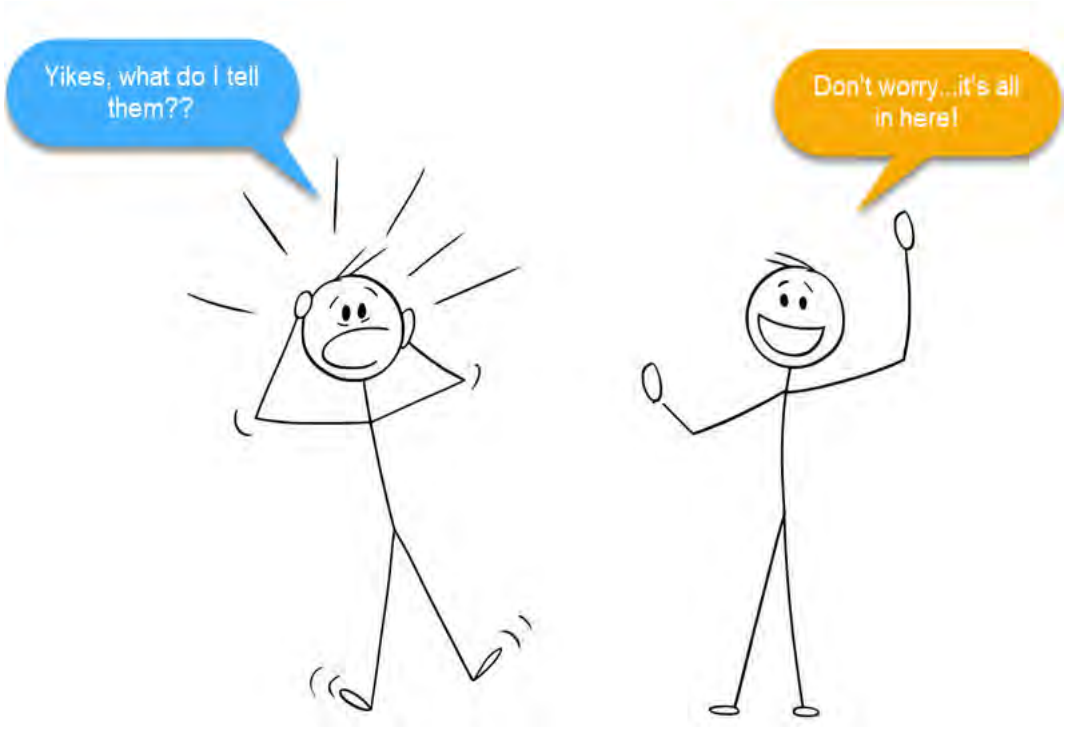
PEDIATRIC ASTHMA:

TALK THE SAME TALK

Asthma Knowledge for Pediatric Health Care Professionals:
Medically Accurate, Consistent Messaging
for All

"Effective asthma control will almost never be achieved by medications alone."

-Anonymous



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Note:
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- To link quickly to a specific page from the Table of Contents, simply click on the page number below or use the bookmark links to the left of this page view.
- Looking for a specific topic? On your keyboard, press the "**Ctrl**" and "**f**" keys at the same time and a "Find/Search" box will appear
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i. FOREWORD

Asthma represents a significant number of children and adults who visit emergency departments and hospitals. Healthcare professionals and families are frustrated that much of the asthma information they receive conflicts with other information. The objective of this document is to promote a medically accurate, consistent, asthma information resource for asthma educators and healthcare professionals who teach families about asthma.

In March 2006, the Alberta Children's Hospital (in Calgary, Alberta, Canada) introduced a Pediatric Asthma Pathway which provides medical guidelines to facilitate continuity in care. The Alberta Childhood Asthma Pathway (ACAP) was launched in 2015. In 2020 the Respiratory Health Strategic Clinical Network became part of Medicine Strategic Clinical Network™. For more information and resources visit the Respiratory Health Section.

This "Talk the Same Talk" document:

- is written from a Canadian medical perspective and considers both the Canadian Asthma Consensus Guidelines and the Global Initiative for Asthma (GINA) Guidelines
- is regularly reviewed for updates, edits and revisions to ensure medical accuracy
- has grown over the years and will continue to evolve with feedback
- had many contributors who provided both expertise and resource tools

Thanks to the everyone who contributed or reviewed content including the many Respiratory Educators, Nurses, Respiratory Therapists, Pharmacists and Physicians from the Alberta Children's Hospital for their contributions.

Please send questions/comments or suggestions for the next update to Kathy.Courtney@ahs.ca

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This document has been edited and updated over many years and is the result of collaboration with numerous respiratory health care professionals. If we have missed a reference or source for any of these materials, please let us know.

Website Note: This document is posted to the Community Pediatric Asthma Service website. There are two ways to access the document:

- When you are on the website, click on the menu Clinical→Health Care Providers→Health Care Provider Tools.
- You can also access and download the document directly by clicking here.

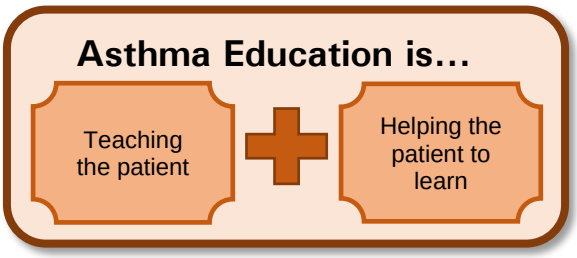
Preparation, production and web support of this education tool has been provided by the Community Pediatric Asthma Service

ii. ACRONYMS

Within both the health care profession and this document, acronyms are frequently used. Please refer to the list below for a definition for acronyms used throughout this document. PC_{20}

Acronyms Used	Definition
ABPA	Allergic Bronchopulmonary Aspergillosis
ACAP	Alberta Childhood Asthma Pathway
AHS	Alberta Health Services
ARIA	Allergic Rhinitis and its Impact on Asthma
BID	Twice a Day
CAE	Certified Asthma Educator
CANA	COPD & Asthma Network of Alberta
CCAP	Calgary COPD & Asthma Program
CMAJ	Canadian Medical Association Journal
CPAS	Community Pediatric Asthma Service
CRE	Certified Respiratory Educator
CTE	Certified Tobacco Educator
CTS	Canadian Thoracic Society
ELO	Exercise Induced Laryngeal Obstruction
FEV_1	Forced Expiratory Volume 1 second
FVC	Forced Vital Capacity
GERD	Gastro Esophageal Reflux Disease
GINA	Global Initiative for Asthma
ICS	Inhaled Corticosteroids
ILO	Induced Laryngeal Obstruction
LLN	Lower Limit of Normal
LPR	Laryngopharyngeal reflux
MMAD	Mar Median Aerodynamic Diameter
OD	Once Daily
PC_{20}	Provocative Concentration of Methacholine that results in 20% fall of FEV_1
PD_{20}	Provocative Dose of Methacholine that results in a 20% fall of FEV_1
PFT	Pulmonary Function Test
PVFM	Paradoxical Vocal Cord Fold Motion
RHS	Respiratory Health Section, Medicine Strategic Clinical Network™
RN	Registered Nurse
RRT	Registered Respiratory Therapist
SABA	Short Acting Beta Agonist
SOB	Shortness of Breath
VCD	Vocal Cord Dysfunction

1. WHAT IS ASTHMA EDUCATION?



As an asthma educator, we must be aware and sensitive to different learning styles. Being able to adapt to each patient's/family's needs is crucial for patient learning.

Asthma education has evolved from simply trying to convince the family to take their inhaled corticosteroid and device technique to a more holistic approach.

Asthma education consists of **five** key, equally important goals:

1. **Assess**: An educator must be able to assess the patient and family history, physical and objective findings and, if available, perform spirometry. As educators, we also actively enter the patient's world to explore the patient'' feelings about having asthma, their understanding of asthma, how asthma is affecting them and their families and what they expect from the visit

2. **Integrate**: To integrate what you have learned with an understanding of the whole person. The educator needs to be aware of the multiple aspects of the patients' and families' lives, personality, learning style, culture and health literacy

3. **Goal Setting**: Finding common ground and realistic goals between patient and educator. This often involves creative thinking and problem-solving. When patients achieve a benefit, they are more likely to sustain change

4. **Health Promotion**: Incorporating prevention and health promotion into the visit, asking about sleep, diet, exercise and stress

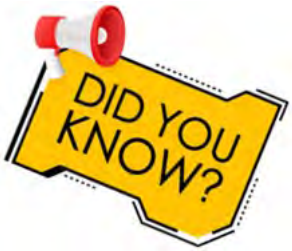
5. **Building relationships**: Building trust, showing compassion, and sharing of power and healing helps build relationships

OUR FAVORITE TOOLS

Here are some of our favorite tools:

- Alberta Acute Childhood Asthma Pathway: Evidence based recommendations
- Alberta Health Services "Understanding Childhood Asthma" Short, eight-minute educational video for parents and kids
- Airway Model sets and Alveolar Model set from Luxidea
- Free app: Simply Sayin' Medical Jargon-family-friendly medical terms and pictures. Apple App Store , Google App Store

2. DID YOU KNOW…

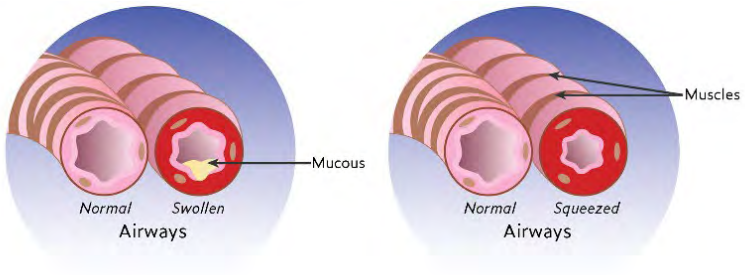


- an estimated 3.8 million Canadians have asthma. Canada has one of the highest rates of asthma in the world
- approximately 10-15% of Canadian children have physician diagnosed asthma
- estimated 80% of asthma deaths could have been prevented with proper asthma education
- 74% of people with asthma report health related anxiety due to asthma
- approximately 250 people (adults and children) die from asthma every year in Canada
- approximately 30% of patients with a physician diagnosis of asthma do NOT have asthma
- up to 90% of patients using asthma/COPD medications have poor device technique
- 60% of people with asthma are poorly controlled which means they do not achieve acceptable levels of control on at least two key criteria according to the national guidelines
- asthma associated with colds and flu is the leading cause of absenteeism in North America
- 75% of children with eczema also have asthma
- approximately 85-90% of people who suffer from asthma also suffer from allergic rhinitis
- Half to two thirds of children will “out grown” their asthma by school age-puberty

3. PATHOPHYSIOLOGY: INFLAMMATION, BRONCHOSPASM, MUCOUS PRODUCTION

Asthma, a heterogeneous condition (diverse in character or content) is usually defined by:

- smooth muscle tightening in the airways
- chronic inflammation
- increased mucous production
- reversible airways obstruction
- inflammation in the small airways contributes significantly to asthma pathology. approximately 50% of total resistance



NORMAL AIRWAYS	"ASTHMATIC" AIRWAYS
The inside of the airways is not inflamed or swollen	The patient is exposed to a "trigger" which causes their lungs to react and their airways to become inflamed and swollen.
The muscles around the airways are relaxed	The muscles around their airways tighten
The airways are clear of mucous	Mucous is produced and builds up in the airways • This results in the airways becoming narrower, blocking the flow of air • This may cause the patient to have symptoms such as cough, wheeze, tightness of chestor difficulty in breathing

COMMON ASTHMA PHENOTYPES

- **Allergic asthma**:
  - Eosinophilic airway inflammation. Patients respond well to ICS.
- **Non-allergic asthma**:
  - May be neutrophilic, eosinophilic or only a few inflammatory cells. This is less responsive to ICS.
- **Asthma with obesity**:
  - Prominent respiratory symptoms and little eosinophilic airwayinflammation.
- **Asthma with persistent airflow limitation**:
  - Thought to be caused by airway wall remodeling.
- **Late-onset asthma**:
  - Some adults, particularly women, present with asthma for the first time in adult life.

4. DIAGNOSIS

The most common question educators receive from parents/caregivers is "Does my child have asthma?". Since diagnosis of asthma can take weeks, months, even years, only a medical physician can make a formal diagnosis.

Asthma is the presence of airways hyper-reactivity in the absence of underlying lung or airway disease. A medical physician can diagnose asthma with the aid of objective testing (spirometry). It may take some time to establish the presence of airways hyper-reactivity and to be certain there is no underlying lung disease. It is unclear why some people get asthma and others do not. This document may help parents who ask "Does My Child Have Asthma?".

It is sometimes challenging for parents/caregivers to accurately describe their child's asthma symptoms. A perfect solution is to have them use their phone to video their child while they are experiencing symptoms, like a cough. They can then bring the video to their appointment with their health care provider for discussion.

An asthma diagnosis is based on:

- **Medical History**
  - Both patient and family. If a parent or close relative have allergies and/or asthma, the chances of having asthma is increased.
  - Children exposed to toxic stress is linked to asthma, among several other conditions.

- **Signs and Symptoms of Asthma**
  - **C**ough, **W**heeze, **T**ightness of chest, **S**hortness of breath.

- **Eczema**
  - If you have eczema, you are more likely to develop asthma.

- **Allergies**
  - If you have allergies, you are also more likely to develop asthma.

- **Response to Asthma Treatment**
  - A documented response to a bronchodilator in an acute asthma episode is helpful. A response over 1-2 weeks to an inhaled corticosteroid (ICS) will assist in deciding the diagnosis and guiding a decision for the best long-term therapy.
  - Asthma treatment is often **started** based on clinical presentation and response to treatment.

- **Spirometry**
  - Since asthma can be intermittent and variable, a patient can have normal breathing test results, but still have a diagnosis of asthma.
  - Spirometry measures volume and airflow. Generally, children 6 years of age and older can perform spirometry. This test is not 100% diagnostic.
  - If the patient's airways are not narrowed at the time of the test, the test results can be normal. The most important function of spirometry is to assess the severity of airway obstruction. An increase in FEV1 Post bronchodilator ≥ 12% helps confirm the diagnosis of asthma.
  - Spirometry is only one tool to help with the diagnosis of asthma.

Table 1. **Diagnosis of asthma.**

CLINICAL HISTORY COMPATIBLE WITH ASTHMA
Paroxysmal or persistent symptoms such as dyspnea, chest tightness, wheezing, sputum production, and cough
and
CONFIRMATION OF REVERSIBLE AIRFLOW OBSTRUCTION

	Children (1-5 years of age)	Children (6 years of age and over)	Adults (18 years of age and over)
Preferred	Documentation by trained health care provider of wheeze and other signs of airflow obstruction with documented improvement with SABA +/- oral corticosteroids	Spirometry showing reversible airflow obstruction $FEV_1/FVC < LLN$ (<0.8-0.9[a]) AND increase in FEV_1 after a bronchodilator or after a course of controller therapy of ≥12%	Spirometry showing reversible airflow obstruction $FEV_1/FVC < LLN$ (<0.75-0.8[a]) AND increase in FEV_1 after a bronchodilator or after a course of controller therapy of ≥12% and a minimum of ≥200mL
Alternative	Convincing caregiver report of wheezing or other symptoms of airflow obstruction with symptomatic response to a 3-month trial of a medium dose of ICS and as needed SABA or symptomatic response to SABA[b]	Peak expiratory flow ≥20% increase after a bronchodilator or after a course of controller therapy[c]	Peak expiratory flow 60L/min (minimum ≥20%) increase after a bronchodilator or after a course of controller therapy[c] OR Diurnal variation >8%[12] based on twice daily readings; >20% based on multiple daily readings[d]
Alternative		Positive challenge test Methacholine PC_{20} <4 mg/ml or PD_{20} <0.5 µmol (100 mcg) PC_{20} 4-16 mg/mL or PD_{20} 0.2-2 µmol (100-400 mcg) is borderline PC_{20} >16 mg/mL or PD_{20} >2 µmol (>400 mcg) is negative[13] OR Exercise challenge with ≥10-15% decrease in FEV_1 post-exercise	

ABBREVIATONS			
FEV1	Forced Expiratory Volume 1 second	PC_{20}	Provocative Concentration of Methacholine that results in 20% fall of FEV_1
FVC	Forced Vital Capacity	PD_{20}	Provocative Dose of Methacholine that results in a 20% fall of FEV_1
ICS	Inhaled Corticosteroids	SABA	Short Acting Beta Agonist
LLN	Lower Limit of Normal		

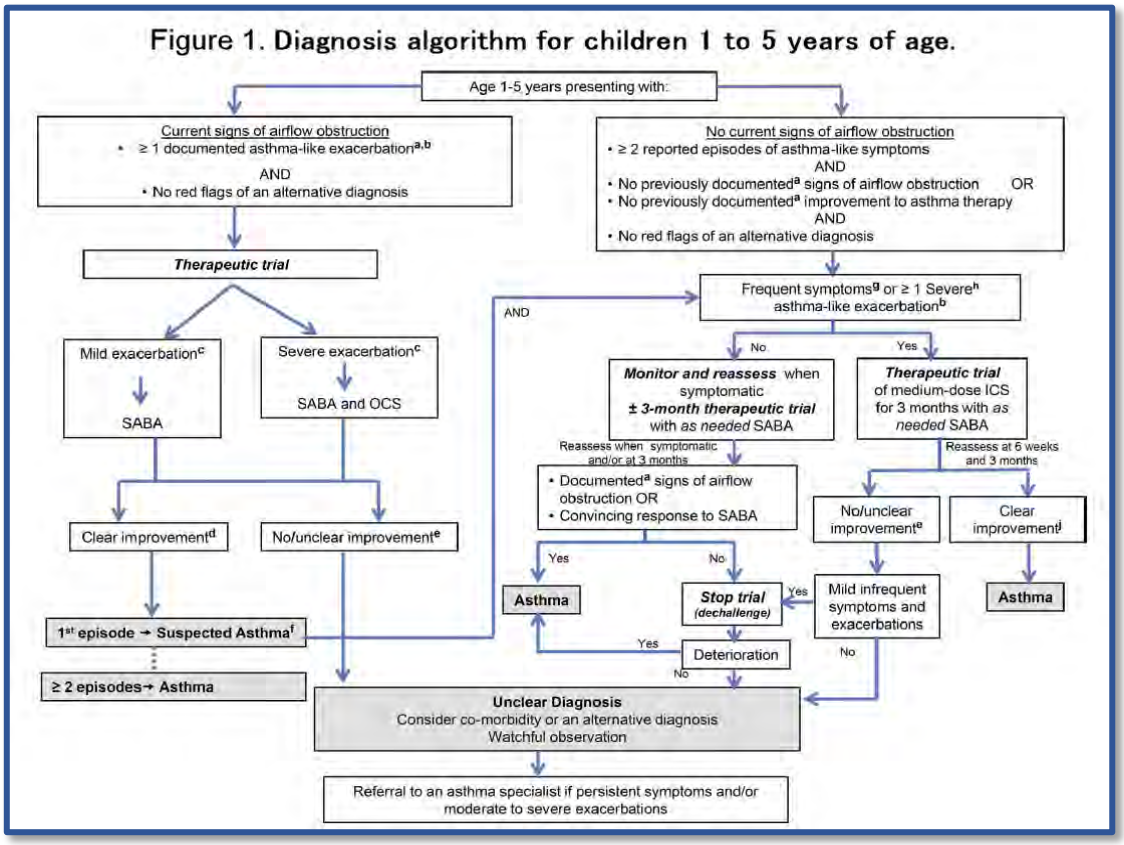
[a]Approximate lower limits of normal ratios for children and adults.

