

Aim: To standardize management for children ≥ 6 years age with asthma.

INITIAL OUTPATIENT VISIT

Patient with concerns for asthma which might include:

- Wheezing (demonstrate to family)
- Chronic cough
- Difficulty keeping up with peers
- Shortness of breath
- Chest tightness
- Recurrent pneumonia

Review history elements. Features supportive of asthma diagnosis include:

- Generally more than one type of respiratory symptom
- Time and intensity variability in symptoms
- Worse symptoms at night or on waking
- Triggered by exercise, allergens, cold air, laughing, viral infections

Additional features to explore:

- *Family History:* Parent with provider-diagnosed asthma, atopy, or eczema
- *Social:* Missing school or activity limitation due to breathing
- *Atopic component:* Provider-diagnosed eczema, food/seasonal allergy
- *Responsiveness:* Symptomatic improvement with albuterol or corticosteroids

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Chronic lung disease (CF, bronchiectasis, PCD, immune deficiency, IPHSS disease)
- Acute or chronic airway disorder (malacia, stenosis, croup, bronchiolitis)
- Acute pneumonia (aspiration, infectious)
- Cardiac or neurologic disorder

Consider additional targeted testing, OFF guideline

- CXR if asymmetric lung findings
- Allergy panel if allergy symptoms, animal dander or other allergic triggers in home
- Spirometry
- Consider referral to Pulmonary (CRCCS)

Complete exam

- *Allergic component:* boggy, pale nasal turbinate, significant atopy/eczema, wheezing
- *Labs:* Not routinely recommended but CBC may show > 4% eosinophils if obtained

Asthma suspected based upon history and exam? (note 1)



Obtain additional testing:

- Spirometry for most patients at time of diagnosis (normal spirometry does not exclude asthma, **page 8**). Can complete in clinic or refer to Special Diagnostics. *Do not delay treatment for spirometry.*
- Allergy panel if uncontrolled asthma, persistent allergy symptoms, animal dander or other allergic triggers in home (**note 2**)
- CXR not routinely indicated. Consider if asymmetric lung exam or not responding to treatment

Revise/complete Asthma Control Test (ACT) (page 9)
Complete Asthma Action Plan "AAP" (page 3–5)

- Albuterol MDI with valved holding chamber +/- mask
- Start controller if symptoms or albuterol use ≥ 2x/month **OR** if initial presentation is acute exacerbation (**pages 10–12**)
- Prescribe oral steroid for red zone (**note 3 or page 13**)
- Complete prescriptions for all items on AAP and assure family picks up from pharmacy to have on-hand
- Family to sign release of information form for school (just state "patient's school, not specific school name)

Consider referral to pulmonary (note 5)
Complete asthma education (note 4)
Screen for social determinants of health referral needs

- Health legal partnership (**note 5**)
- Community Connect refer if available (**note 5**)

Primary care follow-up: 4–6 weeks

Billing/coding tips

- Use asthma specific diagnosis focusing on type and severity, such as exacerbation, mild, intermittent
- If asthma unconfirmed, diagnosis = symptoms e.g., wheezing, cough
- Once asthma is confirmed, don't use symptoms as a diagnosis
- Include secondary diagnosis of tobacco/smoke exposure when appropriate

Aim: To standardize management for children ≥ 6 years age with asthma.

FOLLOW-UP VISIT

Patient with diagnosed asthma in for follow-up without signs of acute illness (page 6 if ill)

- Revise/complete Asthma Control Test (ACT) (**page 9**): *Do NOT use ACT if patient acutely ill as it will confound results*
 - Any ED visits or hospitalizations since last visit?
 - Assess use of medications
 - Estimate number of missed controller doses per week
 - Estimated frequency of albuterol use
 - Any oral steroid use
 - Difficulties getting medicine?
 - Questions about using medicine?
 - Can patient/caregiver correctly demonstrate MDI with valved holding chamber +/- mask technique?
 - Complete exam
- Does the patient have all of the following: ACT score 20 or more (good control), no ED visits for asthma, no barriers to current asthma action plan?**

EXCLUSION GUIDELINES

- Patients **excluded** from this guideline:
- Chronic lung disease (CF, bronchiectasis, PCD, immune deficiency, IPHSS disease)
 - Acute or chronic airway disorder (malacia, stenosis, croup, bronchiolitis)
 - Acute pneumonia (aspiration, infectious)
 - Cardiac or neurologic disorder
 - Acutely ill patient

No

Yes

Not under good asthma control

- Consider spirometry (**page 8**), plan to repeat in 4–6 weeks
- If poor control of asthma not felt related to not getting medications:
 - Consider additional testing (allergy panel, CXR)
 - Consider alternate diagnoses
 - Strongly consider step up in controller therapy (**pages 10–12**)
 - Consider referral to pulmonary (CRCCS) (**note 5**)
- Revise asthma action plan (**page 3–5**) addressing barriers identified in history

Adequate/good asthma control

- Yearly spirometry, or consider 4–6 weeks after treatment changes (**page 8**)
- Review and refresh Asthma Action Plan (**pages 3–4**) including red zone steroid (**page 13**)

- Assure family has meds on-hand and prescription refills
- Review asthma education, provide asthma booklet
- Family to sign ROI form for school if not already obtained (just state "patient's school," not specific school name)
- Screen for social determinants of health referral needs
 - Health legal partnership and Community Connect (**note 5**)

Determine next primary care follow-up visit:

- 4–6 months if good control
- 4–6 weeks if not under good control

Billing/Coding tips

- If asthma confirmed, use asthma specific diagnosis focusing on type and severity, such as exacerbation, mild, intermittent
- If asthma unconfirmed, diagnosis = symptoms e.g., wheezing, cough
- Once asthma is confirmed, don't use symptoms as a diagnosis
- Include secondary diagnosis of tobacco/smoke exposure (e.g., Z77.22 Patients caregiver's currently smokes) when appropriate

Aim: To standardize management for children ≥ 6 years age with asthma.

