Asthma Exacerbation

New asthma diagnosis

Inpatient

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Center for Clinical Excellence

Are history and exam suggestive of asthma exacerbation?

- No → Differential Diagnoses Off Pathway

Yes

Is patient already on asthma controller treatment?

- Yes → Go To Previously Diagnosed algorithm

No

Asthma diagnosis based on clinical criteria?

- No → Differential Diagnoses Off Pathway

Diagnostic aid: Asthma Predictive Index (API)

Yes

- **Order set:** "IP Asthma Clinical Pathway (Admission, Transfer from ICU, Escalation)"
- If **PICU transfer**: Use transfer navigator to discontinue PICU orders.
- Dexamethasone 24-48hrs after previous dose or at discharge ***or*** Prednisone/Prednisolone

Monitoring, symptom scoring and treatments per Weaning & Escalation algorithm

Are there inadequately treated comorbidities?

- Yes → Optimize treatment of comorbidities

No

Are there Modifiable Risk Factors?

- Yes →
  - Targeted asthma education to reduce risk
  - Consider SW consult

No

Modifiable Risk Factors includes:

- Medication self-management barriers
- Asthma triggers and avoidance techniques

Discharge Planning

Classify Asthma Severity

Click here to view the full Partners For Kids Outpatient Asthma Pathway, including medication Mediglyphs and education resources

Select Discharge Medication based on severity

Complete Asthma Action Plan

Discharge when meeting criteria:

- **Albuterol not needed for 4 hours**
- **ACS score of ≤ 2 and pulse ox. >90% in RA**
- **Asthma education and discharge planning has been completed**
- **Follow up has been scheduled or arranged**

Asthma Exacerbation

Previous asthma diagnosis

Inpatient

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Are history and exam suggestive of asthma exacerbation?

- No → Differential Diagnoses Off Pathway

Yes

Is patient already on asthma controller treatment?

- No → Go To New Diagnosis algorithm

Yes

- **Order set:** "IP Asthma Clinical Pathway (Admission, Transfer from ICU, Escalation)"
- If **PICU transfer**: Use transfer navigator to discontinue PICU orders
- Dexamethasone 24-48hrs after previous dose or at discharge ***or*** Prednisone/Prednisolone

Monitoring, symptom scoring and treatments per Weaning & Escalation algorithm

Are there inadequately treated Comorbidities?

- Yes → Optimize treatment of comorbidities

No

Modifiable Risk Factors include:

- Medication self-management barriers
- Asthma triggers and avoidance techniques

Are there Modifiable Risk Factors?

- Yes →
  - Targeted asthma education to reduce risk
  - Consider SW consult

No

Discharge Planning

Step-Up Discharge Therapy due to hospitalization (i.e. very poorly controlled asthma)

Consider Step-Up Discharge Therapy due to hospitalization (i.e. very poorly controlled asthma)

Complete Asthma Action Plan

Click here to view the full Partners For Kids Outpatient Asthma Pathway, including medication Mediglyphs and education resources

Discharge when meeting criteria:

- **Albuterol not needed for 4 hours**
- **ACS score of ≤ 2 and pulse ox. >90% in RA**
- **Asthma education and discharge planning has been completed**
- **Follow up has been arranged**

Asthma Exacerbation

Weaning & Escalation

Inpatient

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Center for Clinical Excellence

Admission of Transfer to floor unit on Asthma Clinical Pathway

- **Order set:** "IP Asthma Clinical Pathway (Admission, Transfer, Escalation)"
- If PICU transfer, use transfer navigator to discontinue PICU orders

PICU to floor transfer when:

- Weaned to albuterol Q2H

or

- Meeting criteria for **floor continuous albuterol**

- Administer **Dexamethasone** 24-48hrs after previous dose or at discharge ***or*** **Prednisone/Prednisolone** Q24H
- Supplemental oxygen to achieve pulse ox. >90%. Wean O_2 for saturation >90%

H8A and Hospital Pediatric or Pulmonary Floor Continuous Albuterol Protocol
(Level 3 care)
Transfer to H8A if in PICU on other floor unit

Go to **PICU Algorithm**

Monitoring

- Spot checks when on RA. Continuous pulse ox. if saturations < 90% or if receiving supplemental oxygen
- Cardiac and continuous pulse oximetry monitoring if starting albuterol burst

Yes **No**

ACT approval for **floor continuous albuterol ?**
(Level 3 care)

Albuterol Weaning

Asthma Clinical Score (ACS)

- Obtain ACS on admission then:
  - Q1H if ACS≥5
  - Q2H if ACS≤4 and extend frequency by 1 hr if ACS 0-1 until Q4H.