[b]In children with mild intermittent symptoms and mild exacerbations, the diagnosis is only suggested because the accuracy of parental report of response to treatment may be unreliable due to misperception and spontaneous improvement of symptoms, which is why confirmation of reversible obstruction by direct observation from a health care provider is preferred.

[c]Comparison of peak expiratory flows should be done on the same device given the variability between devices.

[d]Difference between minimum AM pre-bronchodilator value in 1 week and maximum PM value as % of recent maximum.

Source: Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers, (cts-sct.ca)



[a]Documentation by a physician or trained health care practitioner.

[b]Episodes of wheezing with/without difficulty breathing.

[c]Severity of an exacerbation documented by clinical assessment of signs of airflow obstruction, preferably with the addition of objective measures such oxygen saturation and respiratory rate, and/or validated score such as the Pediatric Respiratory Assessment Measure (PRA M) score.

[d] Based on marked improvement in signs of airflow obstruction before and after therapy or a reduction of ≥ 3 points on the PRA M score, recognizing the expected time response to therapy.

[e]A conclusive therapeutic trial hinges on adequate dose of asthma medication, adequate inhalation technique, diligent documentation of the signs and/or symptoms, and timely medical reassessment; if these conditions are not met, consider repeating the treatment or therapeutic trial.

[f] The diagnosis of asthma is based on recurrent (≥ 2) episodes of asthma-like exacerbations (documented signs) and/or symptoms. In case of a first occurrence of exacerbation with no previous asthma-like symptoms, the diagnostic of asthma is suspected and can be confirmed with re-occurrence of asthma-like symptoms or exacerbations with response to asthma therapy.

[g]>8 days/month with asthma-like symptoms.

[h] Severe exacerbations require any of the following: systemic steroids, hospitalization; or an emergency department visit.

[l] In this age group, the diagnostic accuracy of parental report of a short-term response to as-needed short-acting β2-agonist (SABA) may be unreliable due to misperception and/or spontaneous improvement of another condition. Documentation of airflow obstruction and reversibility when symptomatic, by a physician or trained health care practitioner, is preferred.

[j] Based on 50% fewer severe exacerbations, shorter and milder exacerbations, and fewer, milder symptoms between episodes.

Source: Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers, (cts-sct.ca)

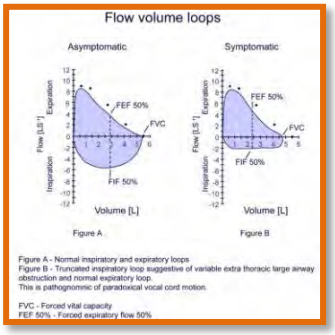
The correct diagnosis of asthma is essential and patients can often have more than one reason for presenting with asthma-like symptoms. There are many conditions which can result in symptoms suggestive of asthma including:

POST NASAL DRIP

- Identify what is causing the trigger and see if they can avoid it. Treatment of sinus rinse, ICS nasal sprays, antihistamines are considerations.

INDUCIBLE LARYNGEAL OBSTRUCTION (ILO)

- Also known as **Vocal Cord Dysfunction** (VCD), **Exercise Induced Laryngeal Obstruction** (EILO), **Factitious Asthma**, **Paradoxical Vocal Cord Fold Motion** (PVFM)
- The signs, symptoms and triggers are similar to asthma, therefore, it is often misdiagnosed as asthma. ILO is vastly under-diagnosed, with only 20% of family physicians and <5% of allied health having ever heard of ILO. Some studies report up to 50% of patients with an asthma diagnosis may have this condition. Diagnosis can be challenging, and some patients can have both asthma and ILO.
- Diagnosis is largely based on ruling out other conditions and empirical presentation. Laryngoscopy is suggested to rule out a pathological cause, for example, polyps on the vocal cords, but this can be difficult to access. The scoping procedure may produce the adduction of the cords but it is rare, making the diagnosis difficult to confirm.
- Proper diagnosis is essential and treatment by a health care provider trained in ILO is critical, this includes respiratory therapists, speech therapists, physiotherapists and psychologists
- Symptoms include:
  - inspiratory stridor/wheeze or cough
  - difficulty breathing in
  - patient feeling it more in upper chest, throat area
  - sudden onset and disappearance of symptoms
  - change in voice quality
  - poor response to asthma medications is also helpful with diagnosis
  - oxygen saturation levels remain normal. If the child is presenting to the emergency department, they appear acutely distressed, yet their oxygen levels are normal. This may be a symptom of ILO
- Device check is essential as patients who report that the medication works or sometimes works while technique is poor, causes the suspicion of ILO or another diagnosis.
- Spirometry testing during an episode typically shows a flattened inspiratory loop which can also be helpful.
- Treatment includes proper posture, proper diaphragmatic breathing, stretching of neck muscles, voice exercises, sniff technique, visualization and laying the tongue on the bottom of mouth.
  - Speech therapy, physio therapy, respiratory therapists and psychiatrists are health care professionals that can help patients.
  - Currently, knowledgeable professionals on this topic are limited making it challenging to find someone to help.



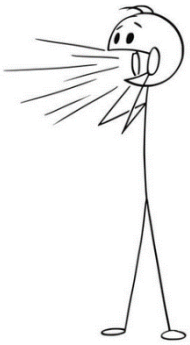
DYSFUNCTIONAL BREATHING/HYPERVENTILATION SYNDROME

- Breathing influences all the body's organs and functions and affects our physical and mental health. Breathing is complex and breathing well is important.
- The 10th cranial nerve (Vagus Nerve) is part of a circuit that lines the neck, heart, lungs and abdomen to the brain.
- Primary breathing muscles are the diaphragm (vital pump responsible for 80-90% of the work during quiet breathing and intercostal muscles (10-20% of the work during quiet breathing) and together they use 5% of body energy.
- Secondary/accessory breathing muscles – Scalene/neck, shoulder, trunk muscles – use 30%of body energy.
- The goal is to achieve a healthy balance of the autonomic nervous system - parasympathetic and sympathetic nervous systems.
- Proper posture is important in how we breath. Poor posture with time spent over computers, gaming and not moving often enough is increasingly problematic in society.
- The natural breathing pattern is: breathing in and out through the nose; low chest/abdominal pattern; 6-10 breaths per minute; a relaxed pause at the end of the out breath.
- Typical dysfunctional breathing symptoms include:
  - feeling "air hunger". Cannot get a full breath of air in. Short of breath (SOB)
  - frequent yawning/sighing
  - breathing discomfort
  - anxious and uptight
  - disturbed sleep
  - sore muscles (back/neck)
  - tiredness
- Patients often describe continued feelings of SOB/air-hunger, even with good asthma control. This may potentially lead to over-treatment of asthma patients with co-existing dysfunctional breathing.
- It may be helpful to do a brief assessment, to make the patient aware that their breathing pattern is abnormal and may be contributing to their symptoms. Providing simple exercises is a consideration.
- To promote a proper breathing pattern, a referral to a trained physiotherapist is recommended for full assessment of the breathing muscles and exercises.
- The importance of proper breathing is becoming more recognized and in the diagnostic repertoires of many clinicians in all areas of health care. Discussing and assessing patients about dysfunctional breathing is critical in asthma management as patients want to live well, including medication and drug-free options for proper breath.

OBESITY/PHYSICALLY UNFIT

- Being obese and physically unfit can mimic symptoms of asthma. Obesity rates are rapidly increasing amongst youth, and as educators, we have a role to play in helping fight obesity.
- Proper diagnosis, treatment and maintaining asthma control is critical.
- Educators should encourage patients to lead a healthy lifestyle of physical activity, healthy diet and good quality sleep.

THROAT CLEARING



- Family describes cough, but observation/video reveals throat clearing.

HABIT COUGH

- Consider habit cough, when cough is the main symptom during waking hours, even with treatment. One to two forced sounding coughs.

GERD (GASTROESOPHAGEAL REFLUX DISEASE)

- When acid repeatedly "refluxes" from the stomach into the esophagus alone, it is known as gastroesophageal reflux disease (GERD). However, if the stomach acid travels up the esophagus and spills into the throat or voice box (called the pharynx/larynx), it is known as laryngopharyngeal reflux (LPR).
- Symptoms of coughing, wheezing, shortness of breath are associated with Reflux. Treat the Reflux, then the respiratory symptoms go away.

CROUP

- A viral infection of the larynx and trachea, typically with a cough sounding is like a harsh, barky cough.
- Generally, improves quickly when exposed to cold air.
- Patients can have croup and then progress to asthma.
- Describing a cough is often subjective and a "barking" cough may not necessarily mean croup, but consider asthma or foreign body aspiration.

BRONCHIOLITIS

- Inflammation of the bronchioles often caused by Respiratory Syntactical Virus or other virus causing coughing and difficulty breathing.

FOREIGN BODY ASPIRATION

- For example, popcorn or a battery.

ALPHA1 ANTITRYPSIN DEFICIENCY

- A rare genetic disorder. Consider if there is a family history of lung disease/COPD and early death.

ALLERGIC BRONCHOPULMONARY ASPERGILLOSIS (ABPA)

is a severe allergic reaction in the lungs after being exposed to a type of fungus called Aspergillus. Patients may present with asthma symptoms such as SOB, cough, wheeze. This is not very common, but did see more of it after the epic floods in Alberta in 2013.

CONGENITAL ANOMALIES

- Anomalies of the respiratory, gastrointestinal or cardiovascular systems i.e., Tracheal Esophageal Fistula, Heart Defects.

CYSTIC FIBROSIS

- All babies born in Alberta are screened for this.
- Sweat chloride testing should still be considered as the gold standard if there is a history of chronic wet cough with recurrent infections, poor growth, or clubbing.
- Children with nasal polyps should also be investigated for cystic fibrosis.

VOCAL CORD PARALYSIS

- Damage to the larynx or vocal cords, i.e., by intubation or trauma. Requires ENT expertise.
- Presents with dysphonia, SOB, difficulty swallowing. It is a rare condition and requires the expertise of an ENT physician.

RESOURCES

SOURCE	LINK
Books	• Breathing Cure: Patrick McKeown • How to take a Breath: Tania Clifton-Smith • Oxygen Advantage: Patrick McKeown • Recognizing and treating breathing disorders – A multidisciplinary approach: Christopher Gilbert, Leon Chaitow, Dinah Bradley
Alberta Health Services	• Triage and Acute Management of Button Battery Ingestions in Children
American Thoracic Society	• Vocal Cord Dysfunction • Exercise-induced Laryngeal Obstruction
Bradcliff Breathing Method	• Nijmegen Questionnaire
Canadian Thoracic Society	• Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers • Guideline Library
Community Pediatric Asthma Service	• Breathing Well • VCD Patient Package • Throat Clearing: Breaking the Cycle • Dysfunctional Breathing
Family Physician Airways Group of Canada	• Tools and Resources
GIKids	• Gastroesophageal Reflux Disease (GERD) and Reflux
National Jewish Medical Centre	• Vocal Cord Dysfunction • Living with Pediatric Vocal Cord Dysfunction (VCD) • Vocal Cord Dysfunction Video
Science Direct	• Habit Cough: An Overview
University of Iowa, Dr. Miles Weinberger	• Chronic Cough Video
University of Southampton, England	• Breathing Freely Video Based Training

5. Asthma Control

- Different guidelines have different criteria for control.
- Broadly accepted "Well-controlled asthma means no symptoms."
- Presence of symptoms, that is, having any of the symptoms below indicates asthma is not well controlled and the patient should re-visit their family physician or adjust their medication(s) as directed by their asthma management plan.

Canadian Thoracic Society 2021 Guideline Update Well-Controlled Asthma Criteria	
Daytime symptoms	≤ 2 days week
Night time symptoms	< 1 night week and mild
Physical activity	Normal
Exacerbations	Mild, infrequent
Absent from school/work due to asthma	None
Need for reliever (SABA pr bud/form)	≤ 2 doses per week
FEV1 or PEF	≥ 90% of personal best
PEF diurnal variation (infrequently used)	< 10 – 15%
Sputum Eosinophils	2 - 3%

Guidelines

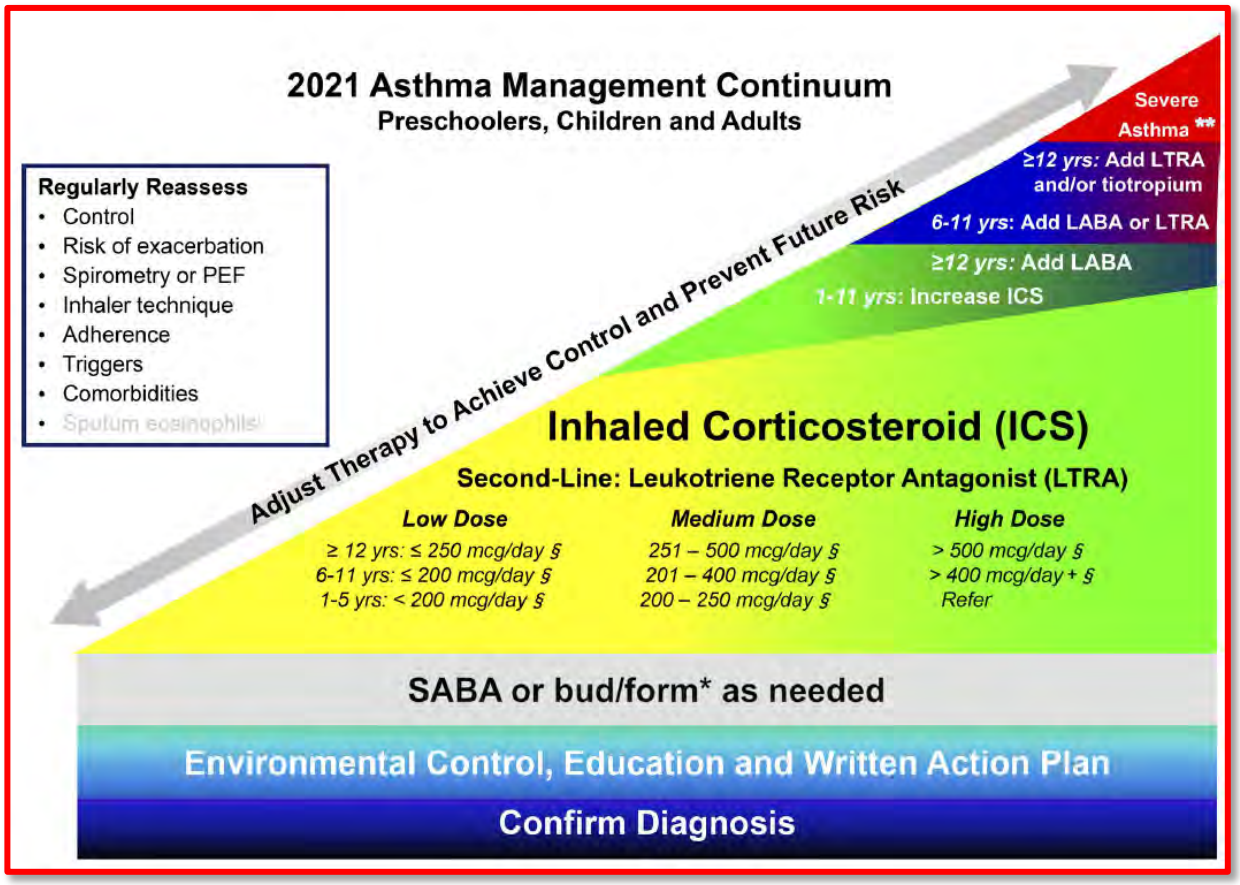
Global Initiative for Asthma (GINA)

2022 GINA Main Report

Box 2-2. GINA assessment of asthma control in adults, adolescents and children 6–11 years

A. Asthma symptom control		Level of asthma symptom control		
In the past 4 weeks, has the patient had:		**Well controlled**	**Partly controlled**	**Uncontrolled**
• Daytime asthma symptoms more than twice/week?	Yes☐ No☐	None of these	1–2 of these	3–4 of these
• Any night waking due to asthma?	Yes☐ No☐			
• SABA reliever for symptoms more than twice/week?*	Yes☐ No☐			
• Any activity limitation due to asthma?	Yes☐ No☐			

To assess symptom control (Box 2-2A) ask about the following in the past four weeks: frequency of asthma symptoms (days per week), any night waking due to asthma or limitation of activity and, for patients using a SABA reliever, frequency of its use for relief of symptoms. In general, do not include reliever taken before exercise, because some people take this routinely without knowing whether they need it.



Management relies on an accurate diagnosis of asthma and regular reassessment of control and risk of exacerbation. All individuals with asthma should be provided with self-management education, including a written action plan. Adherence to treatment, inhaler technique, exposure to environmental triggers, and the presence of comorbidities should be reassessed at each visit and optimized.

Individuals with well controlled asthma on no medication or PRN SABA at lower risk of exacerbation can use PRN SABA, daily ICS + PRN SABA, and if ≥ 12 years of age PRN bud/form*.

