

Acute Asthma Exacerbation Pathway

Inclusion Criteria:

- Age 18 months – 18 years
- Acute asthma exacerbation

Exclusion Criteria:

- Airway issues (e.g. subglottic stenosis, tracheomalacia)
- Chronic lung disease (e.g. cystic fibrosis, restrictive lung disease)
- Congenital and acquired heart disease
- Immune disorders
- Sickle cell disease
- Medically complex children

Pediatric Acute Asthma Exacerbation Respiratory Score (RS)

	0 points	1 point	2 points	3 points
Respiratory Rate				
18 - 23 months	≤ 35	36 - 40	41 - 44	≥ 45
2 - 3 years	≤ 26	27 - 34	35 - 39	≥ 40
4 - 5 years	≤ 24	25 - 30	31 - 35	≥ 36
6 - 11 years	≤ 20	21 - 26	27 - 30	≥ 31
≥ 12 years	≤ 18	19 - 23	24 - 27	≥ 28
Retractions				
All ages	None	Subcostal or Intercostal	2 of the following: Subcostal, intercostal, substernal OR nasal flaring (infant)	3 of the following: Subcostal, intercostal, substernal, supraclavicular OR nasal flaring head bobbing (infant)
Dyspnea				
18 - 23 months	Normal feeding, vocalizations and activity	1 of the following: Difficulty feeding, decreased vocalization, or agitation	2 of the following: Difficulty feeding, decreased vocalization, or agitation	Stops feeding, no vocalization, drowsy and confused, grunting
2 – 3 years	Normal feeding, vocalizations and activity	1 of the following: Decreased appetite, increased coughing after play/activity, can lie down	2 of the following: Decreased appetite, increased coughing after play/activity, prefers sitting	Stops eating or drinking, stops playing OR drowsy and confused, sits upright (tripod position)
≥ 4 years	Counts to ≥ 10 in one breath or speaks in complete sentences	Counts to 7-9 in one breath, speaks in short sentences	Counts to 4-6 in one breath, speaks in partial sentences	Counts to ≤ 3 in one breath, speaks in single words
Auscultation				
All ages	Normal breathing, no wheezing present	End expiratory wheeze only	Expiratory wheeze only (greater than end expiratory wheeze)	Inspiratory and expiratory wheeze OR diminished breath sounds OR both

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Associated Order Set: General Medical Admission (Asthma Subset)

Associated Policies: None

Acute Asthma Exacerbation Pathway – ED Phase

Assess Respiratory Score (RS) at Triage

1st HOUR (ED)

RS 1-5

- **Albuterol** MDI 8 puffs
- **Dexamethasone** 0.6mg/kg (max 16mg) x1

RS 6-8

- **Albuterol** 20mg continuous neb x 1 hr
- **Ipratropium** 0.75mg continuous neb x 1 hr
- **Dexamethasone** 0.6mg/kg (max 16mg) x1

RS 9-12

- Same as RS 6-8, *plus*
- Place **LMX** in anticipation of placing PIV for IV magnesium

Reassess Respiratory Score (RS) at end of 1st hour

2nd HOUR (ED)

RS 1-4

- Discharge home if patient meets discharge criteria

RS 5-8

- If RS was < 8 at triage: **Albuterol** MDI 8 puffs
- If RS was ≥ 9 at triage: **Albuterol** 20mg continuous neb x 1 hr

RS 9-12

- **Albuterol** 20mg continuous neb x 1 hr
- **Magnesium Sulfate** 50mg/kg (max 2g) IV x1 for patients > 2 years
- **Ipratropium as per 1st hour ONLY IF not already given**

Reassess Respiratory Score (RS) at end of 2nd hour

3rd HOUR (ED)

RS 1-4

- Discharge home if patient meets discharge criteria

RS 5-8

- **Albuterol** MDI 8 puffs
- Admit to inpatient acute care

RS 9-12

- **Albuterol** 20mg continuous neb x 1 hr
- **Ipratropium and Magnesium as per 1st hour ONLY IF not already given**
- Admit to PICU at end of 3rd hour if RS remains greater than 10

