhaler. • Where formoterol is specified in the steps, it is because the evidence is based on studies specific to formoterol. • In individuals ages 5–11 years with persistent allergic asthma in which there is uncertainty in choosing, monitoring, or adjusting anti-inflammatory therapies based on history, clinical findings, and spirometry, FeNO measurement is conditionally recommended as part of an ongoing asthma monitoring and management strategy that includes frequent assessment.
Abbreviations	<div>2</div> <p>EIB (exercise-induced bronchoconstriction); FeNO (fractional exhaled nitric oxide); ICS (inhaled corticosteroid); LABA (long-acting beta -agonist); SABA (inhaled short-acting beta -agonist). ▲Updated based on the 2020 guidelines. ‡ Refers to mice and cockroaches, which were specifically examined in the Agency for Healthcare Research and Quality systematic review.</p>

AGES 12+ YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

Intermittent Asthma		Management of Persistent Asthma in Individuals Ages 12+ Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6 [■]
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA or PRN concomitant ICS and SABA▲	Daily and PRN combination low-dose ICS-formoterol▲	Daily and PRN combination medium-dose ICS-formoterol▲	Daily medium-high dose ICS-LABA + LAMA and PRN SABA▲	Daily high-dose ICS-LABA + oral systemic corticosteroids + PRN SABA
Alternative		Daily LTRA* and PRN SABA or Cromolyn,* or Nedocromil,* or Zileuton,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LAMA,▲ or daily low-dose ICS + LTRA,* and PRN SABA or Daily low-dose ICS + Theophylline* or Zileuton,* and PRN SABA	Daily medium-dose ICS-LABA or daily medium-dose ICS + LAMA, and PRN SABA▲ or Daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* or daily medium-dose ICS + Zileuton,* and PRN SABA	Daily medium-high dose ICS-LABA or daily high-dose ICS + LTRA,* and PRN SABA	
		Steps 2–4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy▲			Consider adding Asthma Biologics (e.g., anti-IgE, anti-IL5, anti-IL5R, anti-IL4/IL13)**	
Assess Control						
<ul style="list-style-type: none">First check adherence, inhaler technique, environmental factors,▲ and comorbid conditions.Step up if needed; reassess in 2–6 weeksStep down if possible (if asthma is well controlled for at least 3 consecutive months)						
Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.						
Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.						

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; LAMA, long-acting muscarinic antagonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta₂-agonist

[▲] Updated based on the 2020 guidelines.

* Cromolyn, Nedocromil, LTRAs including Zileuton and montelukast, and Theophylline were not considered for this update, and/or have limited availability for use in the United States, and/or have an increased risk of adverse consequences and need for monitoring that make their use less desirable. The FDA issued a Boxed Warning for montelukast in March 2020.

** The AHRQ systematic reviews that informed this report did not include studies that examined the role of asthma biologics (e.g. anti-IgE, anti-IL5, anti-IL5R, anti-IL4/IL13). Thus, this report does not contain specific recommendations for the use of biologics in asthma in Steps 5 and 6.

■ Data on the use of LAMA therapy in individuals with severe persistent asthma (Step 6) were not included in the AHRQ systematic review and thus no recommendation is made.



NOTES FOR INDIVIDUALS AGES 12+ YEARS DIAGRAM

Quick-relief medications	<ul style="list-style-type: none"> • Use SABA as needed for symptoms. The intensity of treatment depends on the severity of symptoms: up to 3 treatments at 20-minute intervals as needed. • In steps 3 and 4, the preferred option includes the use of ICS-formoterol 1 to 2 puffs as needed up to a maximum total daily maintenance and rescue dose of 12 puffs (54 mcg).▲ • Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and may require a step up in treatment.
Each step: Assess environmental factors, provide patient education, and manage	<ul style="list-style-type: none"> • In individuals with sensitization (or symptoms) related to exposure to pests‡: conditionally recommend integrated pest management as a single or multicomponent allergen-specific mitigation intervention.▲ • In individuals with sensitization (or symptoms) related to exposure to identified indoor allergens, conditionally recommend a multi-component allergen-specific mitigation strategy.▲ • In individuals with sensitization (or symptoms) related to exposure to dust mites, conditionally recommend impermeable pillow/mattress covers only as part of a multicomponent allergen-specific mitigation intervention, but not as a single component intervention.▲
Notes	<ul style="list-style-type: none"> • The terms ICS-LABA and ICS-formoterol indicate combination therapy with both an ICS and a LABA, usually and preferably in a single inhaler. • Where formoterol is specified in the steps, it is because the evidence is based on studies specific to formoterol. • In individuals ages 12 years and older with persistent allergic asthma in which there is uncertainty in choosing, monitoring, or adjusting anti-inflammatory therapies based on history, clinical findings, and spirometry, FeNO measurement is conditionally recommended as part of an ongoing asthma monitoring and management strategy that includes frequent assessment. • Bronchial thermoplasty was evaluated in Step 6. The outcome was a conditional recommendation against the therapy.
Abbreviations	<p>EIB, exercise-induced bronchoconstriction; FeNO, fractional exhaled nitric oxide; ICS, inhaled corticosteroid; LABA, long-acting beta -agonist; SABA, inhaled short-acting beta -agonist.</p> <p>▲Updated based on the 2020 guidelines.</p> <p>‡ Refers to mice and cockroaches, which were specifically examined in the Agency for Healthcare Research and Quality systematic review.</p>



Asthma Management Outline

Key Messages for Asthma Education

What is Asthma?

- Asthma is a chronic inflammatory disorder that affects all the airways in the lungs, from the windpipe (trachea) in the neck to the smallest airways in the lungs (bronchioles).
- Asthma occurs when the airways become irritated from such "triggers" as smoke, viruses, and allergens.
- Asthma narrows the inside of the airways in three ways:
 1. The inside lining of the airways becomes red and swollen (inflammation).
 - ✓ This can last for weeks after an acute episode
 - ✓ May become a condition that never completely goes away
 2. Muscles that are in and around the airways tighten (bronchospasm)
 3. The glands in the airways produce more mucous, often blocking the airways (increased secretions)

Four keys to successful asthma management are:

1. Individualized care and patient education
2. Recognition of warning signs (wheeze, increased cough, retractions) of an acute episode with early treatment.
3. Use of daily controller medication (s)
4. Control of environment and other factors contributing to asthma severity (irritant, allergic, viral and emotional triggers)

Asthma and the environment

- Children with asthma have extra sensitive airways
- Review common triggers
- Help identify personal triggers
- Review ways to limit or eliminate triggers

Tobacco smoke

- Children should never be exposed to smoke of any kind, especially children with asthma
- Second hand smoke from tobacco is harmful to the lungs of children, adolescents & adults
- Children who live in a house with a smoker will be sick more often.
 - ✓ More ear infections, asthma symptoms, allergies, bronchitis and pneumonia and often need to take medications.
 - ✓ More emergency room visits and hospitalizations than people who live in smoke-free homes
- Children whose parents smoke are more likely to smoke themselves when older.
- Review tips for reducing exposure ("ONE Step outside"; smoke-free home and car)
- QuitLine (Colorado quit smoking program) and Second Hand Smoke brochures



Quick relief medication (inhaled bronchodilators)

- Identify various names of common short-acting beta2-agonists (SABA) --Albuterol, Proair Respiclick DPI, Ventolin HFA, Proventil HFA, Xopenex HFA
- Describe mechanism of action, explaining that they provide quick relief only, not long term control. These medications are not to be used daily to control asthma symptoms.
- Describe modes of delivery, dosage and potential side effects
- Let them know to talk to their doctor if they are:
 - ✓ Needing to use their quick relief medication more than two times per week
 - ✓ Waking up at night with asthma symptoms more than two times per month
 - ✓ Having symptoms that limit exercise and other activities
- Ensure that quick relief medication is available for all home, school, childcare and sports settings
- Long acting Beta2-agonist (LABA) - Salmeterol and Formoterol, should not be used as an asthma controller medication alone. LABAs need to be used in combination with an inhaled steroid.

Long term control inhaled medications

- Identify the name of the controller being prescribed
- Emphasize difference between quick relief versus long term control medicines
- Long term control medications DO NOT provide quick relief
- Long term control medications must be taken as prescribed under the ongoing care of a health care provider even when symptom-free
- Rinse mouth and spit after inhaled corticosteroid delivery
- For mask treatment: wash face and swab mouth if unable to brush teeth

Asthma Action Plan (AAP)

- Ensure that the AAP is complete and accurate
- Review the plan with the parent and/or patient using the AAP
- Peak flow monitoring should be included, if appropriate for patient
- Assess that parent/caregiver and patient understand the AAP – how to use it and follow it.
- Use teach back method to validate patient and family understanding of the AAP.
- Reinforce having an AAP is in place at school and/or childcare settings

Principles for Optimal Inhaled Medication Delivery

- Device: correct type for patient age and ability to coordinate
 - ✓ valved-holding chamber (VHC) with mouthpiece if able for HFA MDIs.
 - ✓ For nebulized medications, if not able to use mouthpiece then snug-fitting mask that covers mouth and nose only (NO BLOWBY).
 - ✓ Nebulizer with mouth piece-- Breath hold: 10 seconds at end of inhalation; every few breaths with nebulizer if able



- Body position: standing or sitting upright; find a focal point with slight uplift of chin. For a baby or small child, sitting up straight in adult's lap, one of adult's arm wrapped around child's arms, if necessary.
- If possible, keep babies and children calm -breathing pattern with crying decreases medication delivered. (Crying is more exhalation; need inhalation to get lung deposition of medication.
- Priming: Refer to attached "Priming Medications" table for specific manufacturers' recommendations

Metered Dose Inhalers (MDI)

Both quick relief medications and controllers come in MDI devices. (quick relief – Albuterol, Xopenex: Controllers – Flovent, Alvesco, QVAR, Asmanex, Symbicort, Advair HFA, Dulera)

- Most are recommended to be used with a valved holding chamber (VHC or spacer)
- **New QVAR Redi-Haler is the exception. This new device is a HFA MDI that is breath activated and NO VHC/Spacer is required. No priming required.**

Instructions:

1. Remove inhaler cover and insert inhaler into VHC and shake gently several times
2. Exhale fully prior to use
3. Inhale slowly -you will hear a "whistle" from the spacer if inhaled too quickly
4. Hold breath for 10 seconds
5. For children less than 5 years or unable to perform mouthpiece maneuver:
 - ✓ Always use a mask on VHC
 - ✓ Child sitting up straight in adult's lap; if necessary, with one of adult's arms wrapped around the child's arms while actuating the MDI with the other hand
 - ✓ Observe the child taking 5 breaths in (valve will move with each inhalation)
6. MDI with VHC with good technique is as effective as nebulized medication when used Correctly.

Cleaning:

1. VHC—should be cleaned weekly when used on daily basis.
 - Remove end cap(s) from VHC
 - Separate the mouthpiece from the clear chamber by rotating the mouthpiece counter clockwise until it unlocks and pulls off.
 - Wash all parts in warm water with a mild liquid soap. Rinse all parts with water. Shake out excess water and allow all parts to air dry.
 - Reassemble all parts then turn clockwise until it snaps into place.

Nebulized Medications

Quick Relief examples: Albuterol, Xopenex, Duoneb

Controller: Pulmicort Respules/Budesonide Inhalation Solution

- Mouthpiece optimal; if unable to use mouthpiece, must use snug-fitting mask (**NO BLOWBY**)



Instructions

1. Demonstrate use of compressor and assembly of nebulizer per type
2. If using mask, attach snugly to face, covering mouth and nose
3. Child should be calm during administration of medication. Crying is mostly exhalation and these medications are more effective when they are inhaled
4. Mouthpiece: breathe in slowly **through the mouth**
5. May tap medication reservoir when sputtering; End treatment when there is no more mist being delivered.

Dry-powdered Inhaler (DPI) -None of the DPI s should be kept in the bathroom. Condensation can cause the powder to cake, clog the inhaler and not dispense medication. Approved for 4 years and older with the caveat that most 8-year olds likely have adequate technique.

Dry-powdered Inhaler (DPI) –Diskus

Controller: Advair (Fluticasone + Salmeterol) Diskus, Flovent (Fluticasone) Diskus,

- Must be able to inhale with enough force to dispense the medication -

Instructions:

1. Hold diskus in one hand and place thumb in groove; slide away from body as far as it goes -this opens the diskus and locks the mouthpiece in place
2. Hold the diskus in a horizontal, level position ("like a hamburger") at all times; this will keep the medicine from spilling out
3. Slide the medication until it clicks; this loads the medication. The counter will decrease by one.
4. Turn head away from the mouthpiece and exhale completely.
5. Place mouthpiece in mouth, lips tight, inhale deeply and forcefully (let patient know they might not feel medication being breathed in) hold breath for 10 seconds and then exhale.
6. Place thumb in groove and turn back to close. This resets the diskus for the next dose.

Dry-powder Inhaler (DPI) - Flexhaler

Controller: Pulmicort (Budesonide) Flexhaler

- Must be able to inhale with enough force to dispense the medication
- Dose tracker listed in increments of 20. Flexhaler is empty when solid black line only appears
- Prime with 2 twists when new.

Instructions

1. Must be held in upright position (mouthpiece up - "rocket") whenever dose is being delivered.
2. Twist the cover and lift it off
3. Twist the brown grip on the bottom as far as it will go, and then twist it back again. You will hear a 'click'. Designed to give only one dose no matter how often you click the base/grip on the bottom of the Flexhaler
4. Tilt Flexhaler horizontally ("hotdog position") Do not shake the inhaler after loading it
5. Turn face away and breath out completely.
6. Place mouthpiece in mouth, lips tight, inhale deeply and forcefully (let patient know they might not feel medication being breathed in); hold breath for 10 seconds and then exhale. Rinse/brush teeth after.
7. Place the cover back on and twist shut



Dry-powdered Inhaler- Twisthaler

Controller : Asmanex Twisthaler

- Must be able to inhale with enough force to dispense the medication
- Recommended 4 years or older if able to perform appropriate technique
- Has counter on inhaler base - 30, 60, and 120 doses
- Once per day dosing for most patients

Instructions:

1. Hold the Twisthaler upright ("like a rocket") with the base at the bottom
2. As cap is lifted off dose counter goes down by one. Taking the cap off is what primes the dose.
3. Turn face away and breath out completely
4. Place mouthpiece in mouth, lips tight, inhale deeply and forcefully (let patient know they might not feel medication being breathed in) hold breath for 10 seconds and then exhale.
5. Replace cap and twist clockwise until it clicks -cap must be closed entirely to load the next dose

Dry-powdered Inhaler-- Ellipta Device (Arnuity Ellipta (fluticasone furoate), Breo Ellipta (fluticasone furoate and vilanterol, Trelegy (fluticasone furoate, umeclidinium & vilanterol).

1. Open the cover when you are ready to take the medicine.
2. Slide the cover down. You should hear a "click" and see the mouthpiece.
3. Hold the inhaler away from your mouth, Breathe the air out of your lungs.
4. Put the mouthpiece between your lips and close your lips tightly around it.
5. Take 1 long, steady, deep breath in through your mouth. Do not block the air vent with your fingers.
6. Take the inhaler out of your mouth and hold your breath for about 10 seconds
7. Breathe out slowly and gently. Close the lid on the inhaler. Remember to brush teeth/rinse mouth.

Dry-powdered Inhaler --Respiclick Device (Proair Respiclick, Armon Air, AirDuo)

1. Hold inhaler upright
2. Open the cap all the way until you hear a "click"
3. Hold the inhaler away from your mouth, Breathe the air out of your lungs.
4. Put the mouthpiece between your lips and close your lips tightly around it.
5. Take 1 long, steady, deep breath in through your mouth.
6. Take the inhaler out of your mouth and hold your breath for about 10 seconds
7. Breathe out slowly and gently. Close the lid on the inhaler. Repeat above steps if second dose is needed.
8. Remember to rinse and brush teeth after all inhaled corticoid steroid medications.

Peak Flow Meter (PFM)

- Measures how fast air can be exhaled in one breath and can represent airway obstruction.
- Can help predict early signs of an acute asthma episode, especially useful for "poor perceivers"
- Peak Flow should represent FEV 1 on spirometry
- Following color zones will guide plan of care on the Asthma Action Plan
- Measure peak flow to monitor asthma symptoms and before/after bronchodilator treatments.

Instructions:

1. Stand up, slight chin lift, find focal point



2. Check to be sure indicator is at bottom of the scale
3. Empty lungs; take as deep of breath as possible
4. Put mouthpiece between teeth and seal lips Do not stick tongue into mouthpiece
5. Blow out as hard and fast as possible Maintain correct posture throughout maneuver
6. Marker indicates PF measurement
7. Blow 2 more times and record the highest number

Setting personal best:

1. Measure peak flows once a day at the same time for 2 weeks when well. Take the best of 3 tries.
2. Best reading becomes "personal best".
3. Notify healthcare provider of "personal best" value

Color zones

- Green greater than 80% of personal best
- Yellow greater than 50% and less than 80 of personal best
- Red less than 50% signals medical alert
- Record information on the asthma action plan

80-100%

- Breathing is fine
- No signs of an asthma attack

50-80%

- Breathing is hampered
- Use rescue medication
- Recheck peak expiratory flow in 20 to 30 minutes

Below 50%

- Breathing is labored or faster than normal
- Breathlessness is a problem
- Use a quick relief medication or nebulizer immediately and call the doctor or 911



ASTHMA ACTION PLAN



The colors of a traffic light will help you use your asthma medicines.

- **GREEN means Go Zone!**
Use preventive medicine.
- **YELLOW means Caution Zone!**
Add quick-relief medicine.
- **RED means Danger Zone!**
Get help from a doctor.

Name:	Date:
Doctor:	Medical Record #:
Doctor's Phone #: Day	Night/Weekend
Emergency Contact:	
Doctor's Signature:	

Personal Best Peak Flow: _____

GO	Use these daily preventive anti-inflammatory medicines:		
	MEDICINE	HOW MUCH	HOW OFTEN/WHEN
You have <i>all</i> of these: <ul style="list-style-type: none"> • Breathing is good • No cough or wheeze • Sleep through the night • Can work & play 	<div style="text-align: center;"> Peak flow: <div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="width: 100%; height: 100%; background: linear-gradient(to top, transparent 49%, #2e8b57 49%, #2e8b57 51%, transparent 51%);"></div> </div> </div>		
For asthma with exercise, take:			
CAUTION			
Continue with green zone medicine and add:			
You have <i>any</i> of these: <ul style="list-style-type: none"> • First signs of a cold • Exposure to known trigger • Cough • Mild wheeze • Tight chest • Coughing at night 	<div style="text-align: center;"> Peak flow: <div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="width: 100%; height: 100%; background: linear-gradient(to top, transparent 49%, #f4b084 49%, #f4b084 51%, transparent 51%);"></div> </div> </div>		
CALL YOUR PRIMARY CARE PROVIDER.			
DANGER			
Take these medicines and call your doctor now.			
Your asthma is getting worse fast: <ul style="list-style-type: none"> • Medicine is not helping • Breathing is hard & fast • Nose opens wide • Ribs show • Can't talk well 	<div style="text-align: center;"> Peak flow: <div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="width: 100%; height: 100%; background: linear-gradient(to top, transparent 49%, #d9534f 49%, #d9534f 51%, transparent 51%);"></div> </div> </div>		
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;">MEDICINE</div> <div style="width: 20%;">HOW MUCH</div> <div style="width: 20%;">HOW OFTEN/WHEN</div> </div>			

GET HELP FROM A DOCTOR NOW! Do not be afraid of causing a fuss. Your doctor will want to see you right away. It's important! If you cannot contact your doctor, go directly to the emergency room. **DO NOT WAIT.** Make an appointment with your primary care provider within two days of an ER visit or hospitalization.



NEBULIZED MEDICATIONS:

- Need to be given via mask or mouthpiece. When using mask with inhaled steroids, wash face after using as well as rinse/brush teeth.
- Minimize nebulized Budesonide exposure to eyes due to possible increased risk for cataracts.
- Remind families about cleaning mouthpiece or mask → After each treatment, rinse the mask and/or mouthpiece with mild liquid soap under hot, running tap water. Rub off any “stuck on” mucus. Shake off excess water. If the nebulizer is not rinsed after every treatment, the small holes will become clogged and will not make a mist. It is not necessary to rinse the clear connective tubing.

Metered Dose Inhalers (MDI):

- Majority of MDIs should be used with spacer/valved holding chamber/ VHC.
- Need to prime the MDI 2-3 puffs initial use.
- Use with mask until patient can demonstrate ability to take deep inspiration, coordinate it with activation of the MDI and hold their breath for count of 10.
- When using mask—tight seal above nose and on chin. 5-10 breaths per MDI activation. Wait 1 minute between doses.
- When using mouthpiece. Exhale, then take slow deep inspiration, holding breath for count of 10, exhale. Spacer should not make whistling sound. Wait 1 minute and repeat.
- Clean VHC weekly if using daily. Wash all parts in warm water with a mild liquid soap. Rinse all parts. Shake out excess water and allow to air dry.
- New QVAR Redi-Haler is the exception. This device is a HFA MDI that is breath activated and NO VHC/Spacer is required. No priming or cleaning of device is required.