ACTION PLANS WITHOUT SMART* THERAPY

Determining Asthma Action Plan (AAP) for patient 6 years and older with asthma

Cerner: Order "Asthma Action Plan". Can locate (and print) completed plans under Task → Reports → Asthma Action Plan. Available in English, Spanish.

ECW: Patient progress note > click Arrow next to INK at bottom of progress note > choose Specialty Form > left band shows Asthma folder > click Asthma Forms folder > choose Asthma Action Plan to create new plan.

Print 2–3 copies of AAP for family. Recommend they send one (in English, signed by parent) to school. **(note 3)**

Green zone: Feeling well

- No cough
- No wheeze
- Sleeping comfortable
- Playing/working

Controller medication if indicated (note A): (ICS, e.g., fluticasone)

Albuterol with valved holding chamber +/- mask

- 2–4 puffs 10–15 minutes before exercise

Yellow zone: Beginning to feel ill

- Cough
- Wheeze
- Viral respiratory symptoms
- Night asthma symptoms
- Symptoms with activity
- Chest tightness

Start albuterol with valved holding chamber +/- mask

- 4 puffs every 3–4 hours PRN
- 2–4 puffs 10–15 minutes before exercise

Start/increase controller medication (ICS, e.g., fluticasone, give dose after albuterol)

Red zone: Feeling very ill

- Breathing hard and fast
- Pronounced cough
- Short of breath at rest

Increase controller medication: (ICS, e.g., fluticasone)

Increase albuterol with valved holding chamber +/- mask

- To 4 puffs every 3 hours
- If symptoms worsen or don't improve, take 4 puffs every 20 minutes 3 times and call health care provider

Add oral steroids (note B):

- All patients should have steroids filled and on-hand for use in the red zone if needed. No refills.

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Chronic lung disease (CF, bronchiectasis, PCD, immune deficiency, IPHSS disease)
- Acute or chronic airway disorder (malacia, stenosis, croup, bronchiolitis)
- Acute pneumonia (aspiration, infectious)
- Cardiac or neurologic disorder

NOTE A: Indications/considerations for controller medication: If symptoms ≥ 2x/month, albuterol use ≥ 2x/week **OR** if initial presentation is acute exacerbation **(pages 10–12)**

NOTE B: ORAL STEROID NOTES (PAGE 13)

- Studies have found comparable efficacy between Prednisolone and Dexamethasone
- Dexamethasone 0.6 mg/kg (max 12 mg) PO x 2 doses 1–2 days apart
- Prednisolone 1 mg/kg PO (max 30 mg per dose) BID x 5 days
- GINA 2021 guidelines recommend having steroids in red zone for most patients
- Recommend that families fill prescriptions to have "on-hand" as there may be barriers to families in getting to pharmacy urgently during an exacerbation
- Should not provide additional refills for red zone steroids, instruct family to follow-up when using red zone steroid to get additional for next exacerbation

NOTE C: KEY COMPONENTS TO AN ASTHMA ACTION PLAN (AAP)

1. AAP filled out and discussed with family
2. Prescriptions sent
3. Medications picked up (including red zone steroids) to have on-hand
4. Caregiver knowledge on when to use
5. PCP and school RN have copy of AAP (ideally signed by family and in English for school)

*SMART (Single Maintenance And Reliever Therapy) daily therapy is associated with reduced risk of acute asthma exacerbations compared with ICS with or without LABA and SAMA as relief. However, some insurances do not currently cover SMART therapy.

Aim: To standardize management for children ≥ 6 years age with asthma.

ACTION PLANS WITH SMART* THERAPY

Determining Asthma Action Plan (AAP) for patient 6 years and older with asthma

Cerner: Order "Asthma Action Plan". Can locate (and print) completed plans under Task → Reports → Asthma Action Plan. Available in English, Spanish.

ECW: Patient progress note > click Arrow next to INK at bottom of progress note > choose Specialty Form > left band shows Asthma folder > click Asthma Forms folder > choose Asthma Action Plan to create new plan.

Print 2–3 copies of AAP for family. Recommend they send one (in English, signed by parent) to school. **(note 3)**

Green zone: Feeling well

- No cough
- No wheeze
- Sleeping comfortable
- Playing/working

ICS-formoterol BID (e.g., Dulera or Symbicort; **pages 10–12** for age and severity specific dosing)
Albuterol with valved holding chamber +/- mask
• 2–4 puffs 10–15 minutes before exercise

Yellow zone: Beginning to feel ill

- Cough
- Wheeze
- Viral respiratory symptoms
- Night asthma symptoms
- Symptoms with activity
- Chest tightness

ICS-formoterol BID (e.g., Dulera or Symbicort; **pages 10–12** for age and severity specific dosing)
Plus begin SMART* PRN dosing
• Symbicort HFA: 80/4.5 mcg 1 puff q4h PRN if 6–11 years; 80/4.5 mcg 2 puffs q4h PRN if 12+ years
• Dulera HFA: 50/5 mcg 1 puff q4h PRN if 6–11 years; 100/5 mcg 2 puffs q4h PRN if 12+ years

Red zone: Feeling very ill

- Breathing hard and fast
- Pronounced cough
- Short of breath at rest

ICS-formoterol BID (**pages 10–12**)
Plus SMART* PRN dosing
• Symbicort HFA: 80/4.5 mcg 1 puff q4h PRN if 6–11 years; 80/4.5 mcg 2 puffs q4h PRN if 12+ years
• Dulera HFA: 50/5 mcg 1 puff q4h PRN if 6–11 years; 100/5 mcg 2 puffs q4h PRN if 12+ years
Add oral steroids (note A):
• All patients should have steroids filled and on-hand for use in the red zone if needed. No refills.

