Allergic disease in children

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Case

- 2 year old boy presents with tongue scratching a few minutes after a bite of his mother's peanut butter sandwich. She gave him an additional bite and within 2 minutes, he developed generalized hives and facial swelling.
- What is the diagnosis?
- What is the next best step?

Objectives

- Discuss food allergy in the school setting
  - Use of epinephrine auto-injector and action plans
- Asthma
- Allergic rhinitis
- Stinging insect allergy

Food allergy

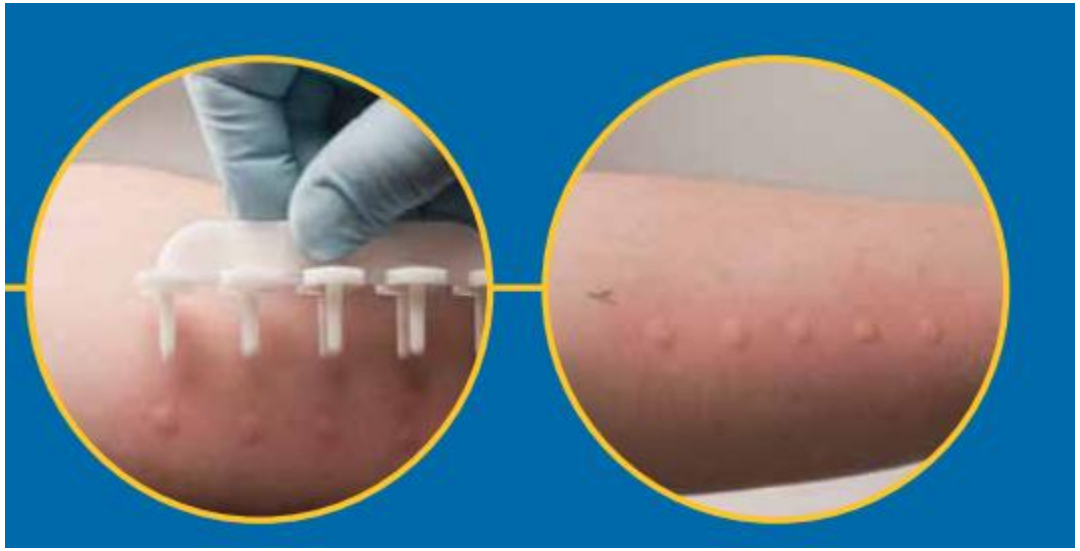
- Affects 1 in 25 children
  - 16-18% of children with food allergy have had a reaction in school
  - 25% of cases of anaphylaxis had previously undiagnosed food allergy
- IgE mediated
- Onset within minutes to 2 hours
- Big 8: peanut, tree nuts, fish, shellfish, milk, soy, egg, and wheat
- Symptoms
  - Skin: hives or angioedema
  - GI: nausea, vomiting, abdominal pain, diarrhea
    - *especially in children
  - Respiratory: cough, wheezing, shortness of breath
  - Systemic: hypotension, loss of consciousness

How a child might describe a reaction

- “This food is too spicy.”
- “My tongue is hot [or burning].”
- “It feels like something’s poking my tongue.”
- “My tongue [or mouth] is tingling [or burning].”
- “My tongue [or mouth] itches.”
- “It [my tongue] feels like there is hair on it.”
- “My mouth feels funny.”
- “There’s a frog in my throat.”
- “There’s something stuck in my throat.”
- “My tongue feels full [or heavy].”
- “My lips feel tight.”
- “It feels like there are bugs in there.” (to describe itchy ears)
- “It [my throat] feels thick.”
- “It feels like a bump is on the back of my tongue [throat].”