CONTROLLER MEDICATIONS: inhaled steroids

Device Type—Metered Dose inhaler MDI

HFA (hydrofluoroalkane) MDI

- **Alvesco (Ciclesonide)** comes in 2 strengths. 80mcg and 160 mcg. RX is 1 inhalation BID. MDIs have 60 doses + counter.



- **Flovent (fluticasone)** comes in 3 strengths; 44 mcg, 110mcg, 220mcg. MDIs have 120 doses + counter.



- **QVAR (Beclomethasone)— QVAR REDI-Haler** comes in 2 strength: 40mcg , 80mcg. MDIs have 120 doses; + dose counter.
This device is a HFA MDI that is breath activated and NO VHC/Spacer is required.
No priming or shaking required. Breathe out, open cap, tightly seal lips around the mouthpiece, forming a tight seal. Breathe in deeply to release the dose of medication. Hold your breath for 5-10 seconds and breathe out slowly. Replace the cap to reload the next dose and repeat. Wipe outside of mouthpiece once a week with a dry tissue or cloth.





- **ASMANEX® HFA 50, 100 & 200 mcg (mometasone furoate) Inhalation Aerosol** (2 inhalations twice daily) MDIs have 120 doses; + dose counter.



COMBINATION MDI Medications (inhaled steroids + long acting beta-agonist (LABA))

- **Advair MDI(Fluticasone + salmeterol)** 3 strengths; 45/21; 115/21; 230/21; MDI has 120 doses + counter.



- **Dulera MDI (Mometasone + Formoterol)** 3 strengths; 50/5, 100/5, 200/5.
- MDI has 120 doses + counter.



- **Symbicort MDI (budesonide+ Formoterol)** 2 strengths 80/4.5; 160/4.5. MDI has 120 doses + counter.



Device Type → DRY POWDERED INHALER (DPI):

Hold in upright position after loading dose. Exhale and then take rapid inhalation and hold breath for 10 seconds. Exhale. Rinse/brush after using steroid DPIs. Do not store DPIs in bathrooms or moist environments. Condensation may clog the mechanism.

- **Asmanex (Mometasone) Twisthaler.** 2 strengths. 110; 220. No priming needed. Taking the cap off loads the dose. When Twisthaler is empty, cap will not come off. + dose counter.
- **Pulmicort (Budesonide) Flexhaler or Turbo haler.** 2 strengths 90mcg; 180mcg. Hold upright. Dose is loaded by rotating and clicking bottom disk. Prime with 2 clicks before initial use. 60 & 120 inhalations + dose counter— counts down by increments of 20.





Diskus

Flovent (Fluticasone propionate) Diskus . 3 strengths. 50 mcg; 100 mcg; 250 mcg.
dose counter.



Ellipta device:

- **Arnuity™ Ellipta® (fluticasone furoate inhalation powder)**, once-daily DPI inhaled corticosteroid (ICS) 12 years and older. The approved doses are Arnuity Ellipta 100mcg and 200mcg. Arnuity Ellipta is administered once daily via the dry powder inhaler called 'Ellipta' device.



Resplick DPI Device

- **ArmonAir Respiclick Fluticasone Propionate** ..
- 3strengths. 55 mcg, 113mcg and 232 mcg.
- Dose counter. 1 puff twice a day.



COMBINATION DPI Medications (inhaled steroids + long acting beta-agonist (LABA))

- **Advair Diskus DPI 100/50; 250/50; 500/ 50.**
- Dose counter. 1 puff twice a day



- **Breo Ellipta DPI (fluticasone furoate and the long-acting beta2-agonist (LABA) vilanterol (VI).** Two strengths, 100/25mcg and 200/25mcg, administered once-daily using the Ellipta DPI.



- **AirDuo DPI Respiclick: (Fluticasone Propionate and Salmeterol)**
Dose counter. 3 strengths 55/14 mcg; 111/14 mcg; 232/14 mcg





Quick Relief Medications:

- **Albuterol MDI (Ventolin, Ciplo, Proventil) .** Most of these MDIs have 200 inhalations. 2-4 puffs every 4 hours prn. All have dose counters.
- **Xopenex (levalbuterol) MDI; + dose counter.** May have fewer cardiac side effects. 2 puffs q 4 hours prn.



- **ProAir RespiClick (albuterol)**—breath activated DPI albuterol: quick relief inhaler. **No spacer required.** Approved for 4 years and older (good choice for teenagers who hate spacers) . Inhaler is white and red. + dose counter



Other inhalers:

- **Atrovent (ipatropium) MDI –** relaxes the upper airways.
- Onset is about 30 minutes. 2 puffs up to 4 times a day. + dose counter.



- **SPIRIVA® RespiMAT® (tiotropium bromide—long acting anticholinergic agent).** Approved by the FDA for the long-term, once-daily, maintenance treatment of asthma in patients 6 years of age and older[†]. For asthma maintenance, the FDA approved a once-daily dose of 2.5 µg (delivered in two puffs of 1.25 µg each). Must be on other daily asthma control medication—not to be used as solo therapy for asthma. + dose counter. (Spiriva Handi-haler has COPD indication, not asthma indication. Dosing is different between the devices.
- **Trelegy Ellipta DPI** (fluticasone furoate, umeclidinium & vilanterol).administered once-daily using the Ellipta DPI. 2 strengths. ICS + LABA+ LAMA. (COPD indication at this time.)





- **Combivent Respimat (Ipratropium + Albuterol) + dose Counter.** The recommended dose for RESPIMAT is one inhalation four times a day -- administered as two inhalations four times a day. The total number of inhalations for COMBIVENT RESPIMAT should not exceed six in 24 hours.



Nasal Steroids: For all of them—initially need to prime with 1-2 sprays.
When using, avoid spraying towards the nasal septum—can cause thinning or perforation of nasal septum.

PEAK FLOW METERS: Remember—peak flows are totally effort dependent. Results should represent FEV1 -- numerical values are just as important as the color zone. Patients often report being in the yellow or red zone without being able to tell you the numerical value of their peak flows. During flares, it is important to know the numerical values.

Indications:




- provider recommendations
- poor perceivers of symptoms,
- Generally, 8 years of age have adequate technique
- History of PICU and > 8 years of age
- As a tool when asthma control medications decreased or weaned off

Green Zone is 80 % or greater of patient's personal best

Yellow Zone is between 50-80 % of personal best

Red Zone is < 50% of personal best



	80-100% <ul style="list-style-type: none">• Breathing is fine• No signs of an asthma attack
	50-80% <ul style="list-style-type: none">• Breathing is hampered• Use rescue medication• Recheck peak expiratory flow in 20 to 30 minutes
	Below 50% <ul style="list-style-type: none">• Breathing is labored or faster than normal• Breathlessness is a problem• Use a quick relief medication or nebulizer immediately and call the doctor or 911

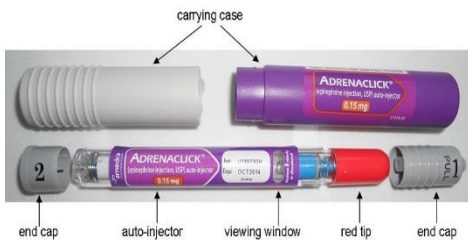


ANAPHYLAXIS: EPIPENS (EPINEPHRINE) for anaphylaxis:

Table

KEY DIFFERENCES BETWEEN EPINEPHRINE AUTO-INJECTOR DEVICES^{6,8,10}

Auto-Injector Device	Appearance	Preparation for Administration	Administration	Dose Verification
EpiPen/EpiPen Jr (0.3 and 0.15 mg epinephrine) Auto-Injectors	One-step, flip-top carrying case with a blue safety release cap and orange tip at the other end	<ul style="list-style-type: none"> Flip open yellow top of the EpiPen or the green top of the EpiPen Jr and slide out pen Grasp unit with orange tip pointing downward Form fist around the unit (tip down) and with other hand pull off blue safety release (do not remove until ready to use) 	<ul style="list-style-type: none"> Hold orange tip near outer thigh Swing and firmly push orange tip against outer thigh until it clicks Hold firmly against thigh for ~10 seconds to deliver drug Remove from thigh and massage injection area for 10 seconds 	<ul style="list-style-type: none"> Audible click signals that drug is being delivered After use, window on side of pen is obscured, indicating drug was dispensed Orange needle cover automatically extends, indicating needle was used Used device will no longer fit back into the external carrying case
Adrenaclick and Epinephrine Injection, USP Auto-Injector, 0.15 mg and 0.3 mg (authorized generic to Adrenaclick)	Contained in a pull-apart cylindrical case with 2 gray caps on either end (labeled #1 and #2)	<ul style="list-style-type: none"> Pull apart cylindrical carrying case Slide out the pen Remove gray cap #1—a red tip will be exposed Remove gray cap #2 	<ul style="list-style-type: none"> Put red tip against middle of outer side of thigh Press red injector tip hard against the thigh until needle enters skin Hold it in place for 10 seconds to deliver the drug 	If needle is exposed, dose was received
Twinject	Contained in a pull-apart cylindrical case with 2 green caps (labeled #1 and #2)	<ul style="list-style-type: none"> Pull apart cylindrical carrying case Slide out the pen Remove green cap #1—a red tip will be exposed Remove green cap #2 	<ul style="list-style-type: none"> Put red tip against middle of outer side of thigh Press red injector tip hard against the thigh until needle enters skin Hold it in for 10 seconds to deliver the drug 	If needle is exposed, dose was received



Auvi-Q

Epinephrine autoinjector: 3 strengths-- 0.1 mg, 0.15 mg & 0.3 mg

FDA-approved epinephrine auto-injector for anaphylaxis with innovative features such as voice instructions that help guide a user with step-by-step instructions through the epinephrine delivery process and an automatic retractable needle system, a first for epinephrine auto-injectors, that injects the epinephrine and retracts the needle back into the device within seconds.

- Patients greater than or equal to 30 kg (66 lbs): AUVI-Q 0.3 mg
- Patients 15 to 30 kg (33 to 66 lbs): AUVI-Q 0.15 mg
- Patients 7.5 to 15 kg (16.5 to 33 lbs): AUVI-Q 0.1 mg (new strength recently added)





Inhaler PRIMING TABLE



Medication	Brand Name	Shake Y / N	Priming	Dose Counter
Albuterol HFA	Ventolin	Yes	How much: 4 sprays When :New, dropped , >14 days since last use	Yes
Albuterol HFA	Ciplo	Yes	How much: 3 sprays When :New, > 14 days since last use	Yes
Albuterol HFA	Proventil	Yes	How much: 4 sprays When :New, > 14 days since last use	No
Levalbuterol HFA	Xopenex	Yes	How much: 4 sprays When :New, > 3 days since last use	No
Fluticasone HFA	Flovent	Yes	How much : 4 sprays When:New, Or >7 days since last use How much:1 spray	Yes
Beclomethasone Dipropionate HFA Redi-Haler	QVAR	No	No priming needed—breath activated inhaler	Yes
Fluticasone/Salmeterol HFA	Advair MDI	Yes	How much: 4 sprays When:New How much; 2 sprays When : dropped, or > 4 weeks since last use	Yes
Budesonide/Formoterol HFA	Symbicort	Yes	How much : 2 sprays	Yes
Mometasone /formoterol HFA	Dulera	Yes	How much: 2 sprays When :New , > 5 days since last use	Yes
Ciclesonide HFA	Alvesco	Yes	How much: 3 sprays When :New, > 10 days since last use	Yes
Respimat Device	Spiriva or Combivent	No	How much: 4 sprays When :New,	Yes

The only DPI (Dry powdered inhaler) that needs to be primed is Pulmicort Flexhaler. Prime with 2-3 twists when new. DPIs do not need to be shaken prior to inhalation.

- Remind patients to watch the dose counter and the expiration date. Using inhalers past their expirations dates may not be as effective.



Additional Asthma Management Resources

Breathing Institute: THE BREATHING INSTITUTE (sharepoint.com) Childrens Hospital Colorado Pulmonary and Sleep Medicine serving Colorado and surrounding states providing exceptional asthma, pulmonary and sleep medicine care to children of all ages. #7 in US News and World report 2023.

Medication Assistance Programs

1. www.GoodRx.com

Drug prices vary wildly between pharmacies. GoodRx finds the lowest prices and discounts. Collect and compare prices for every FDA-approved prescription drug at more than 70,000 US pharmacies; Find free coupons to use at the pharmacy; Show the lowest price at each pharmacy near you.

2. **SingleCare: lower Prescription Prices, Discounts & Coupons**

<https://www.singlecare.com>

Savings: Up to 80% with additional savings for refills

Accepted at: 35,000+ pharmacies

Home delivery: Yes, with GeniusRx

3. www.needymeds.com

Programs that provide help for those who want to get their medications through pharmaceutical company patient assistance programs. All are free or charge a small amount. Most help people in limited geographic areas.

4. Colorado Drug Card - Free Statewide Prescription ...

www.coloradodrugcard.com As a resident of Colorado, you have access to a statewide Prescription Assistance Program (PAP). Create and print your *FREE* discount prescription drug card coupon below. This pharmacy coupon card will provide you with Rx medication savings of up to 75% at more than 68,000 pharmacies across the country including Safeway, Walgreens, Albertsons Sav-on, Target, CVS/pharmacy, Kmart, Walmart, and many more.

Other General information websites

Food Allergy, Research and Education

www.foodallergy.org

Food Allergy Research & Education (FARE) works on behalf of the 15 million Americans with food allergies, including all those at risk for life-threatening anaphylaxis. This potentially deadly disease affects 1 in 13 children in the United States – or roughly two in every classroom. FARE's mission is to improve the quality of *life* and the *health* of individuals with food allergies, and to provide them *hope* through the promise of new treatments.

American Latex Allergy Association

latexallergyresources.org

Provides resources for people allergic to natural rubber **latex**, including **latex** free alternative product lists, informational packets, support groups, and a newsletter



Asthma & Allergy Foundation of America

www.aafa.org

The Asthma and Allergy Foundation of America (AAFA), a not-for-profit organization founded in 1953, is the leading patient organization for people with asthma and allergies, and the oldest asthma and allergy patient group in the world. AAFA is dedicated to improving the quality of life for people with asthma and allergic diseases through education, advocacy and research.

www.aafa.org/media/AMEO-Registration-Access-Instructions.pdf

The American Academy of Allergy, Asthma & Immunology

<http://www.aaaai.org/about-aaaai>

The American Academy of Allergy, Asthma & Immunology is dedicated to the advancement of the knowledge and practice of allergy, asthma and immunology for optimal patient care.

American Lung Association

Local and national organization with information about lung disease, smoking and local events.

www.lungcolorado.org

www.lungusa.org

American Association of Respiratory Care

www.aarc.org

Professional site for resources and educational opportunities.

American Thoracic Society

www.thoracic.org

Professional resources for patient education, continuing educational opportunities, research and more.

Allergy & Asthma Network welcomes patients, families and healthcare professionals dedicated to improving health and quality of life for people with asthma or allergies

<http://www.allergyasthmanetwork.com>

[Certified Asthma Educator \(AE-C\) - The National Board for Respiratory Care \(nbrc.org\)](http://www.nbrc.org)

National Asthma Education and Prevention Program (NAEPP)

The goal of the NAEPP is to enhance the quality of life for individuals with asthma and to decrease asthma-related morbidity and mortality

<https://www.nhlbi.nih.gov/about/org/naepp/>

National Jewish Medical & Research Center offers treatment, information, resources and research for pulmonary, cardiac, immune and related conditions

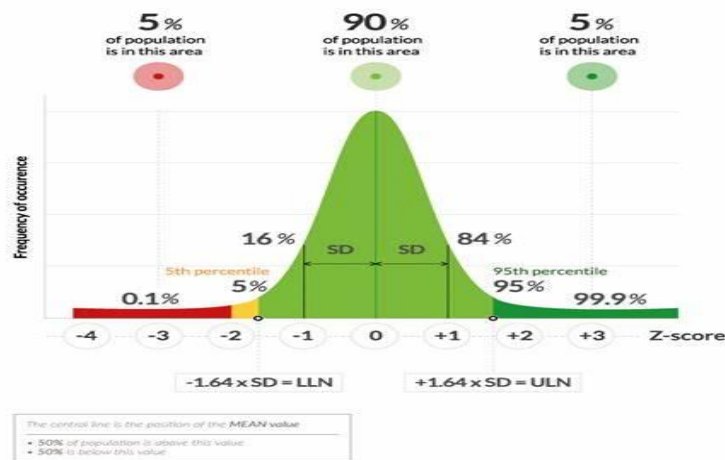
<https://www.nationaljewish.org>

Environmental Protection Agency: EPA's coordinated approach on asthma promotes scientific understanding of environmental asthma triggers and ways to manage asthma in community settings through research, education and outreach. With federal, state and local partners, we are building the nation's capacity to control asthma and manage exposure to indoor and outdoor pollutants linked to asthma

<https://www.epa.gov/asthma>

Z-Scores spirometry interpretation:

2012 Global Initiative using z-scores for spirometry interpretation: The Z-score is calculated by the ratio of the difference between the measured value and that predicted with the residual standard deviation. This simple approach has reduced the false positive results found by the conventional limits of 80% compared to a predicted value or 0.70 in absolute value for the definition of bronchial obstruction that is still used. A spirometry value is considered low if it is more than -1.64 standard deviations from the predicted value (which is the same as the lower 5 percentile).



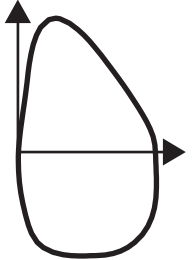
<https://www.spirometry.com/articoli-clinici/interpreting-results-with-gli-2012-using-z-score->

Obstruction	Grade	ATS/ERS 2005	Proposed
Mild	1	>70% pred	z-score \geq -2
Moderate	2	60–69% pred	-2.5 \leq z-score < -2
Moderately severe	3	50–59% pred	-3 \leq z-score < -2.5
Severe	4	35–49% pred	-4 \leq z-score < -3
Very severe	5	<35% pred	z-score < -4

Quanjer PH, Pretto JJ, Brazzale DJ, Boros PW. 'Grading the severity of airways obstruction: new wine in new bottles', Eur Respir J, 2014; 43: 505-512.

Previous spirometry interpretation metrics:

What is normal spirometry?



If the shape is normal,
there is a range of normality.

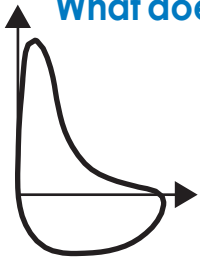
FVC: >80% predicted
FEV1: >80% predicted
FEF25-75: 65-100%
FEV1/FVC (FEV 1%): Norms
based on age +/-5% (of predicted).

FEV₁/FVC:

5-19 yrs ≥ 85%
20-39 yrs ≥ 80%
40-59 yrs ≥ 75%
60-80 yrs ≥ 70%

(NIH references)

What does asthma look like?



Meets the following criteria:

1. Shape of the curve is concave.
2. FEV₁/FVC (FEV1%) is decreased
3. FVC > FEV1 > FEF25-75
4. A 12% and at least 200 ml increase in FEV1 post bronchodilator treatment.

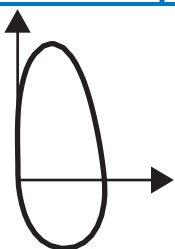
(obstructive/concave
waveform)

For severity rating, the following criteria are suggested:

- **Mild:** 0.00 - 0.04* or >80%
- **Moderate:** 0.05* or 60 - 80%
- **Severe:** <0.05* or <60%

*Note: This value is sometimes expressed as a percent, but this different than the percent predicted.

