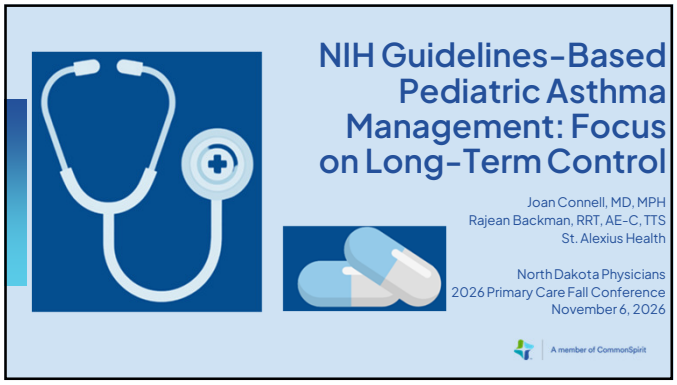
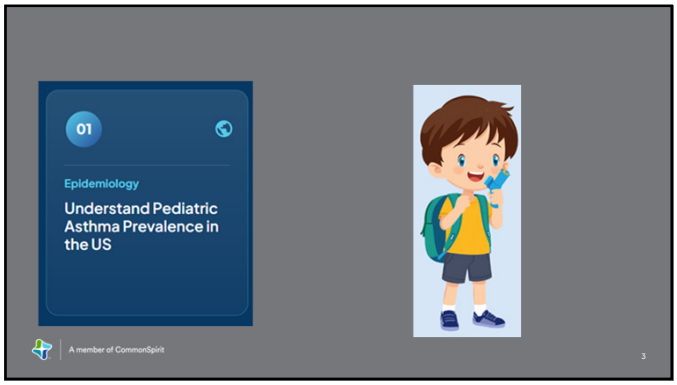

NIH Guidelines-Based Pediatric Asthma Management: Focus on Long-Term Control
Joan Connell, MD, MPH
Rajean Backman, RRT, AE-C, TTS
St. Alexius Health
North Dakota Physicians
2026 Primary Care Fall Conference
November 6, 2026
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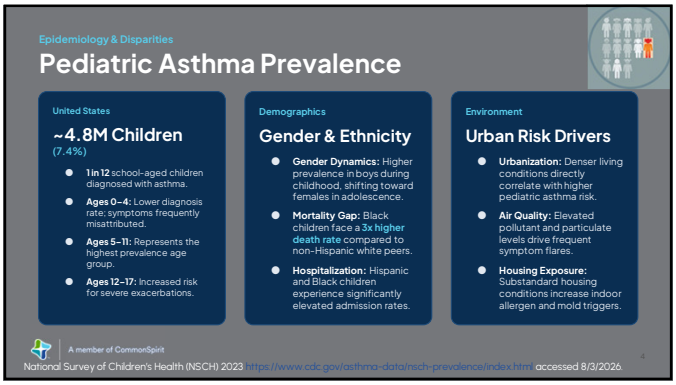
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Learning Goals
Objectives
01
Epidemiology
Understand Pediatric Asthma Prevalence in the US
02
Clinical Data
Review Pediatric Asthma Morbidity & Mortality Data
03
Care Practice
Share Focused Current Pediatric Asthma Management Guidelines
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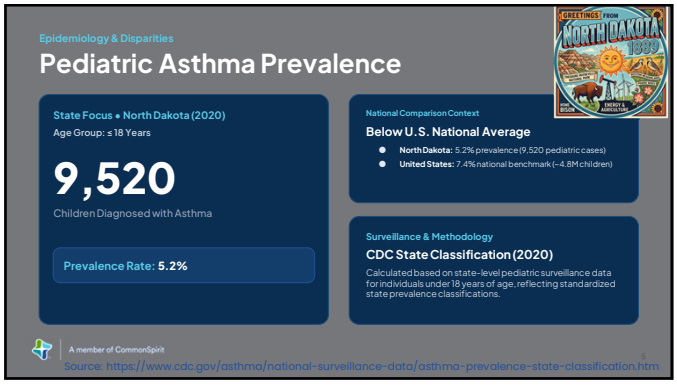
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Epidemiology
Understand Pediatric Asthma Prevalence in the US
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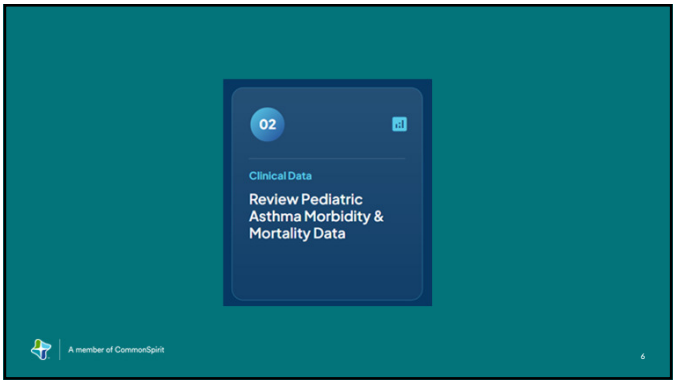
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Epidemiology & Disparities
Pediatric Asthma Prevalence
United States
~4.8M Children
(7.4%)
1 in 12 school-aged children diagnosed with asthma.
Ages 0–4: Lower diagnosis rate; symptoms frequently misattributed.
Ages 5–11: Represents the highest prevalence age group.
Ages 12–17: Increased risk for severe exacerbations.
Demographics
Gender & Ethnicity
Gender Dynamics: Higher prevalence in boys during childhood, shifting toward females in adolescence.
Mortality Gap: Black children face a 3x higher death rate compared to non-Hispanic white peers.
Hospitalization: Hispanic and Black children experience significantly elevated admission rates.
Environment
Urban Risk Drivers
Urbanization: Denser living conditions directly correlate with higher pediatric asthma risk.
Air Quality: Elevated pollutant and particulate levels drive frequent symptom flares.
Housing Exposure: Substandard housing conditions increase indoor allergen and mold triggers.
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National Survey of Children's Health (NSCH) 2023 https://www.cdc.gov/asthma-data/nsch-prevalence/index.html accessed 8/3/2026