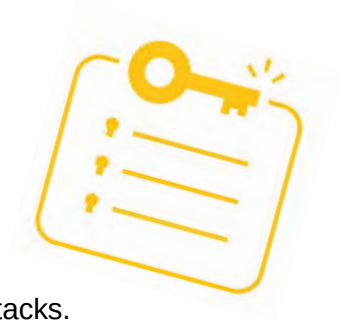
Individuals at higher risk of exacerbation even if well-controlled on PRN SABA or no medication, and those with poorly-controlled asthma on PRN SABA or no medication should be started on daily ICS + PRN SABA. In individuals ≥ 12 years old with poor adherence despite substantial asthma education and support, PRN bud/form* can be considered. LTRA are second-line monotherapy for asthma. If asthma is not adequately controlled by daily low doses of ICS with good technique and adherence, additional therapy should be considered. In children 1-11 years old, ICS should be increased to medium dose and if still not controlled in children 6-11 years old, the addition of a LABA or LTRA should be considered. In individuals 12 years of age and over, a LABA in the same inhaler as an ICS is first line adjunct therapy. If still not controlled, the addition of a LTRA or tiotropium should be considered.

In children who are not well-controlled on medium dose ICS, a referral to an asthma specialist is recommended. After achieving asthma control, including no severe exacerbations, for at least 3-6 months, medication should be reduced to the minimum necessary dose to maintain asthma control and prevent future exacerbations.

HFA (hydrofluoroalkane); SABA, (short-acting beta-agonist), LABA, (long-acting beta-agonist), ICS, (inhaled corticosteroid), LTRA , (leukotriene receptor antagonist), bud/ form: (budesonide-formoterol) in a single inhaler.

Source: Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers, (cts-sct.ca)

KEY POINTS

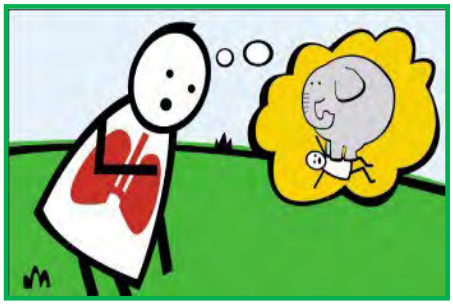


- A child's pattern of asthma may help predict whether the child will "outgrow" the condition. Children with viral triggered asthma have a greater chance of outgrowing asthma than a child whose asthma is triggered by allergies.
- Inhaled corticosteroids are the controller medication of choice for children.
- To be effective, inhaled corticosteroids must be given daily, for at least one season (three or more months) at a time, not just during asthma attacks.
- Leukotriene receptor antagonists (Singulair) may be helpful for asthma triggered by colds.
- Most children who are seen in the Emergency Department with mild/moderate presentation can be given bronchodilator therapy with a metered-dose inhaler and a valved spacer. A mouthpiece is recommended for children four years and older.

RESOURCES

SOURCE	LINK
Canadian Thoracic Society	• Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers • Guideline Library

6. SYMPTOMS



- The most common asthma symptom for children is cough. The cough is typically worse at night when sleeping. It is a "dry and tight sounding" cough, unlike a throat clearing cough.
- Parents report cough, wheezing, shortness of breath and chest tightness occurring most often at night.
- Many patients/parents become accustomed to these symptoms and ignore them, learning to live with them.
- These symptoms are typical for asthma and recognizing symptoms early, avoiding triggers and starting medication all contribute to increased quality of life and improved lung function.
- Asking the parents to take a video of the symptoms is very helpful, as describing these symptoms may often be difficult and subjective.

ASSESSMENT OF SYMPTOMS

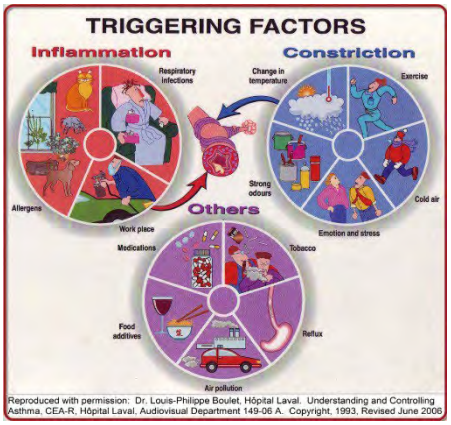
- **C**ough, **w**heeze, **t**ight chest, **s**hort of breath
- Accessory muscle use: This includes increased intercostal muscle use, suprasternal indrawing (sometimes referred to as "tracheal tug")-the skin at the base of the neck pulls in, and scalene retractions.
- Increased respiratory rate/work of breathing
- Breath sounds: Assessment before and after Ventolin is given
- Decreased activity level or tolerance
- Decreased appetite
- Vomiting from excessive cough
- Pale
- Coughing with or following activity

TESTING

- Family physicians can and should order spirometry on anyone 6 years and older.
- Specialists may order further testing including:
  - full pulmonary function studies
  - bronchial provocation
  - sputum eosinophils
  - FeN0-fraction of exhaled nitric oxide
  - blood work to assess adrenal insufficiency. Blood work measuring blood eosinophils (as part of a complete blood count), IgE levels, IgE to Aspergillus to screen for Allergic Bronchopulmonary Aspergillosis), and morning cortisol levels to screen for adrenal insufficiency.
  - methacholine challenge

7. ASTHMA TRIGGERS

Triggers are irritants to the lungs which can cause asthma to worsen. The goal is to minimize or eliminate as many triggers as possible to achieve good asthma control with the least amount of medication. Avoiding known triggers will result in improved asthma control, requiring less medication. Each individual has their own different set of triggers.



Triggers are divided into two main categories:

- **Inflammatory Triggers** which cause inflammation.
- **Symptom Triggers** which are caused by muscle constriction leading to immediate symptoms.

INFLAMMATORY TRIGGERS

Inflammatory triggers cause inflammation of the airways and/or tightening of the airway muscle. This type of trigger requires environmental control and anti-inflammatory medications.

VIRAL COLDS

- Viral colds are the most common trigger for children. The "September spike" occurs 17 days after kids start school and the often catch viral colds. Emergency visits/missed school days significantly increases.
- Suggest that 1 -2 weeks before school starts to restart using daily controller medication, if they aren't already using the medication. This will provide the airways some "protection" before being exposed to viral colds.
- Children triggered only by viral colds have a better chance of "outgrowing" their asthma than children triggered by allergies. Early school years to puberty is when half to two-thirds of children triggered by viral colds "outgrow it" or it "quiet downs."

POLLEN

- Pollen counts are highest from 5-9:00 am. Keeping the bedroom window closed, playing/exercising later in the day and having a bath before bed are all ways to help decrease exposure.

MOLDS

- Keep humidity in homes between 35-50%.
- Avoid outside molds usually found in composts, yards, gardens and school fields.

GRASS

- There are many different types of grass each with their unique pollen. A child may be allergic to one grass, but may not be allergic to others.

PETS

- There is no such thing as a hypoallergenic pet (e.g., Bichon or Poodle). It is the dander (skin flakes) saliva and urine that can be triggers. The hir or fur of animals can also collect pollen, dust, mold and other allergens which they bring into the home.
- If the child is going for a sleep over where there are pets, suggest families to send the child with their own pillow/sleeping bag as this is helpful in limiting exposure when they are sleeping.

DUST MITES

- Keep humidity < 50% as high humidity results in lower levels of dust mite.
- People who are allergic to dust mites are reacting to inhaling proteins in dust that comes from dust mite feces, urine or decaying bodies.

FOREST FIRE SMOKE/POLLUTION

- Forest and camp fires contribute to poor air quality.
- Recommend staying inside on days when air quality is poor.

SMOKING

- Tobacco /marijuana smoke is an irritant. Every visit it is recommended to ask about exposure to first, second and third hand smoke exposure and to provide support and suggestions for quitting or eliminating exposure.
- Ask "Do your friends smoke?". If they answer "yes", they are more likely to smoke.
- "Do you smoke, are you interested in quitting?" This simple question results in 3-4% of people seeking help and quitting smoking.

GASTRO ESOPHAGEAL REFLUX DISEASE (GERD)

- Consideration and treatment of reflux can help the treatment of asthma

ASA/NSAIDS

- Patients with ASA induced asthma need to be cautious of non-steroidal anti-inflammatory drugs (NSAIDs) such as Ibuprofen (Motrin/Advil) and Naproxen (Naprocin). The analgesic and antipyretic recommended for children with asthma is acetaminophen (Tylenol).

SYMPTOM TRIGGERS (IRRITANTS)

- Non-allergic triggers generally do not cause inflammation but can provoke "twitchy" airways especially if the airways are already inflamed.
- Symptoms triggers alone require environmental control, possible medications, possible psychological counseling. Examples include exercise, cold air, strong smells, certain air pollutants, weather change, intense emotions.

RESOURCES

SOURCE	LINK
Asthma Canada	• Asthma Triggers • Breathe Easy Triggers
Community Pediatric Asthma Service	• Asthma Triggers • Smoking, Vaping and More
The Weather Network	• Pollen Counts and Air Quality

8. RHINITIS (ALLERGIC AND NON-ALLERGIC)

There are two types of rhinitis causing itchy nose, roof of the mouth, throat and eyes, sneezing, stuffy nose (congestion), runny nose, tearing eyes and dark circles under the eyes. Referral to an allergist may be helpful in assessing which type it is.

- Allergic Rhinitis (hay fever) - can be seasonal or year-round and is caused from an allergen (animal dander, pollen etc.).
- Nonallergic Rhinitis (vasomotor rhinitis) - is also inflammation of the nasal passages from non-allergic triggers. These could be airborne pollutants, odors, certain foods or beverages, medication, weather or underlying chronic health problems. About a third of patients will have this.

All patients with asthma should be evaluated for allergic rhinitis and its impact on quality of life, sleep and school/work.

TREATMENT

- Treatments may include:
  - saline rinses or saline sprays
  - antihistamines (liquid, tablets or sprays)
  - prescription nasal steroid sprays
  - immunotherapy (allergy injections or oral treatment with sublingual tablets, SLIT)
- Two newer second-generation prescription medications antihistamines are Rupall (rupatadine) and Blexten (bilastine). Over the counter, second-generation antihistamines include Reactine (cetirizine), Claritin (loratadine) and Allegra (fexofenadine). Benadryl, a first-generation antihistamine, is **no longer recommended** due to drowsiness.
- Anticholinergic nasal sprays can be used for a runny nose.
- Allergy medications work best if started before the seasonal allergy develops (i.e., tree pollen). It can prevent the release of histamine decreasing the severity of symptoms.
- Daily treatment with over-the-counter antihistamines can be very effective in decreasing allergy symptoms.
- If you don't control your allergies, you'll never have well-controlled asthma.

RESOURCES

SOURCE	LINK
Community Pediatric Asthma Service	• Don't Forget About the Nose
Medscape	• Rhinitis Options: Fast relief or Delayed Long-Term affect

9. ALLERGIES

Asthma and allergies often go hand in hand. Symptoms can vary from person to person and from one reaction to another.

SYMPTOMS		
• Anaphylaxis	• Red, itchy, watery eyes	• Throat closure
• Cough	• Sneezing	• Trouble swallowing
• Hives	• Stomach cramping	• Vomiting/diarrhea
• Nasal congestion	• Sudden difficulty in breathing	• Wheezing
• Pale or red face and body	• Swelling of the facial features	• Feeling that something bad is about to happen, anxiety

ALLERGY TESTING

- If you suspect allergies, parents should talk to their physician and ask for a referral to see an allergist.
- People should try antihistamines for suspected allergic reactions. Tracking exposure to different potential allergens will also be helpful information to the family physician and the allergist.
- Allergy testing can be done as early as 6 months of age, but is often delayed until 2 or older. Allergies can develop at any age so knowing what allergy symptoms are and trying antihistamines if warranted is important for diagnosing allergies.
- Food allergies can be tested as soon as a child shows signs of allergies.
- Allergy testing is not 100% accurate but is helpful.
- Sulphites (food additive) do not cause a true allergic reaction, but are grouped with food allergens because a sulphite-sensitive individual may react to sulphites with allergy like symptoms.

MOST COMMON FOOD ALLERGENS IN CANADA			
• Crustaceans	• Milk	• Peanut	• Tree nuts
• Egg	• Mollusks	• Sesame	• Triticale
• Fish	• Mustard	• Soy	• Wheat

MANAGING ALLERGIES

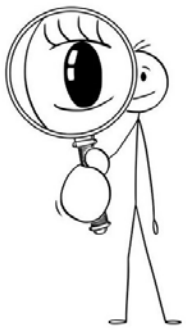
- **Environmental control** measures are key to managing allergies. Learn to avoid your child's triggers (if possible) while still having them lead a normal, active life.
- **Antihistamines** will help with sneezing, nasal congestion, itchy, red watery eyes and are <u>most effective</u> when taken daily to prevent the histamine from being released, which causes the symptoms.
  - There are over the counter and second-generation prescription antihistamines (Rupall and Blextin). Avoid taking Benadryl as it is a sedating medication.
  - Second-generation, newer medications have less of a sedating effect, but help with the symptoms in the same way.
  - Trying children's Reactine, Claritin, Allegra or Aerius (available in liquid form) are long lasting so only one dose per day is needed.

ANTIHISTAMINE MEDICATIONS

*Indicates antihistamines that require a prescription

Brand Name (Drug name)	Formulation/ Strength	Age Approval	Recommended Doses
Aerius (desloratadine)	Syrup	2+years	Once daily
Allegra (fexofenadine)	Tabs: 60-120 mg	12+years	
Benadryl Syrup** (diphenhydramine) **No longer recommended (See note below)**	Syrup: 12.5-25 mg 25-50 mg	2-5: Use only as directed by a physician 12+	5 ml every 4-6 hrs.
Benadryl** **No longer recommended (See note below)**		12+years	
*Blexten (bilastine)	Tabs: 20 mg	12+years	
Children's Claritin (loratidine)	Syrup: 5 ml	2-9 years 10 + (>30 kg)	5 ml OD 10 ml OD
Claritin	Tabs: 5 mg chewable	2+years	
Reactine (cetirizine)	Syrup: 1 mg/ml		
*Rupall (rupatadine)	Syrup: 1 mg/ml 10 and Tabs: 20 mg	2-11 years Dosage by weight	-10 to 25 kg: 2.5 ml OD -> 25 kg – 2.5 ml OD
*Rupall (rupatadine)		12+	10 mg tab OD

** **Benadryl Syrup Note**:
Benadryl is a first-generation antihistamine that is no longer recommended by allergists due to the sedative effects causing an increase in playground accidents. Second generation antihistamines are preferred.



- Special eye drops by prescription may be helpful to control the redness and itching of the eyes. Patanol is particularly effective. Regular use of over-the-counter decongestant allergy drops are not recommended.
- For nasal congestion, antihistamines and flushing with a saline rinse can give some relief. There are several over the counter options. If these are not effective, a prescription nasal steroid spray may be needed. Ideally, the saline rinse is used before the nasal steroid spray. Another option is Dymista which contains an antihistamine and a nasal steroid spray together. Avoid regular use nasal decongestants such as Otrivin, which can cause a rebound effect and should only be used for a few days.
- Immunotherapy (allergy shots) may be an option under the supervision of an allergist. Oral Immunotherapy (OIT) is also supervised treatment with your allergist where an individual consumes an increasing amount of an allergen with the goal of reducing the risk of allergic reactions to the food. Sublingual immunotherapy (SLIT) is also used to treat allergies. Oralair and Grasstek treat grass allergies by taking a pill every day.
  - Asthma symptoms may worsen when undergoing immunotherapy and asthma medications may need to be adjusted to maintain control.

ANAPHYLAXIS

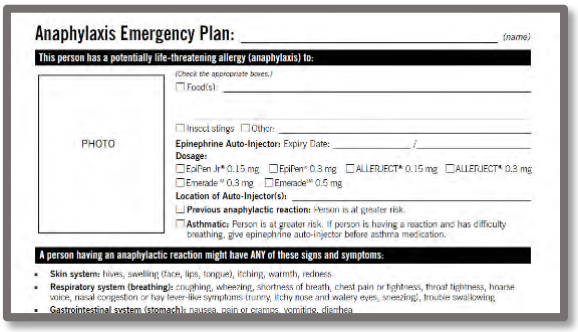
Anaphylaxis is a severe, life-threatening generalized reaction that involves two or more body systems:

Respiratory	Gastro intestinal	Cardiovascular
Bronchoconstriction and swelling of the upper airway. including difficulty breathing, swollen lips/tongue	Commonly diarrhea, vomiting	Vasodilation, drop in blood pressure, shock

- Along with food, anaphylaxis can be caused by medication, insect stings, latex, exercise or unknown reasons (idiopathic).
- There are no contraindications to giving epinephrine – the sooner it is given – the better as it may stop the reactions from cascading.
- Antihistamines and asthma medications should not be used instead of epinephrine for treating anaphylaxis.
- Be prepared and carry at least one, maybe two, epinephrine pens at all times for children with anaphylaxis to food, medication or insect stings. This is a lifesaving device which will reverse the symptoms of anaphylaxis. Remember the medication will expire so the device needs to be reviewed every year even if you don't use it.
- Wear a medical identifier (bracelet, band or watch) to ensure your child will be treated quickly and in the right way. An example of this is the Medic Alert bracelet.

ANAPHYLAXIS EMERGENCY PLAN

At the first sign a known or suspected allergic reaction, use an epinephrine auto injector.



Anaphylaxis Emergency Plan: _____ (name)

This person has a potentially life-threatening allergy (anaphylaxis) to:

(Check the appropriate boxes.)

☐ Food(s): _____

PHOTO

☐ Insect stings ☐ Other: _____

Epinephrine Auto-Injector: Expiry Date: _____ / _____

Dosage:

☐ EpiPen Jr® 0.15 mg ☐ EpiPen® 0.3 mg ☐ ALLERJECT® 0.15 mg ☐ ALLERJECT® 0.3 mg

☐ Emerade® 0.3 mg ☐ Emerade® 0.5 mg

Location of Auto-Injector(s): _____

☐ Previous anaphylactic reaction: Person is at greater risk.

☐ Asthmatic: Person is at greater risk. If person is having a reaction and has difficulty breathing, give epinephrine auto-injector before asthma medication.

A person having an anaphylactic reaction might have ANY of these signs and symptoms:

- Skin system: hives, swelling (face, lips, tongue), itching, warmth, redness.
- Respiratory system (breathing): coughing, wheezing, shortness of breath, chest pain or tightness, throat tightness, hoarse voice, nasal congestion or hay fever-like symptoms (runny, itchy nose and watery eyes, sneezing), trouble swallowing.
- Gastrointestinal system (stomach): nausea, pain or cramps, vomiting, diarrhea.