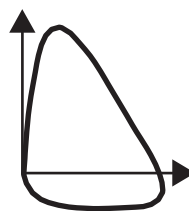
Other flow patterns to look for



Restrictive

Possible causes:

- Obesity
- Pregnancy
- Kyphoscoliosis
- Pulmonary Fibrosis/ILD



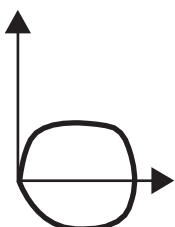
- Foreign body

Variable Extra thoracic Airway Obstruction

Causes:

- Paradoxical vocal cord dysfunction

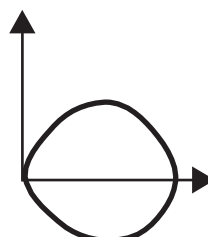
(flattening of inspiratory loop)



Fixed Large Airway Obstruction

Multiple causes:

- Glottic or tracheal stenosis
- Tracheal malacia
- Paratracheal/Intratracheal mass
- Vocal cord paralysis



Variable Intrathoracic Airway Obstruction

Possible causes:

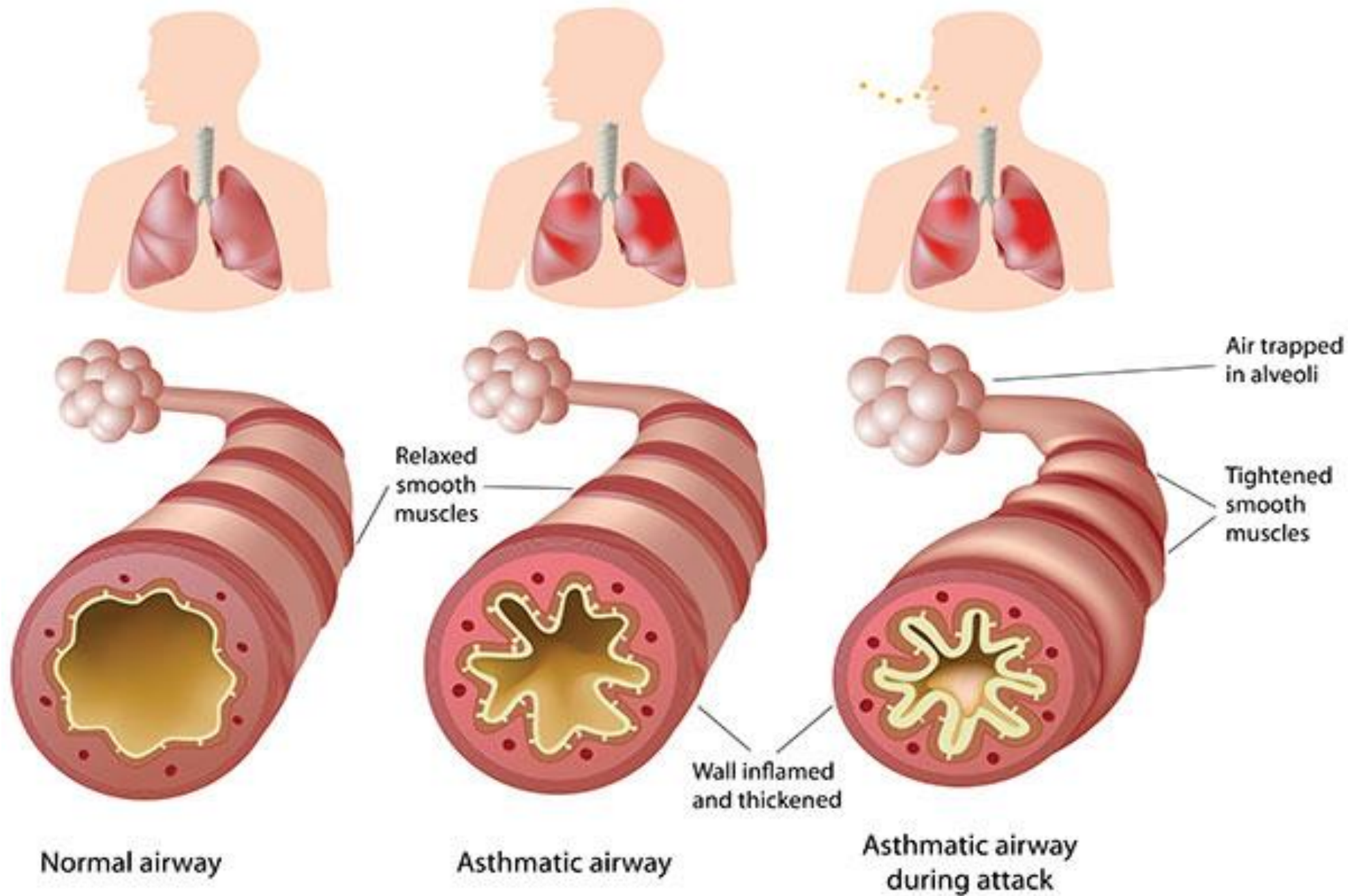
- Movable mass lesion
- Malignancy

The One Minute Interpretation (applies to both methods of spirometry interpretation.)

Check five things:

1. **Is the entry data correct?**
Check age, height, weight, sex and race
2. **Evaluate the quality of the blow**
Good effort with rapid rise to peak flow? Is the curve smooth and reproducible?
3. **What is the shape?**
Normal, obstructive, restrictive or mixed? Is the inspiratory loop cut off?
4. **Look at the percentages for the shape chosen**
Mild, moderate, severe
5. **State your interpretation**
e.g. "mild airway obstruction"

Asthma and Your Airways





SHORT-ACTING BETA₂-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer quick relief of symptoms such as coughing, wheezing and shortness of breath for 3-6 hours

ProAir® Digihaler™
90 mcg
albuterol sulfate
inhalation powder
123 A

ProAir® RespiClick®
90 mcg
albuterol sulfate
inhalation powder
123 A

Proventil® HFA
90 mcg
albuterol sulfate
123 A G

Ventolin® HFA
90 mcg
albuterol sulfate
123 A G

Xopenex® HFA™
45 mcg
levalbuterol tartrate
A G

LONG-ACTING BETA₂-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer lasting relief of symptoms such as coughing, wheezing and shortness of breath for at least 12 hours

Serevent® Diskus®
50 mcg
salmeterol xinafoate
inhalation powder
123 A C

Striverdi® Respimat®
2.5 mcg
olodaterol hydrochloride
123 C

INHALED CORTICOSTEROIDS

reduce and prevent swelling of airway tissue; they do not relieve sudden symptoms of coughing, wheezing or shortness of breath

Alvesco® HFA
80, 160 mcg
ciclesonide
123 A

ArmonAir® Digihaler™
55, 113, 232 mcg
fluticasone propionate
inhalation powder
123 A

Arnuity® Ellipta®
50, 100, 200 mcg
fluticasone furoate inhalation powder
123 A

Asmanex® HFA
50, 100, 200 mcg
mometasone furoate
123 A

Asmanex® Twisthaler®
110, 220 mcg
mometasone furoate
inhalation powder
123 A

Flovent® Diskus®
50, 100, 250 mcg
fluticasone propionate
inhalation powder
123 A

Flovent® HFA
44, 110, 220 mcg
fluticasone propionate
123 A

Pulmicort Flexhaler®
90, 180 mcg
budesonide inhalation powder
123 A

QVAR® Redihaler™
40, 80 mcg
beclomethasone dipropionate
123 A

MUSCARINIC ANTAGONISTS (ANTICHOLINERGIC)

relieve cough, sputum production, wheeze and chest tightness associated with chronic lung diseases

Atrovent® HFA
17 mcg
ipratropium bromide
123 C

Long-acting

Incruse® Ellipta®
62.5 mcg
umeclidinium inhalation powder
123 C

Spiriva® HandiHaler®
18 mcg
tiotropium bromide inhalation powder
C

Spiriva® Respimat®
1.25, 2.5 mcg
tiotropium bromide
123 A C

Tudorza™ Pressair™
400 mcg
acridinium bromide inhalation powder
123 C

COMBINATION MEDICATIONS

contain both short-acting beta₂-agonist and short-acting muscarinic antagonist

Combivent® Respimat®
20/100 mcg
ipratropium bromide and albuterol
123 C

COMBINATION MEDICATIONS

contain both inhaled corticosteroid and long-acting beta₂-agonist (LABA)

Advair Diskus®
100/50, 250/50, 500/50 mcg
fluticasone propionate and salmeterol inhalation powder
123 A C G

Advair® HFA
45/21, 115/21, 230/21 mcg
fluticasone propionate and salmeterol xinafoate
123 A G

AirDuo® Digihaler™
55/14, 113/14, 232/14 mcg
fluticasone propionate and salmeterol inhalation powder
123 A

AirDuo® RespiClick®
55/14, 113/14, 232/14 mcg
fluticasone propionate and salmeterol inhalation powder
123 A G

Breo® Ellipta®
100/25, 200/25 mcg
fluticasone furoate and vilanterol inhalation powder
123 A G

Dulera®
50/5, 100/5, 200/5 mcg
mometasone furoate and formoterol fumarate dihydrate
123 A

Symbicort®
80/4.5, 160/4.5 mcg
budesonide and formoterol fumarate dihydrate
123 A C G

Wixela™ Inhub™
100/50, 250/50, 500/50 mcg
fluticasone propionate and salmeterol xinafoate (approved generic of Advair Diskus)
123 A C

Anoro® Ellipta®
62.5/25 mcg
umeclidinium and vilanterol inhalation powder
123 C

Bevespi Aerosphere®
9/4.8 mcg
glycopyrrolate and formoterol fumarate
123 C

Duaklir® Pressair®
400, 12 mcg
acridinium bromide and formoterol fumarate
123 C

Stiolto™ Respimat®
2.5/2.5 mcg
tiotropium bromide and olodaterol
123 C

contain inhaled corticosteroid, long-acting beta₂-agonist (LABA) and long-acting muscarinic antagonist (LAMA)

Trelegy® Ellipta®
200/62.5/25 mcg, 100/62.5/25 mcg
fluticasone furoate, umeclidinium and vilanterol inhalation powder
123 A C

Breztri Aerosphere™
160/9/4.8 mcg
budesonide, glycopyrrolate and formoterol fumarate
123 C

BIOLOGICS

target cells and pathways that cause airway inflammation; delivered by injection or IV

Cinqair®
reslizumab
A

Dupixent®
dupilumab
A

Fasenra™
benralizumab
A

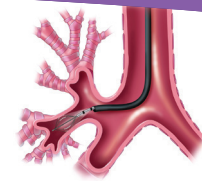
Nucala®
mepolizumab
A

Tezspire™
tezepelumab-ekko
A

Xolair®
omalizumab
A

BRONCHIAL THERMOPLASTY

A minimally invasive procedure that uses mild heat to reduce airway smooth muscle, leading to fewer severe asthma flares, ER visits, and days lost from activities.
www.btfrastrhma.com



PDE4 INHIBITORS

ease lung inflammation and reduce exacerbations

Daliresp®
250, 500 mcg
roflumilast
C

My Asthma Action Plan

Name: _____ Date: _____

Parent/Guardian: _____

Healthcare Provider: _____

Medical Record #: _____

Phone for healthcare provider: _____

Phone for taxi or friend: _____




Traffic light colors help you learn about asthma symptoms and what to do.



RED means **I feel AWFUL**. Get help right away.

YELLOW means **I do NOT feel good**. Add a relief medicine to feel better fast.

GREEN means **I feel GOOD**. Use long-term control medicine.

I feel GOOD	<ul style="list-style-type: none"> Breathing is easy. No cough or wheeze. Can work and play  <p>Peak Flow Numbers: _____ to _____</p>	<input type="checkbox"/> Use asthma long-term control medicine. <table border="1"> <thead> <tr> <th>Medicine:</th> <th>How taken:</th> <th>How much:</th> <th>When:</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____ times a day</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____ times a day</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____ times a day</td> </tr> </tbody> </table> <p>20 minutes before exercise or sports, take _____ puffs of this medicine:</p>				Medicine:	How taken:	How much:	When:	_____	_____	_____	_____ times a day	_____	_____	_____	_____ times a day	_____	_____	_____	_____ times a day				
	Medicine:	How taken:	How much:	When:																					
_____	_____	_____	_____ times a day																						
_____	_____	_____	_____ times a day																						
_____	_____	_____	_____ times a day																						
I do NOT feel good	<ul style="list-style-type: none"> Cough Wheeze Hard to breathe Wake up at night. Can do some, but not all activities.  <p>Peak Flow Numbers: _____ to _____</p>	<p>TAKE _____ puffs of quick-relief medicine. If not back in the Green Zone within 20 to 30 minutes, take _____ more puffs.</p> <table border="1"> <thead> <tr> <th>Medicine:</th> <th>How taken:</th> <th>How much:</th> <th>When:</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____ every _____ hours</td> </tr> </tbody> </table> <p>KEEP USING long-term control medicine:</p> <table border="1"> <thead> <tr> <th>Medicine:</th> <th>How taken:</th> <th>How much:</th> <th>When:</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____ times a day</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____ times a day</td> </tr> </tbody> </table> <p>Call healthcare provider if quick-relief medicine does not work OR if these symptoms happen more than twice a week.</p>				Medicine:	How taken:	How much:	When:	_____	_____	_____	_____ every _____ hours	Medicine:	How taken:	How much:	When:	_____	_____	_____	_____ times a day	_____	_____	_____	_____ times a day
	Medicine:	How taken:	How much:	When:																					
_____	_____	_____	_____ every _____ hours																						
Medicine:	How taken:	How much:	When:																						
_____	_____	_____	_____ times a day																						
_____	_____	_____	_____ times a day																						
I feel AWFUL	<ul style="list-style-type: none"> Medicine does not help. Breathing is hard and fast. Can't walk well. Can't talk. Feel very scared.  <p>Peak Flow Number is Lower than _____</p>	<p>Get help now! Take these quick-relief medicines until you get emergency care.</p> <table border="1"> <thead> <tr> <th>Medicine:</th> <th>How taken:</th> <th>How much:</th> <th>When:</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table> <p>Call 911 if can't walk or talk because it is too hard to breathe OR if lethargic OR if skin is sucked in around neck and ribs during breaths OR if lips or fingernails are gray or blue.</p>				Medicine:	How taken:	How much:	When:	_____	_____	_____	_____	_____	_____	_____	_____								
	Medicine:	How taken:	How much:	When:																					
_____	_____	_____	_____																						
_____	_____	_____	_____																						

COLORADO SCHOOL ASTHMA CARE PLAN

Photo of child

PARENT/GUARDIAN to complete this portion and sign completed form.

Name:	Birth date:
Grade:	Parent/Guardian:
Cell Phone:	Home Phone:
Work Phone:	Other Contact:
Phone:	Preferred Hospital:
School:	Teacher:

Triggers: ☐ Weather (cold air, wind) ☐ Illness ☐ Exercise ☐ Smoke ☐ Dog/Cat ☐ Dust ☐ Pollen

☐ Life threatening allergy: Specify _____

Medication Location: ☐ school office ☐ student possession at all times ☐ other location (list) _____

▪ If there is no quick relief inhaler at school:

- Call parents/guardians to pick up student and/or bring inhaler/ medications to school
- Inform them that if they cannot get to school, 911 may be called

I give permission for school personnel to share this information, follow this plan, administer medication and care for my child and, if necessary, contact our physician. I assume full responsibility for providing the school with prescribed medication and delivery/monitoring devices. I approve this Asthma Care Plan for my child.

PARENT SIGNATURE

DATE

SCHOOL NURSE SIGNATURE

DATE

☐ 504 PLAN OR IEP

HEALTH CARE PROVIDER to complete all items, SIGN and DATE completed form.

GREEN ZONE: Student can do usual activities but should avoid triggers. Asthma is well controlled.

Pretreatment for strenuous activity: ☐ Not Required

Pretreatment for strenuous activity: ☐ Routinely OR ☐ Upon request Explain: (weather, viral, seasonal, other) _____

☐ Give 2 puffs of quick relief med (Check One) ☐ Albuterol ☐ Xopenex ☐ Other: _____ 10-15 minutes before activity.

☐ Repeat in 4 hours if needed for additional or ongoing physical activity.

If currently experiencing symptoms, follow yellow zone.

YELLOW ZONE: SICK – UNCONTROLLED ASTHMA

IF YOU SEE THIS:

- Difficulty breathing
- Wheezing
- Frequent cough
- Complaints of chest tightness
- Unable to tolerate regular activities but still talking in complete sentences
- Peak flow between _____ and _____
- Other: _____

DO THIS:

1. Stop physical activity
2. GIVE QUICK RELIEF MED: (Check One) ☐ Albuterol ☐ Xopenex ☐ Other: _____
☐ 2 puffs ☐ Via spacer ☐ With mask ☐ Other: _____
 - If symptoms do not improve in 10-15 minutes, repeat quick relief medication.
 - Call parents/guardians and school nurse.
3. Stay with student and maintain sitting position.
4. Student may resume normal activities once feeling better.
- * If symptoms do not improve in 10-15 minutes or worsen following quick relief med, follow RED ZONE plan.

RED ZONE: EMERGENCY SITUATION – SEVERE ASTHMA SYMPTOMS

IF YOU SEE THIS:

- Coughs constantly
- Struggles or gasps for breath
- Trouble talking (only speaks 3-5 words)
- Skin of chest and/or neck pull in with breathing
- Lips or fingernails are gray or blue
- ↓ Level of consciousness
- Peak flow < _____

DO THIS IMMEDIATELY:

1. GIVE QUICK RELIEF MED: (Check One): ☐ Albuterol ☐ Xopenex ☐ Other: _____
☐ 2 puffs ☐ Via spacer ☐ With mask ☐ Other: _____
☐ Refer to anaphylaxis plan if student has life threatening allergy.
2. Call 911 and inform EMS the reason for the call.
3. Call parents/guardians and school nurse.
4. Encourage student to take slower deeper breaths.
5. Stay with student and remain calm.
6. If symptoms do not improve, continue to give quick relief medication until EMS arrives.
7. School personnel should not drive student to hospital.

INSTRUCTIONS for QUICK RELIEF INHALER USE: CHECK APPROPRIATE BOX(ES)

- ☐ Student understands the proper use of his/her asthma medications, and in my opinion, can carry and use his/her inhaler at school independently with approval from school nurse.
- ☐ Student is to notify his/her designated school health officials after using inhaler.
- ☐ Student needs supervision or assistance to use his/her inhaler.

HEALTH CARE PROVIDER SIGNATURE

PRINT PROVIDER'S NAME

PHONE/FAX

DATE

Copies of plan provided to: Teacher(s) _____ Phys Ed/Coach _____ Principal _____ Main Office _____ Bus Driver _____ Other _____

CDE Regional Nurse Specialists

Revised April 2015

Asthma Care Quick Reference

DIAGNOSING AND MANAGING ASTHMA

Guidelines from the National Asthma Education and Prevention Program

The goal of this asthma care quick reference guide is to help clinicians provide quality care to people who have asthma.

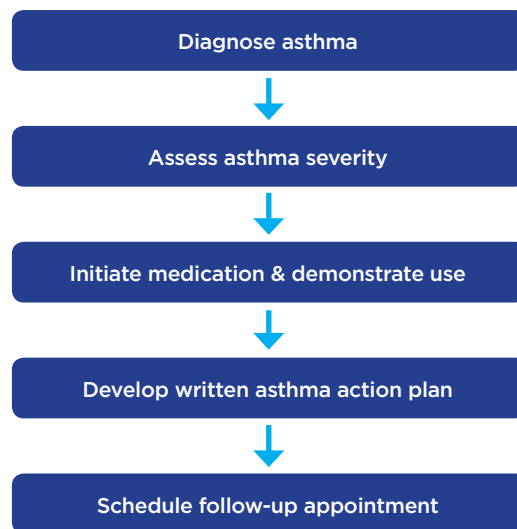
Quality asthma care involves not only initial diagnosis and treatment to achieve asthma control, but also long-term, regular follow-up care to maintain control.

Asthma control focuses on two domains: (1) **reducing impairment**—the frequency and intensity of symptoms and functional limitations currently or recently experienced by a patient; and (2) **reducing risk**—the likelihood of future asthma attacks, progressive decline in lung function (or, for children, reduced lung growth), or medication side effects.

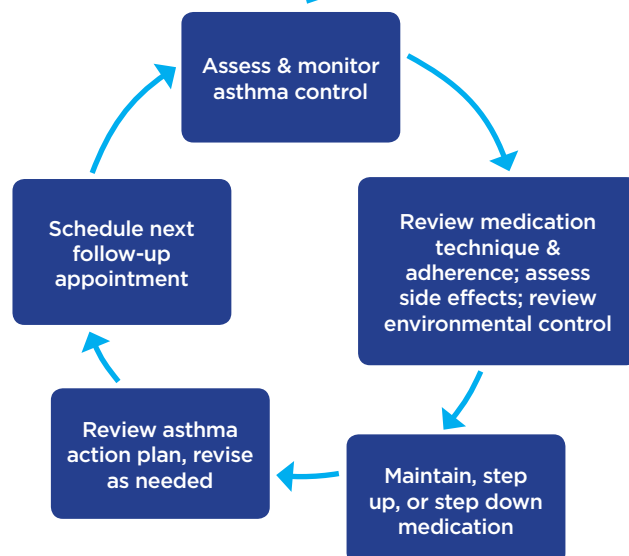
Achieving and maintaining asthma control requires providing appropriate medication, addressing environmental factors that cause worsening symptoms, helping patients learn self-management skills, and monitoring over the long term to assess control and adjust therapy accordingly.

The diagram (right) illustrates the steps involved in providing quality asthma care.

