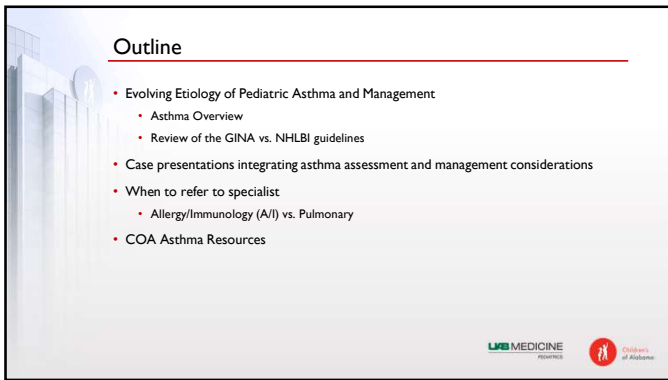
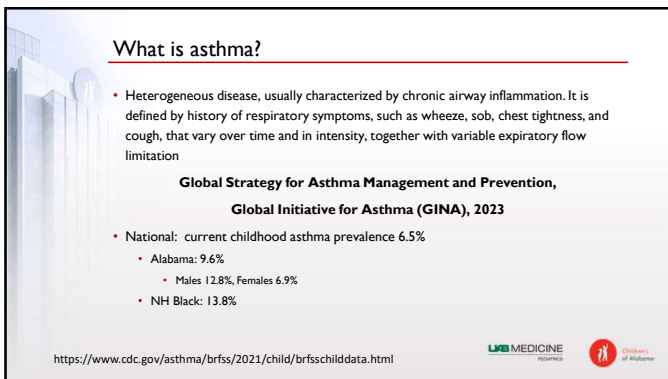


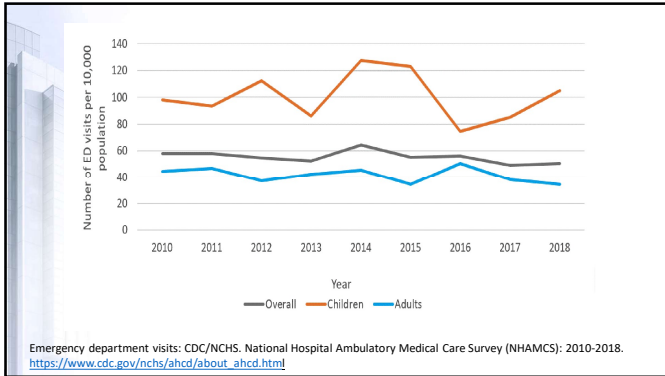
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4

NHLBI EPR-4 : 2020 Update

- 19 Recommendations about 6 key clinical areas of focus
 - Not a full update to EPR-3 guidelines published in 2007
 - Only 3 of the recommendations were strong; remainder of them were conditional
- 6 focus areas: FeNO, Allergy mitigation, Inhaled corticosteroids (ICS), Long-acting muscarinic antagonists, Immunotherapy, and Bronchial Thermoplasty

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

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NHLBI EPR-4 : 2020 Update


- Inhaled corticosteroids
 - 4yo and older with mild to moderate asthma: with likely good adherence, no need to increase ICS during exacerbations
 - 4yo and older moderate to severe: recommend ICS-formoterol in a single inhaler as daily controller and reliever therapy

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



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GINA 2023

- WHO and NHLBI collaborated to develop GINA in 1993
- It is a global evidenced based strategy that can be adapted for local health systems
 - Careful attention to study design, population and clinical relevance
- Updated **annually**
- Resource: <https://ginasthma.org/pocket-guide-for-asthma-management-and-prevention/>



Common themes of GINA and NHLBI is chronic disease management, shared decision making, and movement towards combining ICS with SABA or Formoterol for quick relief

• Proud to be celebrating the 30th year of GINA •

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Case I: "My Child Stays Sick"

HPI: 15 mo old child presents to the office for persistent cough and chest congestion. He was hospitalized 6 weeks ago Rhino/enterovirus+ bronchiolitis requiring O2 and IV fluids. Caregiver states patient initially improved but still with daily cough and intermittent chest congestion, cough interrupting sleep 2-3 nights per week. Had respiratory illness at age 12 months with wheezing, managed with supportive care at home. Given albuterol with that illness, mom unsure if it helped. Caregiver recalls prolonged cough with that illness.



