Dartmouth Health Children's



Managing Asthma in School: Asthma Action Plans & SMART Therapy Update

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Pediatric Pulmonology

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Objectives

- 🫁 Introduction to Asthma
- ⚠️ Recognizing Symptoms
- 🏫 Environmental Triggers at School
- 💊 Managing Asthma — Medication & Guideline Updates
- 👩‍⚕️ The Nurse's Role & Asthma Action Plans
- 🚨 Responding to Asthma Attacks
- 🗣️ Case Scenarios
- ❓ Q&A



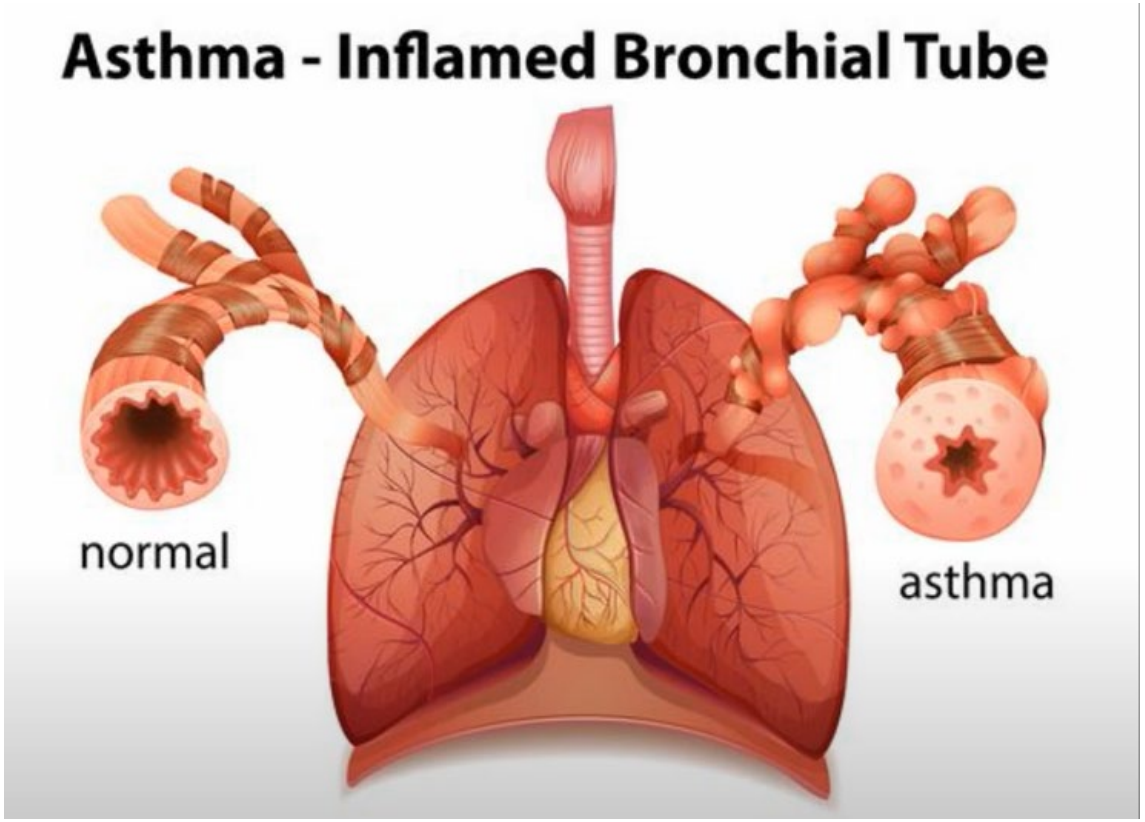
Asthma facts

- 4.9 million children in the U.S. have asthma
- Asthma is the #1 cause of chronic school absenteeism
- 14 million school days missed each year due to asthma
- 1 in 10 school-age children has asthma
- You (the school nurse) are the front line for these students every single school day



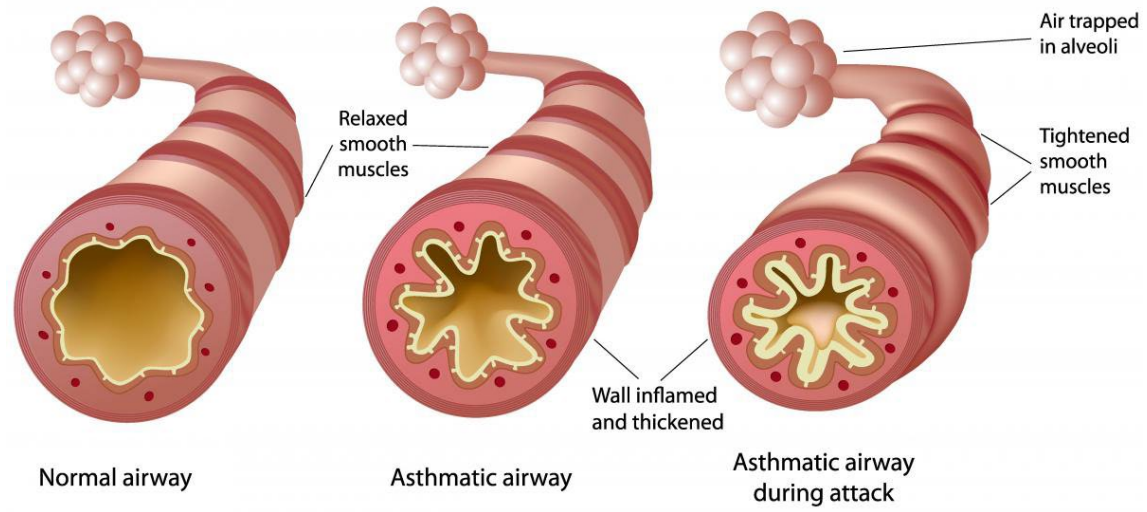
What is asthma

- A chronic lung disease causing airways to become swollen and narrowed
- ❌ No cure — but highly manageable



Three things happening inside the airway during an attack:

- **Swelling** of the airway lining
- **Excess mucus** clogging the airway
- **Tightening** of muscles around the airway (bronchoconstriction)

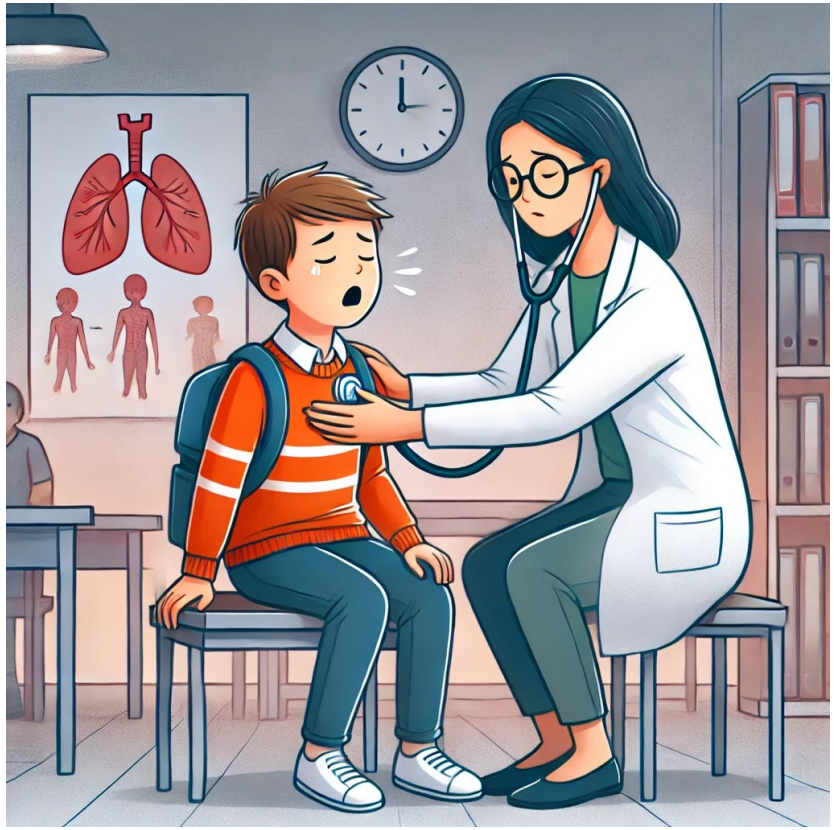


Key point for school: a child may look completely well between episodes.