- Call 9-1-1 and tell them someone is having a life-threatening allergic reaction.
- Children < 15 kg call 911.
- Give a second dose of epinephrine as early as 5 minutes after the first dose if there is no improvement in symptoms.
- Go the nearest hospital even if symptoms are mild or have stopped.
- The reaction could worsen or come back, even after proper treatment. Stay in the hospital for an appropriate period of observation as decided by the emergency department physician (generally about 4-6 hours).
- Call the emergency contact person.

What can be done to help children with anaphylaxis?

- Wear a Medic Alert bracelet if your child has serious life-threatening allergies like a food or medication allergy. A medical alert bracelet will ensure your child will not be given something they are allergic to and that they will be treated quickly and in the right way, if they have a medical emergency.
- Carry an epinephrine pen at all times if your child has a true food, medication or insect sting allergy that has a risk of causing anaphylaxis. This is a lifesaving device that will reverse the symptoms of anaphylaxis.
- Remember, the medication will expire so the device needs to be renewed every year, even if you don't use it.
- Ask your Allergist about Oral Immunotherapy.
- Ask the Allergist about Oral Immunotherapy: from the Allergy Treatment Spotlight

TRAINING DEVICES

- You can obtain a training device from the pharmaceutical company and learn/practice yourself and teach others how to use it. Costs are relatively equal amongst the different types and approximately $110 each (see Epinephrine Auto-Injector table below).
- Practice with an expired device. Get an orange/grapefruit and inject it. Discard the fruit and take empty device to pharmacy to discard.

EPINEPHRINE AUTO-INJECTORS		
		
Allerject	**Emerade**	**EpiPen**
Dose: .15 and .3 mg	Dose: .3 mg and .5 mg	Dose: .15 and .3 mg
23 Gauge needle	25 Gauge needle	22 Gauge needle
.15 mg 1.27cm .3 mg 1.6 cm	2.3 cm intramuscular injection depth	1.52 cm for .3 mg dose 1.27 cm for .15 mg dose
Dose: .15 mg 15-30 kg Children: 3 mg > 30 kg	Dose: .3 mg > 30 kg (Children) Dose: .3 mg < 60 kg (Adults) .5 mg > 60 kg (Adults) *(.3 mg or .5 mg clinical judgment)*	Dose: .15 mg 15-30 kg .3 mg > 30 kg
Allerject Training Device	Emerade Training Device	EpiPen Training Kit

ANAPHYLACTIC REACTIONS

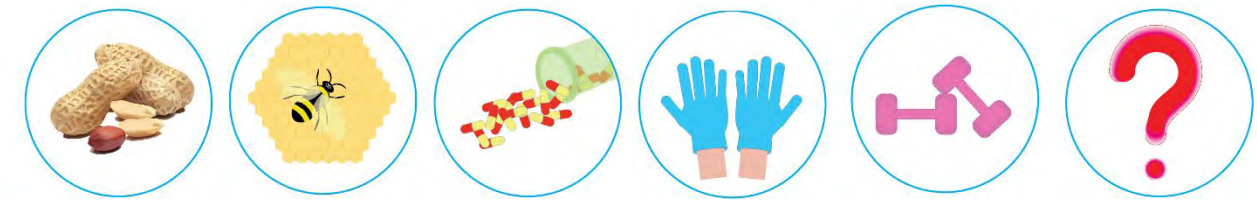
- All epinephrine medication should **ONLY** be injected into the anterolateral aspect of the thigh.
- Anaphylactic reactions are uniphasic accounting for 80-90% of all episodes which typically resolve spontaneously. However, up to 20% will be biphasic where the reaction can last for hours or days without resolving completely.

ORAL ALLERGY SYNDROME

- Oral allergy syndrome or Food Pollen Allergy is a type of food allergy classified by a cluster of allergic reactions in the mouth and throat in response to eating certain fruits, nuts and vegetables (fresh not cooked). This is not a separate food allergy, but rather represents cross-reactivity between distant remnants of tree or weed pollen which is still found in certain fruits and vegetables. It is seen only in people with seasonal pollen allergies and mostly people who are allergic to tree pollen. The most common reaction is itching or burning sensation in the lips, mouth, ear canal or pharynx. It rarely causes anaphylaxis.

COMMON SEVERE ALLERGY TRIGGERS

Severe allergic reactions can be unpredictable: Be prepared and carry an epinephrine auto injector, or two. Visit the website of the epinephrine injector you currently have so that you can learn more about the device and how to use it.



- **Food**: This is the most common trigger for anaphylaxis.
- **Insect stings**: Bees, wasps, hornets and fire ants are the most common. Immunotherapy has proved to be 98% effective in preventing further anaphylactic reactions.
- **Medications and Antibiotics**: All NSAID's are the most common cause of medication induced anaphylaxis.
- **Latex**: Growing concern because of its wide spread use in work and everyday items at home and play.
- **Unknown Causes**: Sometimes you may not know what the cause is. Talking to an allergist who would take an in-depth history may help uncover what triggered the reaction.
- Careful history of what the patient ate prior to exercise – specific foods such as celery, nuts, peaches, wheat and seafood followed by vigorous exercise causes anaphylaxis. Ingestion of these foods with no vigorous exercise – there will be no reaction.
- **Exercise**: May lead to anaphylaxis. This may also occur as part of the oral allergy syndrome or now referred to a Pollen Food Syndrome.

www.allerject.ca

www.emerade.ca

www.epipen.ca

ALLERGY FAQS

An allergy is an exaggerated reaction of your child's immune system.

Symptoms or Risk Factors	
✓ runny nose	✓ Itchy nose or throat
✓ hives	✓ asthma
✓ red, itchy, watery eyes	✓ eczema
✓ nasal congestion and sneezing	✓ anaphylaxis. Swelling of the facial features, throat closing, sudden difficulty breathing, vomiting/diarrhea, fall in blood pressure (symptoms may vary for each person and from one reaction to another)

What can I do to help children with allergies?

- Wash children's hands and face to remove allergens
- Identify the trigger and remove it.
  - For example: replace the feather pillow with another hypoallergenic one; dust allergy: good housekeeping with vacuum/mop/dusting
- Pet allergy:
  - Keep pet out of bedroom and wash hands frequently.
  - May need to consider finding a new home for the pet.
- Antihistamine medications:
  - It is safe to use antihistamines with your asthma medications
  - Ask a pharmacist for suggestions. Prescription antihistamines are available. 2nd generation antihistamines are suggested.

Should my child have allergy testing? If so, at what age?

- Children with suspected food allergy can be tested as young as 6 months of age. Random food allergy testing is not recommended.
- Environmental testing can be done and is helpful– but not always necessary.
- Observation of symptoms and exposure can confirm allergy without testing
- Allergy testing is not always 100% accurate.
- Wait times to see an allergist can be long.

Will children outgrow their allergies?

- It depends on the type of allergy. Many children outgrow food allergies like milk and egg allergies. Other food allergies like peanut and fish much less likely.
- Environmental allergies – less likely they outgrow it and can get worse. With global warming – allergy seasons are longer and more intense.
- What can I do to help children with anaphylaxis?

Can children have a reaction to smelling a particular food?

- To have anaphylaxis to food, you must come into contact with the protein or a mucous membrane.
- For example, smelling peanut butter cannot trigger a reaction. If someone opens a bag of peanuts, the particles could get into the air and theoretically might cause a mild reaction.

RESOURCES

SOURCE	LINK
Allergic Living Magazine	www.allergicliving.com
Allerject	www.allerject.ca
Asthma, Allergy Foundation of America	www.aafa.org
American College for Allergy, Asthma and Immunology	www.acaai.org
Canadian Society of Allergy and Clinical Immunology	www.csaci.ca
Canadian Pediatric Society	www.cps.ca
Emerade	www.emerade.ca
EpiPen Canada	www.epipen.ca
Food Allergy Canada	Pollen, Allergy and Foods Chart
MedicAlert Canada	www.medicalert.ca
TRC Healthcare (Therapeutic Research Centre)	• Managing Seasonal Allergies • Second Generation Antihistamines
World Allergy Organization	www.worldallergy.org
Why Risk It (app)	Food Allergy App

10. MEDICATIONS

- Many asthma medications should be taken daily using proper technique (inhaled steroids and leukotriene antagonists) with individual variations that should be addressed in the Asthma Action Plan.
- Long term untreated or under treated asthma can cause airway remodeling.
- It is the role of all health care professionals to inquire and/or investigate if they see a possible error in the device technique a patient is using.
- MDI Inhalers are an important contributor to greenhouse gas emissions. Increasing awareness about this and trying to lower carbon impact by using dry powder inhalers when appropriate is something to be aware of.
- Up to 90% of patients use their puffers incorrectly:
  - Have the patient demonstrate their technique from start to finish. During their demonstration, resist the urge to interrupt or correct them
  - After they have finished, first offer one positive comment for feedback
  - Now proceed to correct or demonstrate the device technique
  - CTS 2021 Asthma Guidelines recommend mouthpiece spacers for 4 years of age and older.
  - Up to 2/3rd of the medication is lost in the upper airway
- Asthma medications are often used "off label" by physicians.
  - Approximately 80% of medications used in children are off label.
  - You can assure parents this is appropriate. Large research studies are not typically done on young children (ethics) and therefore no statistical data exists.
  - This means outside the recommendations in the product monograph such as a younger age or higher dose.
- Children will often breath shallow or quickly:
  - This will have an effect on the amount of medication that reaches their lungs.
  - You may have to repeat the dose 1-3 extra times in order to get one dose of medication into the lungs.

THE DIFFERENT TYPES OF ASTHMA MEDICATION

A

Preventer/Controller Medicines
- Inhaled Corticosteroids
- Leukotriene Receptor Antagonists
- Oral Steroids
- Combination Medicine

B

Reliever Medicines
- Reliever/" Rescue" Bronchodilators
- Short-Acting Relievers
- Long-Acting Beta Agonists
- Combination Anti Cholinergic

C

Biologic Medicines
- Anti-IgE
- Anti-eosinophilic

A. PREVENTERS/CONTROLLER MEDICINES- ANTI-INFLAMMATORIES

INHALED CORTICOSTEROIDS (ICS)

The Canadian Thoracic Society 2021 Guideline Update recommends inhaled steroids as the controller medication of choice for children. To be effective, inhaled steroids must be given regularly, not only during an asthma exacerbation. Follow up with the family doctor and respiratory educator is important to ensure families understand the role of medication in preventing future emergency room visits.

Inhaled steroid prescriptions given in ER often say “take for 2 weeks”. The timeframe is intended for families to follow up with their family doctor in a timely fashion to review the plan.

The Canadian Thoracic Society 2021 Guideline Update recommends treatment to prevent future ER visits. In practice if children were given oral steroids, we often recommend daily treatment with inhaled steroids until the child has had 1 or 2 more colds. This allows them to assess symptoms and manage them if present, without another ER visit.

- Must be used daily as prescribed to help heal and prevent swelling in the airways.
- At a cellular level, ICS reduces the numbers of inflammatory cells in the airways, reducing eosinophils and reducing airway hyper-responsiveness.
- Asthma patients who smoke may be corticosteroid resistant and require higher doses of ICS to maintain control.
- ICS are very safe due to the way they are delivered. They are inhaled and go directly into the lung tissue and only a very small amount is available systemically to cause unwanted side effects when taken as directed. The use of ICS and their potential side effects is the most common concern of parents. Reassure parents that if taken in the prescribed doses, side effects from ICS are uncommon.
- Use the handout The experts answer your questions about Inhaled Corticosteroids in Asthma to address the topic in more detail.

AVAILABLE INHALED CORTICOSTEROIDS MEDICATIONS

							
	Alvesco	**Arnuity**	**Asmanex**	**Flovent**	**Pulmicort**	**Qvar**	**Aermony**
Color	Red/Brown	Orange Lid	Pink/Grey	Orange	Brown	Burgundy/ Light Brown	Green
Medical Name	Ciclesonide	Fluticasone furoate	Mometasone furoate	Fluticasone propionate	Budesonide	Beclomethason edipoprionate	Fluticasone furoate
Dosage Available	100, 200 mcg	100, 200 mcg	100, 200, 400 mcg	50, 125, 250 mcg	100, 200, 400 mcg	50, 100 mcg**	55, 113, 232 mcg
Bid/od	Bid/od120	Od 30	Bid/od	Bid 120/Diskus 60	Bid 200	Bid 200	Bid 60

** Minimum Therapeutic dose 100 mcg daily

- Dose of ICS is titrated to the lowest dose at which effective control is maintained. The dose may need to be increased depending on a trigger and the length of trigger exposure.
- Inhaled Corticosteroids take 2 - 3 days before you see a noticeable effect. After 1-2 weeks, you should notice a dramatic improvement; 2-6 weeks for the best effect.
- ICS gradually reduce the swelling and heal the airways.
- Use of ICS can prevent airway remodeling and allow for optimal growth in children.
- Regular use of ICS can reduce exacerbations, decrease bronchial hyper responsiveness and prevent loss of lung function.
- Recommend using daily for a minimum of three months or throughout the season/s that trigger asthma.

Table 8. **Comparative inhaled corticosteroids (ICS) dosing categories in preschoolers, children and adults.**

	Preschoolers (1-5 years of age)		Children (6-11 years of age)			Adults and Adolescents (12 years of age and over)		
Corticosteroid (tradename)	**Low**	**Medium**	**Low**	**Medium**	**High**	**Low**	**Medium**	**High ****
Beclomethasone dipropionate HFA (QVAR)	100	200	≤ 200	201-400	> 400	≤ 200	201-500	> 500 (max 800)
Budesonide* (Pulmicort)	n/a	n/a	≤ 400	401-800	> 800	≤ 400	401-800	> 800 (max 2400)
Ciclesonide* (Alvesco)	100	200	≤ 200	201-400	> 400	≤ 200	201-400	> 400 (max 800)
Fluticasone furoate* (Arnuity)	n/a	n/a	n/a	n/a	n/a	100		200 (max 200)
Fluticasone propionate (Flovent)	< 200	200-250	≤ 200	201-400	> 400	≤ 250	251-500	> 500 (max 2000)
Mometasone furoate* (Asmanex)	n/a	n/a	100	≥ 200- < 400	≥ 400	100-200	> 200-400	> 400 (max 800)

Note. Dosing is in micrograms (mcg), dosing categories are approximate, based on a combination of approximate dose equivalency as well as safety and efficacy data.

*Licensed for once daily dosing in Canada

**Maximum (max) doses are the maximum doses approved for use in Canada.

Doses highlighted are not approved for use in Canada with the following exceptions: Beclomethasone is approved for children ≥ 5 years of age; Mometasone is approved for children ≥ 4 years of age; Maximum dose of fluticasone propionate is 200 mcg/day in children 1-4 years of age (250 mcg was included in this age group because the 125 mcg inhaler is often used for adherence and cost), Maximum dose of fluticasone propionate is 400 mcg/day in children 4-16 years of age.

Source: Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers, children and adults

POTENTIAL SIDE EFFECTS

- **Growth Suppression**: The symptoms of asthma can affect growth. Patients with poorly controlled asthma may have sleep interrupted by asthma symptoms which may adverse ly affect production of growth hormone. The increased work of breathing resulting in more calories being consumed, can also affect growth. Routinely monitor the growth of children.

- **ICS**: Low risk at the doses used to treat asthma. This medication has rarely been shown to cause significant clinical growth retardation, weak bones, weight gain or cataracts when given in low to medium doses. ICS prevent ER visits and save lives.

- **Thrush**: Use of a spacer device helps decrease the risk of thrush. It is recommended after each dose to rinse mouth and spit or for younger children, they can take a drink to rinse their mouth. These steps decrease the risk of Candida (yeast) infection. Consider wiping the face with cloth if using a mask/spacer. Less than 1% of children will get thrush, especially if using a spacer. Children metabolize the drug more quickly making this side effect very rare. Alvesco (Ciclesonide) is a pro drug activated by the esterases in the lungs. There is no risk of thrush, so it is unnecessary to rinse the mouth.

- **Hoarse voice:** Uncommon side effect, especially if a spacer is used. Consider medication change to Alvesco as it is a pro-drug (i.e., only active in lungs) if this occurs.

- **Change in mood/behavior**: The mechanism for this is unclear. Changing from one brand of ICS to a different brand usually works (i.e., switch Flovent to Qvar).

LEUKOTRIENE RECEPTOR ANTAGONIST (LTRA)

Achieving Control of Asthma in Preschoolers recommends LTRAs may be useful for asthma triggered by colds. Not everyone with asthma will respond to LTRAs. Recommend a 30-day trial with follow-up.

- Available medications: Singulair and Montelukast (generic)
- Some children do not respond to generic Montelukast so we suggest to start on brand name Singulair. If a good response is received, then move on to try the generic Montelukast.
- Considered a preventer/controller medication. LTRAs block the action of Leukotrienes in the lungs resulting in decreased inflammation and relaxation of small or smooth muscle.
- Taken once a day, typically at night.
- Not usually a first line treatment, but an add-on therapy. Consider for parents who are "steroid" phobic.
- Does not contain steroids and has few side-effects.
- Any side effects or concerns including headache, nausea, diarrhea, depression or changes in behavior, should be reported to the doctor.
- Can be used intermittently with colds or seasonally to help relieve seasonal allergies such as hay fever or nasal congestion.
- Singulair Black Box Warning: Some physicians are talking to families about the "black label" warning from Health Canada for Singulair.
  - Serious neuropsychiatric events which may include aggression, agitation, sleep disturbances, suicidal ideation or actions have been reported in patients taking Singulair.
  - If any side effects present, stop taking Singulair and report to the physician.

AGE	RECOMMENDED DOSAGE
<2 years	4 mg Sprinkles for Children
2 - 5 years	4 mg/day, chewable cherry flavored tablet
6 – 14 years	5 mg/day, chewable cherry flavored tablet
>14 years	10 mg/day

ORAL CORTICOSTEROIDS

Examples: Prednisone Dexamethasone Prednisolone Pediapred

- Oral steroids are 1000 times stronger (delivered in mg) than inhaled steroids (delivered in mcg).
- Potent anti-inflammatory medications are important for use in severe asthma exacerbations.
  - Not to be used as regular asthma management medication due to potential systemic side effects adrenal suppression/crisis.
  - Side effects are dose and duration dependent.
  - Major side effects include adrenal suppression, impaired bone metabolism, linear growth delay in children, and hyperglycemia in diabetics, or steroid induced diabetes.
  - Less concerning side effects include bruising, weight gain, mood change and acne.
- Similar to cortisol, which is produced by the adrenal gland.
- Powerful anti-inflammatory, effective within 4 hours.
- Use of oral corticosteroids are reserved for exacerbations which are unresponsive to inhaled corticosteroids or needed to quickly treat inflammation.