Food allergy: diagnosis

- History and skin testing or blood work



Food allergy management: Avoidance

- Individualized based on nature of allergy, particular institution, age of child/developmental level
- Medical identification jewelry
- No food sharing
- Use of labeled foods
- Providing safe alternative foods
- Notify an adult if they have eaten an unsafe food

***STRICT* AVOIDANCE INCLUDES "CROSS-CONTAMINATION", "PROCESSED IN A FACILITY" AND "MAY CONTAINS".**

- Inhalation of vapors did not cause systemic reactions because there is no protein
- Foods vaporized by heating can cause respiratory symptoms – limit allergen being cooked in science or craft projects
- Standard cleaning and lack of visible contamination sufficient
  - Washing hands with soap and water, wipes (not antibacterial gels alone)
- "Allergen-aware" tables include child's friends eating safe meals; not ostracizing or physically separate children
- Experts do not recommend complete ban on foods so as to not eliminate staple foods from other children

Management

- Medications
  - Epinephrine – “early and often”
    - Children should carry with them at all times
    - Extra epipen can be kept in health office (if self-carried pack is misplaced or if an additional dose is needed or an unassigned epinephrine for general use)
  - Adjunctive medications: antihistamines and steroids
- Call 911
  - 1/3 of cases have biphasic or late phase reactions that can occur within 72 hours

- Risk factors for fatal food induced anaphylaxis
  - **Failure to use epinephrine autoinjectors promptly (>20 minutes)**
  - Coexisting asthma
  - History of severe reactions
  - **Adolescents**
- Facilitate parents meeting with and educate key school staff members to ensure child's safety
  - Directors of transportation, food service, school nurse, classroom teacher, administration, coaches, after-school advisors
  - Address harassment or bullying
- Development of safe policies, regulations and procedures for children with food allergies

FARE — FOOD ALLERGY & ANAPHYLAXIS EMERGENCY CARE PLAN

Food Allergy Research & Education

PLACE PICTURE HERE

Name: _____ D.O.B.: _____

Allergy to: _____

Weight: _____ lbs. Asthma: [ ] **Yes (higher risk for a severe reaction)** [ ] **No**

NOTE: Do not depend on antihistamines or inhalers (bronchodilators) to treat a severe reaction. USE EPINEPHRINE.

Extremely reactive to the following foods: _____

THEREFORE:

[ ] If checked, give epinephrine immediately for ANY symptoms if the allergen was likely eaten.

[ ] If checked, give epinephrine immediately if the allergen was definitely eaten, even if no symptoms are noted.

FOR **ANY** OF THE FOLLOWING:

SEVERE SYMPTOMS

LUNG — Short of breath, wheezing, repetitive cough

HEART — Pale, blue, faint, weak pulse, dizzy

THROAT — Tight, hoarse, trouble breathing/ swallowing

MOUTH — Significant swelling of the tongue and/or lips

SKIN — Many hives over body, widespread redness

GUT — Repetitive vomiting, severe diarrhea

OTHER — Feeling something bad is about to happen, anxiety, confusion

OR A COMBINATION of symptoms from different body areas.

1. **INJECT EPINEPHRINE IMMEDIATELY.**
2. **Call 911.** Tell them the child is having anaphylaxis and may need epinephrine when they arrive.

- Consider giving additional medications following epinephrine:
  - » Antihistamine
  - » Inhaler (bronchodilator) if wheezing
- Lay the person flat, raise legs and keep warm. If breathing is difficult or they are vomiting, let them sit up or lie on their side.
- If symptoms do not improve, or symptoms return, more doses of epinephrine can be given about 5 minutes or more after the last dose.
- Alert emergency contacts.
- Transport them to ER even if symptoms resolve. Person should remain in ER for at least 4 hours because symptoms may return.

MILD SYMPTOMS

NOSE — Itchy/runny nose, sneezing

MOUTH — Itchy mouth

SKIN — A few hives, mild itch

GUT — Mild nausea/ discomfort

FOR **MILD SYMPTOMS** FROM **MORE THAN ONE** SYSTEM AREA, GIVE EPINEPHRINE.

FOR **MILD SYMPTOMS** FROM **A SINGLE SYSTEM** AREA, FOLLOW THE DIRECTIONS BELOW:

1. Antihistamines may be given, if ordered by a healthcare provider.
2. Stay with the person; alert emergency contacts.
3. Watch closely for changes. If symptoms worsen, give epinephrine.