Symptom	What It Looks Like
🎶 **Wheezing**	Scratchy or whistling sound when breathing
💨 **Shortness of breath**	Rapid or labored breathing
📦 **Chest tightness/pain**	Student may clutch chest
😴 **Fatigue**	Avoids or stops play/activity
😷 **Coughing**	Frequent, worse with colds/exercise/cold air

Emergency Warning Signs

- Breathing **faster, slower, or shallower** than usual
- **Short of breath**, unable to walk, must stop activity
- **Persistent coughing/wheezing** with no relief from quick-relief medicine



Asthma can be managed at school
The 3 Pillars of Asthma Management

- **Avoid triggers.**
- **Follow an asthma action plan**
- **Treat asthma attacks promptly**

Asthma Triggers

- 🚬 **Smoke & Vaping**
- 🌡️ **Weather Extremes**
- 🐀 **Pests**
- 🍄 **Mold**
- 🐕 **Animal Dander**
- 🧹 **Dust Mites**
- 🧪 **Cleaning Chemicals & Bus Exhaust**
- 🏃 **Exercise**

- Not all people with asthma share the same triggers.
- Each person with asthma has his or her own set of triggers and will not always respond to them in the same way after an exposure.
- Sometimes not all triggers are known to the individual.

viral infections (such as, colds/flu), cause up to 90 % of asthma attacks in children

Smoking

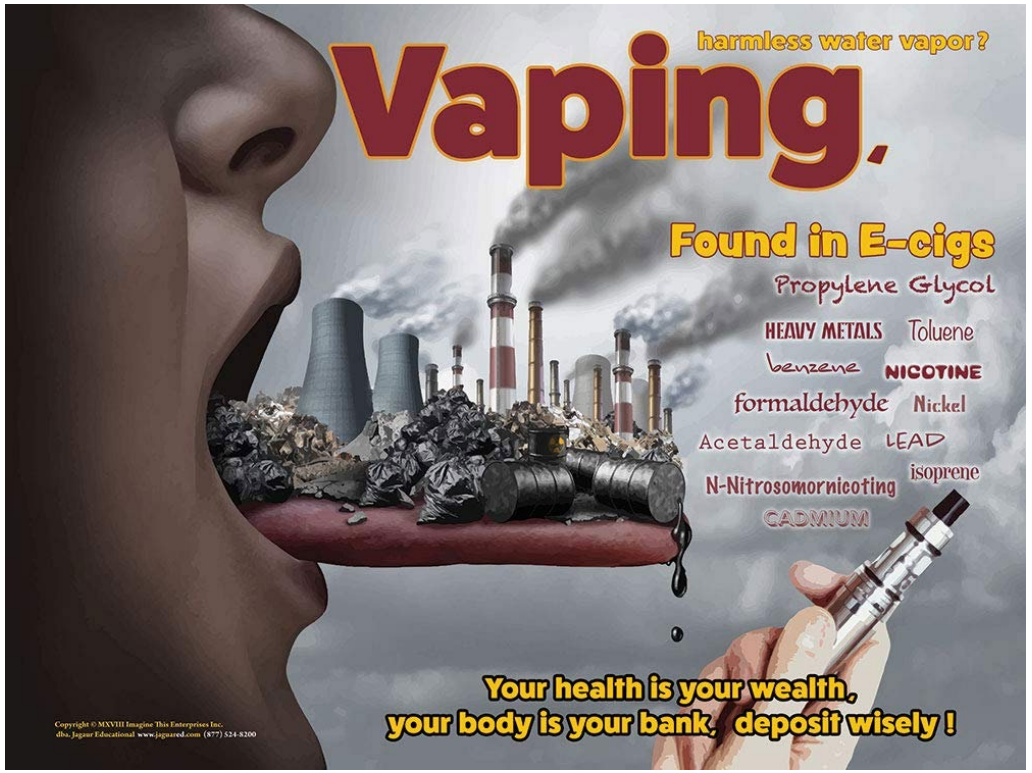
🚬 **Cigarette smoke:** damages lungs, weakens ability to filter germs/irritants

💨 **Vaping/e-cigarettes:** causes airway inflammation; flavored e-cigs contain nicotine, VOCs, formaldehyde

- Youth who vape are more likely to develop asthma — even without prior history

☁️ **Secondhand smoke:** 7,000+ chemicals, ~70 cancer-causing; common asthma trigger

☁️ **Secondhand vape aerosol** also worsens asthma symptoms at school

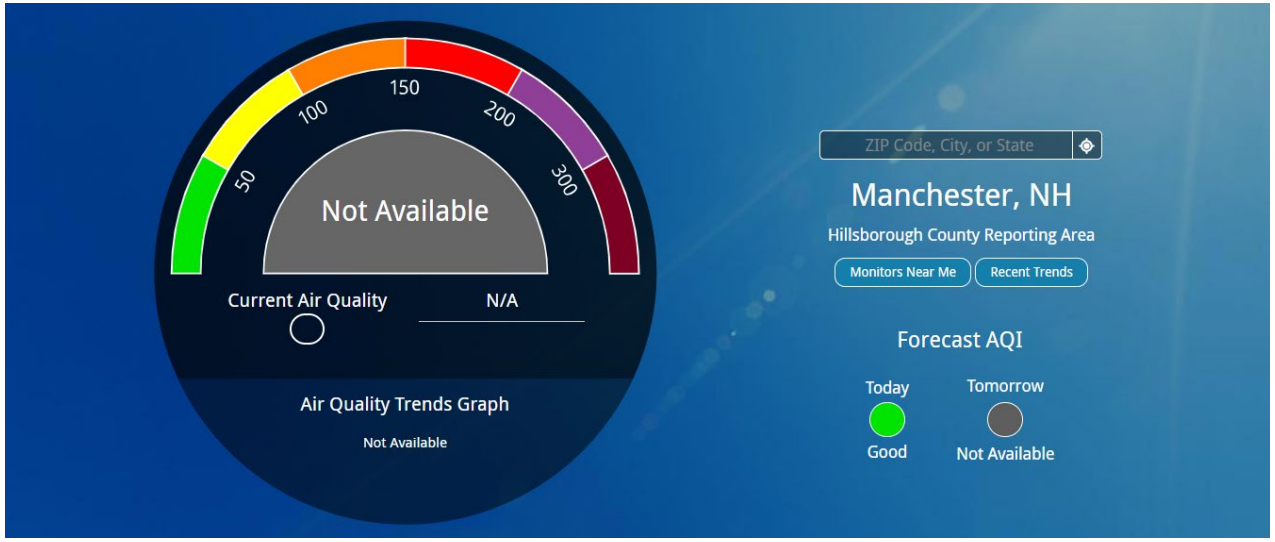


Weather extremes

Condition	Why It Triggers Asthma
🔥 Heat & high humidity	Promotes mold/bacterial growth
❄️ Cold, dry air	Irritates airways & nasal passages
⛈️ Thunderstorms	Wind breaks pollen into inhalable particles ("thunderstorm asthma")