PMH: Full term uncomplicated pregnancy and delivery. 6mo: Hospitalized for RSV bronchiolitis requiring high flow nasal cannula age 6 months. CXR during that admission showed hyperinflation. 1-2 lifetime episodes of otitis media, no other significant infections

Growing well and meeting developmental milestones, has received all recommended childhood vaccines

SH: Lives with mom and siblings, stays with grandmother on weekends. No pets. Attends daycare No tobacco exposure or environmental concerns

FH: 6yo sibling with asthma



No daily medications and no known allergies

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Case I



- Exam: Vital signs Afebrile, RR 26, HR 118, O2 sat 99% RA
 - Afebrile, taking PO well. Patient well appearing, no acute distress. HEENT exam: normal, CV: RRR no murmur, Lungs: few end expiratory wheezes bilateral lower lobes, good air entry, no increased work of breathing or tachypnea, Abd: soft, NTND, BS+, Neuro: non-focal, Skin: no rash
- What's next???

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Case 2 – "My Child Stays Sick"



- 2 year old boy seeing you in the clinic in follow-up for allergies and "congestion". Started when he was 9mo and has been bothering him since. Mom tried OTC cetirizine 2.5mL daily without improvement. At last visit 2 months ago you added montelukast 4mg daily. Today, mom is frustrated that "nothing seems to be helping".
- Year-round congestion, maybe gets a little worse when the weather changes
- Cough from drainage is most days, "constant" daytime and nighttime.
- Constant drainage>congestion
- When he is sick he is coughing to the point of choking → vomiting in bed during the night

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Case 2 –



- Fam Hx: Dads history unknown, Mom with childhood asthma and shellfish allergy
- PMHx:
 - Mild eczema as an infant, has since "outgrown"
 - Recurrent OM s/p tubes
 - RSV at 6mo
 - In the past year, 2 rounds of antibiotics for acute sinusitis
- Growing, developing well
- PE: one dry cough in the room; CTAB, great air movement and no wheezes; mild rhinitis otherwise normal exam
- CXR: unremarkable

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a word on COUGH from asthma



- Dry, non-productive, "annoying" cough
- Parents describe as "constant" and "we stay sick"; attributed to "drainage from allergies"
- Worse at night – first thing when laying down, coughing during sleep to the point of vomiting, first thing upon awakening
- Worse with exertion – particularly in the outdoors/heat of summer
- Cough after a cold will last FOREVER
- NOT helped by allergy medications
- **Unified airway hypothesis** – lower respiratory (lung) inflammation mirrors upper respiratory (sinus) inflammation/congestion

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Diagnosing Asthma: Symptoms



- **Cough, dyspnea, chest tightness, or wheeze**
 - Not all asthma wheezes
 - Cough may be the sole symptom ("cough-variant asthma")
 - Not all that wheezes is asthma
 - Cardiac, VCD, etc.
- **Clinical history is your most important tool!**
 - Generally children <5yo are too young to perform pulmonary function testing

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Diagnosing Asthma: Objective Testing



- **Spirometry preferred: >5 years old**
 - Pre- and post- bronchodilator (albuterol neb or 4 puffs albuterol MDI)
 - 12% improvement in FEV1 and >200cc increase
 - Can't dx with peak flow
- FeNO (fractional exhaled nitric oxide): use ≥5yo as an adjunct to diagnosis
- **4-6 week trial of inhaled corticosteroid then repeat spirometry**
- **1 week trial of oral steroid (1mg/kg div BID prednisolone) course**

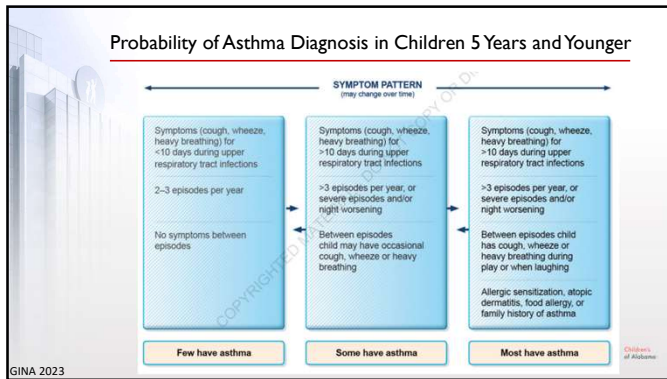
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Diagnosing Asthma: Objective Testing