COMBINATION MEDICINES

- Combination medicine is not recommended as first line therapy for children under the age of 12 years. Respirologists will use in children with severe asthma.
- Combines an Anti-Inflammatory with a long-acting Bronchodilator (ICS/LABA).

AVAILABLE COMBINATION MEDICATIONS

						
Trade Name	**Advair MDI**	**Advair Diskus**	**Breo Ellipta**	**Symbicort Turbuhaler**	**Zenhale MDI**	**Atectura Breezhaler**
Color	Purple	Purple	Light Blue	Red	Blue	White
Medication Names ICS/long acting	Fluticasone propionate / Salmeterol	Fluticasone propionate / Salmeterol	Fluticasone furoate/vilanterol	Budesonide	Mometasone formoterol	Mometasone and Indacaterol
Dosage Available (mcg) ICS/LABA	125/25 250/25 500/25	100/50 250/50 500/50	100/25 200/25	100/6 200/6	50/5 100/5 200/5	80/150 160/150 320/150
Maximum Daily Dosage		200 mcg 4 puffs	*Indicated for patients 18 years and older	8 puffs	4 puffs	1 puff od
# of Doses	120 doses	60 doses	30 doses	120 doses	120 doses	3 blister cards of 10 each = 30

B. Reliever Medications

RELIEVERS/"RESCUE" BRONCHODILATORS

- A measurable decrease in airway resistance is typically observed 5-15 minutes after inhalation for 3-4 hours.
- Relievers start working immediately and within minutes the child may notice an improvement of their asthma symptoms. Relievers reach their peak effect in approx. 60 minutes.
- Quickly and temporarily relaxes the smooth muscles.
- Use as needed to relieve asthma symptoms.
- Should not be used regularly for relief (i.e., 3+ times a week indicates poor asthma control). Re-evaluate triggers, diagnosis and need for ICS.
- Decreasing the number of doses needed indicates increasing asthma control.
- Teach patients to use it to 'relieve' symptoms rather than waiting too long and using it to 'rescue' them from an ER visit. The frequency of use can then be used as a measure of control.
- May be used to prevent exercise induced bronchospasm. The number of doses used for exercise must be included in the weekly maximum to assess control.
- Possible side effects may include shakiness, increased heart rate, hyperactivity, headache and/or nervousness. One benefit of the presence of these side effects is an immediate marker of proper inhaler technique.

AVAILABLE RELIEVERS/ "RESCUE" BRONCHODILATOR MEDICATIONS				
				
Name	**Airomir**	**Bricanyl**	**Ventolin**	**Ventolin Diskus**
Color	Blue	Blue (bottom) White (top)	Blue	Blue
Medication Name	Salbutamolsulfate	Terbutalinesulfate	Salbutamolsulfate	Salbutamolsulfate
Dosage Available	100 mcg	.5 mg	100 mcg	200 mcg
# of Doses	60	120	200	60

SHORT-ACTING RELIEVERS

- Rapid onset, within 5 minutes.
- Works on the smooth muscles for approximately 3 - 4 hours.

LONG-ACTING BETA AGONISTS (LABAS)

AVAILABLE LONG-ACTING BETA AGONISTS MEDICATIONS			
			
Trade Name	**Oxeze**	**Serevent**	**Symbicort**
Color	Green	Green	Red
Medication Name	Formoterol	Salmeterol	Budesonide / Formoterol
Dosage Available	6 ug / 12 ug	50 mcg	100/6 200/6
Onset	Rapid onset, within 5 minutes	Slower onset, within 20-30 minutes	Rapid onset within 5 minutes
Age	6 - 16 years/>16	>4 years	≥12 years
Recommended Dosage	Age 6 - 16 use 12 - 24 µg/day 24 ug/day/48 ug/day	2 puffs BID; 100 µg/day	Max 48 mcg/ 8 doses/day
# of Doses	120	60	120

- **LABAs should not be prescribed alone**; ICS are prescribed with these medications, more commonly as a combination inhaler for age 12+.
- Oxese and Serevent should not be used without daily ICS, increased risk of death.
- Duration of action up to 12 hours.
- Formoterol has a fast action and AstraZeneca published research to allow it to be promoted for PRN use. Although only a small percentage of asthma patients will be able to achieve maximum control with this combination medication, it is incorporated into the Asthma Guidelines and general practice.
- Generally, LABAs are not suitable for acute relief and patients should also have a short-acting reliever. In rare situations, Oxeze may be prescribed for relief of sudden SOB and wheeze since it does have a quick onset of action.

ANTI-CHOLINERGIC ("COMBINATION") MEDICATIONS		
		
Trade Name	**Atrovent**	**Spiriva**
Color	Clear with green cap	Clear with green cap
Medication name	Ipatropium bromide	Tiotroprium bromide monohydrate
Dosage available	20 mcg	2.5 mcg
# of doses	200	60
Onset of action	15-20 minutes	30 minutes
Peak effect	1-2 hours	3-4 hours
Duration of action	Up to 4-6 hours	24 hours
Used for	Adjunct to Beta 2 agonists in the emergency department Alberta Childhood Asthma Pathway recommendation 4 puffs q20 minutes first hour for PRAM score >3 (moderate to severe)	Rarely used by pediatric respirologists to manage the most difficult asthma cases

ATROVENT

- Ipratropium is an acetylcholine antagonist via blockade of muscarinic cholinergic receptors. It inhibits parasympathetic nerve impulses by blocking the binding to its receptor in nerve cells. The nerve fibers of the parasympathetic system cause involuntary constriction of the smooth muscle around the airways.
- If Atrovent nebulized, caution should be taken to avoid getting the medication in the eyes to prevent eye irritation, pupil dilation and aggravation or possible development of glaucoma.
- Children **should not be discharged** from the Emergency Department with Atrovent.
  - **Not for home use**: Patients/families are confused when sent home with this medication.

IV Magnesium sulfate

- Alberta Childhood Asthma Pathway recommends use of IV magnesium sulfate given in emergency department for adjunct therapy for bronchodilation for children with Pram score >9 /severe

Spiriva

- Indicated for patients 18 years of age and older. Rarely used by Pediatric Respirologists for the most difficult to manage cases.
- Inhalation spray.

C. Biologic Medications

Biologics cannot be used to treat an acute asthma exacerbation, and cannot be used to stop an asthma exacerbation.

- Patients taking biologics must remain on their regular asthma medications for the duration of treatment, though the use of reliever medications and oral corticosteroids should decrease over time.
- There may not be an immediate improvement in asthma when beginning biologic medications. However, patients should NOT stop taking a biologic medication without talking with their doctor.
- Biologic medications are covered by some private insurance plans, but must be prescribed by a specialist.
- Can be expensive, upwards to $50,000 a year.
- Generally administered every 2-4 weeks.

Biologic Medications			
			
Medication Name	Xolair (Novartis)	Dupixent (Sanofi)	Nucala (GSK)
Action	IgE blocker	Binding to the IO4 and IL 13 receptor sites inhibiting binding at both receptor sites	Binding to the IO4 and IL 13 receptor sites inhibiting binding at both receptor sites
Indications	6 years and older with moderate to severe persistent asthma 12 and older Chronic hives with no known cause	>12 years of age with severe type 2 eosinophilic asthma	6 years and older with severe type 2 eosinophilic asthma

ANTI-IGE: XOLAIR® (OMALIZUMAB)

Omalizumab is an Immunoglobulin E blocker or IgE blocker, meaning it blocks a substance in the body called IgE

- Omalizumab is indicated for use with patients over the age of 6 with moderate to severe persistent or allergic asthma which is not well controlled on maximal doses of ICS. Also used for frequent asthma exacerbations despite regular use of ICS for moderate to severe allergic asthma.
- Omalizumab acts early in the allergic-inflammatory cascade in people with allergic asthma. It helps to block IgE and prevent the reaction that results in asthma attacks and symptoms before they start.
- The dose of Omalizumab is different for each person, and is based on their IgE level and body weight.
- Omalizumab doses are given once or twice a month as a subcutaneous injection.

ANTI-EOSINOPHILIC: DUPIXENT® (DUPILUMAB) OR NUCALA® (MEPOLIZUMAB)

- Dupilumab is indicated for use in patients >12 with severe Type 2 eosinophilic asthma.
- Mepolizumab is indicated for use in patients 6-17 years or >18 with severe Type 2 eosinophilic asthma.

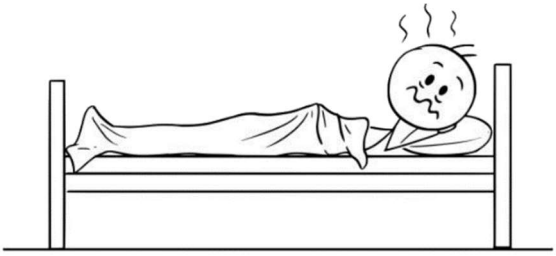
RESOURCES

Global Initiative for Asthma, 2022 GINA Report, Page 108 "Consider Add-on Biologic Type-2 Targeted Treatments"

CORTISOL DEFICIENCY

When the body does not make enough cortisol to meet its needs, it results in side effects that can range from flu-like symptoms to life-threatening.

- **Causes**: There are many causes of cortisol deficiency but the most common is when medications containing corticosteroids are used as treatment. In the treatment of asthma, allergic rhinitis and eczema, this includes using medications containing corticosteroids. Asthma medications (oral and inhaled), nasal sprays, eczema creams, all contain corticosteroids, and a cumulative effect of these medications can cause cortisone deficiency.
- **Sometimes** the cumulative effect of all these medications or long-term use, can cause the adrenal gland to produce less. While this is normal, it can cause problems if the body suddenly needs more, for example, with a fever of 38.5C or higher, infections, broken bones or surgery requiring an anesthetic.
- **Signs and Symptoms**: Often vague but include flu-like symptoms including tiredness, vomiting, stomach/back/leg pain, pale, fainting, hyperkalemia, hypercalcemia, hypotension and can result in death.



- **Diagnosis**: Performing a cortisol level blood test (ordered at 0800 hours when cortisol levels are the lowest in the body), ACTC, serum potassium and calcium.
- **Treatment**: Cortisol type medication is given and slowly weaned over weeks/months as the adrenal glands start making enough cortisol on their own for the body's needs.
- **Patient Teaching**: Educate at-risk patients to monitor symptoms of adrenal suppression. As an alternative, consult an endocrine specialist at a tertiary pediatric hospital.
- **Keep this** in the back of your mind when taking a patient history and ask what type of medications the patient is on. Include medication for asthma, rhinitis, eczema and how many courses of oral steroids they have taken within a one-year period.
- **Cortisol Test**: Have a primary care physician order an 8 a.m. cortisol test.

ADRENAL SUPPRESSION CAUSING CORTISOL DEFICIENCY

The adrenal gland is located above the kidney. The adrenal cortex (outside the adrenal gland):

- produces hydrocortisone commonly referred to as cortisol
- helps regulate your metabolism
- keeps your blood sugar normal
- helps your body respond to stress
- produces aldosterone which helps control blood pressure

RESOURCES

Adrenal Suppression in Pediatric Asthma (pamphlet)

FUTURE OF MEDICATION

- Personalized medicine, also called precision medicine, is a relatively new field in which medical decisions, practices, interventions and/or products are being tailored to the individual based on their specific symptoms and unique genetic profile.
- Pharmacogenomics (PGx), also referred to as pharmacogenetics, focus on understanding how genes affect individual responses to medications, for example, the relationship between drug responses and genetic variants.
- Current practice of "standards of care" is where the best prevention or treatment for the average person is done, a trial-and-error approach. Personalized medicine is the prevention and treatment based on the genetics of the individual. This is in the early stages of development.

RESOURCES

SOURCE	WEBSITE
Alberta Health Services, Canadian Drug News Resources for staff	• Insite→Clinical Tools→Drug Information *(AHS User Name and password needed)*

PHARMACEUTICALS

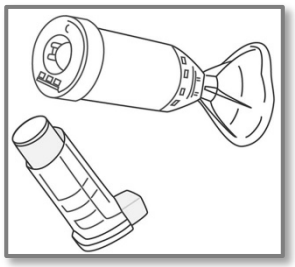
AstraZeneca	COVIS Pharma	Novartis
Bausch Health	GSK	Takeda
Boehringer Ingelheim	Organon	Viatris

11. ASTHMA DEVICES

- Assess device technique at each and every visit.
- Have patient demonstrate entire technique before providing feedback.
- Always provide a positive comment about their technique before providing feedback.

METERED DOSE INHALERS

Important device information



- Spacing devices are recommended for use with all MDI's, regardless of age, as significantly more medication reaches the lungs.
- Adolescents may not want to use a spacing device with their MDI.
  - Consider switching to a dry powder.
  - If they want to use MDI alone, they should be aware they may need to take more puffs to get relief.
- Extremely cold temperatures can affect MDI's as they can freeze and need to be warmed up prior to use.
  - Consider Dry powder inhalers for children participating in cold outdoor activities as they will not freeze.

Common Device Mistakes

- Children should breathe 6 breaths in and out of spacer, ensuing deposition into the lungs or take one slow, deep breath and hold.
- If the child is resisting and you have doubts whether a full dose of medication was received, repeat the dose.
- No whistle should be heard on inspiration. If you hear a warning whistle on inspiration, have patient slow their breathing to improve deposition of medication into the lungs.
- Do not spray medication into chamber before applying mask to face. Gravity starts pulling the medication down into the spacer immediately.

Cleaning Instructions for MDI

- To help prevent buildup that can clog the inhaler recommend remove metal canister from the plastic sleeve and run water through the plastic sleeve periodically or when washing the spacer device. Salbutamol tends to clog it more than ICS medications
- Do not put metal cannister in water a water may get into the MDI

SPACER DEVICES

Important device information

- Up to 2/3 of the medication is lost in the upper airway when using a mask. 2021 CTS asthma guidelines recommend children **4 years of age** and older use a mouthpiece. Generally, once the kids can drink through a straw, they can use a mouthpiece.
- Mask/face seal: if seal is poor, it dramatically decreases the amount of medication inhaled
- A calm child receives more medication than a crying child
- Ensure the breaths are deep enough to get into the lungs:
  - Take fast, shallow breaths.
  - Make sure the spacer is pointing downwards like an instrument and not horizontal.
  - If the teeth/tongue are blocking the mouthpiece, this will result in less medication reaching the lungs. Consider repeating puff.
- An inspiratory whistle indicates inspiratory flow is too fast and the next breath should be slower. Too high of flow will result in more medication being deposited into the back of the mouth.
- Recommend having mask/mouthpiece in position, then depressing MDI rather than depressing MDI and placing spacer in position

Cleaning Instructions for Spacers

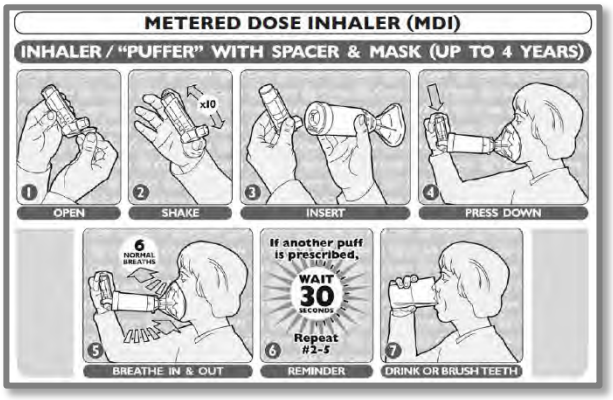
- As more medication sticks to the inside of the spacer it attracts more medication and potentially less gets into the lungs.
- When using a spacer daily for controller medication, it is recommended every 1-2 weeks to disassemble the spacer and wash, dry and rinse following manufacturer directions.

SPACER DEVICES FOR ASTHMA INHALERS					
					
Color	Orange	Yellow	Purple	Blue	Green/Blue
Type	Neonate	Pediatric	Small adult	Adult	Mouthpiece
Age Range	Newborn to 1 year	1 year to 4 years	Physically, cognitively challenged child/adult	Physically, cognitively challenged child/adult	4 years and older
Manufacturer: Trudell Medical International					

SPACER DEVICES FOR ASTHMA INHALERS		
		
Name	**AEROCHAMBER2GO***	**OPTICHAMBER DIAMOND**
Color	White/Blue	Purple/White
Type	Mouthpiece	Mouthpiece, add on mask
Age Range	Adolescent and Adult	Infant to Adult
Manufactured by	Trudell Medical Respironics	Phillips Health Canada

MDI WITH MOUTHPIECE OR MASK INSTRUCTIONS

1. Shake MDI 10 times.
2. Place MDI into spacer device.
3. Place mouthpiece in mouth, between teeth, or mask over face.
4. Depress MDI once.
5. Breathe in and out 6 times OR take 1 deep breath in and hold for 10 seconds.
6. Remove spacer or spacer/mask from child's face.
7. Wait 30 seconds before each activation of MDI.
8. Repeat if necessary.
9. If medication contains an ICS, rinse and spit, brush teeth or give child a drink.
10. View a demonstration video.

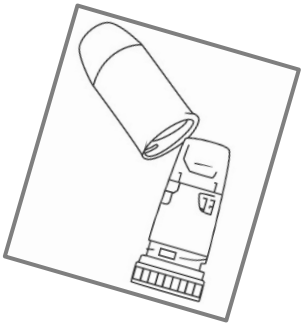


COMMON DEVICE MISTAKES

- MDI without spacer
- Teeth closed in front of mouthpiece
- Fast and shallow breaths
- Inspiratory flow too fast
- Tucking chin – like playing an instrument

DRY POWDERS (TURBUHALER)

Examples: Bricanyl, Pulmicort, Symbicort, Oxeze.



Important Device Information

- Inspiratory flow needs to be high enough to get medication into lungs. Each device requires minimum 30 LPM inspiratory flow.
- Generally, children 6 years and older should be old enough to use dry powder inhalers so consider switching them.

COMMON DEVICE MISTAKES

- Teeth and/or tongue block device (closed mouth technique).
- Breathing into the device. These devices are susceptible to humidity and breathing into them can clog the medicine in the device.
- If the child has forgotten if they loaded the device, you can repeat the dose as it will only load one dose at a time. The counter will advance but only one dose is in the device.