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AirNow.gov



Understanding the Air Quality Index (AQI) Levels

AQI Value	Air Quality Category	Meaning
0-50	Good	Air quality is safe for all activities.
51-100	Moderate	Air quality is acceptable, but sensitive students may have mild symptoms.
101-150	Unhealthy for Sensitive Groups	Asthma-prone students may experience symptoms; precautions needed.
151-200	Unhealthy	Everyone may experience symptoms; restrict outdoor activities.
201-300	Very Unhealthy	Health alert: Limit outdoor activities for all students.
301-500	Hazardous	Health warning: Move all activities indoors.

Pests

Cockroach Allergens

- Source: saliva, feces, shed body parts
- Airborne particles inhaled → airway inflammation
- Common in kitchens, bathrooms, moisture-prone areas



Rodent Allergens

- Source: urine, saliva, dander
- Settle in dust → inhaled → respiratory irritation
- Common in storage rooms, basements, food storage areas



Mold

🍄 Grows in damp, warm, poorly ventilated areas — bathrooms, locker rooms, basements, leaky classrooms

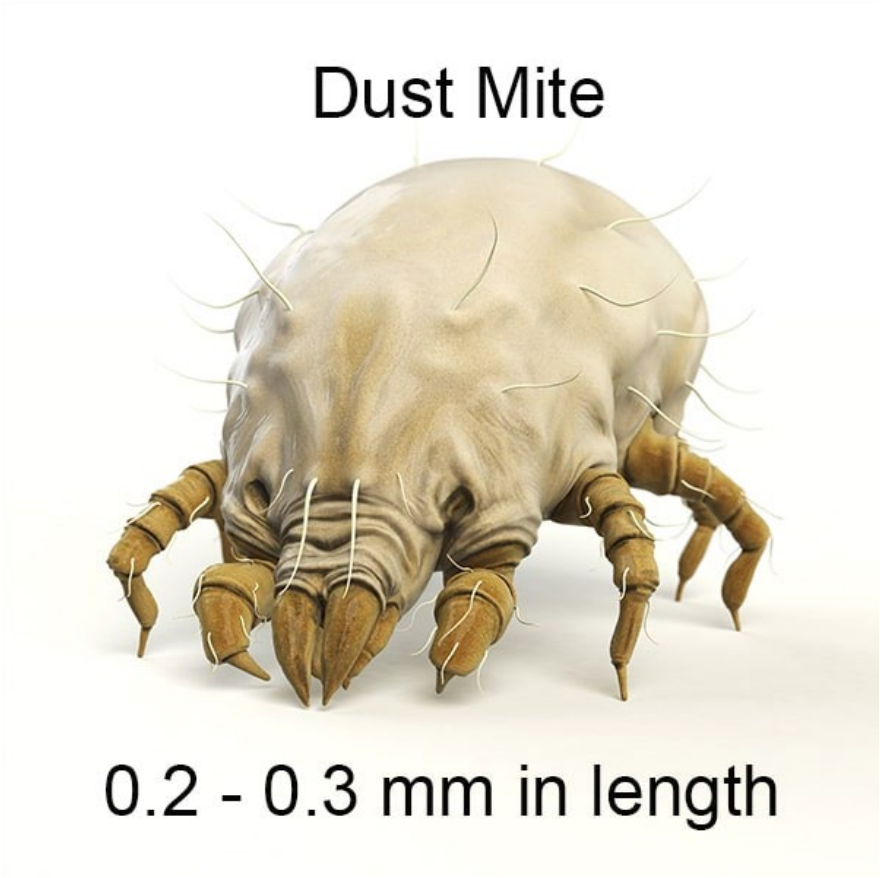
- Releases spores/fragments into the air → inhaled allergens trigger symptoms



Dust mites

- Microscopic bugs in homes/schools

Waste, body parts, and skin become airborne when disturbed → inhaled → inflammation



Animal Dander

🐾 Proteins in dander, saliva, and urine → airborne allergens → immune reaction

- .



Exercise- Exercise induced asthma

Why it happens:

- Rapid breathing dries/cools airways → bronchoconstriction
- Worsened by cold air, pollution, allergens, poor gym ventilation
- High-intensity sports (running, soccer, basketball) increase risk
- Recent respiratory infections increase likelihood



Prevention Strategies

- ✅ Warm-up: 5–10 min gentle activity before exercise
- ✅ Pre-treat: albuterol 10–15 min before exercise (if prescribed)
- ✅ Offer lower-intensity alternatives (walking, swimming, cycling) + breaks
- ✅ Avoid outdoor activity in cold/high-pollen conditions
- ✅ Encourage hydration
- ✅ Cool-down: 5–10 min after activity
- ✅ Ensure coaches/teachers know the student's AAP & triggers

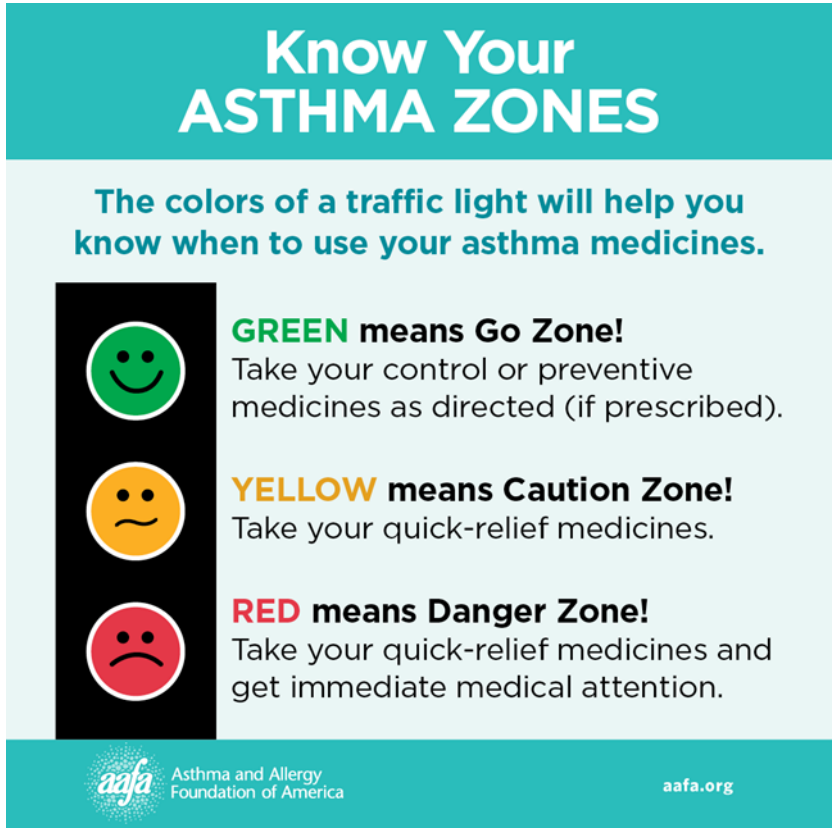
Asthma can be managed at school

- Avoid triggers.
- **Follow an asthma action plan**
- Treat asthma attacks promptly

Asthma action plan

An AAP guides self-management by explaining:

- 💊 What, when, and how to take medicines
- ⚠️ Signs/symptoms of worsening asthma
- 🚨 How to respond to a breathing emergency



My Asthma Action Plan

Name: _____ Date: _____

Parent/Guardian: _____

Healthcare Provider: _____

Medical Record #: _____

Phone for healthcare provider: _____

Phone for taxi or friend: _____

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



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

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

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

I feel GOOD

- Breathing is easy.
- No cough or wheeze.
- Can work and play



☐ Use asthma long-term control medicine.