MEDICATIONS/DOSES

Epinephrine Brand: _____

Epinephrine Dose: [ ] 0.15 mg IM [ ] 0.3 mg IM

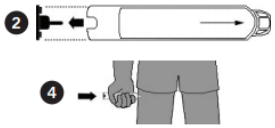
Antihistamine Brand or Generic: _____

Antihistamine Dose: _____

Other (e.g., inhaler-bronchodilator if wheezing): _____

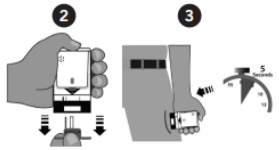
EPIPEN® (EPINEPHRINE) AUTO-INJECTOR DIRECTIONS

1. Remove the EpiPen Auto-Injector from the plastic carrying case.
2. Pull off the blue safety release cap.
3. Swing and firmly push orange tip against mid-outer thigh.
4. Hold for approximately 10 seconds.
5. Remove and massage the area for 10 seconds.



AUVI-Q™ (EPINEPHRINE INJECTION, USP) DIRECTIONS

1. Remove the outer case of Auvi-Q. This will automatically activate the voice instructions.
2. Pull off red safety guard.
3. Place black end against mid-outer thigh.
4. Press firmly and hold for 5 seconds.
5. Remove from thigh.



ADRENACLICK®/ADRENACLICK® GENERIC DIRECTIONS

1. Remove the outer case.
2. Remove grey caps labeled "1" and "2".
3. Place red rounded tip against mid-outer thigh.
4. Press down hard until needle penetrates.
5. Hold for 10 seconds. Remove from thigh.

OTHER DIRECTIONS/INFORMATION (may self-carry epinephrine, may self-administer epinephrine, etc.):

Treat the person before calling emergency contacts. The first signs of a reaction can be mild, but symptoms can get worse quickly.

EMERGENCY CONTACTS — CALL 911

RESCUE SQUAD: _____

DOCTOR: _____ PHONE: _____

PARENT/GUARDIAN: _____ PHONE: _____

OTHER EMERGENCY CONTACTS

NAME/RELATIONSHIP: _____

PHONE: _____

NAME/RELATIONSHIP: _____

PHONE: _____

PARENT/GUARDIAN AUTHORIZATION SIGNATURE DATE PHYSICIAN/HCP AUTHORIZATION SIGNATURE DATE

Appendix B
Sample Individual Health Care Plan
(Anaphylaxis)

Student_____ Date _____

Teacher and room _____

Home Phone _____

History of emergency care required. (Document dates, age of child, allergen, symptoms, treatment). Attach all relevant medical documentation.

Prevention strategies
(Review each item at team meeting and check those that apply)
_____Use of Medic Alert Bracelet,
_____Allergy free lunch table
_____Student aware of location of the health office
_____Beginning of year parent letter
_____Parent provided safe snacks
_____Classroom discussion about allergies
_____Staff training about allergies and EpiPen or Twinject use
_____Parent permission to post/circulate student picture to building staff and bus driver