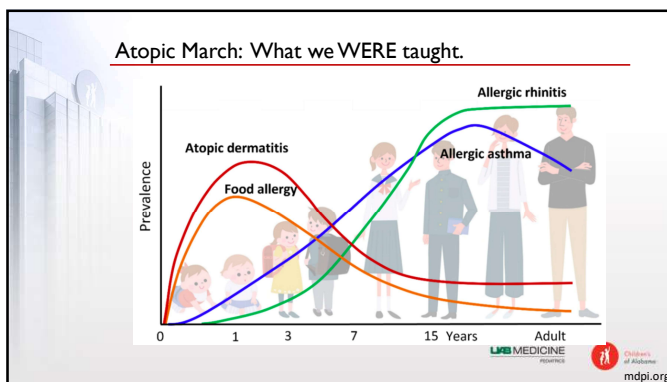
- **Radiology**
 - ALL asthmatics should have a documented chest x-ray
 - Most of the time normal!
 - Can see: hyperinflation of lungs, diaphragm flattening, atelectasis
- **Laboratory**
 - Serum alpha-1 antitrypsin level, all moderate-severe asthmatics
 - CBC/diff to eval eosinophilia
 - Total IgE level
 - Vitamin D level
 - Environmental allergy panel

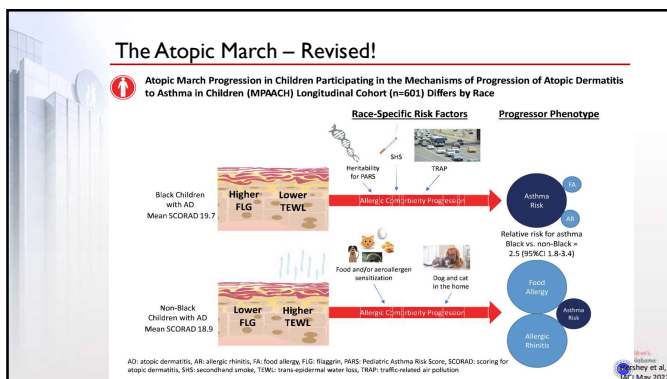
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Question #2

The parents of a 4yo boy who was diagnosed with asthma at 15mo wants to know if their son will outgrow his asthma. The father had asthma as a child but has not had any exacerbations in many years and feels he has outgrown his asthma; he is optimistic that his son will too. The mother does not have asthma or allergies. The triggers for their son's exacerbations are mainly viral infections during the fall and winter. In addition to asthma, their son has recently started having itchy, watery eyes and sneezing fits in the spring. You treated him as an infant for atopic dermatitis with moisturizers and topical steroids.

Of the following you are MOST likely to advise the family that their son will likely:

- A. Not outgrow his asthma since he has risk factors that suggest persistence
- B. Not outgrow his asthma since his triggers are viral infections
- C. Outgrow his asthma after the age of 5
- D. Outgrow his asthma since his father outgrew his asthma
- E. Outgrow his asthma since there is no maternal history of asthma



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Case 3: "My Child Stays Sick"

• 9 year old female with PMHx of severe persistent asthma is following up in your clinic 4 days post-discharge after a 3-day hospitalization for pneumonia.

- Hospital course: CXR demonstrated LLL opacity, started on vancomycin + ceftriaxone in the ER. 2L O2 via NC requirement and weaned to RA before discharge
- Asthma medications at the time of admission:
 - 200/50 mometasone-formoterol MDI (brand name Dulera®)
 - Montelukast 10mg daily



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Case 3:

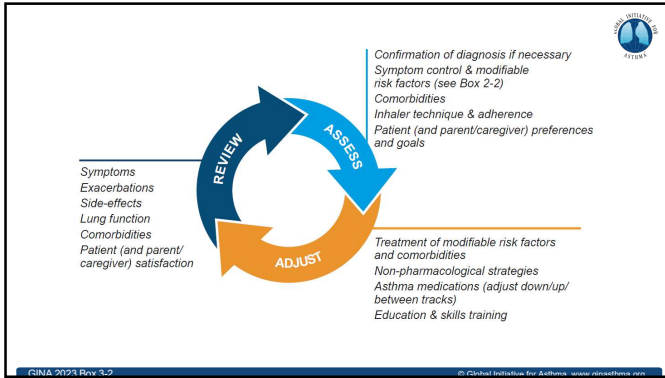
- Other PMHx: severe ADHD, atopic dermatitis, shellfish anaphylaxis
- 2 hospitalizations for acute asthma exacerbations ages 5 and 7 years
- 2 ER visits to COA within the past year – 9 months ago for pneumonia, 4 months ago for wheezing

Upon further inquiry:

- Refill history: Dulera twice in the past 12 months, Albuterol MDI 1-2 times per month
- Saw Mrs. Dr. Cajacob in allergy clinic in 2019 but was lost to follow-up



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Practical Use of Albuterol

- For use in the GREEN zone when well:
 - 4 puffs every 4 hours prn
 - Pre-exercise: 2 puffs 15-20 minutes before play
- For use in the YELLOW/RED zone when sick:
 - Yellow zone: 4-8 puffs every 4 hours
 - Red zone: 8 puffs every 20 minutes x3 (total of one hour)
- Per GINA guidelines: Adolescents/adults may use up to 10 puffs; in other younger children 1 puff may be sufficient.....but I don't recommend either.
- Recommendations are regardless of age**, but limited data
- STOP using albuterol pre-exercise for daily use before PE**

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Case 3: What's Next?

- You tell parent to make another appt with Dr. Cajacob but find that her next available is in 12,596 months
- In the meantime...
 - Arrange for repeat CXR after expected resolution of pneumonia to establish (new) baseline
 - Consider stopping montelukast due to lack of efficacy/concurrent ADHD
 - Ensure appropriate technique with spacer/mask vs. mouthpiece
 - Infectious history?



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Question #3

This same 9 year old patient with severe asthma is discharged from the hospital after requiring IV antibiotic therapy for pneumonia. You:

- A. Attribute this to her underlying severe asthma and poor inhaler compliance
- B. Check labs including immunoglobulins; this is a concerning infection that warrants screening for an underlying immunodeficiency
- C. Expedite asthma specialist follow-up; she urgently needs objective spirometry within the next four weeks
- D. A and C
- E. B and C

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10 Warning Signs of Primary Immunodeficiency

Primary immunodeficiency (PI) causes children and adults to have infections that come back frequently or are unusually hard to cure. 1500 persons are affected by one of the known Primary Immunodeficiencies. If you or someone you know is affected by two or more of the following warning signs, speak to a physician about the possible presence of an underlying Primary Immunodeficiency.

- 1 Four or more new ear infections within 1 year.
- 2 Two or more serious sinus infections within 1 year.
- 3 Two or more months on antibiotics with little effect.
- 4 Two or more pneumonias within 1 year.
- 5 Failure of an infant to gain weight or grow normally.
- 6 Recurrent, deep skin or organ abscesses.
- 7 Persistent thrush in mouth or fungal infection on skin.
- 8 Need for intravenous antibiotics to clear infections.
- 9 Two or more deep-seated infections including septicemia.
- 10 A family history of PI.

Presented in a public sector by:







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Immunoglobulin Reference Ranges

TABLE 15.4
SERUM IMMUNOGLOBULIN LEVELS FOR LOW BIRTH WEIGHT PRETERM INFANTS

Age (months)	Plasma Ig Concentrations in 25- to 28-Weeks' Gestation Infants			Plasma Ig Concentrations in 29- to 32-Weeks' Gestation Infants		
	IgG (mg/dL) ^a	IgM (mg/dL) ^a	IgA (mg/dL) ^a	IgG (mg/dL) ^a	IgM (mg/dL) ^a	IgA (mg/dL) ^a
0.25	25 (11–552)	7.6 (1.3–43.3)	1.2 (0.07–20.8)	368 (195–728)	9.1 (2.1–39.4)	0.6 (0.04–1.0)
0.5	202 (91–440)	14.1 (3.5–56.1)	2.1 (0.09–10.7)	275 (115–637)	13.9 (4.7–41)	0.9 (0.01–7.5)
1.0	158 (67–437)	12.7 (3.0–53.3)	4.5 (0.65–30.9)	209 (97–452)	14.4 (6.3–33)	1.9 (0.3–12.0)
1.5	134 (59–307)	16.2 (4.4–59.2)	4.3 (0.9–20.9)	156 (69–352)	15.4 (5.5–43.2)	2.2 (0.7–6.5)
2.0	89 (58–136)	16.0 (5.3–48.9)	4.1 (1.5–11.1)	123 (64–237)	15.2 (4.9–46.7)	3.0 (1.1–8.3)
3	60 (23–156)	13.8 (5.3–36.1)	3.0 (0.6–15.6)	104 (41–268)	16.3 (7.1–37.2)	3.6 (0.8–15.4)
4	82 (32–210)	22.2 (11.2–43.9)	6.8 (1.0–47.8)	128 (59–426)	26.5 (7.7–91.2)	5.8 (2.5–29.3)
6	159 (64–455)	41.3 (8.3–205)	9.7 (3.0–31.2)	179 (51–634)	29.3 (10.5–81.5)	12.3 (2.7–57.1)
8–10	273 (94–794)	41.8 (31.1–56.1)	9.5 (0.9–98.6)	280 (140–561)	34.7 (17–70.8)	20.9 (8.3–53)

^aGeometric mean (numbers in parentheses are ± 2 SD).
From Ballow M, Cates KL, Rowe JC, et al. Development of the immune system in very low birth weight (less than 1500 g) premature infants: concentrations of plasma immunoglobulins and patterns of infections. *Pediatr Res* 1986;9:899–904.