Albuterol Frequency

- Albuterol MDI 4 (<15kg) or 8 (≥15kg) puffs (or aerosol) Q2H and wean to Q4H for ACS 0-1 and in RA **(Level 1 care)**
- Albuterol Q1H burst (10mg/hr, max x 2) for ACS ≥5. **Notify physician** for IV placement and escalation orders **(Level 2 care)**
- **Notify physician** if Albuterol Q2H for ≥12 hours and unable to wean

Consider ACT if:

- ACS ≥ 5 after albuterol burst x 2 and magnesium sulfate x 1 ***or*** as indicated by clinical assessment

Level 2 care: Escalation (ACS ≥ 5)

- Use Order set: "Asthma Pathway (Admission, Transfer from ICU, Escalation)"
- Place IV. NPO and IV fluids or PO as tolerated
- IV magnesium sulfate: 50mg/kg over 20min (Max. 2 gram & 1 dose). Only give as **addition** to albuterol burst
- Methylprednisolone 1mg/kg (max dose: 30mg) IV Q12H

Asthma Education

- Provide AAP and ongoing education (New diagnosis or Existing diagnosis with poor control) throughout hospitalization
- Assess and address **modifiable risk factors**

Modifiable Risk Factors includes:

- Medication self-management barriers
- Asthma triggers and avoidance techniques

Notify physician when:

- Albuterol frequency is changed to every 4 hours
- Asthma education has been completed

Asthma Exacerbation

PICU

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- Order set: **"IP PICU Status Asthmaticus Clinical Pathway Admission"**
- Assess ACS on admission, then Q2H by RT.
- Administer oxygen to maintain SpO2 ≥ 90%
- **Diagnostic testing and monitoring per protocol**

STOP
If severe decompensation at anytime, consider initiating more rapid ESCALATION and/or intubation sooner. Notify fellow/attending of deterioration.

Severe Distress
ACS ≥8

- Initiation of treatment and transitions between treatment by fellow or attending based on ACS and clinical judgement

- Consider inhaled anesthetics and/or ECMO consult if ACS score > 9 and pH <7.10 or PCO2 > 100 for > 2 hours, despite optimized mechanical ventilation

ACS Score ≥8 or not improving

- Mechanical ventilation
- Terbutaline and assess for intolerance (chest pain or ST changes)

ACS Score ≥8 or not improving

- Intubation considerations:
- - Refractory hypoxemia <90%
- - Mental status changes
- - Severe refractory hypercarbia
- - pH < 7.25

ACS Score ≥8 or not improving

- Trial aminophylline bolus and start infusion if bolus was efficacious. Goal level: 10-15mg/L
- Order level post-bolus and then Q12H.

ACS Score ≥8 or not improving

Trial Ketamine bolus, 0.5 mg/kg IV (max dose 100 mg) over 3 minutes, and start infusion if bolus was efficacious.

ACS Score ≥8

ACS < 4 x 2

De-Escalation

- Discontinue interventions q2h if ACS remains ≤ 4.
- De-escalate by discontinue most recently added intervention first or based on side effects
- If, during de-escalation, ACS increases to >4, go back to previous step and reassess Q1-2H

Moderate Distress, ACS=5

- Continuous SpO2
- NPO and IVFs
- Continuous albuterol
- Methylprednisolone IV Q6H
- Magnesium bolus Q4H prn
- Ipratropium Bromide if < 24 hrs of admission