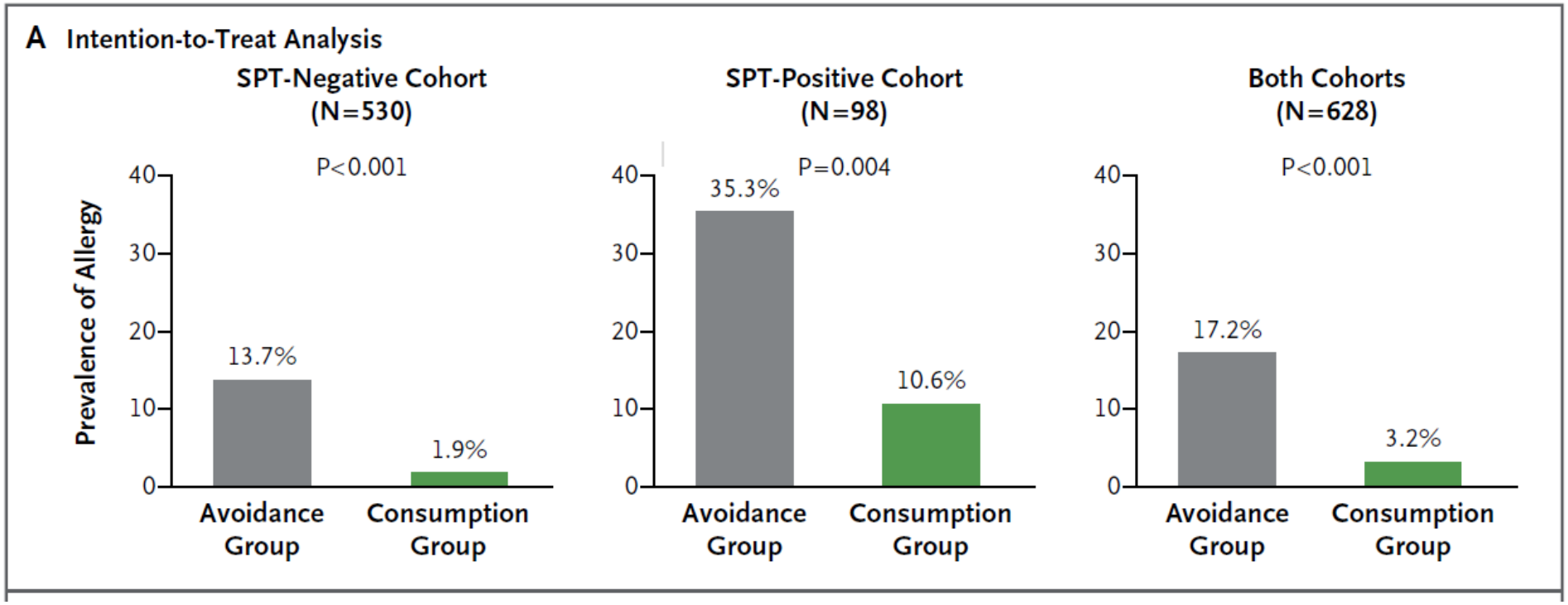
Additional strategies:

Educational accommodations
Review each item at team meeting and check those that apply)
_____Emergency Action Plan (EAP) attached
_____Hand washing and use of disposable wipes
_____Encourage no food sharing
_____Clean student desks after food events
_____For field trips send medication, wet wipes and EAP with student

Additional accommodations:

Food allergy

- Most likely to persist into adulthood
  - About 80% for peanut, tree nut, fish, shellfish
  - 10-20% for milk, soy, wheat, egg by age 5, some up to age 16
- Some children can tolerate baked egg or milk
- New and ongoing research
  - LEAP trial
  - Desensitization



Du Toit et al. Randomized trial of peanut consumption in infants at risk for peanut allergy. *NEJM*. Feb 2015.

Additional resources

- FARE
  - http://allergyready.com
    - Training program for educators for how to prepare for food allergy and anaphylaxis
- National Association of School Nurses (NASN)

Asthma in children

- Prevalence of 7 million children
  - 3 students in a classroom of 30
- Leading cause of school absenteeism
- Severity of asthma associated with poorer academic performance
- Symptoms
  - Cough, chest tightness, wheezing, shortness of breath