4


Epidemiology & Disparities
Pediatric Asthma Prevalence
State Focus • North Dakota (2020)
Age Group: ≤ 18 Years
9,520
Children Diagnosed with Asthma
Prevalence Rate: 5.2%
National Comparison Context
Below U.S. National Average
North Dakota: 5.2% prevalence (9,520 pediatric cases)
United States: 7.4% national benchmark (~4.8M children)
Surveillance & Methodology
CDC State Classification (2020)
Calculated based on state-level pediatric surveillance data for individuals under 18 years of age, reflecting standardized state prevalence classifications.
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Source: https://www.cdc.gov/asthma/national-surveillance-data/asthma-prevalence-state-classification.htm

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02
Clinical Data
Review Pediatric Asthma Morbidity & Mortality Data
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Pediatric Morbidity
Burden of Illness

Quality of Life
- Leading cause of school absenteeism (13.8M missed days/year)
- Academic performance
- Social development
- Activity restrictions

Healthcare Utilization
- 640,000 Emergency Department (ED) Visits
- 100,000 Hospitalizations
- 50-80% use incorrect inhaler technique (AllergyAsthmaNetwork.org April 2018)

Economic & Social
- Caregivers (lost work hours)
- Direct costs (medications, urgent care, hospital stays)

Uncontrolled Disease
Many suffer from "silent" morbidity:
- Activity restrictions
- Interrupted sleep
- Chronic fatigue

National Survey of Children's Health (NSCH) 2023 https://www.cdc.gov/asthma-data/nsch-prevalence/index.html accessed 8/3/2026.

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7

Mortality and Risk Factors
Pediatric Statistics

United States
300-400
Pediatric asthma deaths recorded per year across the nation.

Ethnicity: Black children
- More than double prevalence of white children.
- Face 3 x higher death rates compared to non Hispanic white peers.

North Dakota
1-2
Pediatric asthma deaths per year, highlighting regional impact.

Prevention
Highly Preventable
While asthma is rarely fatal with proper management, most deaths are preventable.

National Survey of Children's Health (NSCH) 2023 https://www.cdc.gov/asthma-data/nsch-prevalence/index.html accessed 8/3/2026.

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03

Care Practice

Share Focused Current Pediatric Asthma Management Guidelines

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Global Initiative for Asthma (GINA) vs National Institute of Health - Expert Panel Report 3 (NIH EPR 3)
Key Similarities

1. Stepwise Framework
Both guidelines use a multi-step treatment model that increases or decreases medication based on regular assessments of symptom control and future exacerbation risk.

2. Core Focus
Both emphasize treating the underlying chronic airway inflammation rather than just providing bronchodilation as the primary path to stability.

3. Goal of Therapy
Both target achieving optimal symptom control, preventing severe attacks, and maintaining normal activity levels.

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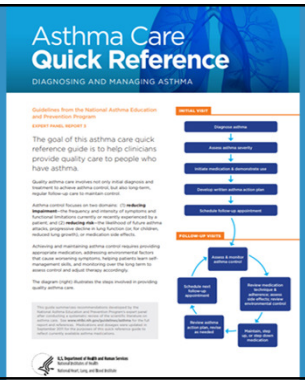
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GINA vs NIH EPR 3 Key Differences

Feature	GINA Guidelines	NIH EPR-3 Guidelines
Update Frequency	Updated **annually** to reflect the latest global scientific literature.	Periodic, comprehensive reports with multi-year gaps between major editions (e.g., EPR-3 in 2007, EPR-4 in 2020).
Primary Audience	**International** clinical practice.	Primarily focused on the **United States** healthcare system.
Initial Assessment Focus	Emphasizes current **symptom control** and frequency of reliever use over the past 4 weeks.	Strongly emphasizes initial categorization of **asthma severity** (intermittent vs. persistent) to dictate starting therapy.
Mild Asthma & Reliever Paradigm	Discourages short-acting beta-agonist (SABA) monotherapy even in mild asthma, preferring as-needed low-dose inhaled corticosteroid (ICS)-formoterol from Step 1/2.	Historically prioritized SABA for rescue use in intermittent/mild disease, evolving more cautiously in later US updates toward ICS-containing rescue options.