STORAGE

- Can be stored in the bathroom with the lids/caps secured in the closed position.
- Not affected by heat or cold.

CLEANING

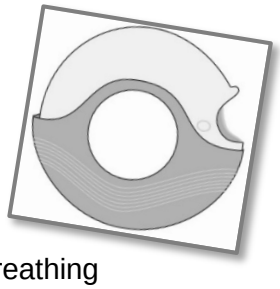
- Wipe mouth piece as necessary with cloth. Do not get the inside of the mouthpiece wet.

TURBUHALER INSTRUCTIONS

1. Remove cap.
2. Turn one way.
3. Turn back. You should hear a click sound.
4. Breathe out away from the device.
5. Place between teeth and lips, deep breath in.
6. Remove Turbuhaler from mouth. Close lips.
7. Hold breath for 10 seconds.
8. Breathe out.
9. Replace cap.
10. If medication contains an ICS, rinse and spit, brush teeth or give child a drink.
11. When the dosage window starts to show red, there are 20 doses left. Once the window is all red, the device is empty.
12. View a demonstration video.

DRY POWDERS (DISKUS)

Examples: Ventolin, Flovent, Advair, Serevent.



COMMON DEVICE MISTAKES

- Teeth and/or tongue blocking device.
- Inspiratory flow needs to be high enough to get into lungs. Each device requires minimum 30 LPM inspiratory flow.
- Breathing into the device. These devices are susceptible to humidity and breathing into them can clog the medicine in the device.
- Generally, children 6 years and older should be old enough to use dry powder inhalers so consider switching them.

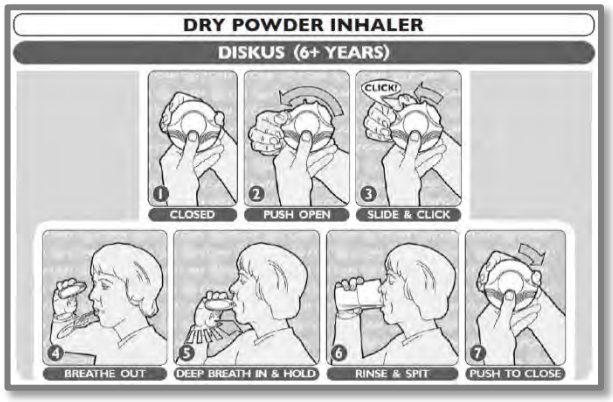
STORAGE

- Can be stored in the bathroom with the cover secured in the closed position.
- Not affected by heat or cold.

CLEANING

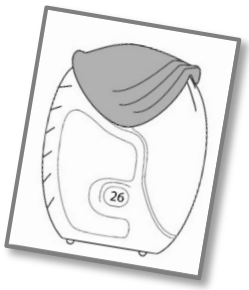
- Wipe mouth piece as necessary with cloth. Do not get the inside of the mouthpiece wet.

DISKUS INSTRUCTIONS



1. Push open cover.
2. Slide button down until it clicks.
3. Breathe out.
4. Place between teeth and lips, deep breath in.
5. Remove Diskus from mouth.
6. Hold for 10 seconds.
7. Breathe out.
8. Close cover.
9. If medication contains an ICS, rinse and spit, brush teeth or give child a drink.
10. There are 60 doses in each Diskus and it will count down as you take each dose.
11. View a demonstration video.

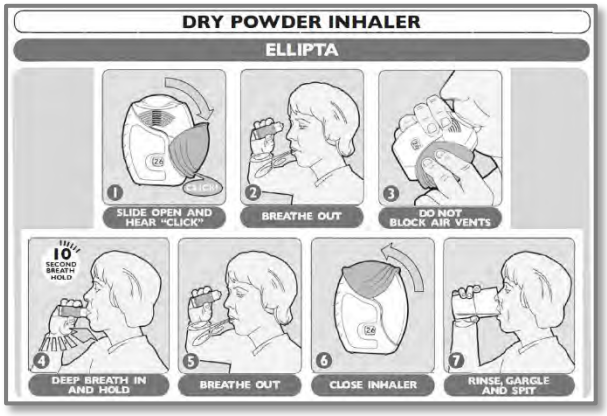
ELLIPTA DEVICE:
Examples: Arnuity (fluticasone furoate)



Important Device Information

- Arnuity is available in 100 mcg and 200 mcg .
- Once a day therapy for ages 12 and over.
- This device holds 30 doses.
- In the future, all dry powders produced by GSK will be placed in the Ellipta device, replacing the Diskus.

ELLIPTA INSTRUCTIONS:



1. Open the foil package and discard the desiccant package.
2. Write the "discard by" date on the space provided (six weeks from the time foil packaged is opened).
3. Open the cover until you hear a click. Dose counter will count down by one.
4. Breathe out as much as comfortable.
5. Put mouthpiece between teeth (do not block the air vent with your fingers).
6. Take one long, steady breath in and hold for as long as comfortable.
7. Exhale, close cover.
8. Rinse mouth and spit.
9. View a demonstration video.

CLEANING:

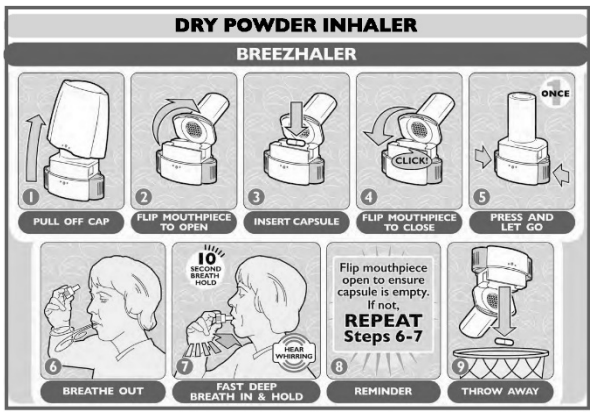
- Wipe mouthpiece with close, as needed.

BREEZHALER DEVICE:
Examples: Atectura (mometasone and indacaterol combination therapy

Important Device Information

- Once a day therapy for ages 12 and over.
- Three blister cards of 10 = 30 doses per package ie. one month of medication.

BREEZHALER INSTRUCTIONS



1. Pull off cap, flip mouthpiece to open, insert capsule, flip mouthpiece to close.
2. Press the side buttons on both sides. This punctures the capsule
3. Press and let go.
4. Breath out.
5. Fast deep breath in and hold.
6. Throw away capsule.
7. Rinse mouth and spit.
8. View a demonstration video.

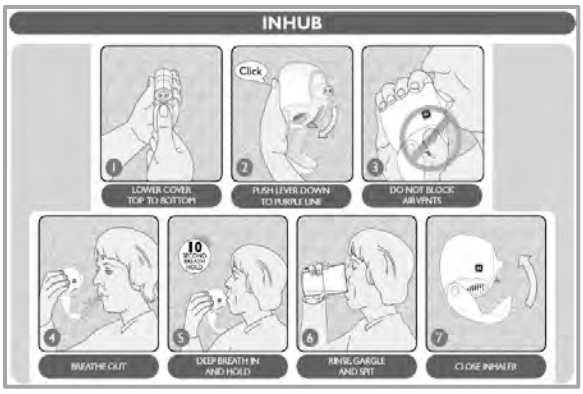
WIXELA INHUB Device:

Available in 100/50, 250/50 and 500/50 mcg.

Important Device Information

- Once a day therapy for ages 12 and over.
- In the future, all dry powders produced by GSK will be placed in the Ellipta device replacing the Diskus.

WIXELA INHUB INSTRUCTIONS:



1. Lower cover top to bottom.
2. Push lever down to purple line.
3. Do not block air vents.
4. Breathe out.
5. Deep breath in and hold.
6. Rinse, gargle and spit.
7. Close inhaler.
8. View a demonstration video.

WET NEBULIZERS (AEROSOLIZED MEDICATION)

- Used mainly in emergency room settings when children cannot use spacer device because of acuity.
- The Canadian Asthma Consensus Guidelines suggest wet nebulizer devices are rarely needed to treat asthma, either chronically or for exacerbations. They are more cumbersome and expensive than spacers with MDI.
- A jet of gas collides with a liquid in the nebulizer to produce a particle mist of varying sizes, many of which are too big to be effective.
- Ideal particle size for inhaled medications to reach the bronchi is between 1 - 5 microns. With wet nebulizers, 2/3 of the medication is lost to the environment.
- The Mini Heart Nebulizer is available through Alberta Health Services.
- Large volume nebulizers are recommended for severe exacerbations as it allows the nebulizer to be filled with up to 30 ml of bronchodilator and runs continuously for 40 - 60 minutes.
- Large volume nebulizers available through Alberta Health Services. Alberta Acute Childhood Asthma Pathway: Evidence based* Recommendations: For Emergency / Urgent Care, PRAM score 9-12)

PARTICLE SIZE AND DEPOSITION OF ASTHMA DEVICES			
Device	**Medication**	**Average Particle size MMAD***	**Maximum Deposition in airways with proper technique**
Wet Nebulizers		3.0 - >10 µm	Variable 10 – 30%
Turbuhaler	Pulmicort, Symbicort, Bricanyl, Oxese	4 µm	22 – 42%
Diskus	Flovent, Ventolin, Advair	4-6 µm	15%
Twisthaler	Alvesco	1.1-2.1 µm	Up to 50%
	Qvar	1.1-2.1 µm	
	Flovent, MDI	2.2 µm	
Mars Median Aerodynamic Diameter (MMDA)			

PARTICLE SIZE AND DEPOSITION OF ASTHMA MEDICATIONS					
Medication	**Aerosol**	**MDI Spacer**		**MDI Alone**	
		Particle size	Maximum Deposition in airways with proper technique	Particle size	Maximum Deposition in airways with proper technique
Advair and Flovent MDI	Suspension (like oil/vinegar)	2.5 µm	Up to 20%	2.5 µm	Up to 12%
Alvesco and QVAR MDI	Solution (i.e., sugar water)	1.0 µm	50-60% with spacer	1.0 µm	50-60% Variable
The relationship of particle size (MMAD) and better lung deposition to clinical efficacy is unknown					

CHECKING DEVICES

- Check spacers for valve movement. Valves may be broken/bent/missing. Replace spacer.
- Check spacers for cracks and replace if cracked.
- Check expiry dates on devices, especially if not used regularly.

How Can I tell If My Device is Empty?						
MDI	**Turbuhaler**	**Diskus**	**Twisthaler**	**Ellipta**	**Breezhaler**	**Wixela**
Shake and feel liquid moving inside	Window is clear or has numbers on it when medication is present	Numbers count backward from 60 to 0	Numbers count backward	Numbers count backward to 0	Insert one capsule at a time	Numbers count down to 0
Count the number of doses that you use	When window shows red, there are 20 doses left		Cap locks onto device when empty	Discard device if it has been out of foil packaging for more than 6 weeks		
Qvar and Alvesco will load until no more medication comes out. The dose is constant from start to finish	Completely red window means empty			9 doses left when red square next to number		
Do not float MDI's in water	The powder you hear when you shake the device is the desiccant (powder drying agent) not medication			Red square with no number, means empty		
	You will still hear powder shaking when the medication is empty					

Resources

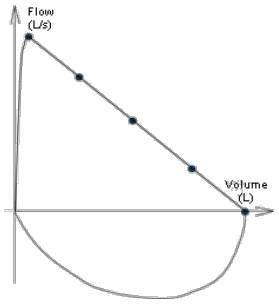
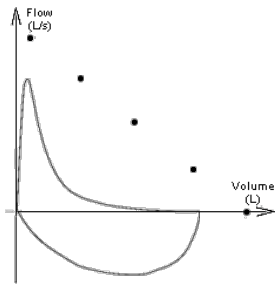
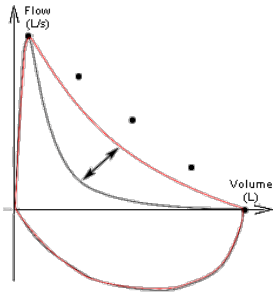
Source	Link
Asthma Canada	• Breathe Easy™: Medications
Community Pediatric Asthma Service	• Asthma Devices • Device Instructions in 14 Languages
American Association for Respiratory Care	• A guide to Aerosol Delivery Devices for Respiratory Therapists 4th edition
Alberta Childhood Asthma Pathways	• Alberta Acute Childhood Asthma Pathway: Evidence based* Recommendations: For Emergency / Urgent Care

12. SPECIALIZED TESTS

SPIROMETRY: OBJECTIVE MEASURE OF AIRFLOW

- Detects airflow limitation with seemingly normal respiratory examination and discussion of asthma symptoms.
- Reduced FEV1 /FVC. Less than lower limit of normal based on age, gender, height, and ethnicity.
- An increase of the FEV1 by ≥12% FEV,/FVC LLN (L.8 -.9) from baseline after Bronchodilator helps confirm the diagnosis of asthma (2021 CTS Clinical Practice Guideline).
- Can also help detect other co-morbidities and alternative diagnoses.
- Helps evaluate response to treatment and monitoring of airway disease.
- Provides an opportunity to teach regarding the mechanism and processes involved in airway disease.
- Patient effort dependent test.
- Generally, children ≥ 6 years of age can be coached to perform this test.
- Key values:

  FEV1: Forced Expired Volume in one second. Maximal volume of air expired in 1 second following maximal inspiration.
  FVC: Forced Vital Capacity. Maximal volume of air exhaled using maximal effort, following maximal inspiration.
  FEV1/FVC: Ratio between the above values.
  LLN: Lower Limit of Normal.
  FEF25-75%: Forced expiratory flow (mid 50%) which can show lower airway inflammation.

FLOW VOLUME LOOPS		
		
Normal Flow Volume Loop	Flow volume loop with airway Obstruction	Flow volume loop showing airway obstruction with reversibility following Bronchodilator

SPUTUM EOSINOPHILS

- Specialized test ordered by Pediatric Respirologists, which helps guide a treatment plan by physicians.
- This non-invasive test involves the patient having sputum induction, which microscopically visualizes the different types of cells.
- A test result high in Sputum Eosinophils indicates the patient has more allergic-type triggers.

NITRIC OXIDE (NO) MEASUREMENT

- Nitric oxide (NO) is endogenously produced when airways are inflamed.
- Asthma patients have elevated NO levels in exhaled air which decreases with anti- inflammatory treatment.
- Measuring exhaled NO is a simple non-invasive test. It takes about the same time to perform as spirometry. It is **not** a tool to diagnose asthma, but plays a role in monitoring patient's response to anti-inflammatory treatment and does not replace spirometry.
- Available at the Pulmonary Function Test Lab (PFT), Alberta Children's Hospital, Calgary, Alberta, Canada.

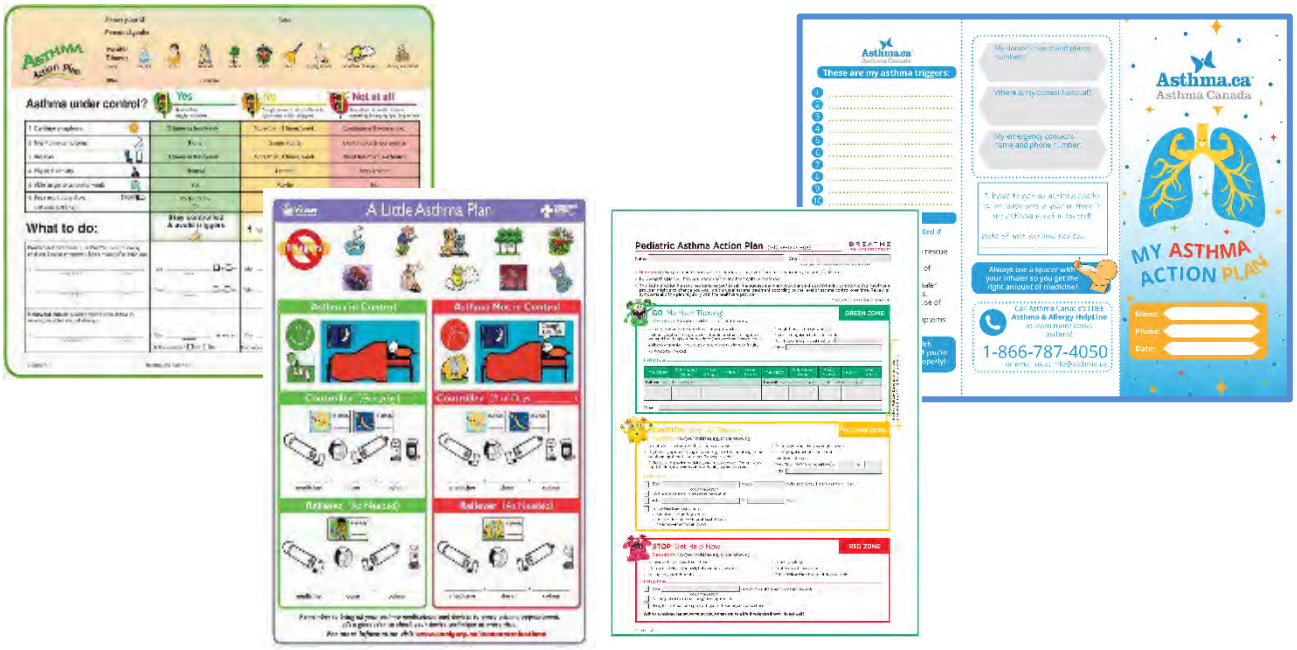
RESOURCES

SOURCE	LINK
Community Pediatric Asthma Service	• Spirometry Video
American Thoracic Society	• Pulmonary Function

13. ACTION PLANS

Key component of care should be **written**, not verbal and should outline:

- avoidance of triggers
- daily preventive management to maintain control
- when and how to adjust reliever and controller medicine for increased asthma symptoms
- clear instructions about when to seek urgent medical attention
- review and adjustment, as needed, with physician and minimum once a year



RESOURCES

SOURCE	LINK
Asthma Canada	• Asthma Action Plan
Canadian Lung Association	• Pediatric Asthma Action Plan
Community Pediatric Asthma Service	• Asthma Action Plans

14. SMOKING, VAPING AND MORE

- All health care providers should ask about tobacco/nicotine use at every interaction. Cessation should be addressed with all current users.
- E- cigarettes were initially invented in 2003 by a pharmacist to be used as a smoking cessation tool. There is increasing use amongst youth in using e-cigarette's but generally not as a smoking cessation tool.