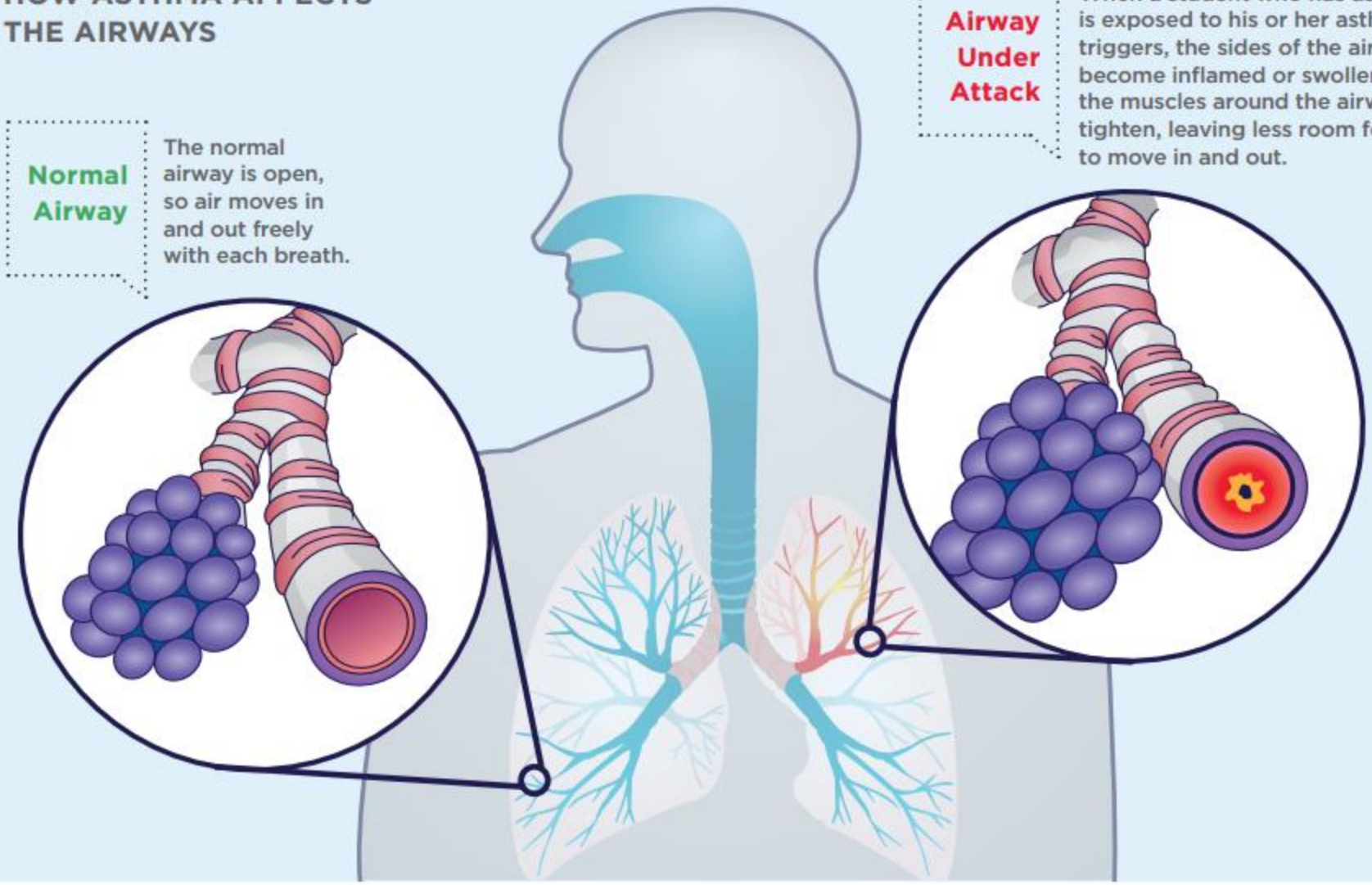
HOW ASTHMA AFFECTS THE AIRWAYS

Normal Airway

The normal airway is open, so air moves in and out freely with each breath.

Airway Under Attack

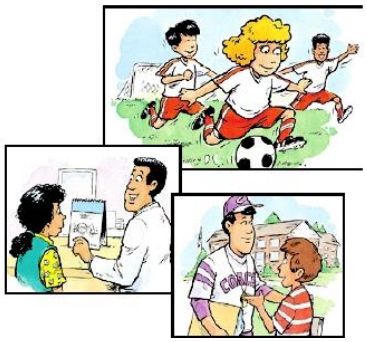
When a student who has asthma is exposed to his or her asthma triggers, the sides of the airways become inflamed or swollen, and the muscles around the airways tighten, leaving less room for air to move in and out.