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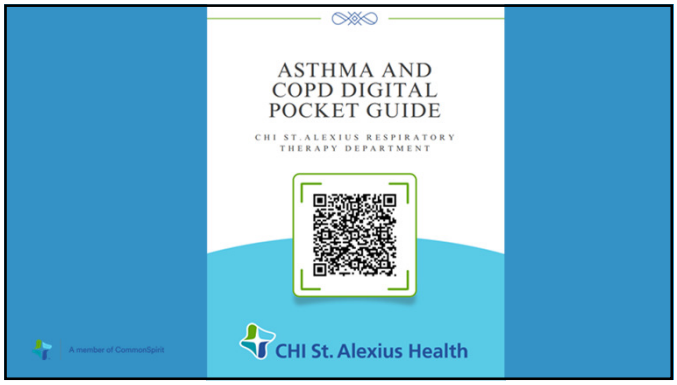
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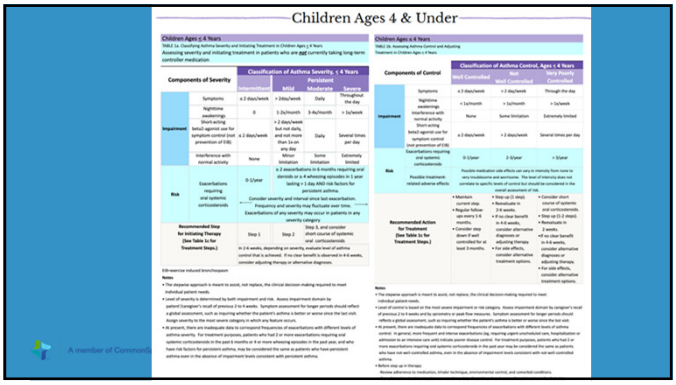
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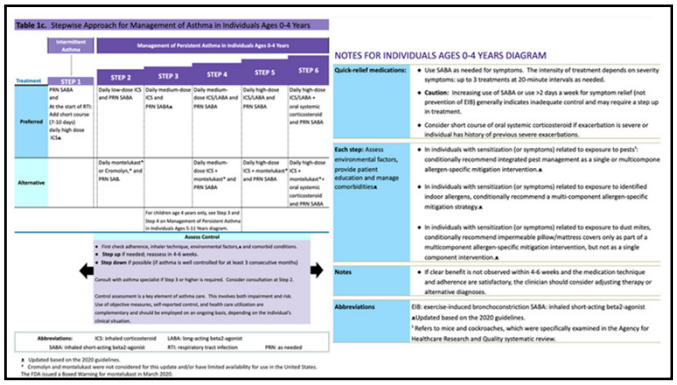
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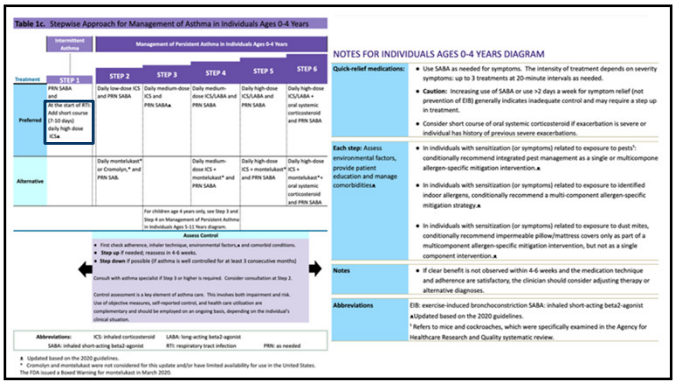
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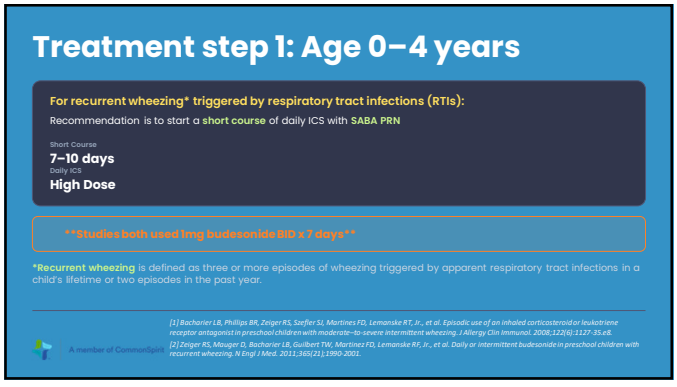
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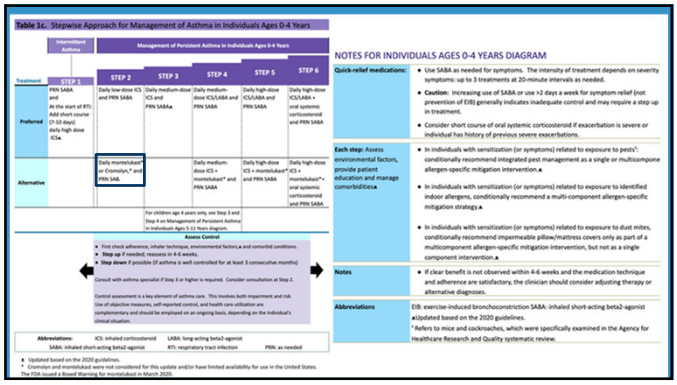
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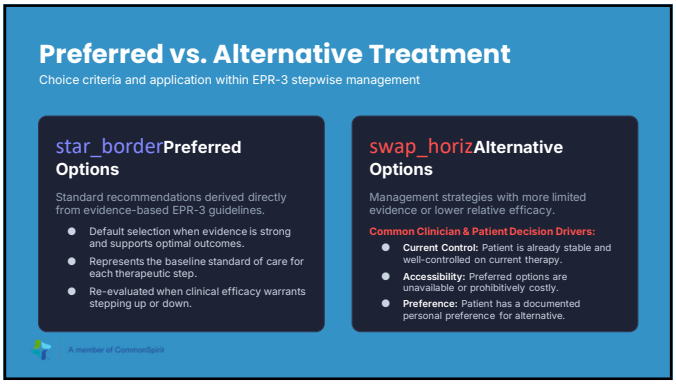
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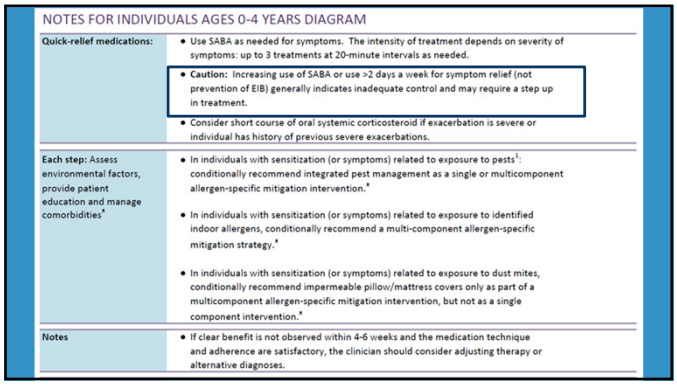