PREVENTION

- Children experiment with smoking as early as the age of 9. Using tobacco/nicotine is a health concern for everyone, and together we can empower children to make the healthy choice to not experiment with tobacco/nicotine.
- The Canadian Pediatric Society provides great practical tips for children of all ages and with their permission, we have listed these tips below.

AGE GROUP	WHAT TO FOCUS ON	INFORMATION TO SHARE
Age 5 to 11	Negative effects and consequences of smoking.	• Smoking causes bad breath and yellow teeth. • Smoking makes it harder to keep up during sports. • Your body can get addicted even after smoking just a few times and it will be hard to stop. • Cigarettes are expensive. You could spend your money on more fun things. • Tobacco companies trick kids into thinking smoking is cool and safe. • Smoking can cause cancer and heart attacks. • It's against the law for kids to buy cigarettes.
Tweens/Teens	Immediate effects of smoking.	• Smoking makes you smell and gives you bad breath. • Smoking makes your teeth yellow and gives you early wrinkles. • You won't be able to run as quickly or do as well at sports if you smoke. • You will have hacking coughs, get more colds and pneumonia. • You will get addicted very quickly. • Cigarettes are expensive—one pack a day for a year could buy a used car ($1,500 to $3,500).
	Long-term health consequences of smoking.	• Smokers are more likely to have fertility problems than non-smokers. • Other forms of tobacco may not be safer than cigarettes. • Smoking exposes the people you love to all the health risks of second-hand smoke.
Source: The Canadian Pediatric Society		

***FOR PARENTS OF TWEENS AND TEENS**

- Teen smoking might begin innocently, but it can become a long-term problem. In fact, most adult smokers started smoking as teens. To help your teen avoid getting hooked, follow the tips below.

***SET A GOOD EXAMPLE**

- Teen smoking is more common among teens whose parents' smoke. If you smoke, quit. Ask your physician about ways to stop smoking.
- In the meantime, don't smoke in front of your teen and don't leave smoking materials around your home. Explain to your teen how unhappy you are with your smoking; how difficult it is to quit and that you'll keep trying until you stop smoking for good.

***UNDERSTAND THE ATTRACTION**

- Teen smoking can be a form of rebellion or a way to fit in with a particular group of friends. Teens may smoke to feel cool or independent.
- Ask your teen what he or she knows about smoking and using electronic cigarettes (vaping), and if any of your teen's friends smoke or vape.
- Talk with your teen about how tobacco companies try to influence ideas about smoking — such as through advertisements or product placement in movies that create the perception that smoking is glamorous, sexy and mature.

***SAY "NO"**

- You might feel as if your teen doesn't hear a word you say, but say it anyway. Tell your teen that smoking and vaping aren't allowed. Your disapproval will have more impact than you think.

***THINK BEYOND CIGARETTES**

- Teens often think that electronic cigarettes (e-cigarettes), as well as smokeless tobacco, clove cigarettes (kreteks), candy-flavored cigarettes (bidis) and water pipes (hookahs), are less harmful or addictive than are traditional cigarettes. They all carry health risks.
- Research suggests that e-cigarettes cause users to inhale potentially harmful chemicals. E-cigarettes can also get teens hooked on nicotine and make the use of tobacco products seem normal, which could lead to the use of cigarettes.

***APPEAL TO YOUR TEEN'S VANITY**

- Remind your teen that smoking gives you bad breath. It makes your clothes and hair smell, and it turns your fingers and teeth yellow. Smoking can also leave you with a chronic cough.

***DO THE MATH**

- Smoking is expensive. Help your teen calculate the weekly, monthly or yearly cost of smoking or vaping every day. You might compare the cost of smoking with that of smart phones, clothes or other teen essentials.

***EXPECT PEER PRESSURE**

- Give your teen the tools he or she needs to refuse cigarettes. Rehearse how to handle tough social situations. It might be as simple as saying, "No thanks. I don't smoke."
- Most teens believe that occasional smoking won't cause them to become addicted and that, if they become regular smokers, they can stop smoking anytime they want. Teens, however, can become addicted after smoking as few as five packs of cigarettes. Remind your teen that most adult smokers start as teens. Once you're hooked, it's tough to quit.

***CONSIDER THE FUTURE**

- Teens tend to assume that bad things happen only to other people. Use loved ones, friends, neighbors or celebrities who've had tobacco-related illnesses as real-life examples of the harm tobacco use can cause.

***GET INVOLVED**

- Take an active stance against teen smoking. Participate in local and school-sponsored smoking prevention campaigns. Support efforts to make public places smoke-free and increase taxes on tobacco products.
- Talk to your teen early and often about the dangers of smoking and vaping. Avoiding smoking is one of the best things your teen can do for a lifetime of good health.

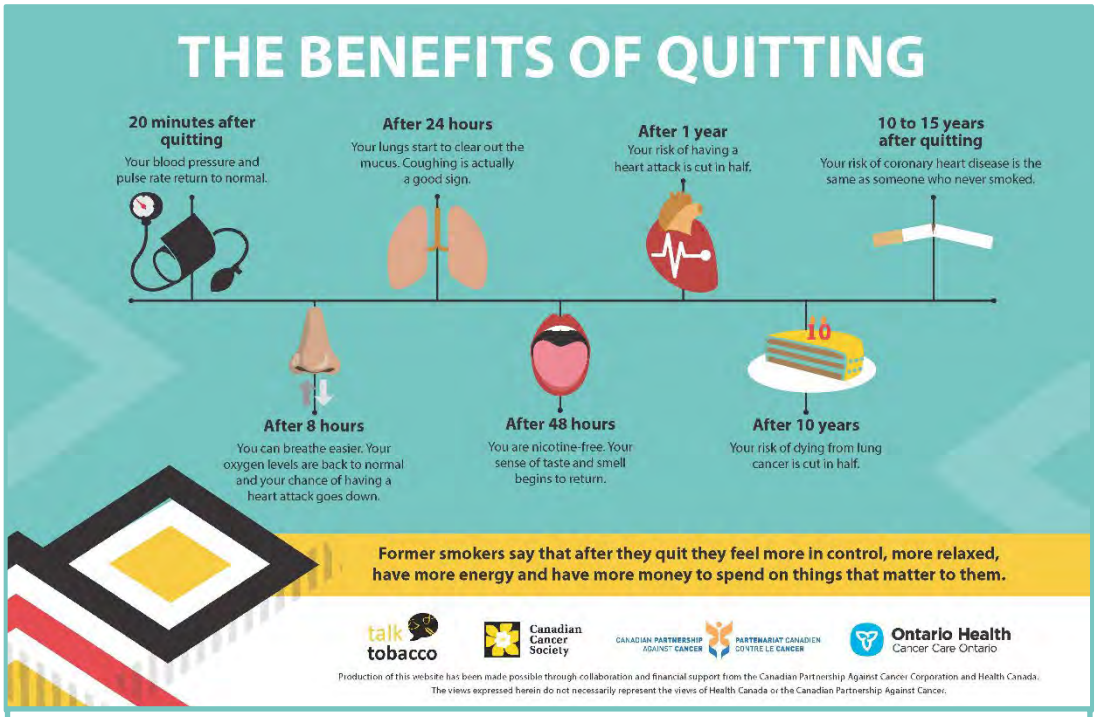
(*The above referenced content source is the Mayo Clinic)

THE BEST NEWS…

Youth who make it to age 19 without smoking will probably never smoke in their lives.

CESSATION (FOR CURRENT SMOKERS)

- Health Canada recommends quitting smoking. Cessation is the best thing you can do to improve your life and health. You will start to see benefits soon after you have your last cigarette.



Source: Talk Tobacco, Indigenous Quit Smoking and Vaping Support

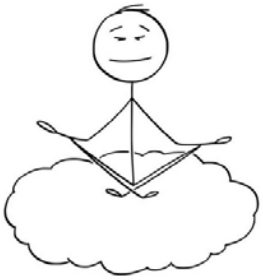
DO YOU LIVE IN ALBERTA?

- If you have decided it's time to quit, call AlbertaQuits Helpline 1-866-710-7848 or visit AlbertaQuits.
- AlbertaQuits offer group counselling and text support and can direct you to one-on-one counselling.

RESOURCES

SOURCE	LINK
Alberta Health Services	• Tobacco and Vaping: Information for Health Professionals
Alberta Lung	• What you need to know about vaping
Government of Canadian, Health Research	• Summary of results for the Canadian Student Tobacco, Alcohol and Drugs Survey 2018-2019
Canadian Pediatric Society	• Smoking and your child or teen
Community Pediatric Asthma Program	• Nicotine in Disguise • Smoking, Vaping and More
Drug Free Kids Canada	• Cannabis Resources • Talking with your kids about Cannabis
Health Canada	• Talking with your teen about smoking • Make your home and car smoke-free • On the road to quitting: A guide to becoming a non-smoker for young adults • Preventing kids and teens from vaping • Quitting Smoking: Deciding to Quit • Quit4Life
Mayo Clinic	• Youth Tobacco Prevention
Talk Tobacco	• Indigenous Quit Smoking and Vaping Support

15. ALTERNATIVE MEDICINE FOR THE TREATMENT OF ASTHMA



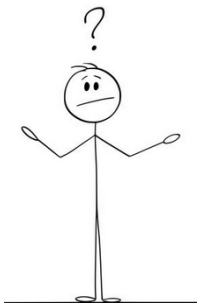
- Alternative therapies have a long tradition and are the primary form of treatment in many cultures.
- The term "natural" does not imply, and should not be taken to mean, that a product is safe. Few of these therapies have been studied and those that have been, have shown to have minimal effects on asthma.
- Having the health care provider acknowledge alternative therapy is often a relief to the patient and families.
- It is estimated that 25% of the general population use alternative therapy, yet many families are reluctant to tell health care providers that they use alternative medicine. Ask the family if alternative medicine is something they use or are thinking about looking into in the future.
- Encourage families tell all their health care providers what other therapies they may be using.
- Contact the Poison and Drug Information Service through Alberta Health Services: 1-800-332-1414 for information regarding herbal medications or refer to Health Canada's About Natural Health Products

FORMS OF ALTERNATIVE MEDICINE FOR ASTHMA		
Acupuncture	Herbs	Nutritional Supplements
Aromatherapy	Homeopathy	Reflexology
Biofeedback	Hypnosis Imagery Therapy	Religion
Chiropractic	Massage	Yoga
Exercise	Naturopathy	Salt Rooms

RESOURCES

SOURCE	LINK
Health Canada	• National Health Products
National Center for Complementary and Alternative Medicine	• Asthma and Complementary Health Approaches: What You Need to Know

16. PATIENT TERMINOLOGY



Try using the word "asthma" when helping a family understand how a physician confirms an asthma diagnosis. For example:

- "Your child may have asthma."
- "Your child probably has asthma."
- "Your child has asthma."

Below is a list of some of the terminology parents may heard about "asthma".

AIRWAY REMODELING

- Changes in the airways that are permanent damage and may result in ongoing asthma symptoms into adulthood and decreased lung function.

ALLERGIC RHINITIS/HAY FEVER

- Stuffy, runny nose caused by an allergen.
- Stuffy, runny nose with no apparent cause.

ANAPHYLAXIS

- This is a potentially life-threatening systemic allergic reaction, taken from the Greek word "without protection".
- Hypotension and shock are the dominant features.
- Anaphylaxis is the most extreme allergic reaction and can cause death. It may involve the skin, respiratory, cardiovascular, and gastrointestinal systems.
- Symptoms can vary from person to person and can be different from one reaction to another.
- No contraindication to using an epinephrine injector.

BRONCHITIS

- Inflammation and swelling of the bronchi (the larger breathing tubes) caused by either a bacterial or viral infection and usually causing a painful cough with greenish mucous.
- Asthma is a disease that not only affects the bronchi but the bronchioles (the smaller breathing tubes in the respiratory system).
- Chronic bronchitis is a disease seen almost exclusively in adults exposed to tobacco smoke that causes the airways to produce more mucous.

COLLAPSED LUNG

- Some patients use this term when they have had an x-ray. They likely did not have a pneumothorax, but are referring to the atelectasis or consolidation that can be present with mucous plugging in asthma and this is an interpretation or how it was explained to them.

CROUP

- A viral infection of the larynx and trachea, typically with a cough sounding is like a harsh, barky cough.
- Generally, improves quickly when exposed to cold air.
- Patients can have croup and then progress to asthma.
- Describing a cough is often subjective and a "barking" cough may not necessarily mean croup. Consider asthma or foreign body aspiration.

DOUBLE PNEUMONIA/WALKING PNEUMONIA

- Pneumonia is an infection caused by a bacteria or virus that causes the alveoli to fill with pus and fluid. The key signs are fever, cough, rapid breathing, lethargy and chest pain.
- Asthma can worsen with pneumonia which is why a confirmed diagnosis for pneumonia needs to be made by a physician.
- Fever is generally present when you have a viral or bacterial pneumonia and not when you have worsening asthma.

ECZEMA

- Dry, itchy, red patches of skin that crack and weep with excessive scratching.
- Allergies in infants often show up as eczema.

EMPHYSEMA

- A disease primarily seen in adult smokers and former smokers.
- This produces permanent damage to the lungs caused by the destruction of alveoli and increase of the lung's rigidity.
- Decreased or absent response to inhaled bronchodilators.

REACTIVE AIRWAY DISEASE

- A "common" term used by some physicians when the diagnosis of asthma is a possibility.
- Physicians may also use this term when the diagnosis of asthma has not yet been made.

SINUSITIS

- Inflammation in the sinuses.

VENTILATOR

- Probably means Ventolin/puffer or Nebulizer.

RESOURCES

SOURCE	LINK
American Academy of Allergy Asthma & Immunology Rhinitis	• www.aaaai.org
Anaphylaxis Canada	• www.anaphylaxis.org
Eczema Society of Canada	• www.eczemahelp.ca
National Eczema Association	• www.nationaleczema.org
Simply Sayin' Medical Jargon (app with family-friendly medical terms)	• Apple App Store • Google App Store

17. Parents' Frequently Asked Questions and Suggested Responses

Does my child have asthma?

- Asthma must be diagnosed by a physician. The diagnosis of asthma considers medical history, family history, allergies, response to asthma treatment and spirometry.
- It generally takes time to determine if a child has asthma—weeks, months and sometimes years.
- Refer to Does My Child Have Asthma? included in handout package.

Will my child outgrow asthma?

- Children whose asthma is triggered by a cold virus are more likely to have a greater chance of "outgrowing" their asthma. This can include up to 50% of children.
- If your child carries the genetic makeup for asthma, and although symptoms may disappear, asthma symptoms can return when they are older (i.e., 30's. 40's, 50's).
- Generally, the more triggers that children are exposed to, the greater the chances of having asthma symptoms. For example, a child can handle a cold but not a cold + pollen + animal dander.
- If there are strong personal or family allergies, it is much more likely your child will not outgrow their asthma symptoms.

Will my child become resistant to asthma medication?

- No. If asthma medications become less effective, contact a health care provider for advice. Your health care provider may increase or change your medications.

When should my child stop taking my medications?

- When your child's asthma is under control, you need to talk to your physician about adjusting the dose. Stopping controller medications too soon may cause airway inflammation to return. A written asthma action plan from your physician is a helpful tool to refer to when you need to use/change the amounts of medication for your child.
- For viral triggered asthma, a good rule of thumb is if your child has a minimum two viral colds with non-asthma symptoms, a trial of stopping asthma medication can be done. Be conscious of timing and do not stop if going on a holiday or important events if the trial is unsuccessful.

My child is lactose intolerant and I have heard that some medications have lactose in them.

- Some dry powder medications contain lactose (Flovent, Advair Diskus, Oxeze Turbuhaler and Symbicort Turbuhaler).
- The amount of lactose in these medications is very small and should have no effect on lactose intolerant people, but talk to your physician about other medications that can be substituted (i.e., MDIs or Pulmicort Turbuhaler).

My child gags on the medicine.

- For people with a strong gag reflex or who do not like the taste of their medications, other medications can be explored with your physician.
- Using spacers with MDIs and changing from a Diskus to a Turbuhaler could be an option. QVAR and Alvesco have an alcohol base and some children do not like this.

WHEN MY CHILD USES A TURBUHALER, I DON'T THINK THEY ARE GETTING ANYTHING.

- The amount and particle size of medication from this device is very small. It is common to think this so it may be helpful to demonstrate the amount by activating the device on the patient's hand.
- Proper device technique is very important.
- Make sure that the device is not empty, expired or broken. Monitoring your child's asthma symptoms and asthma control will ultimately help you decide how this medication is working for your child. Talk to your physician about your concerns.

HOW DO I KNOW WHEN MY CHILD IS OLD ENOUGH NOT TO USE A SPACER WITH HIS PUFFER?

- **Everyone** should use a spacer with MDIs, regardless of age. You get more medication in your lungs using a spacer.
- If your child is 6+ years, other medication devices like dry powder inhalers can be considered.
- Device technique should be reviewed with a health care professional at least once a year and preferably at every visit with your physician or health care provider.
- Asthma guidelines recommend children 4 years of age and younger should use a spacer with a mouthpiece. Children 4 years of age and older use a spacer with a mask.

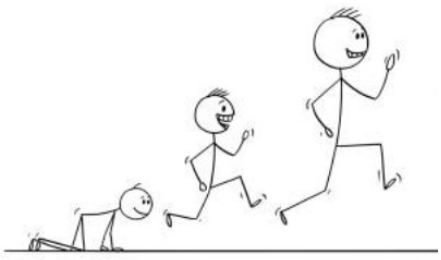
MY CHILD HAS RSV. IS THAT ASTHMA?

- No. RSV is the name of a common respiratory virus called "Respiratory Syncytial Virus". It is a contagious virus which is spread through the air from one person to another, often by coughing and sneezing and by hands. It is a common cause of colds in winter and early spring and can affect all ages.
- RSV symptoms may look like a cold; fever, runny stuffy nose, red eyes, sore throat/ears, and other cold symptoms. Symptoms may get worse and include wheezing, shortness of breath, increase respiratory rate, which look like asthma symptoms, but it is not asthma.
- Infection with RSV at a young age is thought to increase the risk of developing asthma.

DO THE STEROIDS IN ASTHMA MEDICINE CAUSE THRUSH, WEAKEN THE BONES OR STUNT GROWTH?