INITIAL VISIT



FOLLOW-UP VISITS



U.S. Department of Health and Human Services
National Institutes of Health
National Heart, Lung, and Blood Institute

KEY CLINICAL ACTIVITIES FOR QUALITY ASTHMA CARE

(See complete table in *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma* [EPR-3])

Clinical Issue	Key Clinical Activities and Action Steps
→ ASTHMA DIAGNOSIS	
	<p>Establish asthma diagnosis.</p> <ul style="list-style-type: none"> Determine that symptoms of recurrent airway obstruction are present, based on history and exam. <ul style="list-style-type: none"> History of cough, recurrent wheezing, recurrent difficulty breathing, recurrent chest tightness Symptoms occur or worsen at night or with exercise, viral infection, exposure to allergens and irritants, changes in weather, hard laughing or crying, stress, or other factors In all patients ≥ 5 years of age, use spirometry to determine that airway obstruction is at least partially reversible. Consider other causes of obstruction.
→ LONG-TERM ASTHMA MANAGEMENT	
GOAL: Asthma Control	<p>Reduce Impairment</p> <ul style="list-style-type: none"> Prevent chronic symptoms. Require infrequent use of short-acting beta₂-agonist (SABA). Maintain (near) normal lung function and normal activity levels. <p>Reduce Risk</p> <ul style="list-style-type: none"> 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.
Assessment and Monitoring	<p>INITIAL VISIT: Assess asthma severity to initiate treatment (see page 5).</p> <p>FOLLOW-UP VISITS: Assess asthma control to determine if therapy should be adjusted (see page 6).</p> <ul style="list-style-type: none"> Assess at each visit: asthma control, proper medication technique, written asthma action plan, patient adherence, patient concerns. Obtain lung function measures by spirometry at least every 1–2 years; more frequently for asthma that is not well controlled. Determine if therapy should be adjusted: Maintain treatment; step up, if needed; step down, if possible. <p>Schedule follow-up care.</p> <ul style="list-style-type: none"> Asthma is highly variable over time. See patients: <ul style="list-style-type: none"> Every 2–6 weeks while gaining control Every 1–6 months to monitor control Every 3 months if step down in therapy is anticipated
Use of Medications	<p>Select medication and delivery devices that meet patient's needs and circumstances.</p> <ul style="list-style-type: none"> Use stepwise approach to identify appropriate treatment options (see page 7). Inhaled corticosteroids (ICSs) are the most effective long-term control therapy. When choosing treatment, consider domain of relevance to the patient (risk, impairment, or both), patient's history of response to the medication, and willingness and ability to use the medication. <p>Review medications, technique, and adherence at each follow-up visit.</p>

KEY CLINICAL ACTIVITIES FOR QUALITY ASTHMA CARE *(continued)*

Clinical Issue	Key Clinical Activities and Action Steps
Patient Education for Self-Management	<p>Teach patients how to manage their asthma.</p> <ul style="list-style-type: none"> Teach and reinforce at each visit: <ul style="list-style-type: none"> Self-monitoring to assess level of asthma control and recognize signs of worsening asthma (either symptom or peak flow monitoring) Taking medication correctly (inhaler technique, use of devices, understanding difference between long-term control and quick-relief medications) <ul style="list-style-type: none"> Long-term control medications (such as inhaled corticosteroids, which reduce inflammation) prevent symptoms. Should be taken daily; will not give quick relief. Quick-relief medications (short-acting beta₂-agonists or SABAs) relax airway muscles to provide fast relief of symptoms. Will not provide long-term asthma control. If used >2 days/week (except as needed for exercise-induced asthma), the patient may need to start or increase long-term control medications. Avoiding environmental factors that worsen asthma <p>Develop a written asthma action plan in partnership with patient/family (sample plan available at www.nhlbi.nih.gov/health/public/lung/asthma/asthma_actplan.pdf).</p> <ul style="list-style-type: none"> Agree on treatment goals. Teach patients how to use the asthma action plan to: <ul style="list-style-type: none"> Take daily actions to control asthma Adjust medications in response to worsening asthma Seek medical care as appropriate Encourage adherence to the asthma action plan. <ul style="list-style-type: none"> Choose treatment that achieves outcomes and addresses preferences important to the patient/family. Review at each visit any success in achieving control, any concerns about treatment, any difficulties following the plan, and any possible actions to improve adherence. Provide encouragement and praise, which builds patient confidence. Encourage family involvement to provide support. <p>Integrate education into all points of care involving interactions with patients.</p> <ul style="list-style-type: none"> Include members of all health care disciplines (e.g., physicians, pharmacists, nurses, respiratory therapists, and asthma educators) in providing and reinforcing education at all points of care.
Control of Environmental Factors and Comorbid Conditions	<p>Recommend ways to control exposures to allergens, irritants, and pollutants that make asthma worse.</p> <ul style="list-style-type: none"> Determine exposures, history of symptoms after exposures, and sensitivities. (In patients with persistent asthma, use skin or in vitro testing to assess sensitivity to perennial indoor allergens to which the patient is exposed.) <ul style="list-style-type: none"> Recommend multifaceted approaches to control exposures to which the patient is sensitive; single steps alone are generally ineffective. Advise all asthma patients and all pregnant women to avoid exposure to tobacco smoke. Consider allergen immunotherapy by trained personnel for patients with persistent asthma when there is a clear connection between symptoms and exposure to an allergen to which the patient is sensitive. <p>Treat comorbid conditions.</p> <ul style="list-style-type: none"> Consider allergic bronchopulmonary aspergillosis, gastroesophageal reflux, obesity, obstructive sleep apnea, rhinitis and sinusitis, and stress or depression. Treatment of these conditions may improve asthma control. Consider inactivated flu vaccine for all patients >6 months of age.

ASTHMA CARE FOR SPECIAL CIRCUMSTANCES

Clinical Issue	Key Clinical Activities and Action Steps
Exercise-Induced Bronchospasm	<p>Prevent EIB.*</p> <ul style="list-style-type: none"> Physical activity should be encouraged. For most patients, EIB should not limit participation in any activity they choose. Teach patients to take treatment before exercise. SABAs* will prevent EIB in most patients; LTRAs,* cromolyn, or LABAs* also are protective. Frequent or chronic use of LABA to prevent EIB is discouraged, as it may disguise poorly controlled persistent asthma. Consider long-term control medication. EIB often is a marker of inadequate asthma control and responds well to regular anti-inflammatory therapy. Encourage a warm-up period or mask or scarf over the mouth for cold-induced EIB.
Pregnancy	<p>Maintain asthma control through pregnancy.</p> <ul style="list-style-type: none"> Check asthma control at all prenatal visits. Asthma can worsen or improve during pregnancy; adjust medications as needed. Treating asthma with medications is safer for the mother and fetus than having poorly controlled asthma. Maintaining lung function is important to ensure oxygen supply to the fetus. ICSs* are the preferred long-term control medication. Remind patients to avoid exposure to tobacco smoke.

MANAGING EXACERBATIONS

Clinical Issue	Key Clinical Activities and Action Steps
Home Care	<p>Develop a written asthma action plan (see Patient Education for Self-Management, page 3).</p> <p>Teach patients how to:</p> <ul style="list-style-type: none"> Recognize early signs, symptoms, and PEF* measures that indicate worsening asthma. Adjust medications (increase SABA* and, in some cases, add oral systemic corticosteroids) and remove or withdraw from environmental factors contributing to the exacerbation. Monitor response. Seek medical care if there is serious deterioration or lack of response to treatment. Give specific instructions on who and when to call.
Urgent or Emergency Care	<p>Assess severity by lung function measures (for ages ≥ 5 years), physical examination, and signs and symptoms.</p> <p>Treat to relieve hypoxemia and airflow obstruction; reduce airway inflammation.</p> <ul style="list-style-type: none"> Use supplemental oxygen as appropriate to correct hypoxemia. Treat with repetitive or continuous SABA,* with the addition of inhaled ipratropium bromide in severe exacerbations. Give oral systemic corticosteroids in moderate or severe exacerbations or for patients who fail to respond promptly and completely to SABA. Consider adjunctive treatments, such as intravenous magnesium sulfate or heliox, in severe exacerbations unresponsive to treatment. <p>Monitor response with repeat assessment of lung function measures, physical examination, and signs and symptoms, and, in emergency department, pulse oximetry.</p> <p>Discharge with medication and patient education:</p> <ul style="list-style-type: none"> Medications: SABA, oral systemic corticosteroids; consider starting ICS* Referral to follow-up care Asthma discharge plan Review of inhaler technique and, whenever possible, environmental control measures

*Abbreviations: EIB, exercise-induced bronchospasm; ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; LTRA, leukotriene receptor antagonist; PEF, peak expiratory flow; SABA, short-acting beta₂-agonist.

INITIAL VISIT: CLASSIFYING ASTHMA SEVERITY AND INITIATING THERAPY (in patients who are not currently taking long-term control medications)

Level of severity (Columns 2–5) is determined by events listed in Column 1 for both impairment (frequency and intensity of symptoms and functional limitations) and risk (of exacerbations). Assess impairment by patient's or caregiver's recall of events during the previous 2–4 weeks; assess risk over the last year. Recommendations for initiating therapy based on level of severity are presented in the last row.

Components of Severity		Intermittent			Mild			Persistent					
		Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years			
Impairment	Symptoms	≤2 days/week			>2 days/week but not daily			Daily					
	Nighttime awakenings	0	≤2x/month			1-2x/month			3-4x/month				
	SABA* use for symptom control (not to prevent EIB*)	≤2 days/week			>2 days/week but not daily			3-4x/month					
	Interference with normal activity	None			Minor limitation			Some limitation					
	Lung function	Normal FEV ₁ between exacerbations			Normal FEV ₁ between exacerbations			Extremely limited					
Risk	→ FEV ₁ * (% predicted)	Not applicable	>80%	>80%	Not applicable	>80%	>80%	Not applicable	60-80%	Not applicable			
	→ FEV ₁ /FVC*		>85%	Normal†		>80%	Normal†	Reduced 5%‡	75-80%	<60%			
	Asthma exacerbations requiring oral systemic corticosteroids†	0-1/year			≥2 exacerb. in 6 months, or wheezing ≥4x per year lasting >1 day AND risk factors for persistent asthma			Generally, more frequent and intense events indicate greater severity.			Generally, more frequent and intense events indicate greater severity.		
Consider severity and interval since last asthma exacerbation. 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 Therapy <small>(See "Stepwise Approach for Managing Asthma Long Term," page 7)</small> <small>The stepwise approach is meant to help, not replace, the clinical decisionmaking needed to meet individual patient needs.</small>	Step 1			Step 2			Step 3 medium-dose ICS* option			Step 3 medium-dose ICS* option or Step 4			
	In 2-6 weeks, depending on severity, assess level of asthma control achieved and adjust therapy as needed. For children 0-4 years old, if no clear benefit is observed in 4-6 weeks, consider adjusting therapy or alternate diagnoses. Consider short course of oral systemic corticosteroids.												

* **Abbreviations:** EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity; ICS, inhaled corticosteroid; SABA, short-acting beta₂-agonist.

+ Normal FEV₁/FVC by age: 8–19 years, 85%; 20–39 years, 80%; 40–59 years, 75%; 60–80 years, 70%.

‡ Data are insufficient to link frequencies of exacerbations with different levels of asthma severity. Generally, more frequent and intense exacerbations (e.g., requiring urgent care, hospital or intensive care admission, and/or oral corticosteroids) indicate greater underlying disease severity. For treatment purposes, patients with ≥2 exacerbations may be considered to have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

FOLLOW-UP VISITS: ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY

Level of control (Columns 2-4) is based on the most severe component of impairment (symptoms and functional limitations) or risk (exacerbations). Assess impairment by patient's or caregiver's recall of events listed in Column 1 during the previous 2-4 weeks and by spirometry and/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. Assess risk by recall of exacerbations during the previous year and since the last visit. Recommendations for adjusting therapy based on level of control are presented in the last row.

Components of Control	Well Controlled			Not Well Controlled			Very Poorly Controlled		
	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years
Symptoms	≤2 days/week	≤2 days/week but not more than once on each day	≤2 days/week	>2 days/week	>2 days/week or multiple times on ≤2 days/week	>2 days/week	>1x/week	≥2x/week	Throughout the day
Nighttime awakenings	≤1x/month		≤2x/month	>1x/month	≥2x/month	1-3x/week	>1x/week	≥2x/week	≥4x/week
Interference with normal activity	None			Some limitation			Extremely limited		
SABA* use for symptom control (not to prevent EIB*)	≤2 days/week			>2 days/week			Several times per day		
Lung function									
➔ FEV ₁ * (% predicted) or peak flow (% personal/best)	Not applicable	>80%	>80%	Not applicable	60-80%	60-80%	Not applicable	<60%	<60%
➔ FEV ₁ /FVC*		>80%	Not applicable		75-80%	Not applicable		<75%	Not applicable
Validated questionnaires†									
➔ ATAQ*	Not applicable	Not applicable	0	Not applicable	Not applicable	1-2	Not applicable	Not applicable	3-4
➔ ACQ*			≤0.75‡			≥1.5			Not applicable
➔ ACT*			≥20			16-19			≤15
Asthma exacerbations requiring oral systemic corticosteroids§	0-1/year			2-3/year	≥2/year	≥2/year	>3/year	≥2/year	
Reduction in lung growth/Progressive loss of lung function	Not applicable	Evaluation requires long-term follow-up care.		Not applicable	Evaluation requires long-term follow-up care.		Not applicable	Evaluation requires long-term follow-up care.	
Treatment-related adverse effects	The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.			Consider severity and interval since last asthma exacerbation.					
Recommended Action for Treatment <small>(See "Stepwise Approach for Managing Asthma Long Term," page 7) The stepwise approach is meant to help, not replace, the clinical decisionmaking needed to meet individual patient needs.</small>	Maintain current step. Regular follow-up 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	Step up 1 step	Consider short course of oral systemic corticosteroids. Step up 1-2 steps. Reevaluate in 2 weeks to achieve control.		
							Before step up in treatment: Review adherence to medication, inhaler technique, and environmental control. If alternative treatment was used, discontinue and use preferred treatment for that step. For side effects, consider alternative treatment options.		

* **Abbreviations:** ACQ, Asthma Control Questionnaire[®]; ACT, Asthma Control Test[™]; ATAQ, Asthma Therapy Assessment Questionnaire[®]; EIB, exercise-induced bronchospasm; FVC, forced vital capacity; FEV₁, forced expiratory volume in 1 second; SABA, short-acting beta₂-agonist.
† Minimal important difference: 1.0 for the ATAQ; 0.5 for the ACQ; not determined for the ACT.
‡ ACQ values of 0.76-1.4 are indeterminate regarding well-controlled asthma.
§ Data are insufficient to link frequencies of exacerbations with different levels of asthma control. Generally, more frequent and intense exacerbations (e.g., requiring urgent care, hospital or intensive care admission, and/or oral corticosteroids) indicate poorer asthma control.



2020 FOCUSED UPDATES TO THE Asthma Management Guidelines



AT-A-GLANCE GUIDE

This At-A-Glance Guide describes a treatment management approach based on recommendations from the *2020 Focused Updates to the Asthma Management Guidelines: A Report from the National Asthma Education and Prevention Program Coordinating Committee Expert Panel Working Group*.¹ Step diagrams from the 2007 Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma (EPR-3) were updated with the new recommendations. The diagrams are intended to help clinicians integrate the new recommendations into clinical care, and are meant to assist, and not replace, clinical judgment or decision-making for individual patient management, with input from individuals with asthma about their preferences.

AGES 0-4 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 0-4 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA and At the start of RTI: Add short course daily ICS [▲]	Daily low-dose ICS and PRN SABA	Daily medium-dose ICS and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily montelukast* or Cromolyn,* and PRN SABA		Daily medium-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast* and PRN SABA	Daily high-dose ICS + montelukast** + oral systemic corticosteroid and PRN SABA

For children age 4 years only, see Step 3 and Step 4 on Management of Persistent Asthma in Individuals Ages 5-11 Years diagram.

Assess Control

- First check adherence, inhaler technique, environmental factors,[▲] and comorbid conditions.
- **Step up** if needed; reassess in 4-6 weeks
- **Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 3 or higher is required. Consider consultation at Step 2.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; SABA, inhaled short-acting beta₂-agonist; RTI, respiratory tract infection; PRN, as needed

[▲] Updated based on the 2020 guidelines.

* Cromolyn and montelukast were not considered for this update and/or have limited availability for use in the United States. The FDA issued a Boxed Warning for montelukast in March 2020.

¹The full-length report, *2020 Focused Updates to the Asthma Management Guidelines: A Report from the National Asthma Education and Prevention Program Coordinating Committee Expert Panel Working Group*, can be accessed at nhlbi.nih.gov/asthmaguidelines.



U.S. Department of Health and Human Services
National Institutes of Health
National Heart, Lung, and Blood Institute

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December 2020

NOTES FOR INDIVIDUALS AGES 0-4 YEARS DIAGRAM

Quick-relief medications	<ul style="list-style-type: none"> Use SABA as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and may require a step up in treatment. Consider short course of oral systemic corticosteroid if exacerbation is severe or individual has history of previous severe exacerbations.
Each step: Assess environmental factors, provide patient education, and manage comorbidities▲	<ul style="list-style-type: none"> In individuals with sensitization (or symptoms) related to exposure to pests‡: conditionally recommend integrated pest management as a single or multicomponent allergen-specific mitigation intervention.▲ In individuals with sensitization (or symptoms) related to exposure to identified indoor allergens, conditionally recommend a multi-component allergen-specific mitigation strategy.▲ In individuals with sensitization (or symptoms) related to exposure to dust mites, conditionally recommend impermeable pillow/mattress covers only as part of a multicomponent allergen-specific mitigation intervention, but not as a single component intervention.▲
Notes	<ul style="list-style-type: none"> If clear benefit is not observed within 4-6 weeks and the medication technique and adherence are satisfactory, the clinician should consider adjusting therapy or alternative diagnoses.
Abbreviations	<p>EIB, exercise-induced bronchoconstriction; SABA, inhaled short-acting beta₂-agonist.</p> <p>▲Updated based on the 2020 guidelines.</p> <p>‡ Refers to mice and cockroaches, which were specifically examined in the Agency for Healthcare Research and Quality systematic review.</p>

WHAT'S NEW (AGES 0-4 YEARS)

- Step 1:** In children ages 0-4 years with recurrent wheezing, a short (7-10 day) course of daily ICS with as-needed SABA for quick-relief therapy is recommended starting at the onset of a respiratory tract infection.
 - ✓ Recurrent wheezing is defined as at least three episodes of wheezing triggered by apparent infection in their lifetime, or two episodes in the past year, and no symptoms between infections.
 - ✓ One regimen, used in two reviewed studies, is budesonide inhalation suspension, 1 mg twice daily for 7 days at the first sign of respiratory tract infection-associated symptoms.
 - ✓ The main benefit during respiratory tract infections is a reduction in exacerbations requiring systemic corticosteroids.
 - ✓ Caregivers can initiate intermittent ICS treatment at home without a visit to a health care provider when they have clear instructions.
 - ✓ This treatment could affect growth. Carefully monitor growth in children who use this treatment.
- Steps 3 and 4:** For children age 4 years only with persistent asthma, see Steps 3 and 4 on Management of Persistent Asthma in Individuals Ages 5-11 Years.
- Each step:**
 - ✓ Consider the severity of an individual's asthma, the small potential benefit, and the extent of previous symptoms and exacerbations when recommending allergen mitigation interventions.

AGES 5-11 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 5-11 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol [▲]	Daily and PRN combination medium-dose ICS-formoterol [▲]	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS + Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA or Daily medium-dose ICS + LTRA* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* + oral systemic corticosteroid or daily high-dose ICS + Theophylline* + oral systemic corticosteroid, and PRN SABA
		Steps 2-4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy [▲]			Consider Omalizumab** [▲]	

Assess Control

- First check adherence, inhaler technique, environmental factors,[▲] and comorbid conditions.
- **Step up** if needed; reassess in 2-6 weeks
- **Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta₂-agonist

[▲] Updated based on the 2020 guidelines.

* Cromolyn, Nedocromil, LTRAs including montelukast, and Theophylline were not considered in this update and/or have limited availability for use in the United States, and/or have an increased risk of adverse consequences and need for monitoring that make their use less desirable. The FDA issued a Boxed Warning for montelukast in March 2020.

** Omalizumab is the only asthma biologic currently FDA-approved for this age range.

NOTES FOR INDIVIDUALS AGES 5-11 YEARS DIAGRAM

Quick-relief medications	<ul style="list-style-type: none"> Use SABA as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. In Steps 3 and 4, the preferred option includes the use of ICS-formoterol 1 to 2 puffs as needed up to a maximum total daily maintenance and rescue dose of 8 puffs (36 mcg).▲ Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and may require a step up in treatment.
Each step: Assess environmental factors, provide patient education, and manage comorbidities▲	<ul style="list-style-type: none"> In individuals with sensitization (or symptoms) related to exposure to pests†: conditionally recommend integrated pest management as a single or multicomponent allergen-specific mitigation intervention.▲ In individuals with sensitization (or symptoms) related to exposure to identified indoor allergens, conditionally recommend a multi-component allergen-specific mitigation strategy.▲ In individuals with sensitization (or symptoms) related to exposure to dust mites, conditionally recommend impermeable pillow/mattress covers only as part of a multicomponent allergen-specific mitigation intervention, but not as a single component intervention.▲
Notes	<ul style="list-style-type: none"> The terms ICS-LABA and ICS-formoterol indicate combination therapy with both an ICS and a LABA, usually and preferably in a single inhaler. Where formoterol is specified in the steps, it is because the evidence is based on studies specific to formoterol. In individuals ages 5-11 years with persistent allergic asthma in which there is uncertainty in choosing, monitoring, or adjusting anti-inflammatory therapies based on history, clinical findings, and spirometry, FeNO measurement is conditionally recommended as part of an ongoing asthma monitoring and management strategy that includes frequent assessment.
Abbreviations	<p>EIB (exercise-induced bronchoconstriction); FeNO (fractional exhaled nitric oxide); ICS (inhaled corticosteroid); LABA (long-acting beta₂-agonist); SABA (inhaled short-acting beta₂-agonist).</p> <p>▲Updated based on the 2020 guidelines.</p> <p>† Refers to mice and cockroaches, which were specifically examined in the Agency for Healthcare Research and Quality systematic review.</p>

WHAT'S NEW (AGES 5-11 YEARS)

- For individuals with mild to moderate persistent asthma who are taking daily ICS treatment (likely adherent with prescribed daily ICS) as a controller, increasing the regular daily ICS dose for short periods is not recommended when symptoms increase or peak flow decreases.
- Steps 2-4:** Subcutaneous immunotherapy (SCIT) is recommended as an adjunct treatment for individuals who have demonstrated allergic sensitization and evidence of worsening asthma symptoms after exposure to the relevant antigen or antigens.
 - ✓ Do not initiate, increase, or administer maintenance SCIT doses while individuals have asthma symptoms.
 - ✓ Do not administer SCIT in individuals with severe asthma.
- Steps 3 and 4:** For individuals with moderate to severe persistent asthma already taking low- or medium-dose ICS, the preferred treatment is a single inhaler with ICS-formoterol (referred to as single maintenance and reliever therapy, or “SMART”) used both daily and as needed.
 - ✓ Individuals with a severe exacerbation in the prior year are particularly good candidates for SMART to reduce exacerbations.
 - ✓ Do not use ICS-formoterol as reliever therapy in individuals taking ICS-salmeterol as maintenance therapy.
 - ✓ Individuals whose asthma is uncontrolled on maintenance ICS-LABA with SABA as quick-relief therapy should receive the preferred SMART if possible before moving to a higher step of therapy.
 - ✓ In children ages 4-11 years, there may be a lower risk of growth suppression among those taking SMART versus daily higher-dose ICS treatment.
- Steps 5 and 6:** Consider Omalizumab, the only FDA-approved asthma biologic for this age group.
- Each step:**
 - ✓ Consider the severity of an individual's asthma, the small potential benefit, and the extent of previous symptoms and exacerbations when recommending allergen mitigation interventions.