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Chronic lung disease (CF, bronchiectasis, PCD, immune deficiency, IPHSS disease)
- Acute or chronic airway disorder (malacia, stenosis, croup, bronchiolitis)
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NOTE A: ORAL STEROID NOTES (page 13)

- Studies have found comparable efficacy between Prednisolone and Dexamethasone
- Dexamethasone 0.6 mg/kg (max 12 mg) PO x 2 doses 1–2 days apart
- Prednisolone 1 mg/kg PO (max 30 mg/dose) BID x 5 days
- GINA 2021 guidelines recommend having steroids in red zone for most patients
- Recommend that families fill prescriptions to have "on-hand" as there may be barriers to families in getting to pharmacy urgently during an exacerbation
- Should not provide additional refills for red zone steroids, instruct family to follow-up when using red zone steroid to get additional for next exacerbation

NOTE B: KEY COMPONENTS TO AN ASTHMA ACTION PLAN (AAP)

1. AAP filled out and discussed with family
2. Prescriptions sent
3. Medications picked up (including red zone steroids) to have on-hand
4. Caregiver knowledge on when to use
5. PCP and school RN have copy of AAP (ideally signed by family and in English for school)

*SMART (Single Maintenance And Reliever Therapy) daily therapy is associated with reduced risk of acute asthma exacerbations compared with ICS with or without LABA and SAMA as relief. However, some insurances do not currently cover SMART therapy. PRN ICS-formoterol is only preferred for age 12+ so far at treatment steps 1–2. Age 6–11 preferred track for mild/well controlled is ICS+SABA up until step 3 tx with SMART

Aim: To standardize management for children with asthma.

ACTION PLANS (MEDICATION MANAGEMENT)

Patients ≥ 12 years age, mild, well controlled example (GINA Step 1)

Determining asthma action plan (AAP) for patient 12 years and older with asthma

Cerner: Order "Asthma Action Plan". Can locate (and print) completed plans under Task → Reports → Asthma Action Plan. Available in English, Spanish.

ECW: Patient progress note > click Arrow next to INK at bottom of progress note > choose Specialty Form > left band shows Asthma folder > click Asthma Forms folder > choose Asthma Action Plan to create new plan.

Print 2–3 copies of AAP for family. Recommend they send one (in English, signed by parent) to school. **(note 3)**

Green zone: Feeling well

- No cough
- No wheeze
- Sleeping comfortable
- Playing/working

No daily medication

Optional 2 puffs 10–15 minutes before exercise of low dose ICS-formoterol with valved holding chamber +/- mask

Yellow zone: Beginning to feel ill

- Cough
- Wheeze
- Viral respiratory symptoms
- Night asthma symptoms
- Symptoms with activity
- Chest tightness

Start low dose ICS-formoterol with valved holding chamber +/- mask

- 2 puffs every 4 hours

Red zone: Feeling very ill

- Breathing hard and fast
- Pronounced cough
- Short of breath at rest
- Yellow zone medicine is not helping

Increase ICS-formoterol with valved holding chamber +/- mask to 1 puff every few minutes as symptoms persist, up to 6 inhalations on a single occasion. Max of 12 total puffs per day. If symptoms worsen or don't improve, call health care provider or seek care.

Add Oral steroids (note B):

All patients should have steroids filled and on-hand for use in the red zone if needed. No refills.

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Chronic lung disease (CF, bronchiectasis, PCD, immune deficiency, IPHSS disease)
- Acute or chronic airway disorder (malacia, stenosis, croup, bronchiolitis)
- Acute pneumonia (aspiration, infectious)
- Cardiac or neurologic disorder

NOTE A: INDICATIONS/CONSIDERATIONS FOR CONTROLLER MEDICATION:

If symptoms ≥ 2x/month, reliever use ≥ 2x/week **OR** if initial presentation is acute exacerbation **(pages 10–12)**

NOTE B: ORAL STEROID NOTES (page 13)

- Studies have found comparable efficacy between Prednisolone and Dexamethasone
- Dexamethasone 0.6 mg/kg (max 12 mg) PO x 2 doses 1–2 days apart
- Prednisolone 1 mg/kg PO (max 30 mg/dose) BID x 5 days
- GINA 2021 guidelines recommend having steroids in red zone for most patients
- Recommend that families fill prescriptions to have "on-hand" as there may be barriers to families in getting to pharmacy urgently during an exacerbation
- Should not provide additional refills for red zone steroids, instruct family to follow-up when using red zone steroid to get additional for next exacerbation