- **Thrush:** Inhaled corticosteroids **rarely** cause thrush (fungal infection cause by yeast - Candida albicans) in the mouth, especially when using a spacer. Pharmacists, when dispensing the medication, emphasize the importance of rinsing/gargling/brushing teeth after taking this medication, but this does present as a barrier for some families when taking the prescribed ICS. Their child may be too young or unable to do this, so they do not use the medication as they perceive the risk of getting thrush far outweighs the importance of taking the ICS. It is more important to treat the inflammation in the lungs and then treat the thrush if it occurs. Drinking something, rinsing the mouth or brushing teeth will help eliminate these potential side effects.

WEAKEN bones/Stunt Growth



- Corticosteroids are a hormone which your body produces naturally from your adrenal gland. Inhaled corticosteroids, at the doses commonly needed/recommended to treat asthma, have not been shown to cause weak bones, growth suppression, weight gain or cataracts.
- When corticosteroids are taken orally and in higher doses for long periods of time because asthma is not controlled, they can cause weak bones and growth suppression. Your physician is aware of this and will monitor it.

SHOULD I HAVE A HUMIDIFIER IN MY CHILD'S ROOM?

- Having a humidifier in the bedroom does not help someone with asthma symptoms. Avoiding your asthma triggers and proper medication help control asthma. If you use a humidifier, it is important to monitor the humidity level and keep the level below 50%.
- The water in the reservoir should be replaced at least every 24 hours, and the reservoir should be cleaned with soap and water at least once a week. Damp homes are bad for lung health and are a source of mold and bacteria.
- Dust mites can be a trigger for asthma. Although you will not be able to rid your home of these creatures, you will have lower levels if your humidity is below 50%. A hygrometer is a gauge that measures the humidity in your home and can be purchased on-line or hardware stores.

SHOULD I USE A HEPA (HIGH EFFICIENCY PARTICULATE) FILTER?

- It is still unclear whether HEPA filters reduce asthma and allergy symptoms. Having a filter is a personal choice.
- Good housekeeping is very important in removing indoor and outdoor particles which can irritate the lungs. Regular vacuuming, dusting and eliminating clutter, especially in the bedroom, helps eliminate exposure to triggers. Central vacuums should be vented to the outside.
- HEPA filters are available on some vacuum cleaners as well as furnace filters. Price and effectiveness vary between filters. IQAir produce one of the most effective air purifiers, but it is also one of the most expensive.

SHOULD MY CHILD USE THE INHALED CORTICOSTEROID FIRST OR THE SHORT-ACTING BRONCHODILATOR FIRST?

- Most health care professionals suggest using relievers first to stop the cough, making it easier to take the preventer medication.
- The action of these medications is different. You should take your inhaled corticosteroid regularly to reduce inflammation in your lungs. The short-acting bronchodilator only temporarily reduces asthma symptoms such as couching, shortness of breath or chest tightness. Studies indicate it does not matter which medication you take first.

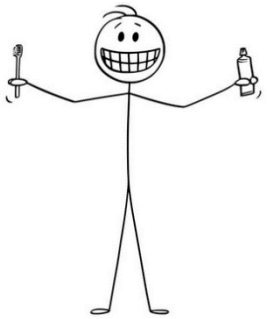
SHOULD I GIVE MY CHILD COUGH SYRUP IF HE/SHE IS COUGHING?

- No. Cough syrup should not be used to treat asthma symptoms. Cough due to asthma requires asthma medications, not cough syrup.
- If the cough is due to rhinitis, then a cough syrup may help.
- Suppressing the cough due to asthma may cause the mucous that is produced during an asthma exacerbation to stay in the lungs where bacteria can grow and increasing the chance of bacterial pneumonia.
- No medications containing acetylsalicylic acid (Aspirin, Motrin or Advil) or cough suppressant (DM) should be taken to treat asthma. Consult a pharmacist about over the counter and prescription medications for asthma.
- Generally speaking, decongestants are acceptable.

THE MEDICATION BOX SAYS "NOT RECOMMENDED FOR CHILDREN UNDER 12 YEARS OF AGE." IS IT SAFE TO USE IN YOUNGER CHILDREN?

- Only 20% of all medications used in pediatrics have approval—meaning most medication is used "off label". Generally, medication trials are not done on children (ethics) and takes years to receive approval for younger ages.
- Pediatric respirologists and physicians have found asthma medications to be very safe and effective in treating asthma in children less than 12 years of age.

THE DENTIST SAYS MEDICATIONS CAN CAUSE TOOTH DECAY?



- The saliva in your mouth rinses the medication away. The pH of some medications which can cause tooth decay. People with dry mouth need to be more aware of good daily oral hygiene and regular dental care.

SHOULD MY CHILD HAVE ALLERGY TESTS IF THEY HAVE ASTHMA?

- Allergies are an important determinant of long-term asthma control. Although not all children need allergy tests, a full allergy assessment is often helpful in confirming triggers.
- Determining what allergens are present makes it easier to plan how to avoid them, but an allergy test cannot always pinpoint exactly what allergy your child has.

IS THERE ANYTHING I CAN DO FOR PREVENTION?

The "**Five Pillars of Health**" are important discussion points.

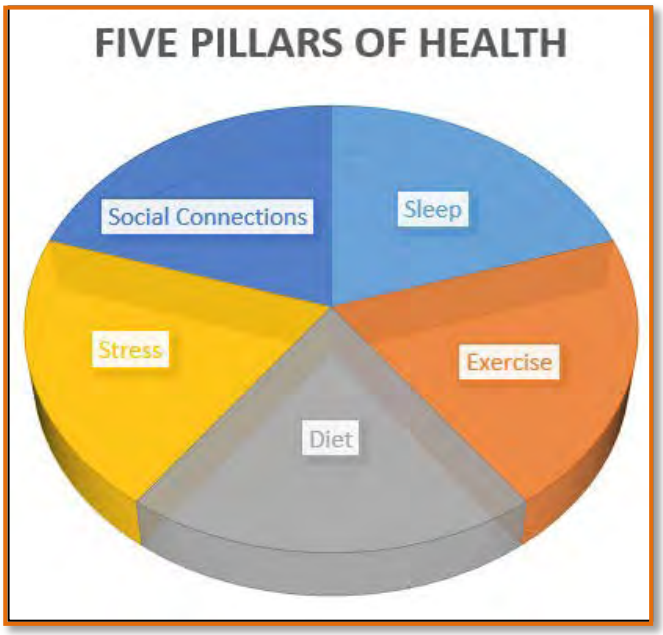
1. **Sleep**: Quality of sleep, not just quantity is important. It is important that we breathe through our nose. If you have a congested nose because of allergic rhinitis, or if children have large tonsils or adenoids which cause them to breathe through their mouth, this can affect their sleep quality. Treating the nose so the child can breathe properly is important.

2. **Exercise**: "Canadian kids are sitting too much and moving too little to reach their full potential"- ParticipACTION. "For better brain health, all children and youth should be physically active on a regular basis. In addition to physical health benefits, physical activity also improves cognition, brain function and mental health." Children who are "out of shape" can confuse shortness of breath with asthma symptoms.

3. **Diet**: There is no diet which will eliminate asthma symptoms. Eating a healthy diet is important to overall health and supporting your immune system.

4. **Stress**: When exposed to stress, like bullying or a volatile home life, this trigger can worsen asthma symptoms. Families are routinely asked about Domestic Violence Screening. Questions such as: "The threat of violence is a problem for many people and can affect their health. Abuse comes in many forms so we ask all patients and their families about violence or the fear of maltreatment in their lives". Is this a concern for you/your children? Do you feel safe right now? Do you feel safe in your schools, work, home?

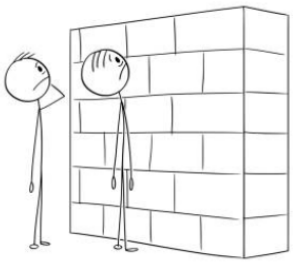
5. **Social Connections**: Having friends and family are important to the mental and physical health of people. Social media is having an impact on how we connect with people and for some, they find themselves more isolated.



Created by Community Pediatric Asthma Service August 27, 2018

18. BARRIERS AND SOLUTIONS FOR OPTIMAL ASTHMA CONTROL:

- Establish the goals of child and parent.
- Balance those goals with therapy.



MEDICATION SIDE EFFECTS	
BARRIERS/CONCERNS	**STRATEGIES/SOLUTIONS**
Use of ICS is parents' top concern.	• Reassure parents that ICS are very safe to use. Not using ICS as directed may cause poor quality of life and decrease growth (calories spent breathing versus growing). • Benefits of treating asthma include child can play with their friends, improved sleep quality, better school performance, not missing school or going to the hospital. • Not related to anabolic steroids. • Use of ICS daily as directed by a physician will reduce the inflammation and mucous in the airways and help make the lungs less sensitive to triggers. • ICS does not affect growth in the doses used to treat asthma (i.e., children will reach their full adult height). • Risk of thrush is very low. Benefits of treating airway inflammation outweighs risk of thrush.
Change in behaviour/personality.	• Talk to the physician about changing from one brand of medication to another. i.e., Flovent to Qvar to Alvesco.
Would rather take an oral medicine than an inhaled medication.	• Inhaled corticosteroids are the primary treatment for asthma. Oral corticosteroids are distributed throughout the body, increasing the risk of unwanted side effects on the body and are taken at a much higher dose than ICS. • Inhaled corticosteroids are delivered right to the lungs with minimal absorption in the rest of the body (i.e., fewer systemic side-effects).
Will my child become dependent on the medicine?	• No. People do not become physically addicted to asthma medications. • With β2 use, some tolerance with time and frequency of use can occur, but it still retains a significant bronchodilator (reliever) action.

COMPLIANCE/ADHERENCE	
BARRIERS/CONCERNS	**STRATEGIES/SOLUTIONS**
Ask about understanding asthma	• Asking and understanding what the patient knows is critical • What are the biggest challenges for your family with having asthma? • Use language the family understands, not health care language. • Use words like “4-hour muscle medicine” versus short-acting bronchodilator or Beta2-agonist.
Difficulty remembering to take medication as prescribed	• Place medications in a location the child goes morning and night. i.e., bathroom, kitchen and bedroom. • Do they need 2 sets of medications, i.e., one for upstairs bathroom and one for the downstairs bathroom or one at each parent’s house? • Use a sticker calendar. • Program electronic device. i.e., alarm, cell phone, asthma app.
Will they only take medication once a day or use as needed	• Let the physician know and consider once a day therapy or combination therapy.
Let child/teen take responsibility	• Provide options and have patient suggest a goal and plan. Establish a plan, check on it and change as needed. • For example, parents can check device every 2 weeks to see if doses have been taken.
Child fights medication	• Let child use it on a stuffed animal, parent or sibling, then on self. • Be consistent; do it the same way, every day. • Let the child use it independently. • Distractions: television, sibling, parent. If parent sings, do not have child singing or talking during treatment, just breathing. • Wrap child in blanket, or place child in lap, parent crosses legs over top and holds arms to secure the child.
Giving Oral corticosteroids	• Mix with some food (i.e., jam) and give small amounts. • Give small amount over 30 minutes. • Give popsicle first which numbs the mouth. Flavored drinks can help mask the taste.
Parents do not believe child has asthma and do not want to give medications	• Ask the child what their main complaint is. It is almost always not being able to play with friends. This will help convince the parents. • Motivational Interviewing: Listen and establish why the family feels this way, then work with their concerns in a collaborative way.
School policy on the administration of medication	• Check with the school and teacher about their policies. • Let the school know of medications/triggers.
Compliance/Adherence	• Reward: What kinds of things would the child be motivated by? An extra bedtime story? A sticker? • Have parents set notification on phone when puffer will be empty for refills at pharmacy.

LANGUAGE AND CULTURAL DIFFERENCES	
BARRIERS/CONCERNS	**STRATEGIES/SOLUTIONS**
Language	• Alberta Health Services Translation Services are available 24 hours a day, 7 days a week in 240 languages. • 1-800-523-1786 • To access, need a client ID # which is available through manager.
Cultural	• The Community Pediatric Asthma Service has asthma information in 14 languages on their website.

ACCESS TO MEDICATIONS	
BARRIERS/CONCERNS	**STRATEGIES/SOLUTIONS**
Do they have a medication plan?	• Are there any problems paying for prescribed medications?
If cost of medication is a factor.	• Costco, Wal-Mart, Superstore are budget-friendly. • Patient does not need to have a Costco membership to purchase medication.
Cannot afford the medication.	• Inpatient: Involve Social Work • Inpatient/Emergency: Dispense medication to the child prior to discharge from hospital. • Does the family qualify for Child Health Benefit? • Qualifying income approximately $17,000-$47,000, dependent on number of children. • If yes, give family Child Benefit Package information. • Make the family physician/pediatrician aware so they can provide samples or apply for compassionate drug plan • Contact the Alberta Children's Hospital Asthma Clinic 403-955-7324 to discuss options.
Parents separated/ divorced; child lives in two homes.	• Is it easier to have a set of medication at each house? • Dispense instructions to read dispensing 2 at a time, one for each house.

RESOURCES

SOURCE	LINK
Government of Alberta	• Alberta Child Health Benefit

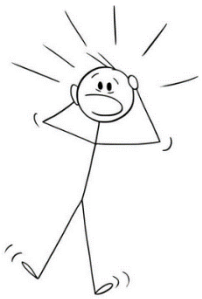
19. PEDIATRIC ASTHMA MANAGEMENT KNOWLEDGE NUGGETS

THE GOAL IS ASTHMA CONTROL	✓ No asthma symptoms ✓ No emergency room visits ✓ No missed school ✓ Run and play ✓ Reliever < 2 times per week
Medication dose is adjusted until asthma control is achieved using the lowest possible dose of medication possible	

- All ICS have excellent anti- inflammatory properties.
- Most asthma can be controlled on a daily low dose of Inhaled Corticosteroid, using the proper technique and good adherence to medication. Higher doses may be required due to breathing patterns and the narrow size of the airways for a child.
- Before suggesting a change in medication, if patients have current prescribed medications that are not expired, consider using the prescribed medications and check their technique. You can then assess why patient is not adhering to medication regime.
- How to decrease or stop the medication? General guidelines – Maintain good control for a minimum of 3 months or 2 viral colds before decreasing or considering a trial of new medication.
- Why do we use medications off label? Testing of medication on children is not done and takes years to receive approval for younger ages. Only 20% of medications used in Pediatrics has approval. Most medication is used off label.
- Do not forget to treat the nose with asthma. Improving rhinitis improves asthma symptoms, improves sleep quality, and proper breathing pattern.
- Adrenal Insufficiency/Crisis: Rare, but one should be aware of it. Cortisol is a hormone that helps keep the body blood pressure and blood sugar normal. When corticosteroids are given to treat inflammation through asthma medications, nasal sprays, eczema creams etc., the cumulative effect of too much corticosteroid from the adrenal glands can slow or stop making its own cortisol. When the body becomes stressed due to injury/sickness, the body cannot make enough of its own cortisol resulting in low blood pressure and blood sugars.
- The signs of adrenal insufficiency are often vague flu-like symptoms including tiredness and joint pain and in extreme cases, death. Treatment includes corticosteroids and slowly weaning so the adrenal gland starts to function normally again.
- Proper diagnosis of asthma is important – Studies show up to 30% of people with physician diagnosed asthma do not have asthma.
- It is estimated that 60% of patients with asthma do not meet asthma control guidelines.
- Spirometry is a helpful test for diagnosis and management. All patients with asthma should have a spirometry test. Keep in mind that asthma is intermittent and having a normal breathing test does not rule out asthma diagnosis and should be correlated with symptoms.

20. UNIQUE CASE STUDIES

Interesting cases seen by Respiratory Educators



- **16-year-old girl** presents with long time "asthma", unresponsive to asthma medications. She has never had a spirometry test before. Treated in the past with high dose inhaled corticosteroids based on her long-term symptoms of SOB and cough with exercise.

  Spirometry revealed restrictive lung disease. Xray showed a teratoma which was surgically removed. A teratoma is a congenital (present prior to birth) tumor formed by different types of tissue.

- **12-year-old boy** presents to Emergency with cough, query asthma exacerbation. He had a "diagnosis" of asthma. Cough started 3 weeks ago and he is using his puffers without significant improvement. He has missed 3 weeks of school because of this cough. His cough is not "characteristic" of an asthma cough, but more in keeping with a "habit" cough. It is a forced, one-time cough every 30 seconds, but stops when he is asleep. A simple spirometry flow volume loop was done and confirmed a normal flow volume loop. Discussed habit cough with family.

  Gave family a visualization that with his coughing, the receptors in his throat are very irritated and are quick to react. "For the next 2 minutes you are going to try not to cough. Like a smoldering fire – every time you feel like coughing take a sip of water and put out the fire." During the 2 minutes casual conversation with parent and he took several sips of water and encouraging him he is doing great. At the end of 2 minutes when the timer went off, he immediately started the cough.

  Discussed how this felt and now a longer trial – with the same process and the same results. He was able to control this cough for longer period of time. Empowering him, that he can and proceeded to spend 45 minutes with initially allowing him to pick a time of min 2 minutes where he could not cough, and if he felt like coughing than he needed to take a sip of water.

- **9-year-old girl** presents in the Emergency Department with asthma, worsening over the last few weeks. She is using her puffers every 3-4 hours, without significant improvement. Monitoring her breathing pattern, she has a respiratory rate of 25, very apical breathing pattern, very sore back muscles.

  Discussion revealed she has anxiety and a fear of dying from COVID-19. Spirometry performed in the Emergency Department revealed a normal spirometry loop. Assuring her that it was not her asthma and having her work on a proper breathing pattern helped lower her anxiety and breathing improved. Mental health workers also supported her.

- **3-year-old girl** presents to Urgent Care with wheeze. She does have a viral cold and is treated for possible asthma with the Alberta Childhood Asthma Pathway. In the following ten days, she returns several more times to Urgent Care with symptoms of wheeze and cough with some response to asthma medications and oral steroids, but not significantly improved.

  Respiratory educator saw the child two weeks from initial incident, talking to Mom she describes how the wheeze was sudden onset. O/A breath sounds not equal bilaterally. Puffers help mildly. Further discussion reveals she was eating popcorn at the time of symptoms 10 days ago. Child was seen by respirologist within the hour and bronchoscopy that afternoon revealed popcorn was seen as aspiration.

RESOURCES

Source	Link
Anxiety Canada	• Anxiety in Children
Canadian Mental Health Association	• Children, Youth and Anxiety
BC Children's Hospital, Kelty Mental Health Resource Centre	• Anxiety: What is it?