AGES 12+ YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 12+ Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6 [■]
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA or PRN concomitant ICS and SABA [▲]	Daily and PRN combination low-dose ICS-formoterol [▲]	Daily and PRN combination medium-dose ICS-formoterol [▲]	Daily medium-high dose ICS-LABA + LAMA and PRN SABA [▲]	Daily high-dose ICS-LABA + oral systemic corticosteroids + PRN SABA
Alternative		Daily LTRA* and PRN SABA or Cromolyn,* or Nedocromil,* or Zileuton,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LAMA, [▲] or daily low-dose ICS + LTRA,* and PRN SABA or Daily low-dose ICS + Theophylline* or Zileuton,* and PRN SABA	Daily medium-dose ICS-LABA or daily medium-dose ICS + LAMA, and PRN SABA [▲] or Daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* or daily medium-dose ICS + Zileuton,* and PRN SABA	Daily medium-high dose ICS-LABA or daily high-dose ICS + LTRA,* and PRN SABA	
		Steps 2–4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy [▲]			Consider adding Asthma Biologics (e.g., anti-IgE, anti-IL5, anti-IL5R, anti-IL4/IL13)**	

Assess Control

- First check adherence, inhaler technique, environmental factors,[▲] and comorbid conditions.
- **Step up** if needed; reassess in 2–6 weeks
- **Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Abbreviations: ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; LAMA, long-acting muscarinic antagonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta₂-agonist

[▲] Updated based on the 2020 guidelines.

* Cromolyn, Nedocromil, LTRAs including Zileuton and montelukast, and Theophylline were not considered for this update, and/or have limited availability for use in the United States, and/or have an increased risk of adverse consequences and need for monitoring that make their use less desirable. The FDA issued a Boxed Warning for montelukast in March 2020.

** The AHRQ systematic reviews that informed this report did not include studies that examined the role of asthma biologics (e.g. anti-IgE, anti-IL5, anti-IL5R, anti-IL4/IL13). Thus, this report does not contain specific recommendations for the use of biologics in asthma in Steps 5 and 6.

■ Data on the use of LAMA therapy in individuals with severe persistent asthma (Step 6) were not included in the AHRQ systematic review and thus no recommendation is made.

NOTES FOR INDIVIDUALS AGES 12+ YEARS DIAGRAM

Quick-relief medications	<ul style="list-style-type: none"> Use SABA as needed for symptoms. The intensity of treatment depends on the severity of symptoms: up to 3 treatments at 20-minute intervals as needed. In steps 3 and 4, the preferred option includes the use of ICS-formoterol 1 to 2 puffs as needed up to a maximum total daily maintenance and rescue dose of 12 puffs (54 mcg).▲ Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and may require a step up in treatment.
Each step: Assess environmental factors, provide patient education, and manage comorbidities▲	<ul style="list-style-type: none"> In individuals with sensitization (or symptoms) related to exposure to pests†: conditionally recommend integrated pest management as a single or multicomponent allergen-specific mitigation intervention.▲ In individuals with sensitization (or symptoms) related to exposure to identified indoor allergens, conditionally recommend a multi-component allergen-specific mitigation strategy.▲ In individuals with sensitization (or symptoms) related to exposure to dust mites, conditionally recommend impermeable pillow/mattress covers only as part of a multicomponent allergen-specific mitigation intervention, but not as a single component intervention.▲
Notes	<ul style="list-style-type: none"> The terms ICS-LABA and ICS-formoterol indicate combination therapy with both an ICS and a LABA, usually and preferably in a single inhaler. Where formoterol is specified in the steps, it is because the evidence is based on studies specific to formoterol. In individuals ages 12 years and older with persistent allergic asthma in which there is uncertainty in choosing, monitoring, or adjusting anti-inflammatory therapies based on history, clinical findings, and spirometry, FeNO measurement is conditionally recommended as part of an ongoing asthma monitoring and management strategy that includes frequent assessment. Bronchial thermoplasty was evaluated in Step 6. The outcome was a conditional recommendation against the therapy.
Abbreviations	<p>EIB, exercise-induced bronchoconstriction; FeNO, fractional exhaled nitric oxide; ICS, inhaled corticosteroid; LABA, long-acting beta₂-agonist; SABA, inhaled short-acting beta₂-agonist.</p> <p>▲Updated based on the 2020 guidelines.</p> <p>†Refers to mice and cockroaches, which were specifically examined in the Agency for Healthcare Research and Quality systematic review.</p>

WHAT'S NEW (AGES 12+ YEARS)

- For individuals with mild to moderate persistent asthma who are taking daily ICS treatment (likely adherent with prescribed daily ICS) as a controller, increasing the regular daily ICS dose for short periods is not recommended when symptoms increase or peak flow decreases.
- Step 2:** For individuals with mild persistent asthma, either of the following two treatments are recommended as part of Step 2 therapy: 1) a daily low-dose ICS and as-needed SABA for quick-relief therapy, or 2) intermittent as-needed SABA and ICS used one after the other for worsening asthma.
 - ✓ One approach to intermittent therapy is two to four puffs of albuterol followed by 80–250 mcg of beclomethasone equivalent every 4 hours as needed for asthma symptoms.
 - ✓ Intermittent therapy can be initiated at home with regular provider follow-up to ensure that the intermittent regimen is still appropriate.
 - ✓ Individuals with either low or high perception of symptoms may not be good candidates for as-needed ICS therapy. Daily low-dose ICS with as-needed SABA may be preferred.
- Steps 2–4:** Subcutaneous immunotherapy (SCIT) is recommended as an adjunct treatment for individuals who have demonstrated allergic sensitization and evidence of worsening asthma symptoms after exposure to the relevant antigen or antigens.
 - ✓ Do not initiate, increase, or administer maintenance SCIT doses while individuals have asthma symptoms.
 - ✓ Do not administer SCIT in individuals with severe asthma.
- Steps 3 and 4:** For individuals with moderate to severe persistent asthma already taking low- or medium-dose ICS, the preferred treatment is a single inhaler with ICS-formoterol (referred to as single maintenance and reliever therapy, or “SMART”) used both daily and as needed.
 - ✓ Individuals with a severe exacerbation in the prior year are particularly good candidates for SMART to reduce exacerbations.
 - ✓ Do not use ICS-formoterol as reliever therapy in individuals taking ICS-salmeterol as maintenance therapy.
 - ✓ Individuals whose asthma is uncontrolled on maintenance ICS-LABA with SABA as quick-relief therapy should receive the preferred SMART if possible before moving to a higher step of therapy.
- Each step:**
 - ✓ Consider the severity of an individual's asthma, the small benefit, and the extent of previous symptoms and exacerbations when recommending allergen mitigation interventions.

EDUCATIONAL RESOURCES

National Heart, Lung, and Blood Institute

- Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma (EPR-3)
www.nhlbi.nih.gov/guidelines/asthma
- Physician Asthma Care Education (PACE): www.nhlbi.nih.gov/health/prof/lung/asthma/pace/
- National Asthma Control Initiative (NACI): <http://naci.nhlbi.nih.gov>

Allergy & Asthma Network Mothers of Asthmatics
800-878-4403
www.aanma.org

**American Academy of Allergy, Asthma,
and Immunology**
414-272-6071
www.aaaai.org

American Academy of Pediatrics
847-434-4000
www.aap.org

American Association of Respiratory Care
972-243-2272
www.aarc.org

American College of Chest Physicians
847-498-1400
www.chestnet.org

American College of Allergy, Asthma & Immunology
847-427-1200
www.acaai.org

American Lung Association
800-LUNG-USA (800-586-4872)
www.lungusa.org

American School Health Association
800-445-2742
www.ashaweb.org

Asthma and Allergy Foundation of America
800-7-ASTHMA (800-727-8462)
<http://aafa.org>

Centers for Disease Control and Prevention
800-CDC-INFO (800-232-4636)
www.cdc.gov/asthma

**Environmental Protection Agency/
Asthma Community Network**
www.asthmacommunitynetwork.org
800-490-9198 (to order EPA publications)
www.epa.gov/asthma/publications.html

National Association of School Nurses
240-821-1130
www.nasn.org

For more information contact:

NHLBI Information Center
P.O. Box 30105
Bethesda, MD 20824-0105
Phone: 301-592-8573
Fax: 301-592-8563
Web site: www.nhlbi.nih.gov

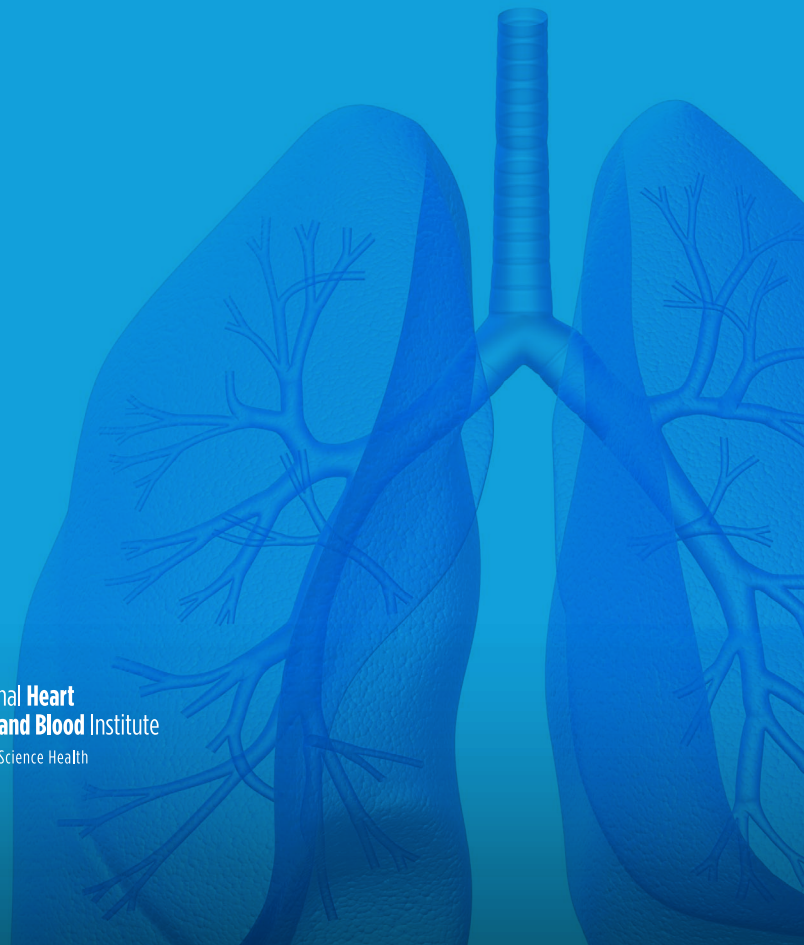


U.S. Department of Health and Human Services
National Institutes of Health



**National Heart
Lung and Blood Institute**
People Science Health

NIH Publication No. 12-5075
Originally Printed June 2002
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Pediatric/Adolescent Asthma Therapy Assessment Questionnaire

Patient Name: _____

ID Number: _____

Physician Name: _____ Date: _____

Please have the parent or guardian complete this questionnaire.

INSTRUCTIONS: Check 1 answer to each question and enter point value (0 or 1) on line

Control Issues Other Issues

1. In the past 4 weeks, did your child:

- | | | | |
|--|----------------------------------|---------------------------------|-------------------------------------|
| a) Have wheezing or difficulty breathing when exercising? | <input type="checkbox"/> Yes (1) | <input type="checkbox"/> No (0) | <input type="checkbox"/> Unsure (1) |
| b) Have wheezing during the day when not exercising? | <input type="checkbox"/> Yes (1) | <input type="checkbox"/> No (0) | <input type="checkbox"/> Unsure (1) |
| c) Wake up at night with wheezing or difficulty breathing? | <input type="checkbox"/> Yes (1) | <input type="checkbox"/> No (0) | <input type="checkbox"/> Unsure (1) |
| d) Miss days of school because of his/her asthma? | <input type="checkbox"/> Yes (1) | <input type="checkbox"/> No (0) | <input type="checkbox"/> Unsure (1) |
| e) Miss any daily activities (such as playing, going to a friend's house, or any family activity) because of asthma? | <input type="checkbox"/> Yes (1) | <input type="checkbox"/> No (0) | <input type="checkbox"/> Unsure (1) |

2. Does your child use an inhaler or a nebulizer for quick relief from asthma symptoms?*

☐ Yes ☐ No ☐ Unsure

(If Yes) In the past 4 weeks, what was the greatest number of times in 1 day your child used this inhaler/nebulizer?

- | | | | |
|--------|-------------------------------|--------------------------|------------------------------|
| 0 | <input type="checkbox"/> (0) | 5 to 6 | <input type="checkbox"/> (1) |
| 1 to 2 | <input type="checkbox"/> (0) | More than 6 | <input type="checkbox"/> (1) |
| 3 to 4 | <input type="checkbox"/> (1)* | Enter score _____ | |

3. Has your child ever had a prescription for an asthma medicine that is NOT used for quick relief but is used to control his/her asthma?

☐ Yes ☐ No ☐ Unsure

(If Yes or Unsure) What best describes how your child takes this medicine now?

- | | | | |
|--|------------------------------|--|------------------------------|
| Takes it every day | <input type="checkbox"/> (0) | Only takes it when he/she has symptoms | <input type="checkbox"/> (1) |
| Takes it some days, but not other days | <input type="checkbox"/> (1) | Never takes it | <input type="checkbox"/> (1) |
| Used to take it, but now does not | <input type="checkbox"/> (1) | Enter score _____ | |

4. Are you dissatisfied with any part of your child's current asthma treatment?

☐ Yes (1) ☐ No (0) ☐ Unsure (1)

5. Do you believe that:

- | | | | |
|---|----------------------------------|---------------------------------|-------------------------------------|
| a) Your child's asthma was well controlled in the past 4 weeks? | <input type="checkbox"/> Yes (0) | <input type="checkbox"/> No (1) | <input type="checkbox"/> Unsure (1) |
| b) Your child is able to take his/her asthma medicine(s) as directed? | <input type="checkbox"/> Yes (0) | <input type="checkbox"/> No (1) | <input type="checkbox"/> Unsure (1) |
| c) Your child's medicine(s) is useful for controlling his/her asthma? | <input type="checkbox"/> Yes (0) | <input type="checkbox"/> No (1) | <input type="checkbox"/> Unsure (1) |

6. During this office visit, would you like the doctor to discuss:

- | | |
|---|------------------------------|
| a) Different types of drugs available to control asthma? | <input type="checkbox"/> (1) |
| b) Your child's asthma treatment options? | <input type="checkbox"/> (1) |
| c) How your child prefers to take his/her asthma medicine(s)? | <input type="checkbox"/> (1) |
| d) Other issues? | <input type="checkbox"/> (1) |

Enter score _____

Add numbers in the light blue area and enter total SCORE here.

Add numbers in the dark blue area and enter total SCORE here.

If either SCORE is 1 or greater, discuss questionnaire with your doctor.

TOTAL _____

TOTAL _____

*This reflects a lower threshold to identify potential control problems than was used in the ATAQ validation studies. This modification was designed to encourage patients and providers to discuss how asthma medications are being used.

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)

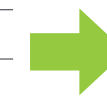
My best peak flow is: _____

Daily Medications

Medicine

How much to take

When to take it



Before exercise

☐ _____

☐ 2 or ☐ 4 puffs

5 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)

1st



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

_____ Number of puffs
(quick-relief medicine)

Can repeat every _____ minutes

or ☐ Nebulizer, once

up to maximum of _____ doses

2nd



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: _____ Number of puffs or ☐ Nebulizer
(quick-relief medicine)

☐ Add: _____ mg per day For _____ (3-10) days
(oral steroid)

☐ 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,
- 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:

☐ _____ Number of puffs or ☐ Nebulizer
(quick-relief medicine)

☐ _____ mg
(oral steroid)

Then call your doctor NOW. Go to the hospital or call an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

DANGER SIGNS

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



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

HOW TO CONTROL THINGS THAT MAKE YOUR ASTHMA WORSE

This guide suggests things you can do to avoid your asthma triggers. Put a check next to the triggers that you know make your asthma worse and ask your doctor to help you find out if you have other triggers as well. Keep in mind that controlling any allergen usually requires a combination of approaches, and reducing allergens is just one part of a comprehensive asthma management plan. Here are some tips to get started. These tips tend to work better when you use several of them together. Your health care provider can help you decide which ones may be right for you.

ALLERGENS

☐ Dust Mites

These tiny bugs, too small to see, can be found in every home—in dust, mattresses, pillows, carpets, cloth furniture, sheets and blankets, clothes, stuffed toys, and other cloth-covered items. If you are sensitive:

- Mattress and pillow covers that prevent dust mites from going through them should be used along with high efficiency particulate air (HEPA) filtration vacuum cleaners.
- Consider reducing indoor humidity to below 60 percent. Dehumidifiers or central air conditioning systems can do this.

☐ Cockroaches and Rodents

Pests like these leave droppings that may trigger your asthma. If you are sensitive:

- Consider an integrated pest management plan.
- Keep food and garbage in closed containers to decrease the chances for attracting roaches and rodents.
- Use poison baits, powders, gels, or paste (for example, boric acid) or traps to catch and kill the pests.
- If you use a spray to kill roaches, stay out of the room until the odor goes away.

☐ Animal Dander

Some people are allergic to the flakes of skin or dried saliva from animals with fur or hair. If you are sensitive and have a pet:

- Consider keeping the pet outdoors.
- Try limiting to your pet to commonly used areas indoors.

☐ Indoor Mold

If mold is a trigger for you, you may want to:

- Explore professional mold removal or cleaning to support complete removal.
- Wear gloves to avoid touching mold with your bare hands if you must remove it yourself.
- Always ventilate the area if you use a cleaner with bleach or a strong smell.

☐ Pollen and Outdoor Mold

When pollen or mold spore counts are high you should try to:

- Keep your windows closed.
- If you can, stay indoors with windows closed from late morning to afternoon, when pollen and some mold spore counts are at their highest.
- If you do go outside, change your clothes as soon as you get inside, and put dirty clothes in a covered hamper or container to avoid spreading allergens inside your home.
- Ask your health care provider if you need to take or increase your anti-inflammatory medicine before the allergy season starts.

IRRITANTS

☐ Tobacco Smoke

- If you smoke, visit smokefree.gov or ask your health care provider for ways to help you quit.
- Ask family members to quit smoking.
- Do not allow smoking in your home or car.

☐ Smoke, Strong Odors, and Sprays

- If possible, avoid using a wood-burning stove, kerosene heater, or fireplace. Vent gas stoves to outside the house.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, and paints.

☐ Vacuum Cleaning

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you must vacuum yourself, using HEPA filtration vacuum cleaners may be helpful.

☐ Other Things That Can Make Asthma Worse

- Sulfites in foods and beverages: Do not drink beer or wine or eat dried fruit, processed potatoes, or shrimp if they cause asthma symptoms.
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.
- Other medicines: Tell your doctor about all the medicines you take. Include cold medicines, aspirin, vitamins and other supplements, and nonselective beta-blockers (including those in eye drops).



U.S. Department of Health and Human Services
National Institutes of Health



NIH Publication No. 20-HL-5251
February 2021

For more information and resources on asthma,
visit nhlbi.nih.gov/BreatheBetter.

LEARN MORE
BREATHE BETTER™

FOR PATIENTS:

Take the Asthma Control Test™ (ACT) for people 12 yrs and older. Know your score. Share your results with your doctor.

Step 1 Write the number of each answer in the score box provided.

Step 2 Add up each score box for your total.

Step 3 Take the test to the doctor to talk about your score.