Medicine:	How taken:	How much:	When:
_____	_____	_____	_____ times a day
_____	_____	_____	_____ times a day
_____	_____	_____	_____ times a day

Peak Flow Numbers:
_____ to _____

20 minutes before exercise or sports, take _____puffs of this medicine:
_____

I do NOT feel good

- Cough
- Wheeze
- Hard to breathe
- Wake up at night.
- Can do some, but not all activities.



TAKE_____ puffs of quick-relief medicine. If not back in the Green Zone within 20 to 30 minutes, take _____more puffs.

Medicine:	How taken:	How much:	When:
_____	_____	_____	every_____ hours

KEEP USING long-term control medicine:

Medicine:	How taken:	How much:	When:
_____	_____	_____	_____ times a day
_____	_____	_____	_____ times a day

Peak Flow Numbers:
_____ to _____

Call healthcare provider if quick-relief medicine does not work OR if these symptoms happen more than twice a week.

I feel AWFUL

- Medicine does not help.
- Breathing is hard and fast.
- Can't walk well.
- Can't talk.
- Feel very scared.



Get help now! Take these quick-relief medicines until you get emergency care.

Medicine:	How taken:	How much:	When:
_____	_____	_____	_____
_____	_____	_____	_____

Peak Flow Number is Lower than _____

Call 911 if can't walk or talk because it is too hard to breathe OR if lethargic OR if skin is sucked in around neck and ribs during breaths OR if lips or fingernails are gray or blue.

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What Every Updated AAP Should Include

- ✅ Current medications (including SMART regimen if applicable)
- ✅ Dosing limits & max daily doses
- ✅ Signs/symptoms of worsening asthma
- ✅ Known triggers/allergens
- ✅ Step-by-step emergency response instructions
- ✅ Provider signature — **updated annually or after any hospitalization/ED visit**

Asthma Action Plan w/ Permission

Lebanon NH 03756-1000
Phone: 603-653-9884

DEPARTMENT | PEDIATRIC PULMONOLOGY AT DHMC

ASTHMA ACTION PLAN
Designed based on the AAFA Asthma Action Plan

Name: [redacted] **DOB** [redacted]	**Today' s Date**: 12/06/24
Emergency Contact (*to be completed by parent/guardian*):	

Asthma Type:
☐ Exercise-induced ☐ Mild Intermittent ☐ Mild Persistent ☒ Moderate Persistent ☐ Severe Persistent

Known Triggers:
☒ Illness ☐ Exercise ☐ Weather changes ☒ Pollen/Dust/Mold ☐ Smoke ☒ Animal dander

Green means GO	USE THESE DAILY CONTROLLER MEDICINES:	
You have all of these: • Breathing is good • No cough or wheeze • Sleep through the night • Can work & play	**MEDICINE**	**ADMINISTRATION**
	Budesonide / Formoterol MDI (Symbicort) 80mcg/4.5mcg	2 puffs twice daily with spacer
	For asthma with exercise, use this medication:	
	Albuterol HFA (Proventil/Ventolin) 90 mcg	2 puffs with spacer every 4 hours as needed

Yellow means CAUTION	CONTINUE WITH GREEN ZONE MEDICINE AND ADD:	
You have any of these: • First signs of a cold • Exposure to known trigger • Cough • Mild wheeze • Tight chest • Coughing at night	**MEDICINE**	**ADMINISTRATION**
	Albuterol HFA (Proventil/Ventolin) 90 mcg	2 puffs with spacer every 4 hours as needed for cough/wheeze/shortness of breath
	Budesonide / Formoterol MDI (Symbicort) 80mcg/4.5mcg	2 puffs twice daily with spacer
	CALL YOUR PRIMARY CARE PROVIDER IF SYMPTOMS WORSEN OF FAIL TO IMPROVE	

Red means DANGER	TAKE THESE MEDICINES AND CALL YOUR DOCTOR NOW!	
Your asthma is getting worse fast: • Medicine is not helping • Breathing is hard & fast • Nose opens wide • Trouble speaking • Ribs show (in children)	**MEDICINE**	**ADMINISTRATION**
	Albuterol HFA (Proventil/Ventolin) 90 mcg	4-6 puffs with spacer every 20 min x3 doses, then every 4 hours as needed for acute exacerbation
	--	--
	GET HELP FROM YOUR PRIMARY DOCTOR OR GO TO THE ED **Make a follow up appointment with your primary care provider after ER visit or hospitalization**	

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Name: [redacted]
DOB [redacted]
12/06/24

PARENT AUTHORIZATION TO ADMINISTER MEDICATION AT SCHOOL

I hereby authorize school staff to administer the medication described below to my child [redacted]

Signature:_____ Date:_____

HEALTHCARE PROVIDER AUTHORIZATION TO ADMINISTER MEDICATION AT SCHOOL

As of 12/06/24, the following medication has been prescribed for [redacted] for the treatment of asthma.
I hereby authorize school staff to possess and administer the medication described below to [redacted]

Medication: Albuterol HFA inhaler with spacer **Dosage**: 2 puffs/inhalations
Time:every 4 hours as needed for cough/wheeze/shortness of breath and 15-20min before sports/gym/exercise
Common Side Effects: tremors and rapid heart rate **Treatment of Side Effects**: Monitor

Signature: Date: 12/06/24

Sheila Ip, DO
PEDIATRIC PULMONOLOGY AT DHMC
ONE MEDICAL CENTER DRIVE
LEBANON NH 03756-1000
603-650-5000

Nurse Checklist for New/Updated AAPs

- ☑ Confirm medication name, dose, and device match the plan
- ☑ Verify inhaler is **not expired**
- ☑ Confirm student/staff know **proper spacer technique**
- ☑ Identify red-flag symptoms specific to that student
- ☑ Confirm emergency contacts are current