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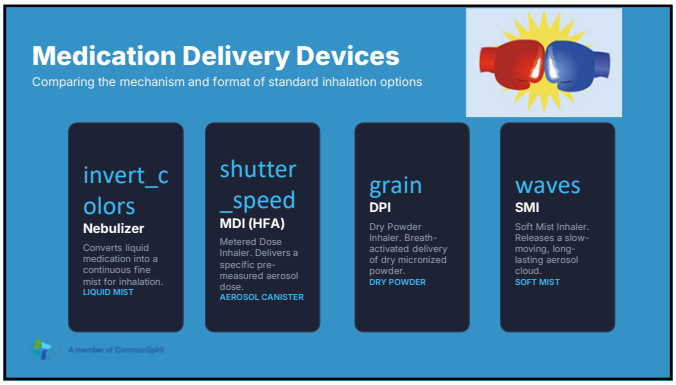
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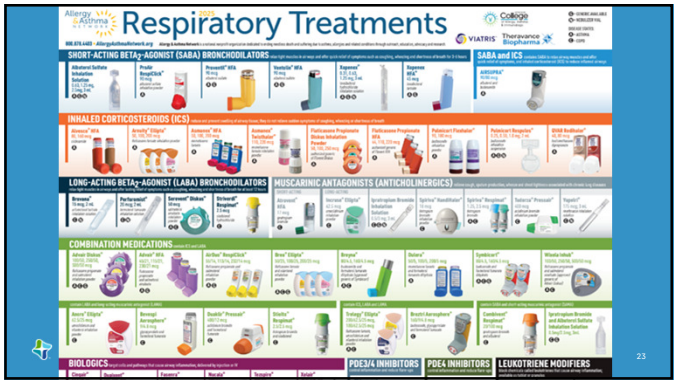
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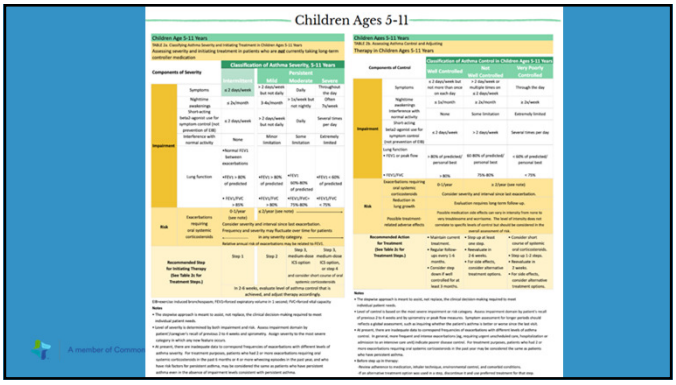
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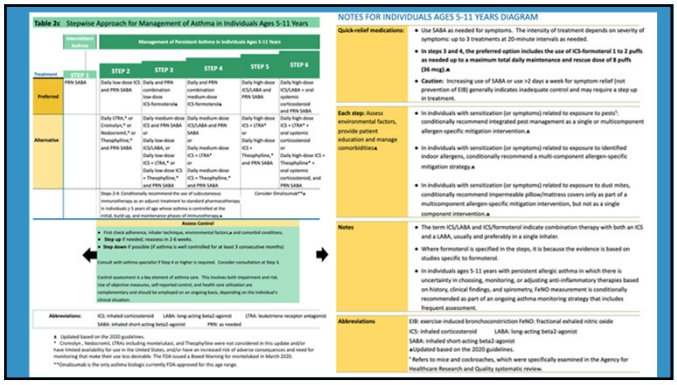
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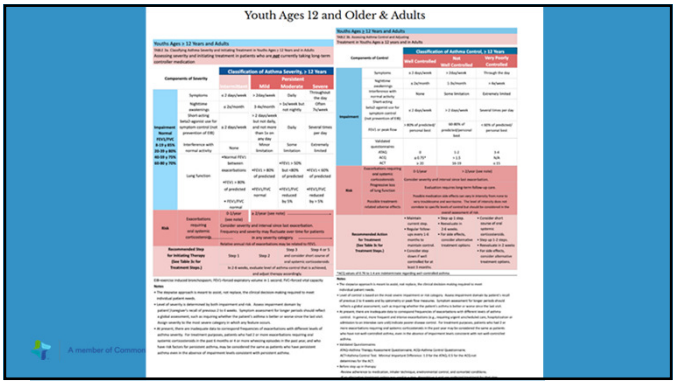
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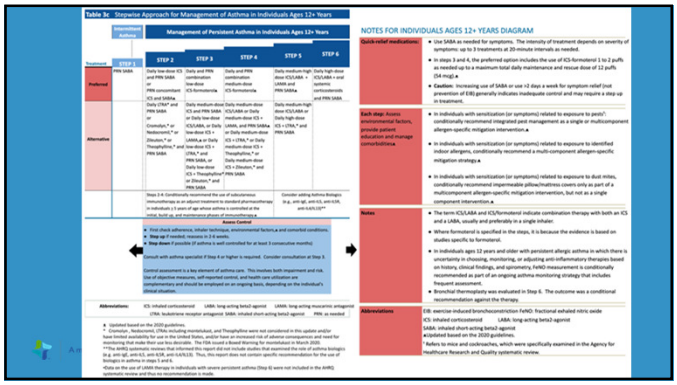
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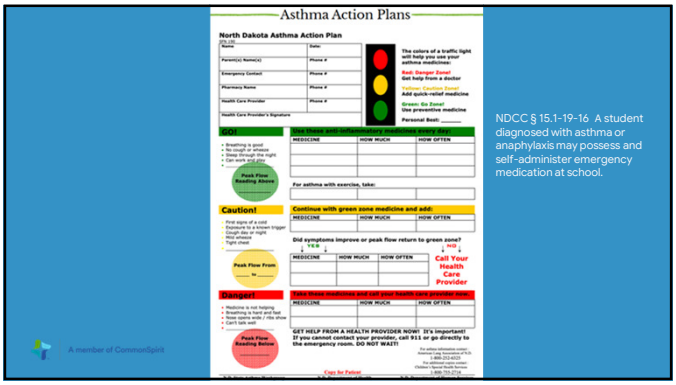
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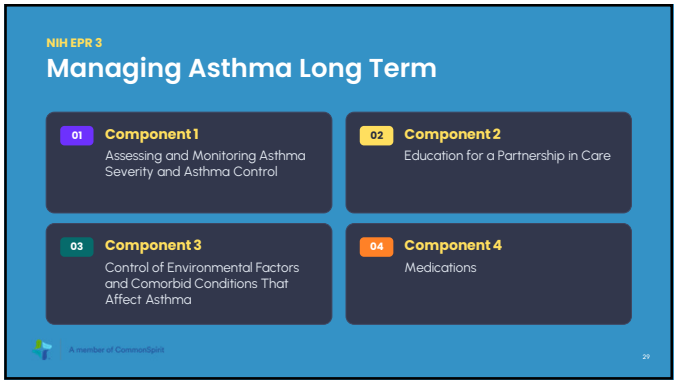