Mild Distress, ACS ≤ 4

Albuterol MDI 4 or 8 puffs **Q2H** and Q1H PRN

- Steroid po Q24H for tot of 3 -10 days

Transfer to Floor when:

- Albuterol Q2H

or

- Improving and stable on continuous albuterol and meeting criteria for **H8A and Hospital Pediatric or Pulmonary Floor Continuous Albuterol protocol**
- FiO2 < 40%
- Off magnesium infusion ≥ 4 hrs
- Off BIPAP/CPAP/HFNC ≥ 4 hrs

Moderate Distress with Incomplete Response
ACS=6-7

- MD/NP re-assessment
- HFNC or BIPAP/CPAP
- Heliox 80/20 or 70/30 if FiO_2 needs are less than 30%
- Magnesium infusion if bolus was efficacious. Order Mg^{2+} levels Q4H (goal level=4-5 mg/dL)

Inclusion & Exclusion Criteria

Inclusion Criteria

- Patient ≥1 year of age with acute exacerbation of known asthma or with a presentation for which asthma is the most likely diagnosis

Exclusion Criteria

- Patients with another primary diagnosis including pneumonia, bronchiolitis, or croup
- Patient with a chronic lung disease other than asthma including cystic fibrosis, restrictive lung disease or bronchopulmonary dysplasia
- Patients diagnosed with congenital or acquired heart disease
- Patients requiring chronic invasive or non-invasive airway support
- Immunocompromised patients
- Patients diagnosed with sickle cell anemia

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

Asthma Exacerbation
Symptoms & Physical Exam

Symptoms

- Acute or subacute decrease in expiratory airflow, presenting as progressively worsening:
  - shortness of breath
  - cough
  - wheezing
  - chest tightness
  - sputum production

  or some combination of these symptoms

Physical Exam

- **Upper respiratory tract:**
  - increased nasal secretion, mucosal swelling, and/or nasal polyp

- **Chest**
  - wheezing during normal breathing or prolonged phase of forced exhalation
  - Hyper-expansion of the thorax
  - use of accessory muscles
  - appearance of hunched shoulders, chest deformity

- **Skin**
  - atopic dermatitis
  - eczema

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to Weaning & Escalation Algorithm | Return to PICU Algorithm

Asthma Clinical Score (ACS)

Scoring Key (Maximum score is "13")	**0**	**1**	**2**	**3**	**4**
Tachypnea *(see reference)*	No	Yes			
O2 Requirement to keep SaO2 ≥ 92%	RA	≤2 liters/31%	>2liters/31% ≤ 4liters/50%	> 4 liters/50%	
Wheezing	None	End expiratory or scattered wheeze	Expiratory wheeze throughout	Inspiratory and expiratory wheeze	"Silent chest" (no air movement)
Air Movement	Normal/Good	Fair	Tight	Silent	
Retractions *(see reference)*	None	One type of retraction	Two or more types of retractions		

Asthma Exacerbation Severity

- Mild Respiratory distress (ACS ≤ 4)
- Moderate Respiratory distress (ACS 5 – 9)
- Severe Respiratory distress (ACS ≥ 10)

Return to New Diagnosis Algorithm

Return to Previously Diagnosed Algorithm

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Diagnosis Clinical Criteria

To establish a diagnosis of asthma, the following should be determined:

- **Episodic symptoms** of airflow obstruction or airway hyper-responsiveness are present.
- Airflow obstruction is at least partially **reversible.**
- Alternative diagnoses are excluded.

- **Asthma Predictive Index (API and mAPI):**
  - **Major criteria**: Parental history of asthma, MD diagnosed eczema, aeroallergen sensitization
  - **Minor criteria:** wheezing without colds, food allergy (egg/peanut/milk) or eosinophilia

History

- Frequency of early wheeze (≤3yrs) is the most important predictor of asthma (at school age)
- Symptoms worse at night
- Symptoms triggered by exercise, viral infection, animals with fur, house-dust mites (in mattresses, pillows, upholstered furniture, carpets), mold, smoke (tobacco, wood),pollen, changes in weather, strong emotional expression (laughing or crying hard), airborne chemicals or dusts, menstrual cycles

Physical Exam

- Lung exam with airflow obstruction, commonly expiratory wheezing
- Signs of atopy including eczema

Spirometry

- To demonstrate obstruction and assess reversibility (5 years of age or older).