Adapted from American College of Chest Physicians

Asthma triggers

- Allergic rhinitis
- Infections
- Exercise
- Cold
- GERD
- Chronic rhinosinusitis
- Occupational allergens or irritants
- Hormones
- Tobacco smoke
- Aspirin



Asthma treatment

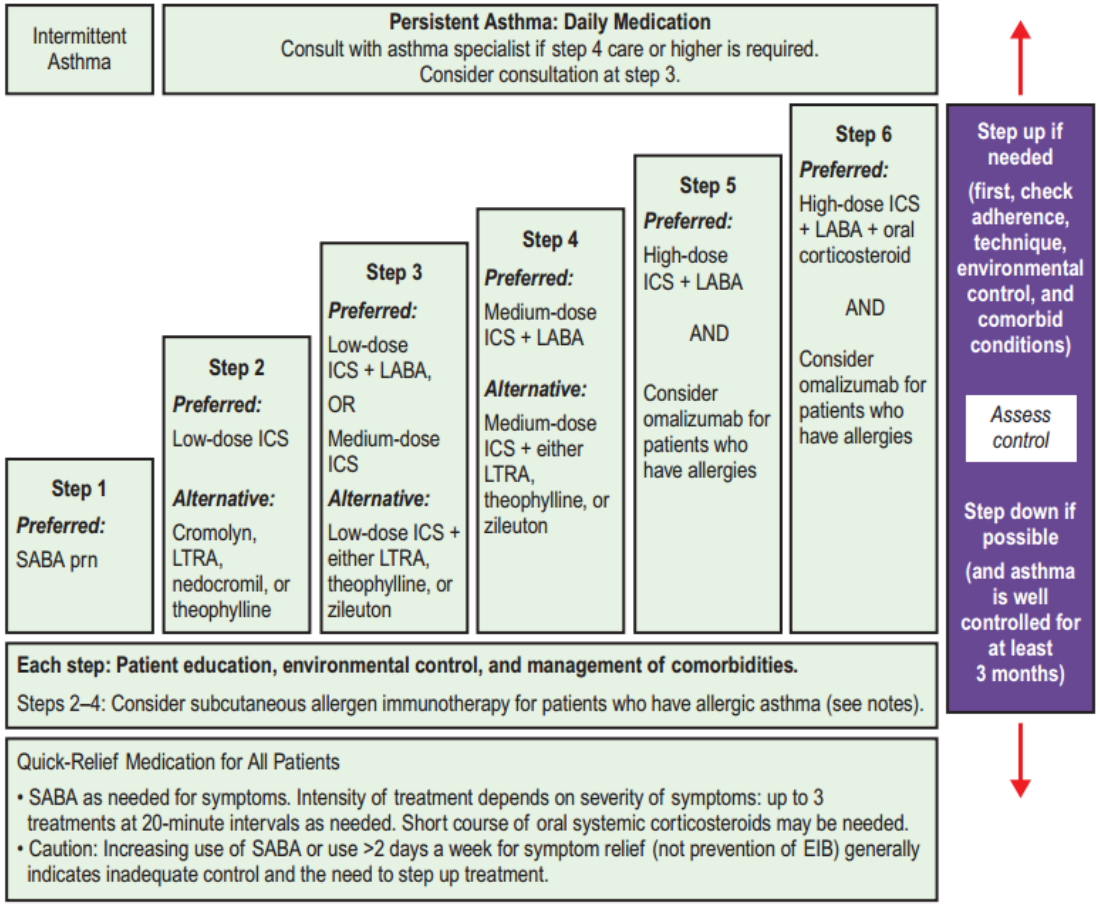


Figure 53-3 Stepwise approach to therapy in patients 12 years of age and older, as presented in the Expert Panel Report 3 (EPR-3). Exercise-induced bronchospasm; *ICS*, inhaled corticosteroid; *LABA*, long-acting β_2-agonist; *LTRA*, leukotriene receptor antagonist; *SABA*, sh acting β_2-agonist. *(From National Asthma Education and Prevention Program. Expert Panel Report 3: guidelines for the diagnosis and managen of asthma. Bethesda, Md.: NIH/National Heart, Lung, and Blood Institute; 2007.)*