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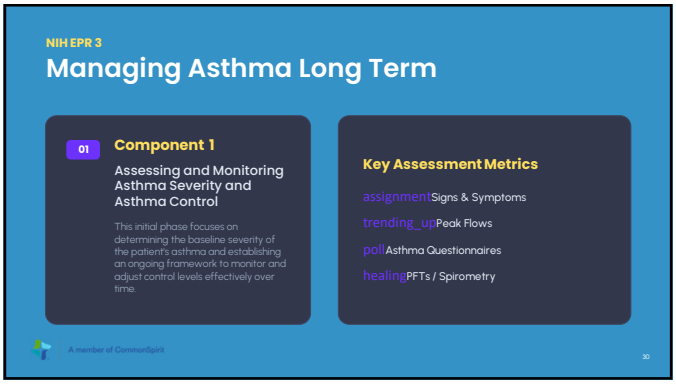


NDCC § 15.1-19-16 A student diagnosed with asthma or anaphylaxis may possess and self-administer emergency medication at school.

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NIH EPR 3

Managing Asthma Long Term

01 **Component 1**

Assessing and Monitoring Asthma Severity and Asthma Control

This initial phase focuses on determining the baseline severity of the patient's asthma and establishing an ongoing framework to monitor and adjust control levels effectively over time.

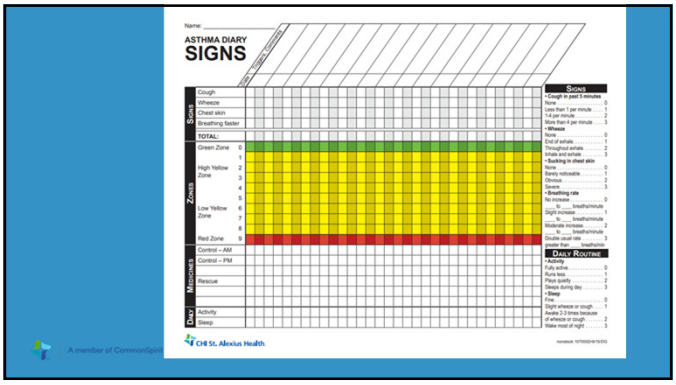
Key Assessment Metrics

assignment Signs & Symptoms

- Daytime: past 2 wks
- Noc time: past month
- Interference w/ activity

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Managing Asthma Long Term

01 **Component 1**

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This initial phase focuses on determining the baseline severity of the patient's asthma and establishing an ongoing framework to monitor and adjust control levels effectively over time.

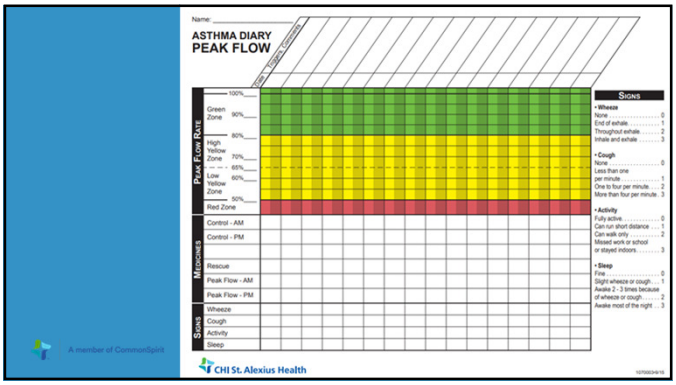
Key Assessment Metrics

trending_up Peak Flows

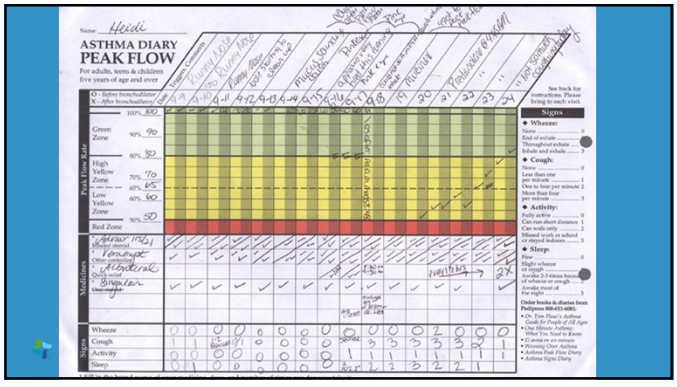


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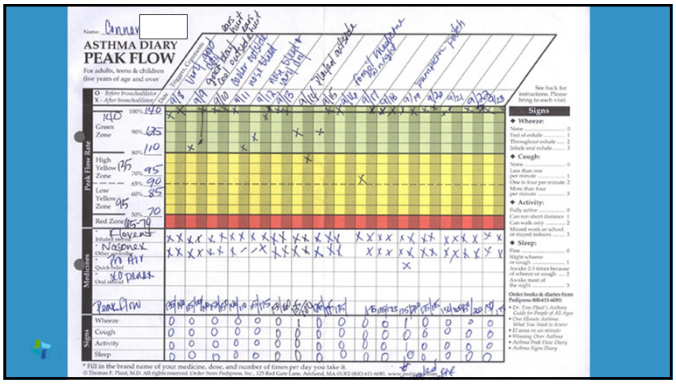
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NIH EPR 3

Managing Asthma Long Term

01 **Component 1**

Assessing and Monitoring Asthma Severity and Asthma Control

This initial phase focuses on determining the baseline severity of the patient's asthma and establishing an ongoing framework to monitor and adjust control levels effectively over time.

Key Assessment Metrics

poll Asthma Questionnaires (Validated)

Outcome measure	Range (points)	Score interpretation
Asthma control		
ACT	5-25	Well controlled: ≥20 Not well controlled: ≤19
Asthma Control Questionnaire-5 (ACQ-5) Asthma Control Questionnaire-6 (ACQ-6)	0-6	Uncontrolled: ≥1.5 Well controlled: <0.75
Asthma Control Questionnaire-7 (ACQ-7)	0-6	Uncontrolled: ≥1.5 Well controlled: <0.75
Asthma-related quality of life		
Asthma Quality of Life Questionnaire Asthma Quality of Life Questionnaire Mini (AQLQ-mini)	1-7	Severe impairment = 1 No impairment = 7
Pediatric Asthma Quality of Life Questionnaire	1-7	Severe impairment = 1 No impairment = 7

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Asthma Control Tests

Childhood Asthma Control Test for children 4 to 11 years.

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 the score (even) for your total.

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

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:

- A simple, 5-question tool that is self-administered by the patient
- Recognized by the National Institutes of Health
- Clinically validated by specialist assessment and spirometry[1]

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NIH EPR 3

Managing Asthma Long Term

01 **Component 1**

Assessing and Monitoring Asthma Severity and Asthma Control

This initial phase focuses on determining the baseline severity of the patient's asthma and establishing an ongoing framework to monitor and adjust control levels effectively over time.