(EPR–2 1997 and EPR-3 2008)

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to Weaning & Escalation Algorithm | Return to PICU Algorithm

New Diagnosis - Asthma Predictive Index (API)

How to use:

- Clinicians may be more aggressive with **trials of asthma medications** in patients who are likely to be diagnosed with asthma later in life.

- The **Asthma Predictive Index (API)** provides a method for predicting likelihood of a later diagnosis of asthma.
- Applies to children ≤ 3 years old

- **Modified Asthma Predictive Index (mAPI)** applies to children ≤ 3 years with 4 or more wheezing episodes

Return to Diagnosis Clinical Criteria

Return to New Diagnosis Algorithm

Differential Diagnoses

Acute:
- Bronchiolitis
- Pneumonia
- Foreign body

Chronic:
- Vocal cord dysfunction
- Anatomic anomalies such as: vascular rings, laryngeal web
- Laryngotracheomalacia
- Cystic fibrosis
- Aspiration

Upper airway disease
- Allergic rhinitis and sinusitis

Obstruction involving large airways
- Foreign body in trachea or bronchus
- Vocal cord dysfunction
- Vascular ring or laryngeal web
- Laryngotracheomalacia, tracheal stenosis, or bronchostenosis
- Enlarged lymph nodes or tumor

Obstruction involving small airways
- Viral bronchiolitis or obliterative bronchiolitis
- Cystic fibrosis
- Bronchopulmonary dysplasia
- Heart disease

Other Causes
- Recurrent cough not due to asthma
- Aspiration from swallowing mechanism dysfunction or gastroesophageal reflux

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to PICU Algorithm

Oral Corticosteroids

Drug	Strength	Dose, Frequency and Duration*	Maximum Daily Dose	Clinical Considerations
Dexamethasone	Tablets:0.5mg, 0.75mg, 1mg, 1.5mg, 2mg, 4mg, 6mg	0.6 mg/kg Once, then repeat in 24-48 hrs	16 mg/day	Tablets can be crushed and mixed in liquid/ semisolid foods
	Oral Liquid: **IV for oral use:** 1mg/mL, 4mg/mL, 10mg/mL **Elixir/oral** solution: 0.5mg/mL, 1mg/mL			IV for oral is product used at NCH Most Commercial products contain alcohol
	IV/IM: 4mg/ml, 10mg/mL			
Orapred® Prednisone	Liquid: 15mg/5mL	2 mg/kg **Daily** for 5 days	60 mg/day	Take with food Solution does NOT contain alcohol
	ODT: 10mg, 15mg, 30mg			
	Tablet: 5mg			
Delatasone® Prednisone	Liquid: 5mg/mL	2 mg/kg **Daily** for 5 days	60 mg/day	Take with food Solution contains alcohol (5%)
	Tablets: 1mg, 2.5mg, 5mg, 10mg, 20mg, 50mg			

* Duration of 5 days is average and typical duration. Treatment may be shorter or longer depending on patient. Range 3-10 days of treatment. Do not need to taper due to short course.

[Return to New Diagnosis Algorithm] [Return to Previously Diagnosed Algorithm] [Return to Weaning & Escalation Algorithm] [Return to PICU Algorithm]

New Diagnosis - Asthma Severity

Classification of Asthma Severity: Clinical Features before Treatment (*Modeled after NHLBI Guidelines*)				
	Intermittent	**Mild Persistent**	**Moderate Persistent**	**Severe Persistent**
Daytime symptoms	≤ 2 days/week	> 2 days/week	Daily	Throughout the day
Nighttime symptoms*	≤ 2 times/month	3 – 4 times/month	> 1 time/week	Nightly
Rescue inhaler use	≤ 2 days/week	> 2 days/week	Daily	Several times a day
Exercise or Physical Activity Limitation	None	Minor	Some	Extremely
FEV1	>80%	>80%	60 – 80%	<60%
FEV1/FVC	>85%	>80%	75 – 80%	<75%
"Risk"	0 – 1 oral steroids/year	> 2 oral steroids per year (*can be any persistent severity*)		