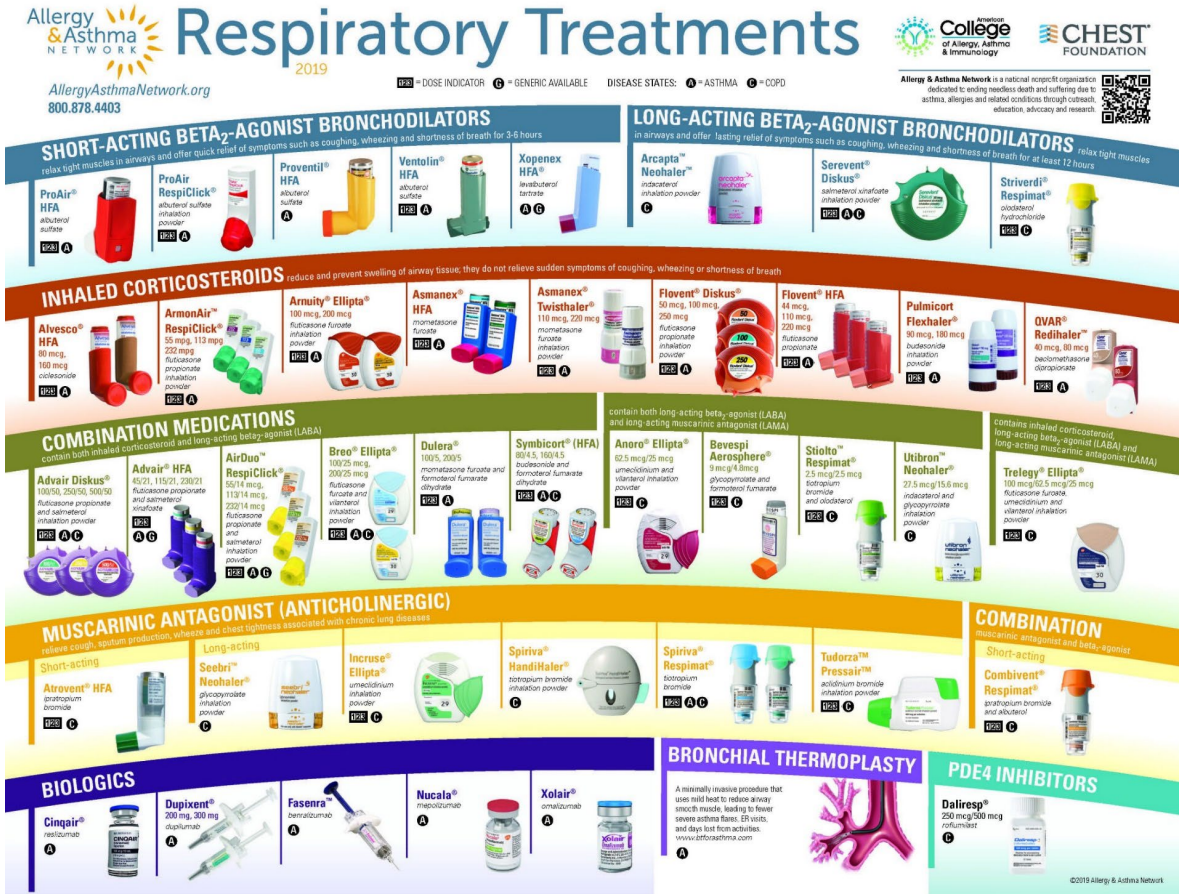
Categories of asthma medication

- ⚡ Quick-relief medicines
- 🛡️ Long-term control medicines
- 🔄 Combination (quick-relief + control) medicines
- 🧬 Biologics (severe asthma, specialist-managed)

Quick-relief medicines (Albuterol)

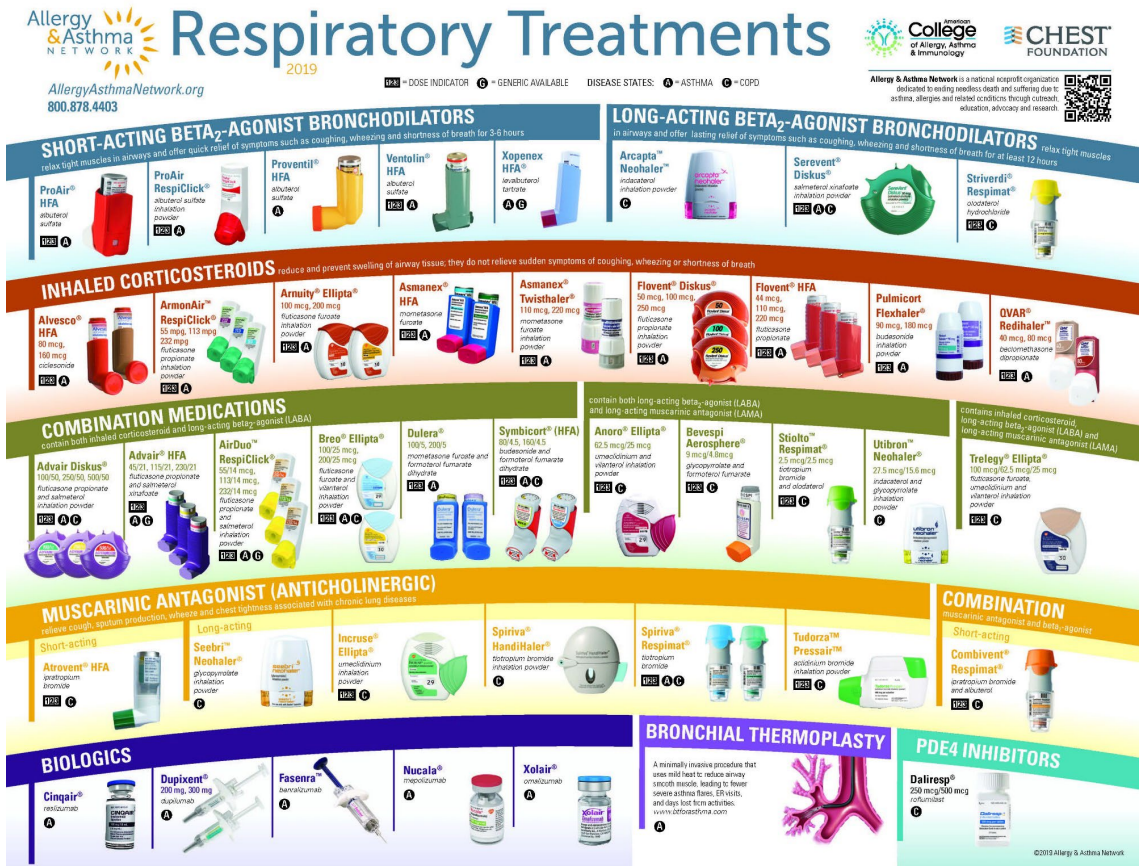


- Work quickly to relieve sudden symptoms
- Relax muscles tightening around airway
- Used as needed, at first sign of symptoms
  - ProAir HFA/ Respiclick
  - Proventil HFA
  - Ventolin HFA
  - Xopenex HFA