Treatment of asthma exacerbation

- Symptoms
  - Cough, wheezing, difficulty breathing, chest tightness, night time awakenings, exercise intolerance, low peak flow readings from baseline
- **Albuterol 2-6 puffs every 20 minutes for one hour as needed**
  - Alternative: nebulizer
- Prednisone
- Differentiate use of short acting rescue medications from controller inhalers
- If also having cutaneous symptoms, consider anaphylaxis and use of epipen

Allergy & Asthma Network
Mothers of Asthmatics
breatherville.org • 800.878.4403

Asthma Inhalers

Sixth Edition • 2007

DPI = includes built-in dose counter

Inhaled Bronchodilators

Inhaled bronchodilators relax tight airways (bronchoconstriction). Bronchodilators treat the noisy part of asthma: coughing, wheezing, choking and shortness of breath.

Short-Acting Inhaled Bronchodilators (3-6 hours)

- Albuterol (generic) — albuterol sulfate
- Alupent® — metaproterenol sulfate
- Atrovent® HFA — ipratropium bromide
- Combivent® — ipratropium bromide and albuterol sulfate
- Maxair® Autohaler® — pirbuterol acetate
- ProAir® HFA — albuterol sulfate
- Proventil® HFA — albuterol sulfate
- Ventolin® HFA — albuterol sulfate (DPI)
- Xopenex HFA® — levalbuterol tartrate

Long-Acting Inhaled Bronchodilators (12 hours)

- Foradil® Aerolizer® — formoterol fumarate inhalation powder
- Serevent® Diskus® — salmeterol xinafoate inhalation powder (DPI)

Inhaled Anti-Inflammatories

Inhaled corticosteroids and other anti-inflammatories reduce and prevent airway inflammation (swelling). Used daily, anti-inflammatories treat the underlying part of asthma that you may not feel or see.

- Azmacort® — triamcinolone acetonide
- Flovent® Diskus® 50 mcg — fluticasone propionate inhalation powder (DPI)
- Flovent® HFA 44 mcg, 110 mcg, 220 mcg — fluticasone propionate HFA (DPI)
- Intal® — cromolyn sodium
- Asmanex® Twisthaler® 220 mcg — mometasone furoate inhalation powder (DPI)
- AeroBid®, AeroBid®-M — flunisolide
- Pulmicort Flexhaler® 90 mcg, 180 mcg — budesonide inhalation powder (DPI)
- QVAR® (HFA) 40 mcg, 80 mcg — beclomethasone dipropionate

Combination Medications

Combination medications contain both long-acting bronchodilator and inhaled corticosteroid components.

Important: Advair and Symbicort should NOT be used to treat acute symptoms of asthma.

- Advair Diskus® 100/50, 250/50, 500/50 — fluticasone propionate and salmeterol inhalation powder (DPI)
- Advair® HFA 45/21, 115/21, 230/21 — fluticasone propionate and salmeterol
- Symbicort® (HFA) 80/4.5, 160/4.5 — budesonide and formoterol fumarate dihydrate

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Asthma Action Plan

For: _____ Doctor: _____ Date: _____

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

GREEN ZONE

Doing Well

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

And, if a peak flow meter is used,

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

My best peak flow is: _____

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

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

YELLOW ZONE

Asthma Is Getting Worse

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

-Or-

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

First

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

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

Second

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

-Or-

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

RED ZONE

Medical Alert!

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

-Or-

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

Take this medicine:

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

❒ _____ mg
(oral steroid)

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

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

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

See the reverse side for things you can do to avoid your asthma triggers.

How To Control Things That Make Your Asthma Worse

This guide suggests things you can do to avoid your asthma triggers. Put a check next to the triggers that you know make your asthma worse and ask your doctor to help you find out if you have other triggers as well. Then decide with your doctor what steps you will take.

Allergens

❒ Animal Dander

Some people are allergic to the flakes of skin or dried saliva from animals with fur or feathers.

The best thing to do:

- Keep furred or feathered pets out of your home.

If you can't keep the pet outdoors, then:

- Keep the pet out of your bedroom and other sleeping areas at all times, and keep the door closed.
- Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet away from fabric-covered furniture and carpets.