*Frequency of nighttime symptoms for **0-4 year olds** are classified differently compared to older patients:
Intermittent: 0/month I Mild Persistent: 1-2/month I Moderate Persistent: 3-4/month I Severe Persistent: >1x/week

Return to New Diagnosis Algorithm

Modifiable Risk Factors

Medication self-management barriers

- Poor controller adherence
- Lack of understanding of inhaler technique
- Poor understanding of asthma action plan
- Unable to access medication at the pharmacy
- Unable to obtain spacer

Asthma triggers

- Seasonal/environmental allergens
- Tobacco smoke (including vaping, second or third hand exposure)
- Mold
- Cockroaches
- Rodents
- Chemical exposures (e.g. incense)

Consider referral to asthma express

Consider referral to school based asthma therapy (SBAT)

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to Weaning & Escalation Algorithm | Return to PICU Algorithm

Tobacco Smoke

Smoking makes asthma worse!

- Studies show caregivers are more likely to make a change if tobacco cessation counseling occurs during an inpatient hospitalization
- Document smoke exposure for all patients with asthma
- Provide the phone number for the Ohio Tobacco Quit Line in the AVS where parents can receive additional counseling and nicotine replacement therapy

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

Asthma Comorbidities

Allergic Bronchopulmonary Aspergillosis
- Consider Pulmonary consult or referral

Allergic Conditions (ex Allergic rhinitis)
- Consider referral to Allergy

Gastroesophageal reflux
- Consider PPI
- Consider GI or Pulmonary referral

Obesity
- Consider nutrition consult
- Consider referral to Healthy Weight & Nutrition Clinic

Obstructive Sleep Apnea
- Consider ENT referral

Rhinitis/sinusitis
- Consider nasal steroid
- Consider ENT referral

Chronic stress/depression
- Consider SW or psychiatry consult
- Consider referral to outpatient BH resources and follow up

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to PICU Algorithm

Testing

- Laboratory studies are not recommended in patients with an uncomplicated asthma exacerbation

- Chest x ray is not recommended in patients with an uncomplicated asthma exacerbation

EPR-3 2008)

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

PICU
Testing & Monitoring

Monitoring:
- Continuous pulse oximetry, cardiac monitoring
- Oxygen to maintain SpO2 > 92%

Diet:
- NPO and IVFs, Strict I/O, Bedrest

Labs:
- ABG, BMP, Mg level, lactate. Troponin if chest pain.
- Order gases Q1H until pH > 7.25

Imaging:
- Order CXR qam and prn if clinical change concerning for pneumothorax

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

Recommended Treatments

- **Oxygen** (by nasal cannula or mask, whichever is best tolerated) to maintain an SaO2 >90 percent.

- **SABA** treatment is recommended for all patients. In the ED, three treatments of SABA spaced every 20–30 minutes can be given safely as initial therapy. Thereafter, the frequency of administration varies according to the improvement in airflow obstruction and associated symptoms and the occurrence of side effects. Continuous administration of SABA may be more effective in more severely obstructed patients. Continuous albuterol can be given as a 1 hr albuterol (15mg if >15kg, 10mg if <15kg) Burst in the ED or on the Med/Surg floor, followed by reassessment and repeat ACS scoring. In mild or moderate exacerbations, equivalent bronchodilation can be achieved either by high doses (4–12 puffs) of a SABA by MDI and spacer in infants, children, and adults under the supervision of trained personnel or by nebulizer therapy. However, nebulizer therapy may be preferred for patients who are unable to cooperate effectively in using an MDI because of their age, agitation, or severity of the exacerbation.