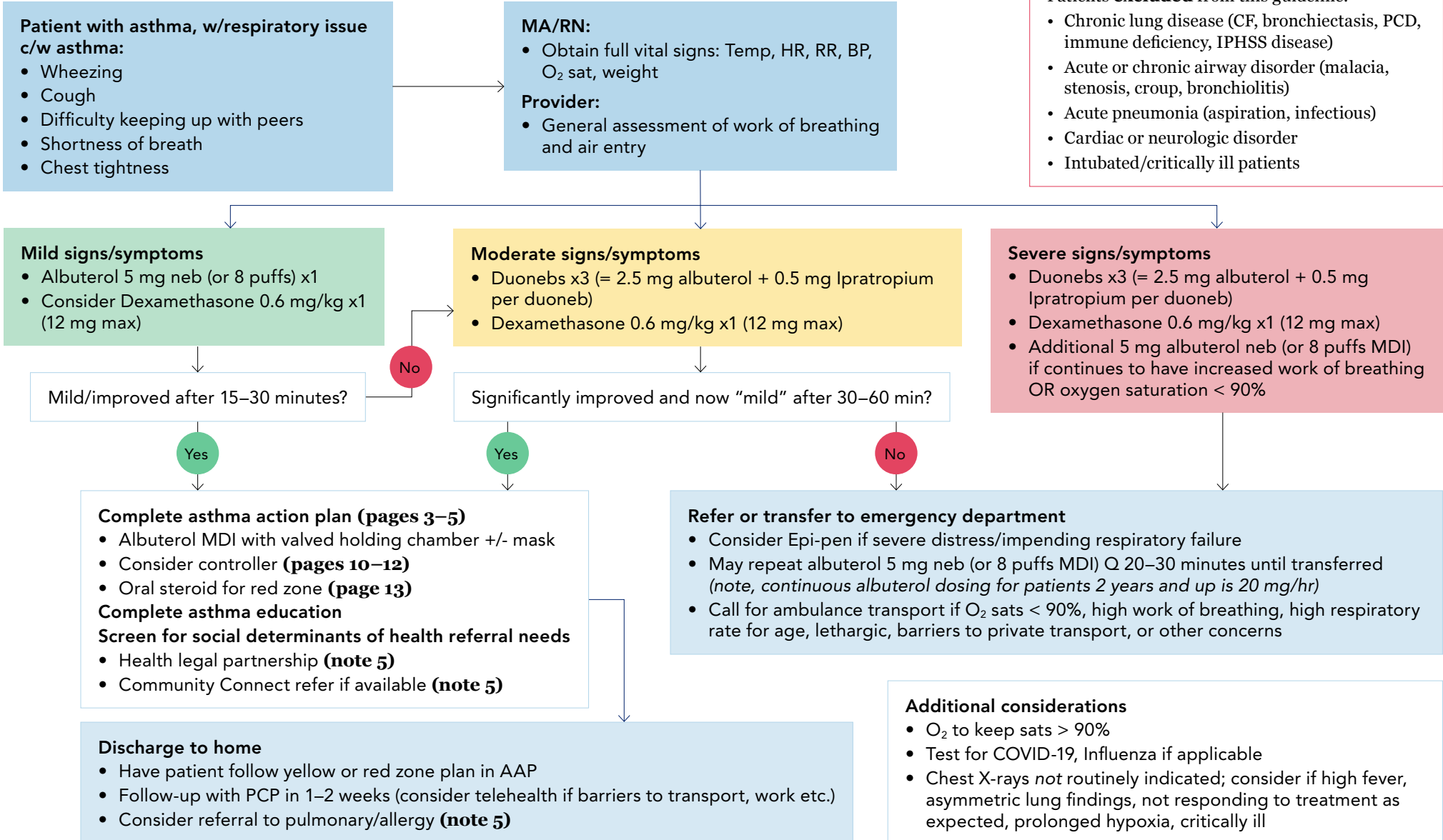
NOTE C: KEY COMPONENTS TO AN ASTHMA ACTION PLAN (AAP)

1. AAP filled out and discussed with family
2. Prescriptions sent
3. Medications picked up (including red zone steroids) to have on-hand
4. Caregiver knowledge on when to use
5. PCP and School RN have copy of AAP (ideally signed by family and in English for school)

Aim: To standardize management for children ≥ 2 years age with acute asthma exacerbation.

CLINIC OR URGENT/READY CARE

2–25 years age



Disclaimer: This guideline is designed for general use with most patients; each clinician should use their own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.

Aim: To standardize management for asthma.

NOTE 1: ASTHMA PREDICTIVE INDEX AND PEDIATRIC ASTHMA RISK SCORE

Various tools exist to assist in risk of asthma development in young children

Pediatric Asthma Risk Score: predicts risk of developing asthma by age 7 years.

Available at Scoring Sheet | Pediatric Asthma Risk Score (PARS) (cchmc.org)

Asthma Predictive Index: Applies to patients ≤ 3 years of old so should not be used for patients on this guideline (6 years and older). Available at Asthma Predictive Index (API) – MDCalc

NOTE 2: ALLERGY TESTING OPTIONS – CONSIDER REFERRAL TO ALLERGIST FOR TESTING GIVEN DIFFICULTY OF TEST INTERPRETATION

Consider for: uncontrolled asthma, persistent allergy symptoms, animal dander or other triggers in the home (to r/o allergies)

Serum IgE test: Immunocap

< 3 years panel: includes some foods (i.e. egg, cow's milk, soy, peanut, wheat, etc.) animal dander, cockroach, dust mite and molds

> 3 years panel: includes some foods, animal dander, cock roach, dust mites, molds, tree pollen, grasses, ragweed

Food Allergy Panel: more extensive food testing, difficult to interpret, recommend referral to allergy specialist for focused testing

Consider allergy referral if significant food allergies with h/o anaphylaxis, uncontrolled allergy/asthma symptoms with little response to initial treatment, interest in allergy immunotherapy injections

NOTE 3: MEDICATION DOSING AND NOTES

- Albuterol: MDI is preferred over nebulizer. They have similar efficacy but there are benefits to MDI in terms of resources needed to administer.
 - Levalbuterol (Xoponex) should only be considered on a case-case basis if patient has albuterol intolerance or ineffectiveness despite correct administration
- Patients < 5 years often need a spacer and mask; all patients need a spacer
- Systemic steroids
 - Dexamethasone (preferred) 0.6 mg/kg PO/IM (max dose 12 mg) x2 doses 24–48 hours apart
 - Prednisolone/Prednisone 2 mg/kg PO per day x5 days (max daily dose 60 mg)
- Duoneb = one albuterol (2.5 mg) plus 0.5 mg Ipratropium

NOTE 4: ASTHMA EDUCATION

- Printed materials including complete “Asthma Booklet” are available on Children's Minnesota intranet (Star Net) Clinical A–Z Library
- Most materials are available in English, Spanish, with some available in Somali and Hmong
- Videos for MDI with spacer technique available on Clinical A–Z Library (English, Spanish). Additional videos anticipated August 2022 including in Somali.
- Patient/caregiver should be able to identify their medication with visual charts
- Consider recommending medication reminder apps to family (for example, Medisafe)
- Tobacco/smoke exposure is a common asthma trigger. Evaluate for first/second hand smoke exposure and provide QuitLine information if applicable. www.quitpartnermn.com has materials in Spanish, Somali and Hmong. 1-800-QUIT-NOW and has free services.