Key Assessment Metrics

healing PFTs / Spirometry

Recommended AT LEAST every 1-2 years, more frequently for asthma that is not well controlled.

FEV1/FVC Normal	
Age 8-19	85%
Age 20-39	80%
Age 40-59	75%
Age 60-80	70%

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NIH EPR 3

Managing Asthma Long Term

01 **Component 1**

Assessing and Monitoring Asthma Severity and Asthma Control

02 **Component 2**

Education for a Partnership in Care

03 **Component 3**

Control of Environmental Factors and Comorbid Conditions That Affect Asthma

04 **Component 4**

Medications

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NIH EPR 3

Managing Asthma Long Term

02

Component 2

Education for a Partnership in Care

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Disease Management

Empower your patient

Encourage self-monitoring, joint decision-making, and active educational engagement to manage symptoms long term.

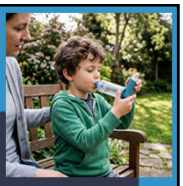
- Select medication and delivery devices that meet patient needs and circumstances.
  - ICSs are the most effective long-term control therapy.
- Review medications, technique, and adherence at EACH follow-up visit.

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NIH EPR 3

Managing Asthma Long Term



02

Component 2

Education for a Partnership in Care

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Disease Management

Empower your patient

Benefits of a spacer / valved holding chamber:

- Re-enforce a slow deep inhale
- Better medication deposition to the lungs
- Minimize deposition in the oropharynx

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NIH EPR 3

Managing Asthma Long Term

02

Component 2

Education for a Partnership in Care

Aerosol Deposition

Gamma Scintigraphy



Inhaler Alone | Inhaler with Valved Holding Chamber (Spacer)

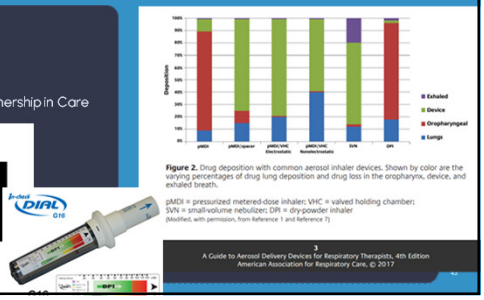


Figure 2. Drug deposition with common aerosol inhaler devices. Shown by color are the varying percentages of drug lung deposition and drug loss in the oropharynx, device, and exhaled breath.

pMDI = pressurized metered-dose inhaler; VHC = valved holding chamber; SVN = small-volume nebulizer; DPI = dry-powder inhaler

(Modified, with permission, from Reference 1 and Reference 7)

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A Guide to Aerosol Delivery Devices for Respiratory Therapists, 4th Edition
American Association for Respiratory Care, © 2017

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NIH EPR 3

Managing Asthma Long Term

03 **Component 3**

Control of Environmental Factors and Comorbid Conditions That Affect Asthma

Environmental Factors: Allergan mitigation is not helpful as a single fix, but useful to gain control of multiple allergens.

- Dust Mites
  - Dust mite proof mattress/pillow covers reduce asthma exacerbations requiring a trip to the ED or hospital admission.
  - Reduce humidity to < 60%
- Cockroaches / Rodents
  - Pest management plan
  - Keep food and garbages closed
- Animal Dander
  - Consider keeping pets outdoors
  - Keep pets out of the bedroom.
- Indoor Mold
  - Remediation
- Pollen and Outdoor Mold
  - Keep windows closed
  - Stay indoors
  - Change your clothes after you come inside

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NIH EPR3

Managing Asthma Long Term

03 **Component 3**

Control of Environmental Factors and Comorbid Conditions That Affect Asthma

Environmental Factors: Irritants

- Tobacco Smoke
  - Ask family members to quit smoking
  - Do not allow smoking in the home or car
- Wildfires
  - AirNOW.gov
- Smoke, Strong Odors and Sprays
  - Avoid wood burning stoves if possible
  - Stay away from strong odors such as perfume, hairspray and paints.
- Vacuum Cleaning
  - Try to have someone else vacuum once or twice a week.
- Cold Air Exposure
  - Cover your nose and mouth with a swarf on cold or windy days.

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NIH EPR3

Managing Asthma Long Term

03 **Component 3**

Control of Environmental Factors and Comorbid Conditions That Affect Asthma

Reduce your risk by using the Air Quality Index (AQI) to plan outdoor activities – www.airnow.gov

AQI Levels of Health Concern	AQI Values	What Action Should People Take?
Good	0-50	Enjoy Activities
Moderate	51-100	**People unusually sensitive to air pollution:** Plan strenuous outside activities when air quality is better
Unhealthy for Sensitive Groups	101-150	**Sensitive Groups:** Cut back or reschedule strenuous outside activities **Ozone:** People with lung disease, children and older adults and people who are active outdoors **Particle Pollution:** People with heart or lung disease (including diabetes), older adults and children **Carbon Monoxide:** People with heart disease and possibly infants and fetuses **Nitrogen Dioxide:** People with lung disease, children and older adults **Sulfur Dioxide:** Active children and adults with asthma
Unhealthy	151-200	**Everyone:** Cut back or reschedule strenuous outside activities **Sensitive groups:** Avoid strenuous outside activities
Very Unhealthy	201-300	**Everyone:** Significantly cut back on outside physical activities **Sensitive groups:** Avoid all outside physical activities

EPA

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NIH EPR3 • Component 3: Environmental Factors & Comorbid Conditions

Comorbid Condition: Allergic Rhinitis

03 **Component 3**

Control of Environmental Factors and Comorbid Conditions That Affect Asthma

- Inhaled Nasal Steroids are the most effective overall treatment class.
- Relieves nasal congestion, sneezing, and runny nose.
- Provides 24-hour daily relief without drowsiness warnings.