ED Discharge Criteria

- Tolerating oral intake
- No supplemental oxygen
- PCP follow up planned in 1-2 days
- RS 1-4 for minimum 1 hour, minimum 2 hours if initial RS greater than 9
- MDI/spacer education complete

For patients awaiting transfer to inpatient in ED beyond 3rd hour, continue q1h assessments of respiratory score and asthma management as per inpatient pathway until admitted

Acute Asthma Exacerbation Pathway – Inpatient Phase

Albuterol Phase Progression by Respiratory Score (RS):

Upon inpatient admission, patients are either placed into phase 1 or phase 2 for their albuterol therapy, depending on their admission respiratory score (see below). With each respiratory score assessment (frequency differs by phase, see below), the patient may have their albuterol therapy weaned (RS 1-4), continued as is (RS 5-8), or increased (RS 9-12). Patients should receive a minimum of one treatment in phases 2 and 3, and two treatments in phase 4, prior to discharge.

Steroid Treatment

- ☐ Initiate **prednisone** or **prednisolone** **2mg/kg/day** for a total course of **5-10 days** depending on severity

Pulm. Consultation

- ☐ Consult **pediatric pulmonology*** for patients requiring PICU level of care, or for those patients already followed in their clinic

** Consultation requested by LPCH pulmonology service*

Discharge Instructions

- Continue albuterol MDI 4 puffs q4 hours until seen by outpatient provider
- Complete steroid course
- Follow up with outpatient provider in 24-48 hours
- Provider to create and review Asthma Action Plan with family prior to discharge
- Provider to evaluate if patient requires initiation OR dose modification of home inhaled steroids prior to discharge (see p4)

Albuterol Therapy - Phase 1:

- START HERE** on admission if **RS ≥ 9**
- Albuterol 20mg/h continuous neb**
- RS assessment minimum q2 hour
- RN/RT to notify provider if remains in phase 1 > 3 hours

Wean for RS 1-4 ↓↑ Step back for RS 9-12

Albuterol Therapy - Phase 2:

- START HERE** on admission if **RS ≤ 8**
- Albuterol MDI 8 puffs q2 hours**
- RS assessment q2 hours
- RN/RT to notify provider if remains in phase 2 > 8 hours

Wean for RS 1-4 ↓↑ Step back for RS 9-12

Albuterol Therapy - Phase 3:

- Albuterol MDI 8 puffs q4 hours
- RS assessment q4 hours
- RN/RT to notify provider if remains in phase 3 > 12 hours

Wean for RS 1-4 ↓↑ Step back for RS 9-12

Albuterol Therapy - Phase 4:

- Albuterol MDI 4 puffs q4 hours
- RS assessment q4 hours

Discharge Criteria:

- Observed for minimum two treatments in Phase 4 + RS ≤ 4
- Tolerating oral intake
- No supplemental oxygen
- Follow up established in 24-48 hours
- Family able to administer inhaler + spacer with correct technique (RT to teach and evaluate)

Albuterol Nebulizer (0.5% solution)	Albuterol MDI (90mcg/ puff)
2.5 mg	4 puffs
5 mg	8 puffs

Albuterol metered dose inhalers (MDIs) are as effective as nebulizer (neb) treatments, and are more portable and cost effective. However if patient not participating with MDI treatments (e.g. during sleep) OK to substitute with neb per conversion above.

Consider Rapid Response Team IF:

- Symptoms severe or worsening (RS ≥ 11)
- FiO₂ > 50% required to maintain SpO₂ > 90%
- Lack of progression in phase 1 or 2
- Signs of clinical deterioration ↓

Signs of Clinical Deterioration

- Drowsiness
- Confusion
- Silent chest exam
- Hypercapnia
- Rapid increase in O₂ requirement

PEC Considerations

Consider transfer to PICU if not improving after 2-3 hours continuous albuterol and RS ≥ 9