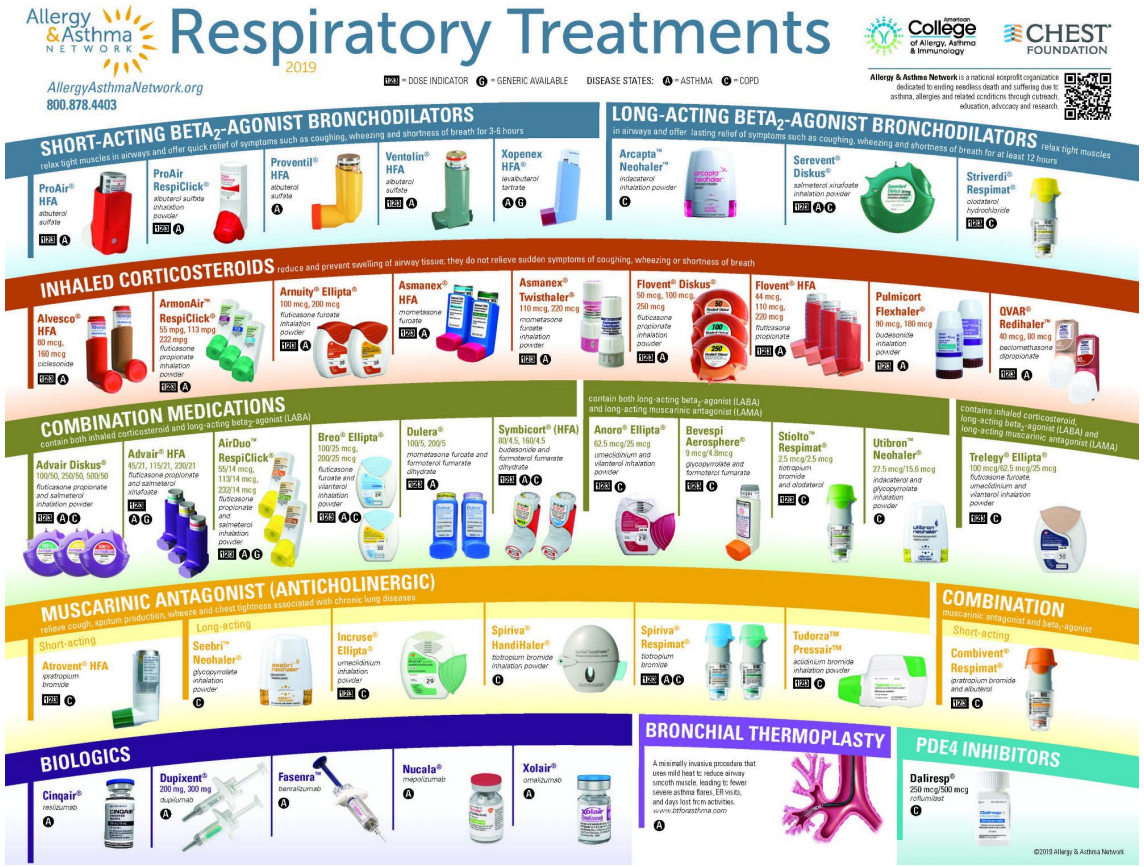
Long-term control medicines inhaled corticosteriods –ICS

- Reduce swelling & mucus in airways
- Effects last up to 12 hours
- Prevent symptoms — taken daily
  - Flovent HFA/Diskus
  - Pulmicort Flexhaler
  - Qvar Redihaler
  - Alvesco HFA
  - Arnuity Ellipto
  - Asmanex HFA



Combinations of quick-relief and controller medicines

- Used for both quick-relief and control (depending on the product)
- Relax airway muscles + reduce swelling/mucus
- Advair HFA/Diskus (fluticasone + salmeterol)
- AirDuo RespiClick (fluticasone + salmeterol)
- Breo Ellipta (fluticasone + vilanterol)
- Dulera (mometasone + formoterol)
- **Symbicort HFA (budesonide + formoterol)** ⬅️ key for SMART therapy



⭐ What's New: SMART Therapy

Single Maintenance And Reliever Therapy (SMART)

🎯 For moderate-to-severe persistent asthma

Use budesonide-formoterol (Symbicort) as both:

- Daily controller
- Quick-relief inhaler (instead of albuterol)

💊 1 inhaler instead of 2

📈 Shown in major trials to improve asthma control and reduce severe exacerbations

Why Formoterol Works for Rescue

Formoterol is a long-acting bronchodilator that also acts fast

⏱️ Onset in about **15 minutes**

⚖️ As effective as albuterol for quick relief

⚠️ **Other LABAs have not been studied this way — SMART therapy applies specifically to budesonide-formoterol, not all combination inhalers**

✅ FDA Approval Status

- **FDA-approved:** Budesonide-formoterol (Symbicort) as a **maintenance** ICS-LABA therapy
- **FDA-approved age:** 6 years and older
- ⚠️ **Important clarification:**
  - **No ICS-formoterol product currently carries an FDA label specifically for PRN/rescue use**
  - The **SMART approach is a guideline-endorsed strategy** (NAEPP 2020), not a separate FDA-approved indication
  - Nurses should follow the **prescriber's specific orders** on the student's AAP
-

Age-Specific Guidance Summary

🟢 **Ages 12+:** Strong evidence & recommendation for SMART

🟡 **Ages 4–11:** Guideline-supported, more cautious application; FDA approval begins at 6+

🔴 **Ages 4–5:** Use is guideline-supported by extrapolated evidence but **outside current FDA labeling** — requires clear provider direction

Bottom line for nurses: *Always administer per the* ***student's individualized, provider-signed AAP*** *— regardless of general guideline vs. label nuances.*

The Evidence Behind SMART

- Landmark trials: **SYGMA 1, SYGMA 2, START**
- Demonstrated:
  - Fewer severe exacerbations vs. SABA-only rescue
  - Comparable or improved symptom control
  - Lower overall ICS exposure vs. fixed-dose regimens in some studies

SMART Therapy: Maximum Daily Doses in Children

For budesonide-formoterol (Symbicort or Breyna) used as both maintenance and reliever therapy:

Age	Maximum total inhalations in 24 hours
4–11 years	8 puffs/day
12 years and older	12 puffs/day

If a Student Remains on ICS + Separate SABA

- This is **still an appropriate, guideline-supported approach**
- Take ICS **daily** to control symptoms
- Use **quick-relief inhaler** for sudden symptoms

✅ **You do not need to change a plan that isn't using SMART** — confirm it matches the student's current AAP

School Staff should know the following about asthma and allergy

- Signs and symptoms
- Common risk factors, triggers and /or allergens
- How to prevent asthma flares / allergy exposures
- Never send a child to the School Health Office alone
- What are the signs and symptoms of an emergency
- Needed medication
- How to administer medication
- How to access emergency medical services as needed (911)

What to do?

🧘 **Stay calm**

📣 **Call for nurse/unlicensed assistive personnel**

💊 **If student carries medication, assist with self-administration**

🚪 **Remove triggers if possible**

- **If medication is kept in the clinic or office, call for the medication.**
- **Follow asthma action plan**

☎️ **No rescue medication available or no improvement → CALL 911**

👀 **Monitor breathing; keep student calm**

❤️‍🩹 **Start CPR if student is not breathing**

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Stock albuterol and emergency preparedness

Why schools consider stock medication

Some students have no inhaler available, an inhaler is empty/expired, asthma is not yet diagnosed, or an emergency occurs away from the health office.

Implementation depends on local rules

Standing orders, training, documentation, parental notification, storage, and who may administer vary by state and district.

Know your school's protocol before the emergency.

EMERGENCY RESPONSE

Acute symptoms at school: first 5 minutes

1



Stay with student

- Keep the student calm and seated upright.
- Assess work of breathing (look for accessory muscle use) and ability to speak (full sentences, short phrases, or unable to speak).

2



Use the action plan

- Follow the student's **Asthma Action Plan**.
- If on **SMART therapy**, use the prescribed ICS–formoterol inhaler as the reliever.