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
-----------------	---	------------------	---	------------------	---	----------------------	---	------------------	---

Score

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
-----------------------	---	-------------------	---	---------------------	---	-----------------	---	-----------------------	---



The American Lung Association supports the Asthma Control Test and does not endorse products.

Copyright 2002, by QualityMetric Incorporated.
 Asthma Control Test is a trademark of QualityMetric Incorporated.

Total

If your score is 19 or less, your asthma may not be controlled as well as it could be. Talk to your doctor.

FOR PHYSICIANS:

The ACT is:

- Clinically validated by spirometry and specialist assessment¹
- Supported by the American Lung Association
- A self-administered, brief, 5-question assessment that can help you assess your patients' asthma during the past 4 weeks

Reference: 1. Nathan RA et al. *J Allergy Clin Immunol*. 2004;113:59-65.



GlaxoSmithKline

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Childhood Asthma Control Test for children 4 to 11 years old. Know the score.

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

This test will provide a score that may help your doctor determine if your child's asthma treatment plan is working or if it might be time for a change.

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.

Have your child complete these questions.

1. How is your asthma today?

 0 Very bad	 1 Bad	 2 Good	 3 Very good
---	--	---	--

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

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

3. Do you cough because of your asthma?

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

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

 0 Yes, all of the time.	 1 Yes, most of the time.	 2 Yes, some of the time.	 3 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 Not at all	4 1-3 days	3 4-10 days	2 11-18 days	1 19-24 days	0 Everyday
------------------------	----------------------	-----------------------	------------------------	------------------------	----------------------

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

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

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

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

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. Bring this test to the doctor to talk about the results.

**19
or less**

SCORE

TOTAL

Single Maintenance and Reliever Therapy (SMART)

What are the names for these medicines?

Generic: mometasone furoate and formoterol fumarate, budesonide and formoterol fumarate

Brand Name: Dulera®, Symbicort®

What do these medicines do?

- SMART therapy for asthma means needing only one inhaler for both “daily” and “quick relief” asthma treatment.
- A SMART treatment inhaler has two medicines combined into one device:
 - A steroid that helps with airway inflammation (swelling in the airways that make it harder to breathe)
 - A long acting bronchodilator (LABA) - this relaxes smooth muscles in the airways, stopping you from coughing, wheezing, having chest tightness or shortness of breath.
- This therapy is for children 5 years and older

How are these medicines taken?

These medicines are breathed in with an inhaler and valve holding chamber or spacer.

When your asthma is well controlled (you don't have asthma symptoms)

- Take this medicine twice a day.

When you are experiencing asthma symptoms (cough, shortness of breath, wheeze)

- You should continue to take this medicine twice each day and start taking 2 puffs every 4 hours for a maximum of 8 puffs (5 to 11 years) or 12 puffs (12 years and older) in 24 hours
- If your doctor has prescribed Albuterol (Proair®, Ventolin®, Proventil®) or Levalbuterol (Xopenex®), take them after you have reached your maximum number of puffs of your SMART inhaler in a day **AND** call your doctor.
- Your doctor may also prescribe Albuterol or Xopenex® for you to take instead of your SMART inhaler when you are at school or away from home for asthma symptoms or increased activity/exercise

What are the side effects of these medicines?

The effects of poorly controlled asthma are worse than the possible side effects of inhaled steroids. To avoid side effects, your doctor will prescribe the lowest dose of inhaled steroid possible to control asthma symptoms. If you/your child uses high doses of inhaled steroids over long periods of time, side effects may include:

- delayed growth
- weak bones (osteopenia)
- vision changes

Another rare side effect is Thrush, a yeast infection in the mouth and throat. Thrush causes a white coating on the tongue or inside the cheeks. Your child should brush their teeth and rinse and spit after taking an inhaled steroid to lower their risk of getting Thrush.

Please talk to your/your child's doctor if you have any concerns about medicine side effects or if your child has any side effect symptoms.

Care of Respimat Inhaler

- Wipe the mouthpiece inside and out once a week with a damp cloth
- Any slight discoloration of the mouthpiece will not affect the performance of the inhaler.
- Do not take the inhaler apart or remove the transparent base once the cartridge has been inserted.
- Store at room temperature and keep the inhaler dry.

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Author: Asthma Education Standards Committee | Approved by Patient Education Committee | Valid through 2020

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15TH ANNUAL

Reach the Peak Asthma and Allergy Overview and Update

Children's Hospital Colorado Patient Handouts

- ✓ What is Asthma?
- ✓ Asthma Triggers
- ✓ What is an Asthma Action Plan?
- ✓ Choosing the Correct Inhaler Device
- ✓ Inhaled Steroids
- ✓ Oral Steroid Bursts
- ✓ Inhaled Bronchodilators
- ✓ Combination Controller Medicines
- ✓ Metered Dose Inhalers (MDI)
- ✓ Diskus
- ✓ Ellipta Inhaler
- ✓ Flexhaler
- ✓ INHUB: fluticasone and salmeterol
- ✓ QVAR RediHaler
- ✓ RespiClick Inhaler
- ✓ Respimat Soft Mist Inhaler
- ✓ Twisthaler
- ✓ Home "Acorn" Nebulizers
- ✓ How to Use a Peak Flow Meter
- ✓ Nasal Steroid Spray Technique

What is Asthma?

Asthma is a lung disease. There is no cure, but asthma can be well controlled so that your child can be healthy and enjoy all their favorite activities.

Asthma causes the airways (breathing tubes in the lungs) to get smaller, making it hard to breathe. Common symptoms of asthma are:

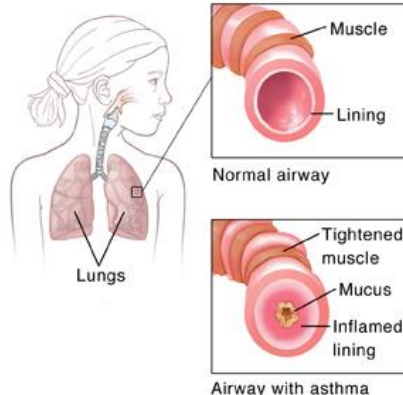
- coughing
- wheezing
- chest tightness
- trouble breathing
- waking at night with cough or trouble breathing

These symptoms may continue but will get better with asthma medicines.

How does asthma make it hard to breathe?

When a child is having asthma symptoms, three things are happening in the lungs.

1. **Inflammation (swelling)** inside of the airway. This means there is less room for air to get in and out of the airway.
2. **Bronchospasms** are when the muscles wrapped around the outside of the airway tighten down. This also means there is less room for air to get in and out.
3. **More mucus** is made than a person without asthma and it can block the airways.



What are triggers and how do they cause an asthma attack?

Lots of things can cause an asthma attack. The things that cause asthma attacks are called triggers. Each child has different triggers for their asthma. Some common triggers are:

- Cigarette smoke (tobacco, marijuana, e-cig)
- Colds and other viruses that affect the nose, throat, airways, and lungs
- Exercise
- Perfumes and other strong smells
- Cold air, weather changes
- Air pollution
- Worry, stress, emotions
- Pollen, dust, molds, animal dander

What other comorbidities (conditions) can occur along with asthma?

- Allergies
- Eczema
- Obstructive sleep apnea
- Obesity
- GERD (gastroesophageal reflux disease)
- Stress, anxiety, depression

Medicines

Medicines are used to treat asthma. They make symptoms better by decreasing swelling and bronchospasm. There are three main types of medicine for asthma.

1. **Quick relief inhalers**, like albuterol, quickly relax the muscles around the airways and should make the asthma attack better within 5-10 minutes. These medicines are also called bronchodilators.
2. **Controller medicines** or inhaled steroids are medicines that help to lessen swelling inside the airways, but they don't work fast enough to stop symptoms during an asthma attack. They need to be taken every day, even when your child feels good. This is because they prevent asthma symptoms and attacks. Your child should continue to take these medicines every day as prescribed (especially during increased asthma symptoms).
3. **Oral steroids** may be needed during an asthma attack for asthma symptoms that don't get better with albuterol alone.

All medications may have side effects. Tell your child's doctor about any worries you have about side effects from your child's medicines. It is very important to follow the directions in the asthma action plan on when and how to use your child's asthma medicines.

Asthma control

Asthma is well controlled when:

- Your child can run and play as much as they want
- Your child doesn't miss school, work, or activities
- Your child sleeps well at night
- You can't remember the last time your child had to visit the ER (emergency room) for asthma

Remember the Rules of Two® to check for asthma control

Does your child:

- Have asthma symptoms or take their quick-relief inhaler more than two times a week (not counting pre-treatment for exercise)?
- Wake up at night with asthma symptoms more than two times a month (when feeling well)?
- Refill their quick relief inhaler more than two times a year?

If you answered "yes" to any of these questions, then your child's asthma is not well controlled. Please talk with your child's doctor.

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Follow your “Asthma Action Plan” and get EMERGENCY CARE for asthma if your child has these symptoms

- It's hard to breathe while walking or talking
- The muscles in your child's neck, chest, or ribs are pulling in or your child's nostrils are flaring with each breath
- The quick relief inhaler isn't working, and your child is getting worse
- Your child's peak air flow is below 50% of their normal
- Your child's skin or lips look blue, they pass out, or they cannot breathe. **If this happens, call 911 right away.**

Asthma Triggers

Children with asthma have sensitive airways and many things around them can make their asthma worse. The things around your child that cause an asthma attack are called triggers. Triggers are different for each child. Their doctor can help figure out what their triggers are. Try to keep your child away from these triggers, especially at home and school where your child spends most of their time.

If your child has asthma symptoms such as cough, trouble breathing, or wheezing, follow their “Asthma Action Plan”.

Common asthma triggers:

Irritants

Smoke

- Being around smoke can be harmful to a child with asthma and increases the chance of having an asthma attack.

Tobacco or Marijuana Smoke

- DO NOT let anyone smoke inside your house or car
- If you can, quit smoking
 - Call 1-800-QUIT-NOW (1-800-784-8669) for help from the Colorado Quitline
- You should only smoke outside
 - Wear a “smoking jacket” and leave it outside
- Wash your hands after smoking
- Keep your child away from places where people smoke
- Also avoid electronic cigarettes and vaping



Wood Smoke

- Don't use a wood burning stove for heat or a wood fireplace
- Avoid campfires



Strong Smells

- Don't use air fresheners, perfume, cologne, room spray, or hair spray
 - The strong smells can trigger an asthma attack
- Use unscented cleaning products



Pollution

- When the pollution is high, have your child stay indoors



Illness

- Your child should avoid people who are sick
- Make sure your child gets a flu shot every year
- Follow your child's “Asthma Action Plan”




Cold Air

- Have your child wear a clean scarf or pull their turtleneck around their face
- Tell your child to breathe through their nose when they are outside in the cold air
- Your child can also take 2 puffs of albuterol before going outside when it's cold



Allergens


Pollen & Outdoor Mold

- 
- Keep house and car windows closed during allergy season
 - Use central air conditioning or fans when you can
 - Mow your lawn often and keep the grass short to cut down on pollen
 - If your child is allergic to grass, they shouldn't mow the lawn
 - You can check pollen counts online or in local weather reports
 - Stay indoors when pollen and mold counts are high
 - Have your child take a shower and change their clothes after being outside during high-pollen seasons
 - Don't hang your clothes outside to dry
 - Talk to your doctor about allergy medicines and saline nasal rinses


Indoor Mold

- Keep your bathrooms and kitchen clean and well ventilated
- If you find mold, use a bleach solution (1 part bleach and 10 parts water) to clean the area (**children with asthma should never use bleach or other chemicals with strong smells**)
- Keep indoor humidity at less than 40%
- Fix all water leaks and remove any standing water
- Have your heating, ventilation, and air conditioning systems cleaned often and repaired right away

House Dust

- 
- Wash stuffed toys and bedding in hot water (130°F) every week
 - Keep stuffed animals off the bed
 - Cut down on clutter
 - Bare floors are best
 - If you have carpet, vacuum it often
 - Take down drapes and blinds when possible
 - Put mattresses, pillows, and box springs in allergen proof coverings
 - If you have a forced-air furnace, change the dust filters regularly during the heating season

Animals

- 
- Any animal that has feathers or fur can cause an allergic reaction. **There are no hypoallergenic dogs or cats.**
 - Pets can bring outdoor pollens inside
 - It's best to keep your pets outside
 - Always keep pets out of your child's bedroom
 - Have your child wash their hands and change their clothes after playing with pets
 - Brush your pets outside every day and give them a bath every week

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Author: Breathing Institute | Approved by Patient Education Committee | Valid through 2025

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IN CARE OF KIDS

- Use high-efficiency particulate air (HEPA) filters and vacuums
- If your child's asthma or allergy symptoms aren't getting better, you may need to think about having your pet live somewhere else



Cockroaches

- Don't leave food and garbage out
- Put out bait traps or call a professional exterminator to get rid of cockroaches

Other Triggers



Exercise

- Give your child their quick relief medication (albuterol or levalbuterol) 15 minutes before they exercise

Strong Emotions

- Laughing or crying can trigger an asthma attack
- Teach your child relaxation or calming methods like deep breathing (take a breath slowly through your nose and then blow out slowly through your mouth)



What is an Asthma Action Plan?

An asthma action plan is a written plan that explains how to take care of your child's asthma. All children with asthma should have an asthma action plan. Your child's asthma action plan:

- Lists what medicines to take and when to take them
- Describes what triggers to avoid
- Explains how to treat worsening symptoms or attacks
- Outlines when you should call your doctor
- Explains when you should go to the emergency room or urgent care

All of your child's caregivers should know about and have a copy of their asthma action plan. Caregivers can be parents, grandparents, babysitters/nanny, neighbors, stepparents, and so on. The caregivers can help the child to follow the plan, manage their asthma and take the right actions if they have asthma symptoms. If your child goes to school, daycare, preschool, after school programs, or camps they may need for your child to have a School Asthma Care Plan.

An asthma action plan is split into three zones (green, yellow, red) based on the child's symptoms.

The **Green Zone** is where you want your child to be daily. They have no asthma symptoms and they feel good. This is when asthma is well controlled.

- They should not need to take quick relief medicine more than two times a week (outside of taking before exercise if needed). If your child is taking quick reliever more often than this, please let your doctor know.
- Your child should take their controller medicines as prescribed by their doctor everyday. **Don't stop taking the controller until your doctor has told you or your child to do so, even if their asthma is well controlled.**
- A controller medicine makes asthma symptoms better and stops asthma symptoms.
- If your child has asthma symptoms with exercise, your doctor may recommend your child pretreat with a quick relief medicine, like albuterol, 10-30 minutes before running or playing.

<p>GREEN ZONE</p> <p>Doing well</p> <p><i>I feel good</i></p> <p>I play, sleep, and go to school. Breathing is easy. No coughing or wheezing. I am using my quick relief medicine less than 2 times per week.</p>	<p>What should I do?</p> <ul style="list-style-type: none">• Avoid my asthma triggers• See my healthcare provider every 1 to 6 months for asthma check ups• If needed, take 2-4 puffs of my quick relief inhaler at least 10 minutes before exercise• Take my daily medicines to stay in control of my asthma <p>Controller medicines I should be taking every day for long-term control:</p> <p>Quick Relief medicines I may need to take before running, jumping, playing, exercising, etc.</p>
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The **Yellow Zone** means that your child is having asthma symptoms.

- Your child should use the quick-relief medicine, albuterol, as recommended by your doctor.
- Keep on taking daily controller medicines.
- Your doctor may recommend an oral steroid by mouth (prednisone or dexamethasone).

YELLOW ZONE
Caution



I don't feel good

I have trouble playing or sleeping.
I am coughing, wheezing, or having trouble breathing or speaking.
I am using my quick relief medicine more than 2 times per week.

What should I do?


- Continue taking my daily controller medicines and add quick relief medicine.
- If symptoms go away within 30 minutes, return to the Green Zone.
- Asthma symptoms can get worse fast. When in doubt, call your healthcare provider for advice.
- If symptoms are not getting better in 24 hours, continue quick relief every 4 hours and call your healthcare provider.

I will continue to take my Controller medicine, ALSO I need to take my Quick Relief medicine

The **Red Zone** means your child is having severe asthma symptoms or an asthma attack and the quick relief medicine isn't helping enough.

- Follow the steps in your child's asthma action plan and **get medical attention right away!**

RED ZONE
Medical alert!



I feel bad and need help

I cannot play, do activities, or sleep.
My cough or wheeze is not getting better.
I need my quick relief medicine more than every 4 hours.

I need my Quick Relief more than every four hours.

What should I do?

- Take your quick relief inhaler with spacer 4-6 puffs every 20 minutes while you go to see a healthcare provider **right away**.
- You need help fast. Family or friends should call 911 if your skin or lips turn blue, if you pass out from asthma, or if you cannot breathe.

We will talk to you about which medicines your child's doctor has prescribed before your child goes home from the hospital.



Inhaled Devices for Pediatric Asthma

Inhaled medications are critical to the long-term management of asthma. Studies have shown most patients do not use their inhaled device correctly, therefore minimizing the benefit of inhaled medication.

Optimizing deposition of inhaled medication will result in higher local concentrations, lower systemic exposure, and fewer systemic side effects.

Device technique is crucial to optimizing deposition, however, for some children coordination and peak inspiratory flow can be a factor. It is important for health care providers to evaluate and select the best device for the child's age & ability.

Below is a table with recommended ages based on the type of device and inspiratory flow need for optimal deposition.

Device	Trade Name	Brand Names	Inspiratory Flow	Recommended Age
pMDI	Albuterol Levalbuterol Mometasone Furoate Fluticasone Ciclesonide Fluticasone/Salmeterol Budesonide/Formoterol Formoterol/Mometasone Ipratropium	Ventolin, Proventil, Proair Xopenex Asmanex Flovent Alvesco Advair Symbicort Dulera Atrovent	Low	Spacer with mask < 5 years Spacer > 5 years
Respiclick* [◇]	Albuterol Fluticasone Fluticasone/Salmeterol	Proair ArmonAir Airduo	Med-Low	≥ 12 years
Redihaler* [◇]	Beclomethasone	Qvar	Med	≥ 7 years
Diskus*	Fluticasone Fluticasone/Salmeterol	Flovent Advair	Med-Low	≥ 7 years
Ellipta* [◇]	Fluticasone Fluticasone/Vilanterol	Arnuity Breo	Med-Low	≥ 7 years
Inhub*	Fluticasone/Salmeterol	Wixela	Med-Low	≥ 7 years
Flexhaler *	Budesonide	Pulmicort	Med-High	≥ 7 years
Twisthaler * [◇]	Mometasone Furoate	Asmanex	Med-High	≥ 7 years
Respimat *	Tiotropium	Spiriva	Low	≥ 7 years

Note: * does not need a spacer/valve holding chamber, [◇] breath actuated

Some devices may be approved for younger ages.

References:

Alliance Tech Medical (2016). Inspiratory training device In-Check™ DIAL G16. [Brochure].Granbury, TX: Alliance Tech Medical, Inc.

Choosing the Right Asthma Delivery Device. (n.d.). Allergy & Asthma Network. Retrieved from <https://www.allergyasthmanetwork.org/choosing-the-right-delivery-device/>

van Aalderen, W.M., Garcia-Marcos, L., Gappa, M., Lenney, W., Pedersen, S., Dekhuijzen, R., & Price, D. (2015). How to match the optimal currently available inhaler device to an individual child with asthma or recurrent wheeze. Primary Care Respiratory Medicine. doi: <https://doi.org/10.1038.2014.88>

Inhaled Steroids

What are the names of inhaled steroid medicines?

Generic names: fluticasone, beclometasone, budesonide, ciclesonide, mometasone

Brand names: Flovent, Qvar, Pulmicort, Alvesco, Asmanex

What do inhaled steroids do?

Inhaled steroids reduce inflammation (swelling) in the airways. Inhaled steroids are often called controller medications. When taken daily, they help to prevent symptoms of asthma. They do not work quickly enough to stop an asthma attack.

How are inhaled steroids taken?

Inhaled steroids are breathed in using a metered dose inhaler (MDI), a dry powder inhaler (DPI) or a nebulizer. Always use a valved holding chamber or spacer with an MDI.

What are the side effects of inhaled steroids?

- Thrush is a yeast infection in the mouth and throat, and rarely happens when using inhaled steroids. Thrush causes a white coating on the tongue or inside the cheeks. Sore throat, hoarse voice, and dry mouth may also happen. Your child should brush his or her teeth and rinse and spit after taking an inhaled steroid to reduce the risk of getting thrush.
- If your child uses high doses of inhaled steroids for a long period of time, side effects may include growth delay, osteopenia (weak bones), and vision changes.

The effects of poorly controlled asthma are worse for your child than the possible side effects of inhaled steroids. To avoid side effects of inhaled steroids, your doctor will prescribe the lowest dose possible to control asthma symptoms.

Please talk to your child's doctor if you have any concerns about side effects or if your child has any side effects.

What special instructions should be followed when taking inhaled steroids?

- Do not stop taking inhaled steroids without talking to your child's doctor.
- If your child uses inhaled steroids with a nebulizer and mask, make sure the mask fits snugly and completely covers the nose and mouth. Do not use the nebulizer without a mask or mouth piece because the medication will not get into the lungs and could irritate the eyes.
- Be sure to have medication refilled when there are less than 20 puffs left on the inhaler. If there aren't any refills left, you need to call your child's pediatrician for a new prescription.