- **Systemic corticosteroids** are recommended for most patients.
  In the hospital: Give Prednisone/prednisolone 2 mg/kg PO qday, (Max: 60 mg) for 5 days. There is no known advantage for higher doses of corticosteroids in severe asthma exacerbations, nor is there any advantage for intravenous administration over oral therapy provided gastrointestinal transit time or absorption is not impaired. The total course of systemic corticosteroids for an asthma exacerbation requiring an ED visit or hospitalization may last from 3 to 10 days. For corticosteroid courses of less than 1 week, there is no need to taper the dose. For slightly longer courses (e.g., up to 10 days), there probably is no need to taper, especially if patients are concurrently taking ICSs.

  Dexamethasone 0.6mg/kg PO, (Max: 16mg) x 2 doses have equivalent efficacy to prednisone/ prednisolone in children hospitalized with asthma.

- **Magnesium sulfate iv**
  Give magnesium sulfate 2 grams in adults and 25–75 mg/kg x 1 (max: 2 grams) IV to children with a moderate or severe asthma exacerbation not adequately responding to albuterol and a systemic steroid. Studies of both children and adults show magnesium sulfate IV added to conventional therapy is safe, reduces symptoms and hospital admission rates. The efficacy of iv magnesium sulfate in asthma has not been studied in children <2 years of age and the number of children <2 year with wheezing in the safety study is very low.

- **Heliox**

  Consider heliox-driven albuterol nebulization for patients who have life-threatening exacerbations and for those patients whose exacerbations remain in the severe category after 1 hour of intensive conventional therapy.

  EPR-3 Guideline.

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

Treatments Not Recommended

- **Ipratropium bromide**
  In the hospital: not recommended. Two controlled clinical trials failed to detect a significant benefit from the addition of ipratropium to treatment after hospitalization for severe acute asthma.

- **Antibiotics** are not generally recommended for the treatment of acute asthma exacerbations except as needed for comorbid conditions. Bacterial, *Chlamydia* or *Mycoplasma* infections infrequently contribute to exacerbations of asthma therefore, the use of antibiotics is generally reserved for patients who have fever and purulent sputum and for patients who have evidence of pneumonia. When the presence of bacterial sinusitis is strongly suspected, treat with antibiotics.

- **Aggressive hydration** is not recommended for older children and adults but may be indicated for some infants and young children with increased respiratory rate and decreased oral intake. In these patients, clinicians should make an assessment of fluid status (urine output, urine specific gravity, mucus membrane moisture, electrolytes) and provide appropriate corrections. Oral routes of hydration are preferable except in very severe exacerbations with the possibility of endotracheal intubation.

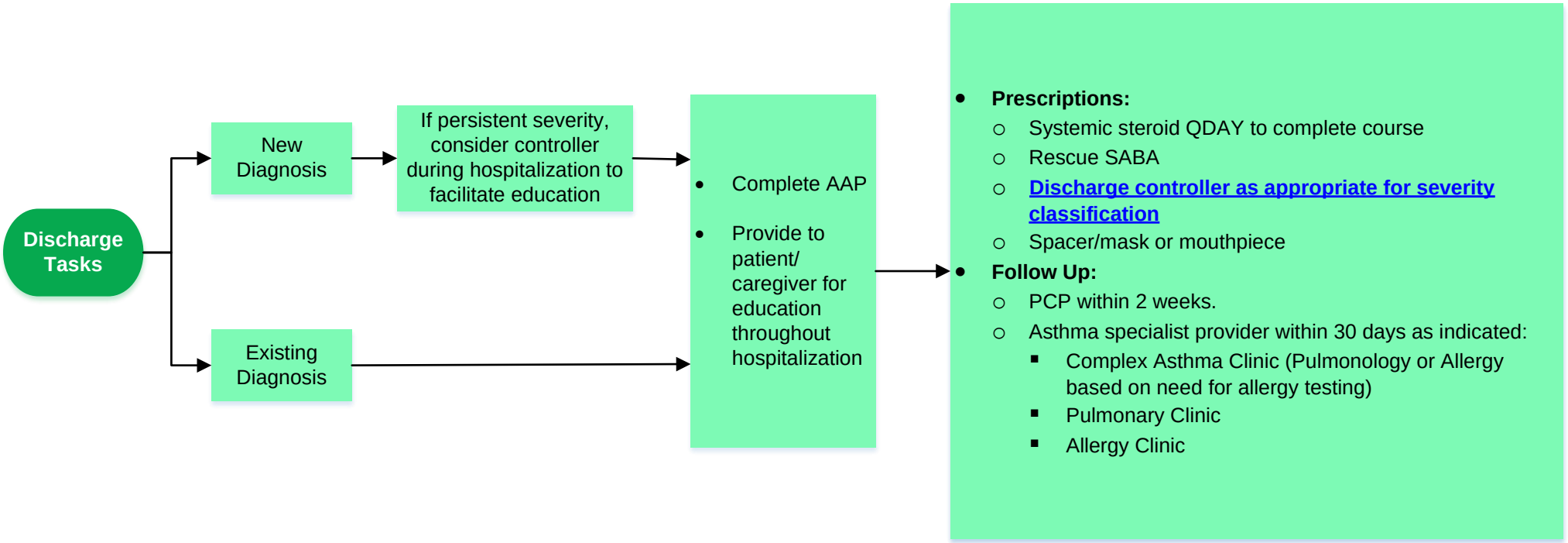
- **Chest physical therapy** is not generally recommended. For most exacerbations, chest physiotherapy is not beneficial and is unnecessarily stressful for the breathless asthma patient. Because mucus plugging is a major contributing cause of fatal asthma further studies are needed on the role of improved airway clearance in near-fatal exacerbations.