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GINA 2023 – Children 6–11 years

Personalized asthma management:
Assess, Adjust, Review

Confirmation of diagnosis if necessary
Symptom control & modifiable risk factors (see Box 2-2)
Comorbidities
Inhaler technique & adherence
Child and parent/caregiver preferences and goals

Treatment of modifiable risk factors & comorbidities
Non-pharmacological strategies
Asthma medications (adjust down or up)
Education & skills training

Asthma medication options:
Adjust treatment up and down for individual child's needs

REVIEW (blue arrow) → **ASSESS** (blue arrow) → **ADJUST** (orange arrow) → **REVIEW**

Other controller options (limited indications, or less evidence for efficacy or safety):
Consider daily low-dose ICS
Daily leukotriene receptor antagonist (LTRA), or low-dose ICS taken whenever SABA taken*

STEP 1
Low-dose ICS taken whenever SABA taken*

STEP 2
Daily low-dose inhaled corticosteroid (ICS) (see table of ICS dose ranges for children)

STEP 3
Low-dose ICS, LABA, OR medium-dose ICS, OR very low-dose ICS-formoterol maintenance and reliever (MART)

STEP 4
Medium-dose ICS, LABA, OR low-dose ICS-formoterol maintenance and reliever therapy (MART). Refer for expert advice

STEP 5
Refer for phenotypic assessment
≥ higher-dose ICS, LABA or add-on therapy, e.g. anti-IgE, anti-IL5, anti-IL13

RELIEVER
As-needed SABA (or ICS-formoterol reliever* in MART in Steps 3 and 4)

*Anti-inflammatory reliever (AIR)

Box 3-13 © Global Initiative for Asthma. www.ginasthma.com

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Case 4

- HPI:** 13 yo male presents to your office for football sports physical. He was last seen in your office by a colleague 3 years ago. Since that time, mom and patient report that he has done well. He has history of asthma, 2 COA ED visits in the past 12 months for wheezing. Last ED visit almost admitted per mom. Uses albuterol after football practice for solo since the season changed and 1-2 times per week before bedtime for cough. He denies nighttime cough, but mom report she hears him coughing during sleep. Mom also wants to restart his ADHD meds. Hasn't been doing well in school this year.
- PMH:** Full term, no complications. No surgeries. Asthma diagnosis age 7 after an asthma hospitalization. Seasonal allergies well controlled with otc meds. Allergic reaction requiring ED visits thought to be related to shrimp, no allergy testing. Avoids all seafood.
- SH:** lives with mom, stays with father occasionally on the weekends. Denies vaping/tobacco use or exposure. No pets, no environmental concerns. His symptoms are typically worse in the fall/winter. Patient typically misses > 10 days per year for asthma.
- FH:** Multiple family members with asthma, otherwise non-contributory
- NKDA**
- Meds:** Albuterol MDI prn, uses nebulizer when "really bad". Used to be on an "orange" inhaler from previous MD but out of refills. Doesn't use a spacer.

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Case Continues

- Physical exam:** well appearing, overweight, no acute distress, Vital signs normal, HEENT: swollen nasal turbinates, no rhinorrhea. TMs clear CV: RRR without murmur Lungs: clear bilaterally, no cough or wheezing Remainder of physical exam unremarkable

Gone are the days of Flovent and Albuterol.....