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Oral Steroids

What are other names for oral steroid medicines?

Generic: prednisone, prednisolone, dexamethasone, methylprednisolone

Brand Name: Deltasone, Orapred, Decadron, Medrol

What do oral steroids do?

This medicine lessens swelling in the airways. It can also help quick relief medicines (like albuterol) work better.

Why do oral steroids help with asthma?

When your child has serious asthma symptoms, it means that the lining of the airway is irritated and swollen. Symptoms include:

- coughing that is hard to stop
- difficulty breathing
- wheezing
- a tight feeling in the chest.

An oral steroid will help lessen the swelling in the airways so air can get in and out of the lungs more easily.

How is an oral steroid different from an inhaled steroid?

Oral steroids are taken in from your stomach, then get into the bloodstream and circulate through your entire body. Oral steroids are stronger and reduce swelling quicker than inhaled steroids.

How do you know when to give oral steroids?

Your child's doctor will tell you when to give an oral steroid burst. Your child may need it if their asthma symptoms don't go away after giving albuterol (or other quick relief medicines) every 4 hours. Follow your child's asthma action plan.

What is an oral steroid burst?

This term means the medicine is given for a short period of time. It's usually taken for 3 to 7 days.

What are the side effects of oral steroids?

Oral steroids are used to help your child recover from serious asthma symptoms. There can be side effects if they are given for more than 2 weeks or given more than twice a year. Side effects include:

- weight gain
- mood changes
- bone loss
- acne
- difficulty fighting infections

It is common for children with long-term asthma to need an occasional oral steroid burst, but if your child needs it more than once a year, it is a sign that your child's asthma is poorly controlled.

The steroids used to treat asthma are not the same as anabolic steroids, used illegally by some athletes for bodybuilding.

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Inhaled Bronchodilators (Short-Acting Beta2-Agonists)

What are other names for inhaled bronchodilator medicines?

Generic names: albuterol, levalbuterol

Brand names: ProAir (red inhaler), Ventolin (blue inhaler), Proventil (yellow inhaler), Xopenex (light blue inhaler)

Common terms: quick-relief, rescue, fast-acting, albuterol

What do inhaled bronchodilators do?

Inhaled bronchodilators are often called rescue medicines because they work fast to open the airways and make it easier to breathe. **These medicines should be used to treat asthma attacks (coughing, wheezing or feeling short of breath).** They work by relaxing or stopping bronchospasms (the tightening of the muscles around the airways). Bronchospasms happen when the airways come into contact with an asthma trigger. Common triggers are cold or flu viruses, cigarette smoke, pollen, animal dander, cold air, air pollution, and exercise. Your doctor may recommend your child use a bronchodilator before exercise to stop bronchospasms triggered by exercise.

How are inhaled bronchodilators taken?

Inhaled bronchodilators come in a form that are inhaled (breathed in) either through a nebulizer or from a metered-dose inhaler (MDI) with a spacer.

What are the side effects of inhaled bronchodilators?

The most common side effects are shakiness, jittery feeling or fast heart rate. These symptoms usually go away after 15 minutes.

What special instructions should be followed when taking inhaled bronchodilators?

- Give your child an inhaled bronchodilator as recommended by their doctor, usually as needed for frequent cough, wheezing, or shortness of breath. Your doctor may also recommend using it before exercise.
- Call your doctor or go to the ER (emergency room) if your child's symptoms don't get better after giving an inhaled bronchodilator, or if your child needs an inhaled bronchodilator more than every 4 hours because of having trouble playing, sleeping, breathing, or speaking from coughing or wheezing.
- Tell your doctor if your child uses an inhaled bronchodilator more than 2 times week during the day or more than 2 times a month at night. This may be a sign that your child needs more medicines to manage their symptoms, or there may be something else going on.
- Be sure to have medication refilled when there are less than 20 puffs left on the inhaler. If there aren't any refills left, you need to call your child's pediatrician for a new prescription.

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Combination Controller Medicines (Inhaled steroid and long acting bronchodilator)

What are other names for these medicines?

Generic: fluticasone and salmeterol, mometasone and formoterol, budesonide and formoterol

Brand Name: Advair®, Dulera®, Symbicort®, AirDuo®, Breo®

What do these medicines do?

These are combination medicines that contain both an inhaled steroid and a long acting bronchodilator. These medicines lessen swelling in the airways and relax tight muscles around the airways to make it easier to breathe and prevent asthma symptoms. These are asthma controller medications and must be taken every day to work.

These medicines do not work quickly enough to stop an asthma attack.

How are these medicines taken?

These medicines are breathed in with an inhaler. There are two types of inhalers:

- Traditional Metered dose inhaler (MDI). Always use with a valved holding chamber or spacer.
- Dry powder inhaler (DPI).

What are the side effects of these medications?

- The effects of poorly controlled asthma are worse for your child than the possible side effects of inhaled steroids. To avoid side effects, your healthcare provider will prescribe the lowest dose of inhaled steroid possible to control asthma symptoms.
- Thrush, a yeast infection in the mouth and throat, occurs rarely. Thrush causes a white coating on the tongue or inside the cheeks. Your child should brush their teeth and rinse and spit after taking an inhaled steroid to reduce these side effects.
- If your child uses high doses of inhaled steroids over long periods, side effects may include growth delay, weak bones (osteopenia), and vision changes.
- Please talk to your child's healthcare provider if you have any concerns about medicine side effects or if your child has any side effect symptoms.

What special instructions should be followed?

Don't stop this medicine without talking to your child's healthcare provider.

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Metered Dose Inhaler (MDI) with Spacer/Valved Holding Chamber and Mouthpiece

1. Remove caps from the spacer/valved holding chamber and metered dose inhaler (MDI)
2. Shake the inhaler for 3-5 seconds
3. Connect the inhaler to the spacer/valved holding chamber
4. Stand or sit up straight
5. Breathe out, insert mouthpiece between teeth and make a tight seal with your lips
6. Press down on the inhaler once to spray into the spacer/valved holding chamber
7. Breathe in deeply through your mouth for about 5 seconds
 - You should not hear a whistle
 - If you hear a whistle, you are breathing in **too fast**
8. Hold your breath for 10 seconds
9. Breathe out normally
10. Wait 1 minute and repeat steps 2-9 for each puff prescribed
11. Remove the inhaler from the spacer/valved holding chamber
12. Replace the cap on your inhaler when finished



If you are using an inhaled steroid, wash your face, and rinse your mouth or brush your teeth after each use

If the inhaler is new, has not been used in a while, or has been dropped, it needs to be primed

- Spray 2-4 times to prime
- This does not count as a dose of medication

To watch a video on how to use the MDI, visit: <http://www.childrenscolorado.org/MDI>

Cleaning Instructions

- Clean spacer/valved holding chamber once a week
- Take apart the spacer/valved holding chamber
- Rinse in warm soapy water
- Rinse with clean water and air dry
- Do not put in the dishwasher
- Clean the small hole in the inhaler once a week with a wet Q-tip
- Replace the inhaler when the counter reaches 000
 - It may continue to spray, but no medicine is coming out

Metered Dose Inhaler (MDI) with Spacer/valved Holding Chamber and Facemask

Note: The facemask and spacer should be used with patients **under the age of 7** or who cannot coordinate pressing down on the inhaler, making a tight seal around the mouthpiece, and/or inhaling and holding their breath for a count of 10 seconds.



1. Remove the caps from the spacer/valved holding chamber and inhaler
2. Shake the inhaler for 3-5 seconds
3. Connect the inhaler to the spacer/valved holding chamber
4. Attach the mask to the mouthpiece of the spacer/valved holding chamber
5. Have your child stand or sit up straight
6. Place the mask over your child's nose and mouth to make a tight seal
7. Have your child breathe out
8. Press down on the inhaler once to spray into the spacer/valved holding chamber
9. Have your child slowly breathe in and out **for a total of 10 breaths**
10. Wait 1 minute and repeat steps 2-9 for each puff prescribed
11. Remove the inhaler from the spacer/valved holding chamber
12. Replace the cap on the inhaler when finished

If your child used an inhaled steroid, have them wash their face, rinse their mouth or brush their teeth after each use

If the inhaler is new, has not been used in a while, or has been dropped, it needs to be primed

- Spray 2-4 times to prime
- This does not count as a dose of medication

Cleaning Instructions

- Clean spacer/valved holding chamber once a week
- Remove the facemask mask and take apart the spacer/valved holding chamber
- Rinse in warm soapy water
- Rinse with clean water and air dry
- Do not put in the dishwasher
- Clean the small hole in the inhaler once a week with a wet Q-tip
- Replace the inhaler when the counter reaches 000
 - It may continue to spray but no medicine is coming out

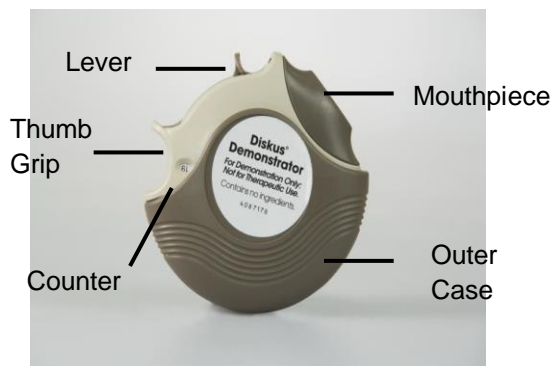
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Diskus

A Diskus is a device that puts a very fine dry powder of medicine into the lungs. You must take a deep and forceful breath in for the powder to reach all parts of your lungs.



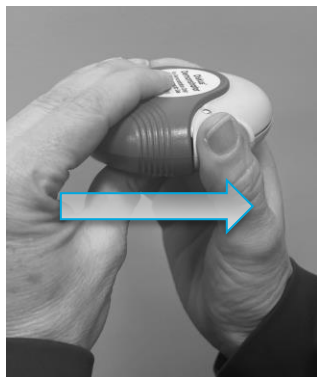
Brand and generic names

- Flovent (fluticasone)
- Advair (salmeterol)



Step 1: Open the Diskus

Hold the Diskus flat in your left hand like a hamburger. Place your right thumb in the thumb grip and slide it over until it stops.



Step 2:

Slide the lever over to the right until you hear it click. The number on the counter will count down by 1. The Diskus is now ready to use. Make sure you don't drop, close, or tilt the Diskus before you breathe in the medicine. If you do, repeat steps 1 and 2 to load a new dose of medicine.



Step 3: Inhaling the medicine

Breathe out (exhale) for as long as you can while holding the Diskus level and away from your mouth. Put the mouthpiece up to your mouth and make a tight seal with your lips. Breathe in fast and deep until your lungs are full. Remove the Diskus from your mouth and hold your breath for 10 seconds. You may or may not taste or feel the medicine. **DO NOT** take an extra dose from the Diskus even if you don't taste or feel the medicine. If you accidentally blow into the Diskus, follow steps 1-2 to load a new dose of medicine.



Step 4: Close the Diskus

Put your thumb in the thumb grip and slide it back towards you as far as it will go until you hear it click. This covers the mouthpiece and resets the Diskus for the next scheduled dose.

Keep your Diskus in a dry place at room temperature and don't get it wet. Make sure to brush your teeth and rinse your mouth with water after using the Diskus.

To watch a video on how to use the Diskus, scan the QR code or visit the link:



<https://bit.ly/3mLYzHx>

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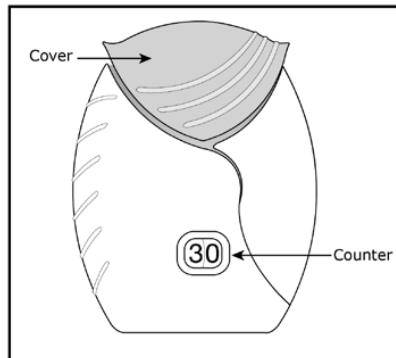
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Ellipta Inhaler

Medicine: Arnuity Ellipta (fluticasone furoate), Trelegy (fluticasone furoate, umeclidinium, vilanterol) and Breo Ellipta (fluticasone furoate and vilanterol)



The Ellipta inhaler puts medicine into the lungs. You must take a fast and full breath for the powder to reach deep in your lungs.

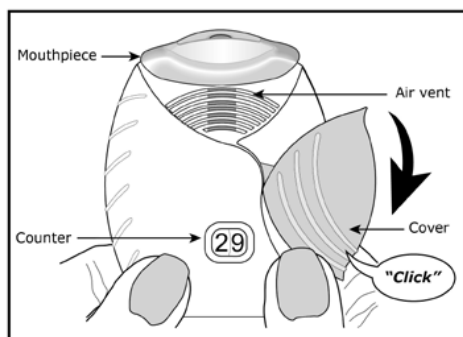


How to use the Ellipta inhaler:

- Open the cover when you are ready to take the medicine.
 - Don't shake the inhaler

Step 1: Open the cover of the inhaler.

- Slide the cover down. You should hear a "click" and see the mouthpiece. The inhaler is now ready to use.
- There is a counter on the inhaler. Each time the inhaler is used the number should go down
 - If the counter doesn't count down when you hear the click, the inhaler won't give you the medicine.
 - If the inhaler isn't working call your doctor or pharmacist

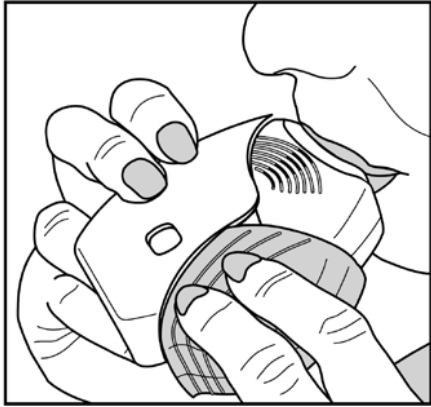


Step 2: Breathe out.

- Hold the inhaler away from your mouth,
 - Breathe the air out of your lungs.

Step 3: Inhale your medicine.

- Put the mouthpiece between your lips and close your lips tightly around it. Your lips should fit over the curved shape of the mouthpiece.
- Take 1 long, steady, deep breath in through your mouth.
 - Don't breathe in through your nose.
- Don't block the air vent with your fingers.
 - Take the inhaler out of your mouth and hold your breath for about 10 seconds (or as long as you can).



Step 4: Breathe out slowly and gently.

Step 5: Close the inhaler.

- Slide the cover up and over the mouthpiece as far as it will go.

Step 6: Rinse your mouth.

- Rinse your mouth with water after you have used the inhaler and spit the water out or brush your teeth.

Care of the Ellipta:

- Never get the Ellipta wet.
- Store it in a dry place at room temperature with the cover closed.
- Clean the mouthpiece if needed by wiping it with a dry cloth. Routine cleaning is not recommended.

Reminders:

- Never blow INTO the mouthpiece.
- The Ellipta can't be used after it's empty. Don't take the inhaler apart.
- The inhaler should be thrown away 6 weeks after it's first opened or when the counter says 0. Write the date you open the tray on the label of the inhaler. When the counter reaches 20, call for a refill.
- When using a dry powder inhaler, you may not taste the powder and you may not feel the medicine being delivered.

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Flexhaler

A Flexhaler is a device that puts a very fine dry powder of medicine into the lungs. You must take a deep and forceful breath for the powder to reach all of your lungs.



Brand and generic names

- Pulmicort (budesonide)

How to use the Flexhaler

1. Hold the Flexhaler upright so the white cover points up.
2. Hold the grip in one hand and use your other hand to unscrew the cover and remove it.
3. Keep the Flexhaler upright, twist the colored wheel to the right as far as it will go, then twist it all the way back to the left until it clicks.
4. The Flexhaler is now ready to use.
 - Turn away from the Flexhaler and breathe out.
5. Holding the Flexhaler in a flat position, place the mouthpiece in your mouth and seal your lips around the Flexhaler.
6. Breathe in fast and deep through your mouth until you feel your lungs are full. Hold your breath for 10 seconds.
 - Prime the Flexhaler the first time it is used by repeating step 3.
 - If a second dose is prescribed, repeat steps 3 through 6.
 - If you tip or drop the Flexhaler, repeat step 3 to load a new dose of medicine.
7. Brush your teeth and rinse your mouth after using the Flexhaler



Care of the Flexhaler

- Never get it wet
- Store in a dry place with the cover on
- Clean the mouthpiece 2 times a week by wiping it with a dry cloth

Reminders

- Never blow **INTO** the mouthpiece
- It's not reusable
- Never take it apart
- Make sure to keep track of the cover. If the cover is lost, the device will not work.
- There is a counter at the top of the window, underneath the mouthpiece. When the counter reads 0, the Flexhaler is empty and should be thrown away and replaced with a new Flexhaler.
- When using a dry powder inhaler, you may not taste the powder and you may not feel the medicine.

To watch a video on how to use the Flexhaler, scan the QR code or visit the link:

<https://bit.ly/3kGw2jM>



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INHUB: fluticasone and salmeterol (Wixela)

The INHUB puts a fine dry powder medicine into the lungs. You must breathe in quickly and deeply to get the medicine into the lungs. You may or may not feel or taste the medicine.

Step 1: Open. Hold the INHUB in one hand and with your other hand on the grip lower the mouthpiece cover from the top to the bottom.



Step 2: Push down the lever. Hold the INHUB in the vertical position. Push the yellow lever down to the end of the purple arrows (you may hear a click).



Step 3: Exhale. Hold the INHUB away from your mouth and exhale to empty your lungs.



Step 4: Inhale your medicine. Put the mouthpiece in your lips. Breathe in quickly and deeply through the INHUB. Do not breathe in through your nose. Remove the INHUB from your mouth and hold your breath for about 10 seconds. Then breathe out slowly.



Step 5: Close the INHUB. Push the mouthpiece cover up to the closed position. This will automatically return the yellow lever to the start position. Store the INHUB in the closed position until your next dose.



Step 6: Rinse your mouth or brush your teeth after breathing in the medicine

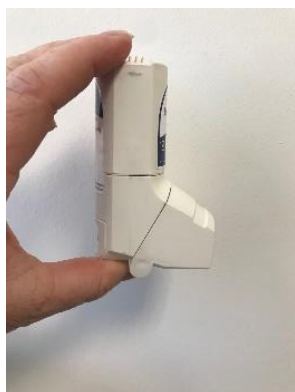
RediHaler

Medicines: Qvar

The RediHaler is a breath-triggered inhaler that sprays medicine into your lungs when you take a deep breath in. **You don't need a spacer with this type of inhaler.**

How to use the RediHaler:

1. Cap must be closed before you use the inhaler or you will not get any medicine.



2. Open the cap when you are ready to take your medicine.



3. Face away from the RediHaler and breath out fully. Never breathe out into the inhaler mouthpiece
4. Hold the inhaler upright, place mouthpiece in your mouth and close your lips around it to form a tight seal
5. Inhale deeply and fully
6. Remove inhaler from your mouth and hold your breath for 5 to 10 seconds
7. Close cap
8. Repeat steps 2-7 if more than 1 puff are recommended by your doctor

RespiClick Inhaler

Medicines: ProAir (albuterol sulfate), Air Duo (fluticasone/salmeterol)

The RespiClick is an inhaler that puts a dry powdered medicine into your lungs. **You don't need to use a spacer with this type of inhaler.**

How to use the RespiClick inhaler:

1. Open



- Hold the inhaler upright as you open the cap fully
- Open the cap all the way back until you hear a "CLICK"
- Your RespiClick is now ready to use

2. Inhale



- Don't let your lips or fingers block the vent above the mouthpiece
- Take a full breath in fast and deep
- Hold your breath for 10 seconds
- Remove the inhaler from your mouth and check the counter on the back of the inhaler to make sure you got the dose

3. Close



- Always close the cap after each inhalation so your inhaler will be ready for your next dose
- If you need another dose, close the cap and repeat all the steps

Additional information:

- Don't use a spacer (or valved holding chamber) with the RespiClick inhaler
- Make sure the cap is closed before each dose
- Don't open the cap unless you are taking a dose
- When using a dry powder inhaler, you may not taste the powder and you may not feel the medicine being delivered.
- If the mouthpiece needs cleaning, wipe it with a dry cloth or tissue. Don't wash
- The RespiClick contains a powder and must be kept dry. Store at room temperature and avoid exposure to extreme heat, cold or humidity.
- There is a counter on the back of the inhaler. When the counter says 20, you should call the pharmacy for a refill.
- When the counter says 0, the RespiClick is empty and should be thrown away and replaced with a new RespiClick.

Respimat Soft Mist Inhaler

Medicines: COMBIVENT RESPIMAT (ipratropium bromide and albuterol), SPIRIVA RESPIMAT (tiotropium bromide)

The Respimat is an inhaler that puts a very fine mist of medicine into the lungs.