- **Mucolytics** are not recommended because they may worsen cough or airflow obstruction.

EPR-3 Guideline

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

Discharge Planning



Patient`s Home

Discharge —Yes→ **SABA 2-4 puffs Q4H for 24-48hrs based on exacerbation severity, then home management per Asthma Action Plan**

Return to New Diagnosis Algorithm

Return to Previously Diagnosed Algorithm

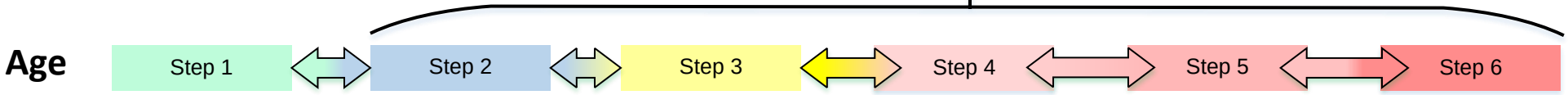
Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Discharge Medication Options

Click here to view the full **Partners For Kids Outpatient Asthma Pathway,** including medication Mediglyphs and education resources

For Step 2-6 only daily controller medications are shown. As needed albuterol should also be prescribed for these patients if not using ICS-Formoterol as **SMART**.



	Intermittent	Mild Persistent	Moderate Persistent	Severe Persistent		
Age: 0-4	SABA PRN and short course daily ICS at start of RTI	Low dose ICS	Medium dose ICS	Medium dose ICS-LABA	High dose ICS-LABA	High dose ICS-LABA + OCS
Age: 5-11	SABA PRN	Low dose ICS	Low dose ICS-formoterol #	Medium dose ICS-formoterol #	High dose ICS-LABA	High dose ICS-LABA + OCS
Age: 12+	SABA PRN	Low-dose ICS daily or PRN	Low dose ICS-formoterol	Medium dose ICS-formoterol	Medium or High dose ICS-LABA + LAMA	High dose ICS-LABA + OCS

Choosing the correct discharge controller:

- **New Asthma Dx**: Select controller based on **Asthma Severity** → select box above to see dosing
- **Previous Asthma Dx**: Review pre-hospitalization controller dosing → **step-up** → select box above to see dosing

4 year old's can also be treated with this approach

For alternative treatment options click here to view 2020 NHLBI guidelines.