NOTE 5: REFERRALS/CONSULTS AND HIGH RISK ASTHMA FEATURES

- **Pulmonology** (CRCCS- Critical Care and Respiratory Services Group)
 - Patients with asthma that is not well-controlled, needing medium-dose ICS or more, or with high risk asthma (see below) should be referred. Also consider referral based on provider judgement/preference, family preference.
 - High risk asthma = 1 major + minor **or** 3 minor criteria
 - **Major criteria:** oral corticosteroids $\geq 25\%$ of year, high dose inhaled corticosteroid, **ANY** life-threatening asthma event, ICU admit within 5 years
 - **Minor criteria:** Daily inhaled corticosteroids + 2nd controller, ≥ 3 steroid bursts/year, FEV₁ $\leq 50\%$ predicted, anytime, 2 ED visits or hospitalization in past year, daily smoke exposure, daily environmental exposures, socioeconomic factors impacting disease, poor attitude/belief regarding medications, low or high perceiver of symptoms, requiring kenalog injection, history of anaphylaxis, comorbid conditions (sinus disease, severe atopy, obesity, sickle cell disease, chronic lung disease).
- **Allergy** if significant food allergies with h/o anaphylaxis, uncontrolled allergy/asthma symptoms with little response to initial treatment, interest in allergy immunotherapy injections.
- **Community Connect:** resources for social determinants of health available at hospital-based clinics, West St. Paul, Brooklyn Park
- **Health Legal Partnership (HLP):** issues related to housing, immigration available at hospital-based clinic

Aim: To standardize management for asthma.

PULMONARY FUNCTION TESTING NOTES

Spirometry

- Spirometry is available at most Children’s Minnesota-affiliated clinics or patient can be referred to Special Diagnostics at Children’s Minnesota. Resources for spirometry may be limited in some settings.
- Abnormal spirometry is not needed for diagnosis of asthma (may be normal if not during exacerbation)
- **Testing is pt and technician dependent. Interpret w/caution.**
- FEV₁: FVC ratio is key component (see box)
 - FEV₁/FVC < 80% defines obstruction
 - Some define it at 85% for asthma
- Bronchodilator response
 - FEV₁ improvement by 12% is significant responsiveness/reversibility
- Spirometry is recommended. (Resources for spirometry may be limited in some settings. Prioritize annual visits or for high risk patients).
 - At diagnosis (baseline for future comparisons)
 - 4–6 weeks after starting treatment or after treatment changes
 - Yearly. Consider more frequently in high risk patients or those with poor lung function.
- Staff to do MDI Instruct with the patient at the time of the PFT, fill out the Education Powerform relating to this education in the Asthma Powerform

Other pulmonary function testing

- Methylcholine challenge: consider if asthma diagnosis is unclear after other testing including traditional spirometry. Order from clinic, special diagnostics at Children’s Minnesota completes it.
- Exercise challenge: consider if asthma diagnosis is unclear after other testing and having symptoms with exercise. Order from clinic, special diagnostics at Children’s Minnesota completes it.

Billing/coding tips:

Charges will be billed when spirometry, neb/MDI demo performed. Charges are entered by clinic support staff upon completion.

Box 1-2. Diagnostic criteria for asthma in adults, adolescents, and children 6–11 years

1. HISTORY OF VARIABLE RESPIRATORY SYMPTOMS	
Feature	Features that support the diagnosis
Wheeze, shortness of breath, chest tightness and cough (Descriptors may vary between cultures and by age)	<ul style="list-style-type: none"> • Generally more than one type of respiratory symptom (in adults, isolated cough is seldom due to asthma) • Symptoms occur variably over time and vary in intensity • Symptoms are often worse at night or on waking • Symptoms are often triggered by exercise, laughter, allergens, cold air • Symptoms often appear or worsen with viral infections
2. CONFIRMED VARIABLE EXPIRATORY AIRFLOW LIMITATION	
Feature	Considerations, definitions, criteria
2.1 Documented expiratory airflow limitation	At a time when FEV ₁ is reduced, confirm that FEV ₁ /FVC is reduced (it is usually >0.75–0.80 in adults, >0.90 in children ¹³)
AND	
2.2 Documented excessive variability in lung function* (one or more of the following):	The greater the variations, or the more occasions excess variation is seen, the more confident the diagnosis. If initially negative, tests can be repeated during symptoms or in the early morning.
• Positive bronchodilator (BD) reversibility test	Adults: increase in FEV ₁ of >12% and >200 mL (greater confidence if increase is >15% and >400 mL). Children: increase in FEV ₁ of >12% predicted Change measured 10–15 minutes after 200–400 mcg salbutamol (albuterol) or equivalent, compared with pre-BD readings. Positive test more likely if BD withheld before test: SABA ≥4 hours, twice-daily LABA 24 hours, once-daily LABA 36 hours
• Excessive variability in twice-daily PEF over 2 weeks	Adults: average daily diurnal PEF variability >10%* Children: average daily diurnal PEF variability >13%*
• Significant increase in lung function after 4 weeks of anti-inflammatory treatment	Adults: increase in FEV ₁ by >12% and >200 mL (or PEF [†] by >20%) from baseline after 4 weeks of treatment, outside respiratory infections
• Positive exercise challenge test	Adults: fall in FEV ₁ of >10% and >200 mL from baseline Children: fall in FEV ₁ of >12% predicted, or PEF >15%
• Positive bronchial challenge test (usually only for adults)	Fall in FEV ₁ from baseline of ≥20% with standard doses of methacholine, or ≥15% with standardized hyperventilation, hypertonic saline or mannitol challenge
• Excessive variation in lung function between visits (good specificity but poor sensitivity)	Adults: variation in FEV ₁ of >12% and >200 mL between visits, outside of respiratory infections Children: variation in FEV ₁ of >12% in FEV ₁ or >15% in PEF [†] between visits (may include respiratory infections)