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GINA 2023 – Adults & adolescents 12+ years

Personalized asthma management
Assess, Adjust, Review
for individual patient needs

Assess: Symptoms, Exacerbations, Side-effects, Lung function, Comorbidities, Patient satisfaction

Adjust: Treatment of modifiable risk factors and comorbidities, Non-pharmacological strategies, Asthma medications (adjust down/up between tracks), Education & skills training

Review: Confirmation of diagnosis if necessary, Symptom control & modifiable risk factors (see Box 2-3), Comorbidities, Inhaler technique & adherence, Patient preferences and goals

TRACK 1: PREFERRED CONTROLLER and RELIEVER
Using ICS-formoterol as the reliever* reduces the risk of exacerbations compared with using a SABA reliever, and is a simpler regimen

TRACK 2: Alternative CONTROLLER and RELIEVER
Before considering a regimen with SABA reliever, check if the patient is likely to adhere to daily controller treatment

Other controller options (limited indications, or less evidence for efficacy or safety – see text)

STEP 1 – 2 As-needed-only low dose ICS-formoterol	STEP 3 Low dose maintenance ICS-formoterol	STEP 4 Medium dose maintenance ICS-formoterol	STEP 5 Add-on LAMA. Refer for assessment of phenotype. Consider high dose maintenance ICS-formoterol, a anti-IgE, anti-IL5/5R, anti-IL4/13, anti-TSLP
RELIEVER: As-needed low-dose ICS-formoterol*			
STEP 1 Take ICS whenever SABA taken*	STEP 2 Low dose maintenance ICS	STEP 3 Low dose maintenance ICS-LABA	STEP 4 Medium/high dose maintenance ICS-LABA
RELIEVER: as-needed ICS-SABA*, or as-needed SABA			
Low dose ICS whenever SABA taken* or daily LTRA, or add LAMA/SULT or add NMI/SULT	Medium dose ICS, or add LTRA, or add NMI/SULT	Add LAMA or LTRA or NMI/SULT or switch to high dose ICS	Add asthmocyon (adjR) or LTRA. As last resort consider adding low dose OCC but consider side-effects

*Anti-inflammatory reliever (AIR) Box 3-12 © Global Initiative for Asthma www.ginasthma.com

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Common asthma comorbidities

- Allergic Rhinitis
- Atopic Dermatitis
- Food Allergies
- Eosinophilic Esophagitis
- GERD
- OSA
- Obesity
- Vocal Cord Dysfunction
- Anxiety

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Question #4

- According to 2023 GINA Guidelines, the preferred recommended treatment plan for this 13 yo patient is:

A. Continue prn albuterol/short acting beta agonist and daily montelukast

B. Start daily ICS and as needed albuterol/short acting beta agonist

C. Start daily ICS/formoterol and as needed ICS/formoterol



D. Start daily ICS/formoterol, daily montelukast, and prn albuterol/short acting beta agonist

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Question #5



- Successful personalized asthma management requires ongoing assessment, adjustment, and review. Which of the following factors are included in this ongoing care process?
- A. Symptoms, Exacerbations, Side Effects, Risk factors, Comorbidities, Patient/ Caregiver Satisfaction
- B. Comorbidities, Inhaler Technique, Exclude Alternative Diagnoses, Medication Adherence, Patient/Caregiver Preferences
- C. Treat modifiable risk factors, Non-pharmacologic strategies, Medications, Education and skills training
- D. All of the above

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When to refer to asthma specialist?



- Patient with poorly controlled asthma or “asthma” not behaving as asthma
- History of 2 or more hospitalizations in the past 12 months
- History of life threatening asthma exacerbation
- Patient and caregivers need additional chronic disease management education
- Symptoms concerning for a comorbid condition that needs further evaluation
- Evaluation for biologics

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What to Refer to Allergy/Immunology

- Any uncontrolled OR moderate/severe persistent asthmatic
 - A/I preferred:
 - Food allergy history/concerns
 - Uncontrolled eczema or seasonal allergies
 - Immunodeficiency concerns
 - Eosinophilic esophagitis
- Anaphylaxis: Any & All
- Eczema: Severe/Uncontrolled – do NOT delay introduction of/eliminate foods!
- Uncontrolled rhinitis despite treatment
- Chronic urticaria that has failed quadruple normal dosing of cetirizine/levocetirizine/fexofenadine





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What to Refer to Pediatric Pulmonary

- Any uncontrolled OR moderate/severe persistent asthmatic
 - Pulmonary preferred:
 - Concerns for Cystic Fibrosis or Primary Ciliary Dyskinesia
 - Concerns for Aspiration
 - Comorbid congenital heart disease
 - Concerns for airway abnormalities malacia, vascular ring
 - Concerns for OSA
- Asthma clinic
 - Severe asthma or asthma refractory to standard therapies
 - Recurrent hospitalizations and/or urgent care visits
 - Co-morbid conditions that contribute to difficult disease control
 - Unique asthma self management education needs

<https://www.childrensai.org/services/asthma-clinic/education-and-resources>



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Thank You! Questions?

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