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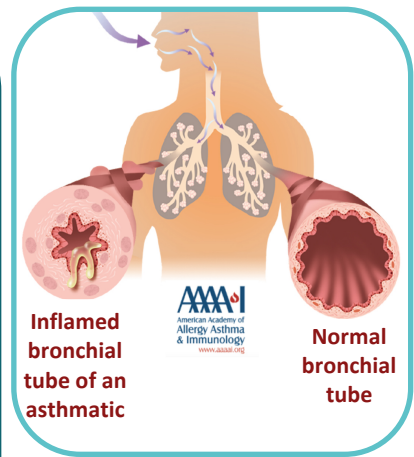
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Asthma Definition: a common chronic disease of children, characterized by airway inflammation, edema, mucous production and smooth muscle constriction in response to a trigger (infection, environmental allergen or irritant, exercise, weather changes, stress)

Asthma Diagnosis: is suggested when a patient has a history of intermittent or chronic cough, dyspnea, and wheeze on auscultation. Exclusion of alternate diagnoses, and reversible airway obstruction on spirometry following bronchodilator therapy confirms the diagnosis.

Wheeze Differential:

- Bronchiolitis
- Foreign body aspiration
- Croup
- Anaphylaxis
- Airway compression (*cysts, tumors, LAD, cardiomegaly, vascular rings*)
- Gastroesophageal reflux
- Recurrent aspiration
- Chronic lung disease (*cystic fibrosis, primary ciliary dyskinesia, BPD, bronchiolitis obliterans, interstitial lung disease*)
- Pulmonary edema
- Left sided heart failure
- Vocal cord dysfunction



Classifying Asthma Severity and Initiating Maintenance Therapy

(Table borrowed, with slight modifications, from the NHLBI Asthma Care Quick Reference Guide - 2012)

	Intermittent			Mild Persistent			Moderate Persistent			Severe Persistent		
	Ages 0-4 years	Ages 5-11 years	Ages ≥ 12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥ 12 years	Ages 0-4 y	Ages 5-11 y	Ages ≥ 12 y	Ages 0-4 y	Ages 5-11 y	Ages ≥ 12 y
Asthma symptoms	≤ 2 days/week			≥ 2 days/week but not daily			Daily			Throughout the day		
Nighttime awakenings	0	≤ 2x /month		1-2/ mo	3-4x /month		3-4x/ month	>1x/week but not nightly		> 1x/ week	Often 7x/week	
SABA use (exclude use for EIB prevention)	≤ 2x/week			3 - 6x /wk	3 – 6x/ week and not > 1x on any day		Daily			Several times per day		
Interference with normal activity	None			Minor limitation			Some limitation			Extremely limited		
Exacerbations requiring systemic corticosteroids	0-1x/year			≥ 2x in 6 months OR wheeze ≥ 4x/ year		≥ 2x/ year	<div>Generally, more frequent and intense events indicate greater severity</div>					
Recommended Step for Initiating Therapy*	STEP 1: Inhaled short acting beta agonist (SABA) as needed			*STEP 2: Low-dose inhaled corticosteroids (ICS) + SABA as needed		*STEP 3: Medium dose ICS						
							Consider referral to an asthma specialist.					
	*For children already on asthma maintenance therapy please refer to NHLBI Asthma Care Reference, page 6 - 7 (click here) for recommendations on stepping up therapy for children with poor control											
	In 2-6 weeks, depending on severity, assess level of asthma control achieved and adjust therapy as needed. For children 0 – 4 years old, if no clear benefit is observed in 4-6 weeks, consider adjusting therapy or alternate diagnosis.											

References:

1. Link, H. W. "Pediatric Asthma in a Nutshell." *Pediatrics in Review*, vol. 35, no. 7, July 2014, pp. 287-98.
2. National Heart, Lung, and Blood Institute. *Asthma Care Quick Reference*. U.S. Department of Health and Human Services, Sept. 2012.
3. Sawicki, Gregory, and Kenan Haver. "Asthma in Children Younger than 12 Years: Initial Evaluation and Diagnosis." *Uptodate.com*, 16 Nov. 2018.
4. Seattle Children's Hospital, Atkins R, Ken L, Beardsley E, Drummond K, Foti J, Klee K, Mitgita R. 2015 July. *Asthma Pathway*. Available from: <http://www.seattlechildrens.org/pdf/asthma-pathway.pdf>

Asthma Resources:

1. [How to use a spacer + mask video](#)
2. [How to use a spacer + mouthpiece video](#)
3. [NHLBI Quick Asthma Care Reference Guide](#)

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