BD: bronchodilator (SABA or rapid-acting LABA); FEV₁: forced expiratory volume in 1 second; ICS: inhaled corticosteroid; LABA: long-acting beta₂-agonist; PEF: peak expiratory flow (highest of three readings); SABA: short-acting beta₂-agonist. See Box 1-4 (p.27) for how to confirm the diagnosis in patients already taking controller treatment. *Daily diurnal PEF variability is calculated from twice daily PEF as (day’s highest minus day’s lowest) divided by (mean of day’s highest and lowest), averaged over one week. †For PEF, use the same meter each time, as PEF may vary by up to 20% between different meters. BD reversibility may be lost during severe exacerbations or viral infections,¹⁴ and airflow limitation may become persistent over time. If reversibility is not present at initial presentation, the next step depends on the availability of other tests and the urgency of the need for treatment. In a situation of clinical urgency, asthma treatment may be commenced and diagnostic testing arranged within the next few weeks (Box 1-4, p.27), but other conditions that can mimic asthma (Box 1-5) should be considered, and the diagnosis confirmed as soon as possible.

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Aim: To standardize management for asthma.

ASTHMA CONTROL TEST (ACT) NOTES

Asthma Control Test (ACT) is a 5–7 question tool, recognized by NIH, to assess asthma control. Scores 19 or less indicate poor control. ACT tools are located on Star Net as well as adhoc charting in Cerner and in Smart Forms (SF) in eCW clinics.

- C-ACT, for kids 4–11 years age (caregiver and patient questions)
 - How was your asthma today?
 - How much of a problem is your asthma with exercise?
 - Do you cough because of your asthma?
 - Do you wake up at night because of your asthma?
 - During the last 4 weeks how many days did your child have daytime asthma symptoms?
 - During the last 4 weeks how many days did your child wheeze during the day because of asthma?
 - During the last 4 weeks how many days did your child wake up during the night because of asthma?
- ACT, for kids/adults 12 years and older
 - During the last 4 weeks how much of the time did your asthma keep you from getting as much done at work/school/home?
 - During the last 4 weeks how often have you had shortness of breath?
 - During the last 4 weeks how often did your asthma symptoms wake you up at night or earlier than usual in the morning?
 - During the last 4 weeks how often have you used your rescue inhaler or nebulizer (e.g., albuterol, do not count if used preventatively before exercise)
 - How would you rate your asthma control during the past 4 weeks?
- ACT should be completed at diagnosis, approximately 1–3 months after starting treatment, then every 3–12 months depending on symptom control (more frequently if not well-controlled). Also obtain within ~ 1–4 weeks following asthma exacerbation.
- **Do not conduct an ACT if acutely ill.** ACT can be challenging to interpret with illness given potential for overlap of symptoms (e.g., cough). A low ACT because of viral illness may not necessitate a change in the Asthma Action Plan.

Aim: To standardize management for asthma.

CONTROLLER OPTIONS

Patients 6–11 years age

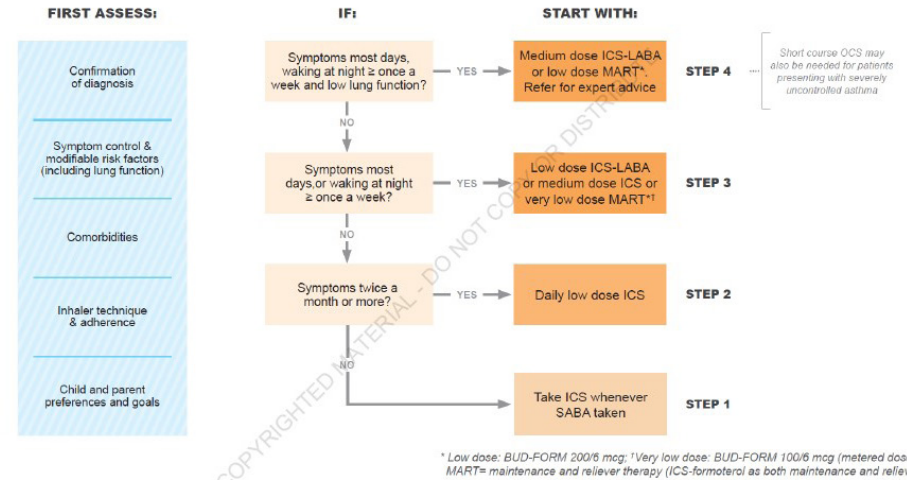
General controller considerations:

- Controller type and dose will be individualized for patients depending on their asthma symptoms, risk factors, triggers, level of control and which insurance plan they have (coverage of different controllers varies widely)
- Pick a controller that the patient’s insurance will cover
- Use the lowest strength dose that will control the patient’s asthma symptoms and have the lowest morbidity
- Patients needing to use albuterol more than twice per week (excluding prior to exercise), or with symptoms ≥ 2x/month should be considered for controller
- Also consider controller if initial asthma presentation is an acute exacerbation
- PRN ICS-formoterol is only preferred for age 12+ at treatment steps 1–2. Age 6–11 preferred track for mild/well controlled is ICS+SABA up until step 3 tx with SMART.