❒ Dust Mites

Many people with asthma are allergic to dust mites. Dust mites are tiny bugs that are found in every home—in mattresses, pillows, carpets, upholstered furniture, bedcovers, clothes, stuffed toys, and fabric or other fabric-covered items.

Things that can help:

- Encase your mattress in a special dust-proof cover.
- Encase your pillow in a special dust-proof cover or wash the pillow each week in hot water. Water must be hotter than 130º F to kill the mites. Cold or warm water used with detergent and bleach can also be effective.
- Wash the sheets and blankets on your bed each week in hot water.
- Reduce indoor humidity to below 60 percent (ideally between 30—50 percent). Dehumidifiers or central air conditioners can do this.
- Try not to sleep or lie on cloth-covered cushions.
- Remove carpets from your bedroom and those laid on concrete, if you can.
- Keep stuffed toys out of the bed or wash the toys weekly in hot water or cooler water with detergent and bleach.

❒ Cockroaches

Many people with asthma are allergic to the dried droppings and remains of cockroaches.

The best thing to do:

- Keep food and garbage in closed containers. Never leave food out.
- Use poison baits, powders, gels, or paste (for example, boric acid). You can also use traps.
- If a spray is used to kill roaches, stay out of the room until the odor goes away.

❒ Indoor Mold

- Fix leaky faucets, pipes, or other sources of water that have mold around them.
- Clean moldy surfaces with a cleaner that has bleach in it.

❒ Pollen and Outdoor Mold

What to do during your allergy season (when pollen or mold spore counts are high):

- Try to keep your windows closed.
- Stay indoors with windows closed from late morning to afternoon, if you can. Pollen and some mold spore counts are highest at that time.
- Ask your doctor whether you need to take or increase anti-inflammatory medicine before your allergy season starts.

Irritants

❒ Tobacco Smoke

- If you smoke, ask your doctor for ways to help you quit. Ask family members to quit smoking, too.
- Do not allow smoking in your home or car.

❒ Smoke, Strong Odors, and Sprays

- If possible, do not use a wood-burning stove, kerosene heater, or fireplace.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, and paints.

Other things that bring on asthma symptoms in some people include:

❒ Vacuum Cleaning

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you vacuum, use a dust mask (from a hardware store), a double-layered or microfilter vacuum cleaner bag, or a vacuum cleaner with a HEPA filter.

❒ Other Things That Can Make Asthma Worse

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

Allergic rhinitis

- Symptoms: Nasal congestion, runny nose, sneezing, watery, itchy eyes
- Common allergens: tree, grass, weed pollen, dog, cat, dust mite, mold
- Treatment
  - Antihistamines (zyrtec, claritin, allegra)
    - Try to avoid benadryl due to sedation or paradoxical effect
  - Nose sprays (flonase, nasacort, astelin)
  - Singulair
  - Allergy shots

Stinging insect allergy

- Large local reactions
  - No increased risk of anaphylaxis
- With a history of anaphylaxis, repeated risk with a future sting is 20-30% in children
- Avoidance measures
- Carry epinephrine
- Venom immunotherapy

Figure 78-1 Stinging insects of the order Hymenoptera. **A,** Honeybee (*Apis mellifera*). **B,** Yellow jacket (*Vespula maculifroms*). **C,** Wh hornet (*Dolichovespula maculata*). **D,** Paper wasp (*Polistes exclamans*). **E,** Imported fire ant (*Solenopsis invicta*). *(Reproduced by perm ALK-Abelló A/S, Hørsholm, Denmark © 2012 ALK.)*

References

- Sicherer S et al. Clinical report management of food allergy in the school setting. Pediatrics. Nov 29, 2010.
- http://www.foodallergy.org/
- http://azdhs.gov/phs/oeh/fses/pdf/allergies1007.pdf
- Greenberger P et al. Allergy and Asthma Proceedings. Vol 33. June 2012.
- http://www.nhlbi.nih.gov/files/docs/public/lung/asthma_actplan.pdf
- Managing asthma: a guide for schools. Dec 2014.