Medicine Used to Treat Allergic Rhinitis

	Inhaled nasal steroid*	loratidine (Claritin, Alavert)	cetirizine (Zyrtec)	diphenhydramine (Benadryl)
Most effective class of medicine for the treatment of nasal allergy symptoms	✓			
Stops multiple chemical responses that can cause nasal allergy symptoms	✓			
Relieves nasal congestion	✓			
Effective anti-inflammatory	✓			
Relieves sneezing, runny nose, itchy nose	✓	✓	✓	✓
No drowsiness warning	✓	✓		
24 hour relief	✓	✓	✓	
Safe for daily use	✓	✓	✓	✓

*e.g. Flonase, Nasacort, Nasonex, Veramyst, Omnaris, Zetonna, Beconase AQ

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NIH EPR3 • Component 3: Environmental Factors & Comorbid Conditions

Comorbid Condition: GERD in Pediatric Asthma

1. HIGH PREVALENCE

61%

Prevalence in children with persistent asthma based on abnormal pH studies.

- Of these, 50% had no "typical" symptoms of GERD.

2. HOSPITAL IMPACT

4% Annually

Of all pediatric hospitalizations annually are due to GERD.

- 27% of these are associated with acute or chronic respiratory complaints.

3. MEDICATION RISK

SABA & Steroids

Common asthma therapies can significantly exacerbate reflux symptoms.

- May decrease lower esophageal sphincter tone.
- May decrease esophageal body contractility, worsening reflux.

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NIH EPR 3

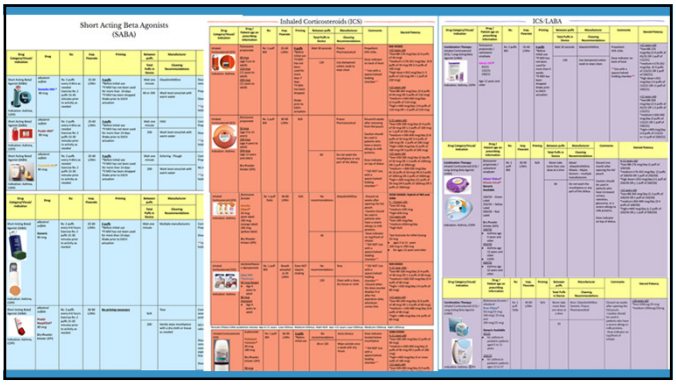
Managing Asthma Long Term

04 **Component 4**
Medications

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Medications

2x2x2 Rule

Key Parts of the Rule

- **Daytime use:** Using your quick-relief rescue inhaler more than **2 times a week**.
- **Nighttime symptoms:** Waking up coughing or wheezing more than **2 times a month**.
- **Inhaler refills:** Needing a new rescue inhaler refill more than **2 times a year**.

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ICS Use & Growth

Seen with particular ICS's and at higher doses

1. Temporary Growth Reduction
Can cause a small, temporary reduction in growth velocity during the first 1–2 years of treatment in children.

2. Non-Progressive Effect
The initial impact is generally non-progressive and does not accumulate over long-term therapy.

3. Minimal Adult Impact
Ultimately has a minimal, clinically insignificant impact on final adult height.

*Refer to pediatric endocrinology if concerns

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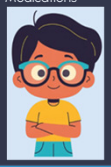
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SMART: Single Maintenance And Reliever Therapy

Preferred Treatment Strategy

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** used both **daily and as needed**.

- Approved in patients ≥ 5 yrs
- NIH guidelines ≥ 12 years

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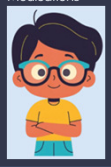
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SMART: Long-Acting Beta Agonist (LABA)

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Medications



Formoterol
Breyna, Symbicort and Dulera
Onset: 2–3 minutes
Duration: 12 hours
Max puffs/day;
- 5–11 yrs: 8 per day
- ≥ 12 yrs: 12/day

Salmeterol
Wixela, Advair and AirDuo
Onset: 10–30 minutes
Duration: 12 hours
* Continue SABA for rescue therapy

Vilanterol
Breo
Onset: 5–10 minutes
Duration: 24 hours
* Continue SABA for rescue therapy

* Daily use should generally not exceed 100 mcg salmeterol or 24 mcg formoterol.
** Frequent or chronic use of LABA to prevent EIB is discouraged, as it may disguise poorly controlled persistent asthma.

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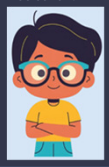
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SMART
Clinical Benefits

- Increases time to exacerbation
- Increases severity of exacerbation
- Decreases frequency of night time awakenings
- Increases lung function

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Medications

Treatment Escalation
Preferred Stepwise Management

When a patient's asthma is uncontrolled on a **medium-dose ICS/LABA**:

- **Add LAMA (approved to age 6, in guidelines starting at age 12)first**
- **Do this before increasing to a high-dose ICS**

*Refer to pediatric pulmonology unable to reach/maintain "well controlled"

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Medications



AirSupra
ICS/SABA
Budesonide 80 mcg / albuterol 90 mcg



Indication:

- **18 years** of age and older
- **2 puffs PRN** for symptomatic relief
- Maximum **6 doses** (12 inhalations) in a 24-hour period

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Inhaled Reliever Therapies for Asthma
A Systematic Review and Meta-Analysis

SABA vs. ICS/formoterol vs. ICS/SABA

27 randomized clinical trials (N = 50,496 adults and pediatric patients)

Conclusion & Relevance:
ICS combined with formoterol and ICS combined with SABA were each associated with **reduced exacerbations** and **improved asthma control** compared with SABA alone.

JAMA. DG Rayner, DM Ferri, et al. October 28, 2024

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Biologics Overview

- 7 approved biologics for severe asthma
- Targeting IgE, IL-4/13, IL-5, & TSLP
- Varying age indications (6+ to 18+)
- Convenient dosing intervals