Common SMART (Single Maintenance And Reliever Therapy) and inhaled corticosteroid (ICS) controller options and dosing,
 *Do not use RediHaler with a spacer. RediHaler is a breath-actuated MDI device, Qvar HFA MDI inhalers have been discontinued from production.

Box 3-4Dii. Selecting initial controller treatment in children aged 6–11 years with a diagnosis of asthma (V2)

SUGGESTED INITIAL CONTROLLER TREATMENT
 in CHILDREN 6-11 years with a diagnosis of asthma



BUD-FORM: budesonide-formoterol; ICS: inhaled corticosteroid; LABA: long-acting beta₂-agonist; MART: maintenance and reliever therapy with ICS-formoterol; OCS: oral corticosteroids; SABA: short-acting beta₂-agonist

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	PRN/SMART dos	Very low dose	Low dose	Medium dose	High dose	Comments
ICS-LABA						
Fluticasone-Salmeterol (Advair) HFA			45/21 mcg 1 puff BID	45/21 mcg 2 puffs BID	115/21 mcg 2 puffs BID	MAX dose 4 puffs per day
(S)MART = Budesonide-formoterol. Max 8 puffs per day.						
Symbicort HFA	80/4.5 mcg 1 puff q4h PRN	80/4.5 mcg 1 puff daily	80/4.5 mcg 1 puff BID	80/4.5 mcg 2 puffs BID	160/4.5 mcg 2 puffs BID	
Dulera HFA	50/5 mcg 1 puff q4h PRN	50/5 mcg 1 puff BID	50/5 mcg 2 puffs BID	100/5 mcg 2 puffs BID	200/5 mcg 2 puffs BID	
ICS						
Fluticasone (Flovent) HFA	44 mcg 1 puff q4h PRN + SABA		44 mcg 1 puff BID	44 mcg 2 puffs BID	110 mcg 2 puffs BID	
Beclomethasone (Qvar) RediHaler*	40 mcg 1 puff q4h PRN + SABA		40 mcg 1 puff BID	40 mcg 2 puffs BID	80 mcg 2 puffs BID	
Mometasone (Asmanex) HFA	50 mcg 1 puff q4h PRN + SABA		50 mcg 1 puff BID		50 mcg 2 puffs BID	

Aim: To standardize management for asthma.

CONTROLLER OPTIONS

Patients ≥ 12 years age

General controller considerations:

- Controller type and dose will be individualized for patients depending on their asthma symptoms, risk factors, triggers, level of control and which insurance plan they have (coverage of different controllers varies widely)
- Pick a controller that the patient's insurance will cover
- Use the lowest strength dose that will control the patient's asthma symptoms and have the lowest morbidity
- Patients needing to use albuterol more than twice per week (excluding prior to exercise), or with symptoms ≥ 2x/month should be considered for controller
- Also consider controller if initial asthma presentation is an acute exacerbation

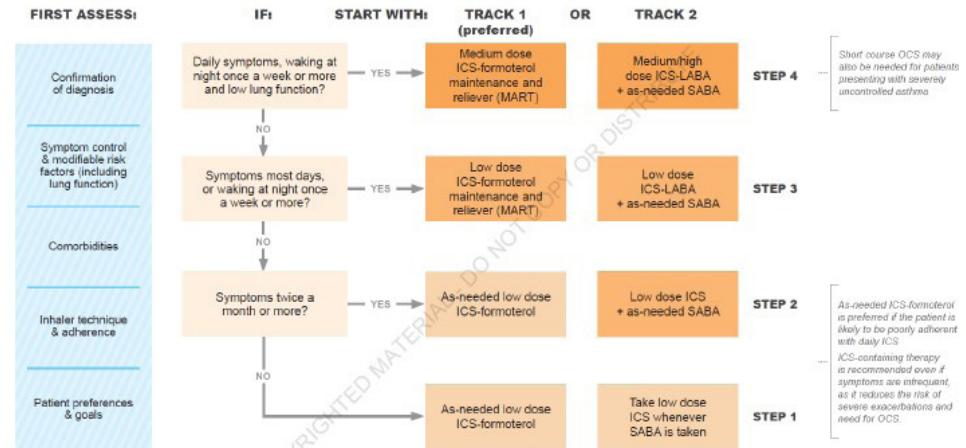
Common SMART (Single Maintenance And Reliever Therapy) and inhaled corticosteroid (ICS) controller options and dosing:

*Do not use RediHaler with a spacer. RediHaler is a breath-actuated MDI device, Qvar HFA MDI inhalers have been discontinued from production.

Box 3-4Bii. Selecting initial controller treatment in adults and adolescents with a diagnosis of asthma (V2)

STARTING TREATMENT

in adults and adolescents 12+ years with a diagnosis of asthma



ICS: inhaled corticosteroid; LABA: long-acting beta₂-agonist; MART: maintenance and reliever therapy with ICS-formoterol; OCS: oral corticosteroids; SABA: short-acting beta₂-agonist

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	PRN/SMART dose	Low dose	Medium dose	High dose
ICS-LABA				
Fluticasone-Salmeterol (Advair) HFA		45/21 mcg 2 puffs BID	115/21 mcg 2 puffs BID	230/21 mcg 2 puffs BID
Fluticasone-Salmeterol (Advair) Diskus*		100/5 mcg 1 puff BID	250/5 mcg 1 puff BID	500/5 mcg 1 puff BID
(S)MART = Budesonide-formoterol. Max 12 puffs per day				
Symbicort HFA	80/4.5 mcg 2 puffs q4h PRN	80/4.5 mcg 2 puffs BID	160/4.5 mcg 2 puffs BID	
Dulera HFA	100/5 mcg 2 puffs q4h PRN	100/5 mcg 2 puffs BID	200/5 mcg 2 puffs BID	
ICS				
Fluticasone (Flovent) HFA	44 mcg 2 puffs q4h PRN + SABA	44 mcg 2 puffs BID	110 mcg 2 puffs BID	220 mcg 2 puffs BID
Beclomethasone (Qvar) RediHaler*	80 mcg 1 puff q4h PRN + SABA	80 mcg 1 puff BID	80 mcg 2 puffs BID	
Budesonide (Pulmicort) Flexhaler DPI*	90 mcg 2 puffs q4h PRN + SABA	90 mcg 2 puffs BID	180 mcg 2 puffs BID	
Mometasone (Asmanex) HFA	50 mcg 2 puffs q4h PRN + SABA	50-100 mcg 2 puffs BID		200 mcg 2 puffs BID

Disclaimer: This guideline is designed for general use with most patients; each clinician should use their own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.