Load the medicine cartridge into the inhaler

1. Keep cap closed
2. Press safety catch and pull off clear base



3. Insert narrow end of cartridge into inhaler and gently push against a firm surface to ensure that it has gone all the way in



4. Replace clear base



IN CARE OF KIDS

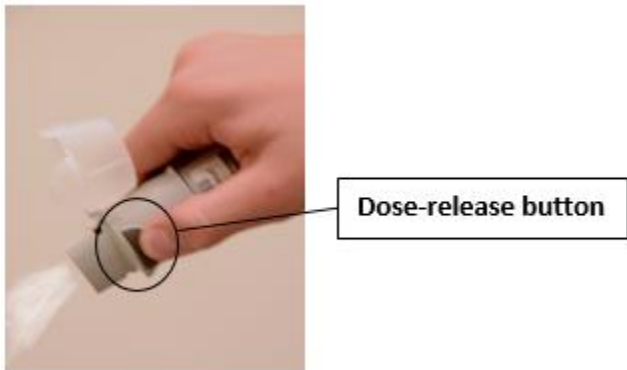
5. Turn base in direction of the arrows on label until you hear a click (half a turn counter clockwise).



6. Flip cap open until it clicks into open position



7. Point Respimat® inhaler toward ground and press dose release button to prime the inhaler



8. Close cap
9. Repeat steps 5-8 until a cloud of spray is visible
10. Then repeat 3 more times before first use

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More Information:

- Don't use with a spacer (or valved holding chamber)
- Don't shake the RediHaler
- Don't prime RediHaler if you have not used it in several weeks
- Make sure the cap is closed before each dose
- Don't open the cap until you are ready to take your dose
- Store at room temperature with the cap closed. Don't keep it where it's very hot or very cold.
- Don't wash or put any part of the RediHaler in water
- Clean mouthpiece weekly with a clean, dry tissue or cloth
- Call your pharmacy or doctor to refill your RediHaler when the counter shows 20 inhalations
- When the counter shows 0, the RediHaler is empty and should be thrown away

How to use the Respimat inhaler:

1. "Turn"



Hold the inhaler upright with the cap closed. Turn base in direction of the arrows on label until you hear a click (half a turn counterclockwise).

2. "Open"



Flip cap OPEN until it clicks into open position.

3. "Press"



- Close your lips around the mouthpiece end without covering air vents.
- Press dose release button while taking in a slow, deep breath
- Keep breathing in slowly until your lungs are full
- Close cap
- Repeat Turn, Open, Press (T.O.P.) for a total of 2 puffs

Care of Respimat Inhaler

- Wipe the mouthpiece inside and out once a week with a damp cloth
- Any slight discoloration of the mouthpiece will not affect the performance of the inhaler.
- Do not take the inhaler apart or remove the transparent base once the cartridge has been inserted.
- Store at room temperature and keep the inhaler dry.

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Twisthaler

Medicine name: Mometasone (ASMANEX)



The Twisthaler puts a very fine dry powder into the lungs. You must take a deep and forceful breath in for the powder to reach your lungs.

When you get a new Twisthaler, remove it from the foil pouch and write the date on the cap. The Twisthaler will need to be thrown away 45 days after it's opened or when the dose counter says 00. You should call for a refill when the counter says 20.

How to use the Twisthaler:

1. Hold the Twisthaler upright, with the pink or grey base at the bottom. Twist the cap counter-clockwise (to the left) to remove it.
2. When you twist and lift off the cap, the dose counter will go down by one and the medicine will be loaded into the device. The medicine is now ready to be inhaled (breathed in).
3. Turn away from the Twisthaler and breathe out.



4. Hold the Twisthaler flat (horizontally) and place the mouthpiece in your mouth and seal your lips around it.



IN CARE OF KIDS

5. Breathe in fast and deep through your mouth until your lungs are full.
6. Hold your breath for 10 seconds. Then breath out normally.
7. Put the cap back on and twist clockwise (to the right) until you hear it click and close.
8. Repeat steps 3 through 7 for each dose ordered.
9. Brush your teeth or rinse your mouth after each use.

How to care for your Twisthaler:

Use a dry cloth to wipe the mouthpiece after use. Never get the Twisthaler wet.

The Twisthaler has a dose counter that counts down the dose by itself when the cap is removed. This also loads the dose of medicine. When the counter reads 00 there is no medicine left in the Twisthaler, throw it out and get a refill from the pharmacy.

1. Keep your Twisthaler in a dry place at room temperature.
2. Never breathe INTO the mouthpiece.
3. Never use a spacer with your Twisthaler.
4. Don't lose the cap or you won't be able to load the device with medicine.

Unlike other inhaled medicines, you may not taste or feel the dry powder. You may not know if the medicine is getting into your lungs. If you follow the directions, you will get the full dose of medicine.

Watch this video on how to use the Twisthaler: <https://bit.ly/38q0TLT>



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Home “Acorn” Nebulizers

How do I use the nebulizer with a mouthpiece?

1. Plug the machine into a wall outlet
2. Open the nebulizer cup
3. Pour the medication into the nebulizer cup. (Add saline, if recommended)
4. Close the nebulizer cup top tightly
5. Plug one side of the clear plastic tubing into the machine and the other side into the nebulizer cup.
6. Put the mouthpiece together and attach it to the nebulizer
7. Place the mouthpiece in your child's mouth and make sure there is a good seal around the mouthpiece with the lips
8. Turn on the machine. A fine mist will come out
9. Have your child breathe in and out through the mouthpiece normally (you should see the fine mist move in and out). Continue until the medicine is gone. This should take about 10-15 minutes.
 - If your child is able, tell them to take an extra deep breath and hold it for 5-10 seconds every 10 breaths.



How do I use the nebulizer with a mask?

1. Plug the machine into a wall outlet
2. Open the nebulizer cup
3. Pour the medication into the nebulizer cup. (Add saline, if recommended)
4. Close the nebulizer cup top tightly
5. Plug one side of the clear plastic tubing into the compressor machine and the other side into the nebulizer cup
6. Attach the nebulizer cup to the nebulizer mask
7. Place the mask on your child's face (make sure you have a tight seal)
8. Turn on the machine. A fine mist will come out
9. Have your child breathe in and out normally, until the medicine is finished. This should take about 10-15 minutes.



Key Points:

- Your child should sit upright and be awake during the nebulizer treatment.
- If the nebulizer isn't misting, pour out the medicine, rinse with sterile water and start over.
- When you hear the nebulizer make a sputtering noise, tap the cup so the droplets of medicine on the side can be nebulized.

Equipment Maintenance:

1. **Cleaning:** After each treatment, take the nebulizer apart and wash with warm water and liquid dish soap. This includes the mask and/or mouthpiece. Rub off any mucus. Rinse all parts. Shake off the extra water and allow to air dry.
 - If the nebulizer isn't rinsed after each treatment, the small holes inside the nebulizer can become clogged and won't make a mist.
 - It isn't necessary to rinse the clear tubing.
2. **Disinfecting:** At least once a week, the nebulizer, mask, and/or mouthpiece should be disinfected:
 - Soak in a solution of 1 part distilled white vinegar and 3 parts hot tap water for 1 hour.
 - After soaking, rinse all parts with sterile water and air dry.
 - You can make sterile water by boiling tap water for 10 minutes.

For any questions, please call 720-777-6181 and ask for a Respiratory Therapist.

To watch a video on how to use the Acorn Nebulizer, visit: <https://bit.ly/3zxcF2X>



How to Use a Peak Flow Meter

A peak flow meter is an easy-to-use handheld device that measures how fast you can push air out of your lungs. During an asthma attack, it may be hard for air to get out of your lungs. A peak flow meter can be sensitive to changes in your airways, which can help you and your doctor create an effective treatment plan.

1. **Before each use, make sure the sliding marker is at the bottom of the numbered scale.**



Slide marker

2. **Stand or sit up straight. Take a deep breath. Put the mouthpiece between your teeth and close your lips tight. Don't put your tongue into the mouthpiece.**



3. **In one breath, blow out as hard and fast as you can. The sliding marker will move up the scale. Repeat this test 3 times. Record the HIGHEST of the 3 numbers on your peak flow chart.**



When to use your peak flow meter

- When you first start checking your peak flow readings, take them daily for 2-3 weeks at the same time in the afternoon, to help find out what your “personal best” number is.
- When you have asthma symptoms like a cold, or other sickness that changes your breathing.
- When you need to use quick-relief (rescue) medicine, like albuterol. Check your peak flow before you take your quick-relief medicine. Then check your peak flow again 20 minutes after you take your quick-relief medicine.

Your peak flow measurement is part of your “Asthma Action Plan”

Your “Asthma Action Plan” lists what medicines to take and when to take them. It uses 3 color zones: green, yellow, and red, like a stoplight. Symptoms and peak flow numbers can help you judge whether your asthma is controlled or not.

- **Green Zone:** 80% to 100% of your “personal best” peak flow number. All systems “go.” You are relatively free of symptoms. Keep up your current daily asthma plan.
- **Yellow Zone:** 50% to 80% of your “personal best” peak flow number. “Use Caution,” as your asthma is worsening. Use your quick-relief (rescue) medicine, like albuterol, then check your peak flow again. If you are still in the yellow zone, call your doctor for help.
- **Red Zone:** Below 50% of your “personal best” peak flow number. **HEALTH ALERT!** Repeat the use of your quick-relief (rescue) medicine, like albuterol. If you are still in the red zone, call your doctor right away or go to an ER (emergency room).

To watch a video on how to use the peak flow meter, visit:

<http://www.childrenscolorado.org/Peak>

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Author: Asthma Education Standardization Committee | Approved by Patient Education Committee | Valid through 2025

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Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex. • ATENCIÓN: si habla español, tiene a su disposición servicios gratuitos de asistencia lingüística. Llame al 1-720-777-1234. • CHÚ Ý: Nếu bạn nói Tiếng Việt, có các dịch vụ hỗ trợ ngôn ngữ miễn phí dành cho bạn. Gọi số 1-720-777-1234.

Nasal Steroid Spray

Nasal steroid sprays are sometimes used to treat stuffy noses, allergy symptoms and/or snoring.

Preparation

1. Gently blow your nose, or use a nasal saline rinse to clear out any mucus before using the nasal steroid spray
2. Wash your hands with soap and water for 15 seconds, about as long as it takes to sing “Happy Birthday”
3. Gently shake the nasal steroid spray bottle
4. Remove cover
5. Prime nasal steroid spray bottle if needed
 - To prime: press down on the spray bottle 2 times, spraying the medicine into the air
 - Note: You’ll need to prime your spray bottle before taking your dose if:
 - This is the first time you are using it
 - You haven’t used it for 7 days or more

To use

1. Place your middle finger and your pointer finger on the sides of the spray tip. Place your thumb on the bottom of the spray bottle.
2. Insert the spray tip into one nostril. Point the spray bottle away from the middle of your nose.
3. Use your opposite hand to press the other nostril closed.
4. Keep your head upright. Press down on the spray bottle as you begin to breathe in slowly through your nose. Breathe out slowly through your mouth.
5. If you are using more than 1 spray in each nostril, follow steps 1 through 3 again.
6. Repeat these steps for the other nostril.
 - Do not to sneeze or blow your nose right after using the spray.
 - If any spray runs out of your nose, you can wipe it away with a tissue.



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What special instructions should be followed?

- Don't stop or lower your dose of any medicines unless directed to do so by a doctor
- These medicines are important in managing lung disease. If you have questions or concerns about medicines talk to a doctor

CHCO General Asthma Topics: (right click to open hyperlinks)

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_WhatIsAsthma_Eng.pdf

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_AsthmaTriggers_Eng.pdf

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_WhatIsanAsthmaActionPlan_Eng.pdf

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_ExerciseAndAsthma_Eng.pdf

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_InhaledBronchodilators_Eng.pdf

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_InhaledSteroids_Eng.pdf

https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_NasalSteroidSpray_Eng.pdf

[https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_InducibleLaryngealObstruction\(ILO\)_Eng.pdf](https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_InducibleLaryngealObstruction(ILO)_Eng.pdf)

Asthma Devices—how to use:

1. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_MeteredDoseInhalerwithSpacerValveHoldingChamberandMouthpiece%20_Eng.pdf
[How to Use an MDI With a Spacer - YouTube](#)
2. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_Diskus_Eng.pdf
<https://www.youtube.com/watch?v=mfiShjE9P-Q>
3. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_ElliptaInhaler_Eng.pdf
4. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_Flexhaler_Eng.pdf
5. [https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_INHUBFluticasoneAndSalmeterol\(Wixela\)_Eng.pdf](https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_INHUBFluticasoneAndSalmeterol(Wixela)_Eng.pdf)

6. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_Redihaler_Eng.pdf
7. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_RespiClickInhaler_Eng.pdf
8. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_RespimatInhaler_Eng.pdf
9. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_Twisthaler_Eng.pdf
https://www.youtube.com/watch?v=F3u_A0b_O6s
10. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_HomeAcornNebulizer_Eng.pdf
[How to Use an Acorn Nebulizer - YouTube](#)
11. https://childrenscolorado.sharepoint.com/sites/handouts/documents/ASTHM_HowToUseAPeakFlowMeter_Eng.pdf
[How to use a peak flow meter - YouTube](#)

15TH ANNUAL

Reach the Peak Asthma and Allergy Overview and Update

Asthma Resources

- ✓ Children's Hospital Colorado Enduring Educational Activities
- ✓ CHCO Breathing Institute Program Information
- ✓ Patient Assistance Programs



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Enduring Education Modules

To open websites→ Right click and select: "Open Hyperlink"

[Search | Children's Hospital Colorado Continuing Education \(childrenshospitalcolorado.org\)](https://www.childrenshospitalcolorado.org/continuing-education/search)

[Diagnosing Asthma | Children's Hospital Colorado Continuing Education \(childrenshospitalcolorado.org\)](https://www.childrenshospitalcolorado.org/continuing-education/diagnosing-asthma)

[Evaluation of Poorly Controlled Asthma v23 | Children's Hospital Colorado Continuing Education \(childrenshospitalcolorado.org\)](https://www.childrenshospitalcolorado.org/continuing-education/evaluation-of-poorly-controlled-asthma-v23)

[Spirometry Testing v23 | Children's Hospital Colorado Continuing Education \(childrenshospitalcolorado.org\)](https://www.childrenshospitalcolorado.org/continuing-education/spirometry-testing-v23)

THE BREATHING INSTITUTE

Dedicated to Breathing Better Day and Night



The physicians and care teams of the Breathing Institute at Children's Hospital Colorado provide comprehensive clinical care and consultation for children with common and complex breathing disorders. Our world-class team of pediatric pulmonologists is always available to care for children with shortness of breath, wheezing, cough, noisy breathing, oxygen dependency, recurrent pneumonia and other general lung disorders. Special areas of expertise include asthma, cystic fibrosis, airway anomalies and disease, pulmonary hypertension, apnea, aspiration, ventilator dependency, chronic lung disease of infancy, sleep-disordered breathing and other high acuity breathing disorders.

The Breathing Institute provides care for many different Breathing specialties under one division.



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<https://www.childrenscolorado.org/doctors-and-departments/departments/breathing-institute/>

Some of Our Programs & Specialties Are:

AeroDigestive Program

Pulmonary Hypertension & Vascular Disease

Asthma Program

Network of Care

Cystic Fibrosis

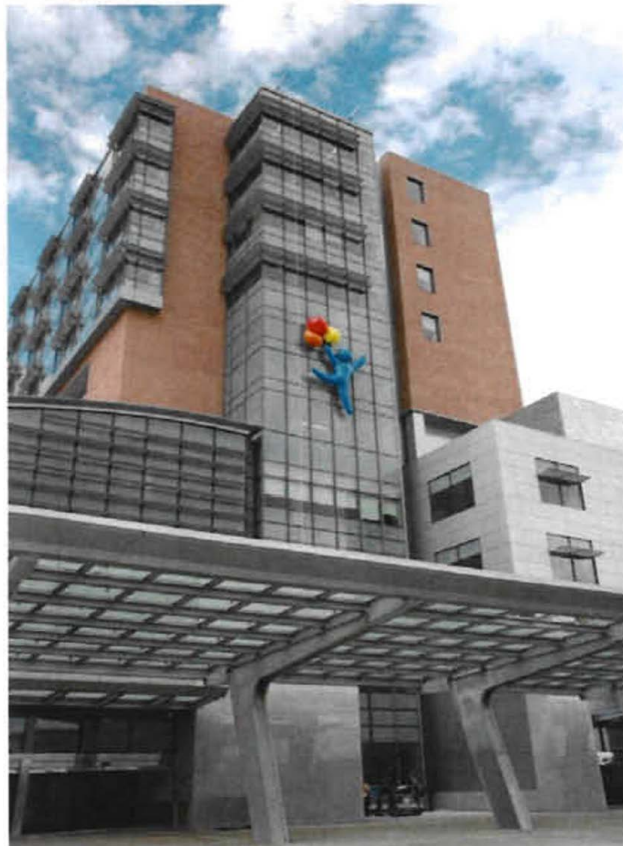
Respiratory Care

Community Outreach Projects

Sleep Program

Diffuse Lung Disease {ILD, PCD}

Ventilator Care Program



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<https://www.childrenscolorado.org/doctors-and-departments/departments/breathing-institute/>

CONTACT US

Pediatric Heart Lung Center

Phone: 720-777-5821

Breathing Institute

Phone: 720-777-6181

Asthma Clinic

Phone: 720-777-6181

Aerodigestive Program

Phone: 720-777-6181

Interstitial Lung Disease (chILD) Program

Phone: 720-777-6181

Mike McMorris Cystic Fibrosis Research and Care Center

Phone: 720-777-6181

Sleep Center

Phone: 720-777-6181

Ventilator Care Program

Phone: 720-777-6181



Additional Asthma Management Resources

Breathing Institute: THE BREATHING INSTITUTE (sharepoint.com) Childrens Hospital Colorado Pulmonary and Sleep Medicine serving Colorado and surrounding states providing exceptional asthma, pulmonary and sleep medicine care to children of all ages. #7 in US News and World report 2023.

Medication Assistance Programs

1. www.GoodRx.com

Drug prices vary wildly between pharmacies. GoodRx finds the lowest prices and discounts. Collect and compare prices for every FDA-approved prescription drug at more than 70,000 US pharmacies; Find free coupons to use at the pharmacy; Show the lowest price at each pharmacy near you.

2. **SingleCare: lower Prescription Prices, Discounts & Coupons**

<https://www.singlecare.com>

Savings: Up to 80% with additional savings for refills

Accepted at: 35,000+ pharmacies

Home delivery: Yes, with GeniusRx

3. www.needymeds.com

Programs that provide help for those who want to get their medications through pharmaceutical company patient assistance programs. All are free or charge a small amount. Most help people in limited geographic areas.

4. Colorado Drug Card - Free Statewide Prescription ...

www.coloradodrugcard.com As a resident of Colorado, you have access to a statewide Prescription Assistance Program (PAP). Create and print your *FREE* discount prescription drug card coupon below. This pharmacy coupon card will provide you with Rx medication savings of up to 75% at more than 68,000 pharmacies across the country including Safeway, Walgreens, Albertsons Sav-on, Target, CVS/pharmacy, Kmart, Walmart, and many more.

Other General information websites

Food Allergy, Research and Education

www.foodallergy.org

Food Allergy Research & Education (FARE) works on behalf of the 15 million Americans with food allergies, including all those at risk for life-threatening anaphylaxis. This potentially deadly disease affects 1 in 13 children in the United States – or roughly two in every classroom. FARE's mission is to improve the quality of *life* and the *health* of individuals with food allergies, and to provide them *hope* through the promise of new treatments.

American Latex Allergy Association

latexallergyresources.org

Provides resources for people allergic to natural rubber **latex**, including **latex** free alternative product lists, informational packets, support groups, and a newsletter



Asthma & Allergy Foundation of America

www.aafa.org

The Asthma and Allergy Foundation of America (AAFA), a not-for-profit organization founded in 1953, is the leading patient organization for people with asthma and allergies, and the oldest asthma and allergy patient group in the world. AAFA is dedicated to improving the quality of life for people with asthma and allergic diseases through education, advocacy and research.

www.aafa.org/media/AMEO-Registration-Access-Instructions.pdf

The American Academy of Allergy, Asthma & Immunology

<http://www.aaaai.org/about-aaaai>

The American Academy of Allergy, Asthma & Immunology is dedicated to the advancement of the knowledge and practice of allergy, asthma and immunology for optimal patient care.

American Lung Association

Local and national organization with information about lung disease, smoking and local events.

www.lungcolorado.org

www.lungusa.org

American Association of Respiratory Care

www.aarc.org

Professional site for resources and educational opportunities.

American Thoracic Society

www.thoracic.org

Professional resources for patient education, continuing educational opportunities, research and more.

Allergy & Asthma Network welcomes patients, families and healthcare professionals dedicated to improving health and quality of life for people with asthma or allergies

<http://www.allergyasthmanetwork.com>

[Certified Asthma Educator \(AE-C\) - The National Board for Respiratory Care \(nbrc.org\)](http://www.nbrc.org)

National Asthma Education and Prevention Program (NAEPP)

The goal of the NAEPP is to enhance the quality of life for individuals with asthma and to decrease asthma-related morbidity and mortality

<https://www.nhlbi.nih.gov/about/org/naepp/>

National Jewish Medical & Research Center offers treatment, information, resources and research for pulmonary, cardiac, immune and related conditions

<https://www.nationaljewish.org>

Environmental Protection Agency: EPA's coordinated approach on asthma promotes scientific understanding of environmental asthma triggers and ways to manage asthma in community settings through research, education and outreach. With federal, state and local partners, we are building the nation's capacity to control asthma and manage exposure to indoor and outdoor pollutants linked to asthma

<https://www.epa.gov/asthma>