3



Give medication

- Administer the prescribed inhaler (e.g., ICS–formoterol if SMART therapy, or albuterol) with a spacer, as directed in the action plan.
- Ensure correct inhaler technique.

4



Monitor and reassess

- **Reassess** in 5–10 minutes.
- Check symptoms, oxygen saturation, work of breathing, and ability to speak.
- If symptoms persist, give a second dose per the action plan (do not exceed maximum dose).

5



Next steps

- Notify parents and advise follow-up with the student's healthcare provider.
- Call 911 (EMS) immediately if the student is drowsy, has difficulty speaking, severe respiratory distress, or oxygen saturation < 92%, or if symptoms worsen despite treatment.

Call 911 now: asthma danger signs

- Severe difficulty breathing / rapidly worsening distress
- Cannot speak in full phrases or can barely speak
- Bluish/gray lips or face
- Drowsy, confused, exhausted, or collapsing
- "Silent chest" / very poor air movement with distress
- Reliever is not helping or symptoms recur rapidly
- You are seriously concerned — do not wait for a pulse oximeter number

911

Give reliever per emergency plan while help is coming.

NHLBI advises calling 911 for concerning signs such as drowsiness/confusion, blue tint to skin/lips, or severe breathing difficulty.

Case Scenario 1: Mild asthma flare up during PE class

- 10 y.o reports to the nurse's office with complaints of shortness of breath, chest tightness and mild wheezing after running during PE class
- He has a known h/o asthma and an albuterol inhaler at school

Assess:

Check RR, oxygen saturation (if pulse ox is available), and listen for wheezing

Action Plan:

Follow the student's asthma action plan if available

Intervention:

Administer 2 puffs of the student's albuterol inhaler with a spacer

Allow the student to sit in a comfortable, upright position and rest

Monitor:

Observe the student for 10-15 min for improvement.

If symptoms resolve, allow the student to return to class with instructions to avoid strenuous activity for the rest of the day

If symptoms persist or worse, call parents and consider contacting EMS.

Record the incident, including symptoms, interventions and the student's response

Case Scenario 2: Moderate Flare-Up with Post-Tussive Vomiting (SMART therapy)

- A 13-year-old student presents to the school nurse with frequent coughing, wheezing, and vomiting after intense coughing episodes.
- The student appears distressed and cannot participate in class.

Management

Assess

Check respiratory rate, SpO_2, work of breathing, and ability to speak.

Review Asthma Action Plan

Confirm the student uses SMART therapy (ICS-formoterol as both controller and reliever).

Intervene

Administer the prescribed ICS-formoterol inhaler as rescue medication, according to the Asthma Action Plan.

Use a spacer if appropriate for the inhaler device.

Monitor

Reassess symptoms and oxygen saturation.

Repeat ICS-formoterol if directed by the action plan, without exceeding the prescribed daily maximum.

Next Steps

Notify parents and recommend follow-up with the healthcare provider.

Call EMS immediately for drowsiness, difficulty speaking, severe respiratory distress, or SpO_2 below 92%. Do not delay emergency care.

Document

Record symptoms, medication and dose administered, response, and parent notification.

In SMART therapy, the prescribed ICS-formoterol inhaler serves as both the daily controller and quick-relief medication. Follow the student's individualized AAP.

Case Scenario 3: severe flare-up during class

- 7 y.o student becomes very short of breath during a math lesson
- She is visibly struggling to breathe, using accessory muscles, and speaking in short phrases.
- She does have an asthma action plan and her inhaler is at home

Management

Immediate Action:

Call 911 for emergency medical assistance

Intervention:

Refer to the student's asthma action plan

Place the student in an upright position and encourage slow, deep breaths

Monitor:

Continuously observe the student for worsening symptoms such as cyanosis, extreme fatigue, or inability to speak

Contact the parents immediately

Record the event, interventions provided, and emergency response

Case Scenario 4: coughing and wheezing without an action plan

- 9 y.o student complains of persistent coughing and wheezing after coming in from recess.
- No asthma action plan or inhaler at school
- This is the first time the school nurse if aware of the student's asthma

Management

Assess;

Evaluate respiratory status, including oxygen saturation, respiratory rate, and wheezing

Intervention

If the student's symptoms are mild to moderate, monitor closely

If symptoms are severe, call 911 and provide emergency albuterol (if allowed under school policy)

Notify parents and recommend immediate follow up with a healthcare provider to create an asthma action plan

Record in the incident and follow up with the family to ensure proper asthma management moving forward

PLANNING BEYOND THE HEALTH OFFICE

Field trips, sports, and after-school activities

- Medication travels with the student — not on a bus returning to school.
- Identify the trained adult responsible for medication access.
- Carry a copy of the action/emergency plan.
- Confirm spacer/device availability.
- Know the emergency communication plan and destination.
- For sports: coach/athletic staff should know who self-carries and where backup medication is.