Aim: To standardize management for asthma.

NON-ICS CONTROLLER OPTIONS

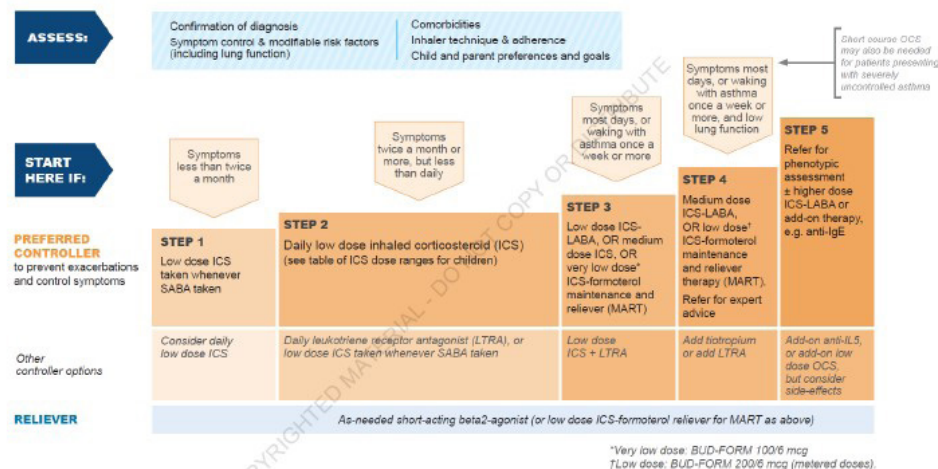
Other controller or daily medication options and dosing:

Medication	Dose	Comments, when to consider use
Montelukast (Singulair)	Age 6–14: 5 mg Q pm Age 15+: 10 mg Q pm	Leukotriene Receptor Antagonist (LTRA): Additive option for step 2 or higher. Less effective than daily ICS. Black box warning for neuropsychiatric events (agitation, aggression, depression, sleep disturbances, suicidal thoughts and behavior). Changes should be monitored closely if prescribing.
Cetirizine (Zyrtec)	5–10 mg once daily	Cetirizine (Zyrtec)
Tiotropium (Spiriva Respimat 1.25 mcg)	2 inhalations once daily	Long Acting Muscarinic Antagonist (LAMA): Additive option for step 4 or higher if uncontrolled on medium to high dose ICS-LABA.

Box 3-4Di. Selecting initial controller treatment in children aged 6–11 years with a diagnosis of asthma (V1)

STARTING TREATMENT

Children 6–11 years with a diagnosis of asthma



BUD-FORM: budesonide-formoterol; ICS: inhaled corticosteroid; LABA: long-acting beta₂-agonist; LTRA: leukotriene receptor antagonist; MART: maintenance and reliever therapy with ICS-formoterol; OCS: oral corticosteroids; SABA: short-acting beta₂-agonist

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Aim: To standardize management for asthma.

ORAL CORTICOSTEROID (OCS) NOTES

Oral steroid (OCS) Options	Dose	Total doses per course	Taste	Storage	Cost*	Other
Dexamethasone 4 mg tablet	0.6 mg/kg Q day x 2d (max 12 mg/dose)	2	Crush & mix on spoon with ice cream, honey, syrup or peanut butter	Room temp	\$10–15	Prefer for cost, short duration, long expiration
Dexamethasone liquid 1 mg/ml	0.6 mg/kg Q day x 2d (max 12 mg/dose)	2	Compound has the advantage of negligible flavor, slightly sweet	Compound at Children's: 90 day expiration at room temp	\$15–20	Don't extend past 2 day course. Specify alcohol-free on rx. Commercial product 30% alcohol.
Prednisolone solution 15 mg/5 ml	1–2 mg/kg/d divided BID x 3–5d (max 30 mg/dose, total of 60 mg/day)	6–10	Tastes bad with a strong bitter aftertaste	Room temp, protect from light	\$15–30	0–5% alcohol depending on the manufacturer
Prednisone 10 mg tablet	1–2 mg/kg/d divided BID x 3–5d (max 30 mg/dose, total of 60 mg/day)	6–10	Bitter tablets, more difficult to mask	Room temp	\$10	

* Estimated cost for total course by Children's Minnesota outpatient pharmacy price quote for a 30 kg child without insurance applied as of 4/2022

Red zone steroids

- The GINA 2021 Asthma recommendations note that most patients 6 years and older with asthma benefit from having oral corticosteroids on hand at home for initiation during acute exacerbation
- Dexamethasone and Prednisone/Prednisolone have been shown to have similar efficacy in multiple studies
- Key components:
 - Most asthma action plans should include oral corticosteroids for red zone (enough doses for complete course)
 - Assure prescriptions sent
 - Assure medication picked up to have on-hand for future exacerbation
 - Assure caregiver knowledge on when to use
 - Assure caregiver knows to see primary care provider after initiating steroids (including to obtain refill)

Aim: To standardize management for children ≥ 2 years age with acute asthma exacerbation.

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