Biosimilar

- omalizumab - Omlyclo

Biologic Treatments Available for Asthma

	OMALIZUMAB (XOLAIR)	MEPOLIZUMAB (NUCALA)	BENRALIZUMAB (FASENRA)	RESLIZUMAB (CINQAIR)	DUPILUMAB (DUPIXENT)	TEZEPELUMAB-EKKO (TEZSPIRE)	DEPEMOKIMAB-ULAA (JYSELECA)
Asthma Indication	Moderate-to-severe asthma and positive allergy test to perennial aeroallergen (allergic asthma)	Severe eosinophilic asthma	Severe eosinophilic asthma	Severe eosinophilic asthma	Moderate-to-severe eosinophilic asthma or OCS-dependent asthma	Severe asthma	Severe eosinophilic asthma
Approved Ages	6+	6+	6+	18+	6+	12+	12+
Administration	Subcutaneous injection (shot)	Subcutaneous injection (shot)	Subcutaneous injection (shot)	Intravenous infusion (IV)	Subcutaneous injection (shot)	Subcutaneous injection (shot)	Subcutaneous injection (shot)
Setting of Administration	Clinic or home	Clinic or home	Clinic or home	Clinic	Clinic or home	Clinic or home	Clinic
Dosing Interval	Every 2-4 weeks	Every 4 weeks	Every 4 weeks for the first 3 doses, then every 8 weeks	Every 4 weeks	Every 2-4 weeks	Every 4 weeks	Every 6 months
Molecule/ Target	IgE (Anti-IgE monoclonal antibody	IL-5/Anti-IL-5 monoclonal antibody	IL-5 receptor/Anti-IL-5 receptor monoclonal antibody	IL-5/Anti-IL-5 monoclonal antibody	IL-4 and IL-13/ Anti-IL-4R alpha monoclonal antibody	TSLP/Anti-TSLP monoclonal antibody	IL-5/Anti-IL-5 mono-clonal anti-body

Abbreviations used: immunoglobulin-E (IgE), interleukin (IL), oral corticosteroids (OCS), thymic stromal lymphopoietin (TSLP)
Updated March 2026 - aafa.org

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Biosimilar to omalizumab = Omlyclo

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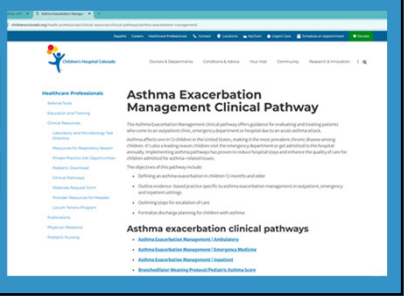
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04 **Component 4**
Medications

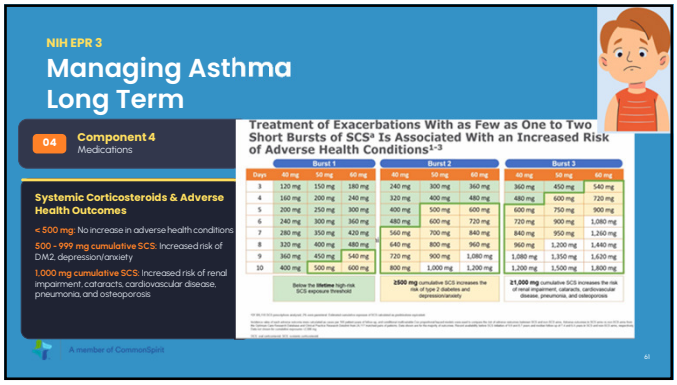
Acute Exacerbation Management



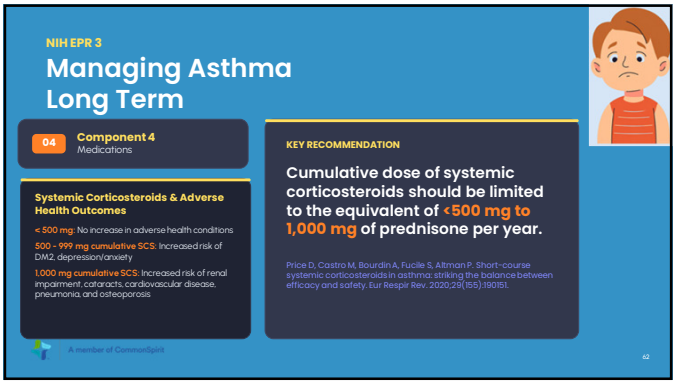
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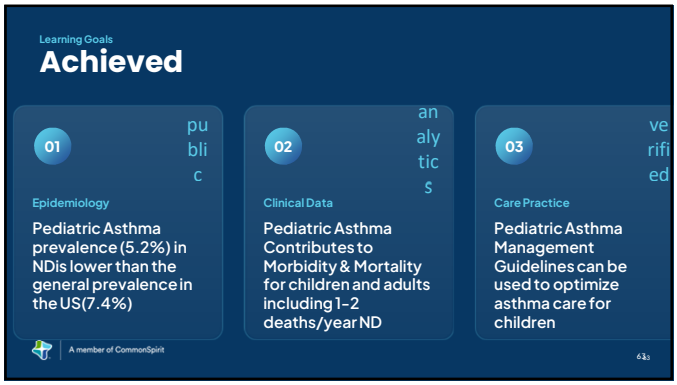
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Managing Asthma Long Term
04
Component 4
Medications
Systemic Corticosteroids & Adverse Health Outcomes
< 500 mg: No increase in adverse health conditions
500 - 999 mg cumulative SCS: Increased risk of DM2, depression/anxiety
1,000 mg cumulative SCS: Increased risk of renal impairment, cataracts, cardiovascular disease, pneumonia, and osteoporosis
Treatment of Exacerbations With as Few as One to Two Short Bursts of SCS[a] Is Associated With an Increased Risk of Adverse Health Conditions[1-3]
Burst 1
Burst 2
Burst 3
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04
Component 4
Medications
Systemic Corticosteroids & Adverse Health Outcomes
< 500 mg: No increase in adverse health conditions
500 - 999 mg cumulative SCS: Increased risk of DM2, depression/anxiety
1,000 mg cumulative SCS: Increased risk of renal impairment, cataracts, cardiovascular disease, pneumonia, and osteoporosis
KEY RECOMMENDATION
Cumulative dose of systemic corticosteroids should be limited to the equivalent of <500 mg to 1,000 mg of prednisone per year.
Price D, Castro M, Bourdin A, Fucile S, Altman P. Short-course systemic corticosteroids in asthma: striking the balance between efficacy and safety. Eur Respir Rev. 2020;29(155):190151.
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Learning Goals
Achieved
01
publi c
Epidemiology
Pediatric Asthma prevalence (5.2%) in NDis lower than the general prevalence in the US(7.4%)
02
analytic s
Clinical Data
Pediatric Asthma Contributes to Morbidity & Mortality for children and adults including 1-2 deaths/year ND
03
verifi ed
Care Practice
Pediatric Asthma Management Guidelines can be used to optimize asthma care for children
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