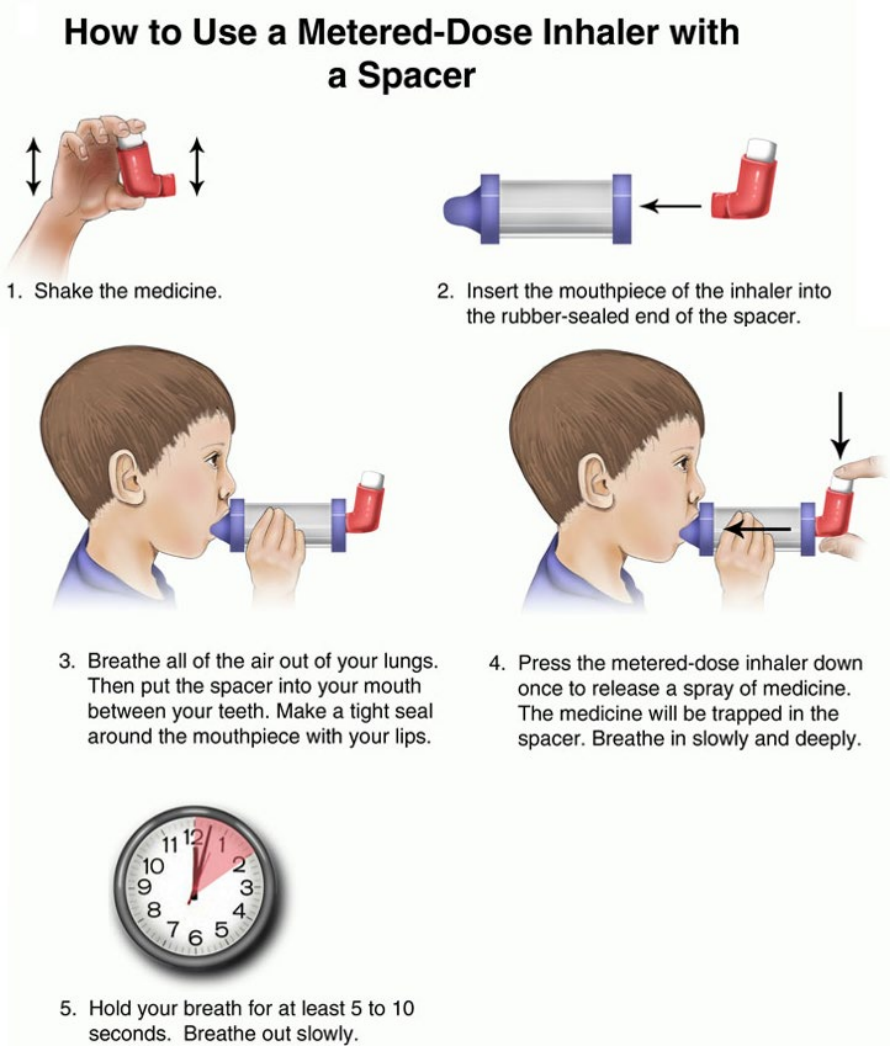
Before departure

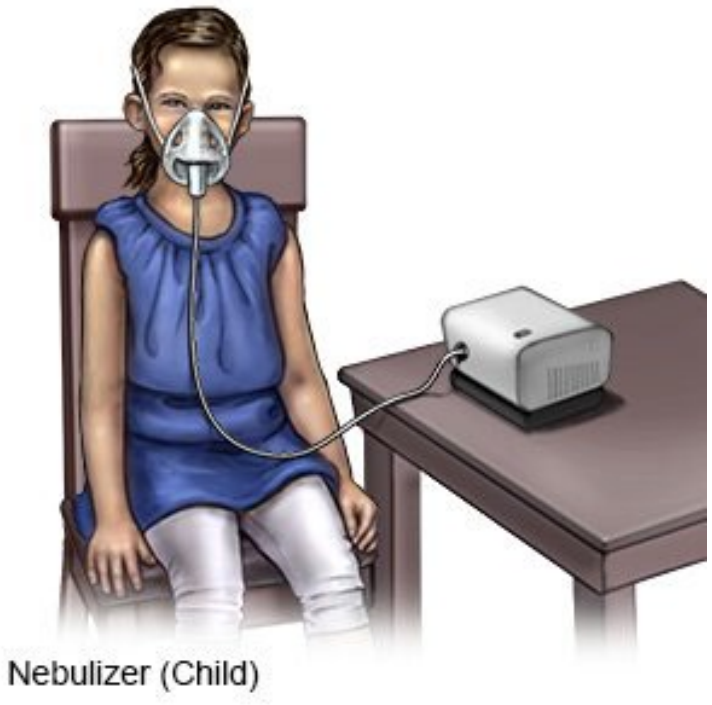
Ask one question:

"If symptoms start 20 minutes from school, can we treat immediately?"

If the answer is no, fix the plan before leaving.

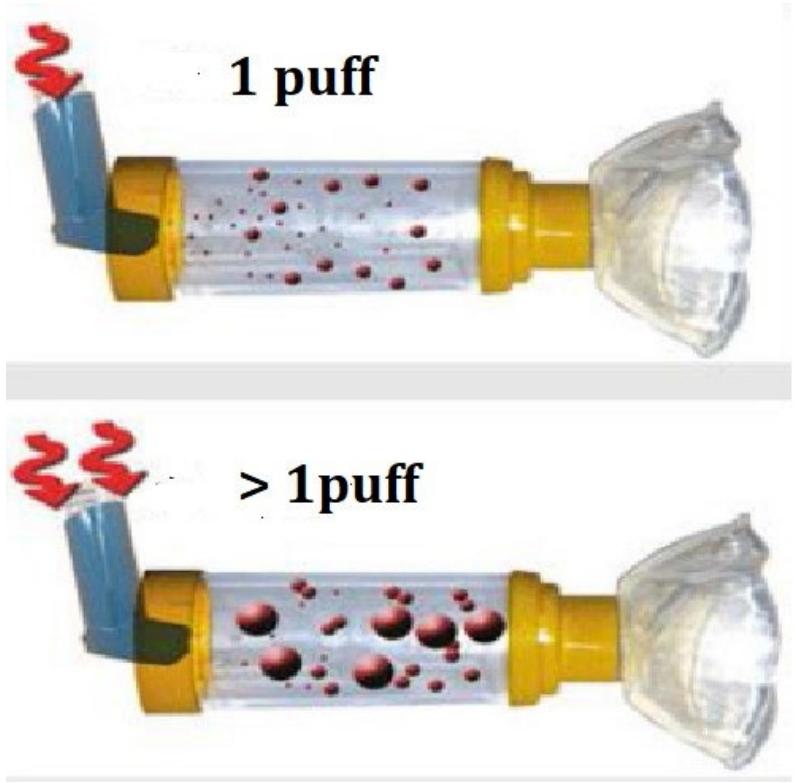
Spacer vs Nebulizer




Nebulizer (Child)

- Metered-dose inhalers with a spacer can perform at least as well as wet nebulization in delivering beta$_2$-agonists in children with acute asthma

Spacer Use



⚠️ **Common Errors:**

❌ **Multiple puffs without waiting**

❌ **Breathing too fast**

❌ **Not holding breath long enough**

❌ **Poor mask/mouthpiece seal (younger students)**

Key Takeaways Recap ✅

👩‍⚕️ **You are the coordinating hub** of school-based asthma care

🔄 SMART therapy is a **guideline-endorsed**, evidence-based option — **not universal**, and **not fully FDA-labeled for PRN use**

📋 Always follow the **student-specific AAP**

🏫 Environmental trigger control is a **shared responsibility** — you play a key role in identifying & mitigating

🚨 Know the red flags, know the emergency steps, act fast

Thank you for your attention! Questions!

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👨‍⚕️ Nurse Actions:

- ✅ Educate students on vaping risks
- ✅ Support strict enforcement of smoke-/vape-free policies
- ✅ Ensure AAP & inhaler access for affected students
- ✅ Offer cessation resources/counseling referrals

👩‍⚕️ Nurse Actions:

- ✅ Limit outdoor activity on poor air quality days
- ✅ Encourage covering nose/mouth in cold weather
- ✅ Maintain indoor humidity **30–50%**
- ✅ Keep windows closed; use A/C when air quality is poor



👨‍⚕️ Nurse Actions (Integrated Pest Management):

- ✅ Eliminate food/moisture sources
- ✅ Seal cracks and crevices
- ✅ Use traps/non-toxic pest control
- ✅ Regular HEPA vacuuming & surface wiping
- ✅ Proper sealed waste disposal



Prevention Strategies

- ✅ Report leaks/moisture promptly to facilities
- ✅ Support dehumidification (<50% humidity)
- ✅ Encourage improved ventilation in problem areas



Prevention Strategies

- ✅ Regular vacuuming (HEPA) & damp dusting
- ✅ Wash fabrics weekly
- ✅ Maintain humidity <50%
- ✅ Ventilate classrooms
- ✅ Minimize fabric clutter (stuffed animals, cloth decor)
- ✅ Use allergen-proof barriers where possible

Prevention Strategies

- ✅ Avoid furry classroom pets — choose fish/reptiles
- ✅ Restrict therapy/service animal visits to designated areas; notify affected students
- ✅ Promote regular cleaning & handwashing after animal contact
- ✅ Ensure good classroom ventilation

Other Allergens

🧪 Cleaning products: fumes can linger and worsen symptoms → prioritize non-toxic products

🚌 School bus exhaust: fine particles settle in lungs, irritate airways

Prevention Strategies

✅ Advocate for non-toxic cleaning protocols

✅ Support idle-reduction policies for buses near entrances