Return to New Diagnosis Algorithm

Return to Previously Diagnosed Algorithm

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Short-Acting Beta-2 Agonists (SABA)

BOLD = Preferred, no PA required for Medicaid patients

Mechanism of delivery	Drug	Strength	Dose and Frequency	Cost
Metered-dose Inhalers (MDI) • Shake before use • Needs primed • Use with spacer	**Ventolin®, Proventil®**, Proair® Albuterol HFA	90 mcg	2-4 puffs as needed Every 4 hours	$76
Nebulizer Solution • Passive inhalation via nebulizer • Requires nebulizer device	**AccuNeb®** **Albuterol solution**	2.5 mg/3 mL (0.083%)	1 vial as needed Every 4 hours	$17

Intermittent Inhaled Corticosteroids (ICS)

Mechanism of delivery	Drug	Strength	Dose and Frequency	Cost
Nebulizer Solution • Passive inhalation via nebulizer • Requires nebulizer device	**Pulmicort® Respules** Budesonide	1 mg/2mL solution	1 mg (1 ampule) BID for 7 to 10 days at first sign of respiratory illness	$106
Metered-dose Inhalers (MDI) • Shake before use • Needs primed • Use with spacer	**Flovent® HFA*** Fluticasone propionate	110 mcg	2 puffs BID for 7 to 10 days at first sign of respiratory illness	$351

*Flovent HFA dosing is the expert opinion of Nationwide Children's Hospital and is not described in the NHLBI guidelines

[Return to Discharge Medication Options]

[Return to New Asthma Dx Algorithm]

[Return to Existing Asthma Dx Algorithm]

[Return to PICU Algorithm]

Inhaled Corticosteroids (ICS) – Low and Medium Dose

BOLD = Preferred, no PA required for Medicaid patients

Inhaler Mechanism	Drug	Age (years)	Low Dose Inhaler Strength	Dose and Frequency	Medium Dose Inhaler Strength	Dose and Frequency	Cost per Inhaler
Metered-dose Inhalers (MDI) • Aerosolized inhalation that is pushed to activate • Shake before use • Needs primed • Spacer compatible	**Flovent® HFA** **Fluticasone propionate**	0-4	44 mcg	2 puffs BID	110 mcg	1 puff BID	$351
		5-11					
		≥ 12	44 mcg	2 puffs BID	110 mcg	2 puffs BID	
	Asmanex® HFA Mometasone furoate	0-4	NA	NA	NA	NA	$250
		5-11	NA	NA	50 mcg	1 puff BID	
		≥ 12	100 mcg	1 puff BID	100 mcg	2 puffs BID	
Dry Powder Inhalers (DPI) • Breath-actuated • Spacer Incompatible	**Asmanex® Twisthaler®** **Mometasone furoate**	≥ 12*	110 mcg	2 inhalations Daily	220 mcg	2 inhalations Daily	$238
	Pulmicort® Flexhaler® **Budesonide**	≥ 12*	90 mcg	2 inhalations BID	180 mcg	2 inhalations BID	$269
	Qvar® Redihaler® Beclomethasone	≥ 12*	40 mcg	2 inhalations BID	80 mcg	2 inhalations BID	$260
	Arnuity® Elipta® Fluticasone furoate	≥ 12*	100 mcg	1 inhalation Daily	100 mcg	1 inhalation Daily	$220
Nebulizer Solution • Passive inhalation via nebulizer • Requires nebulizer device	**Pulmicort® Respules** **Budesonide**	≤ 6	0.25 mg/2mL solution	2 ampules Daily	0.5 mg/2mL solution	2 ampules Daily	$106

For patients ages 5 and older, the medium and low doses are suggestions based on the 2020 GINA guidelines. For patients ages 0-4, the NHLBI EPR3 2007 guidelines were referenced. These doses are based on available studies and product information, and are not steroid equivalencies. NA: There is not sufficient evidence to recommend a dose for this age and medication

*DPIs may also be used in patients < 12 with shared decision-making. A younger patient may have the inspiratory capacity and coordination to use a DPI, but an MDI with mask and spacer is the optimal delivery method for patients < 12.

Global Initiative for Asthma. Global Strategy for Asthma Management and. Prevention, 2020. Available from: www.ginasthma.org

Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. [Bethesda, Md.]: U.S. Dept. of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute, 2007. National Heart, Lung, and Blood Institute.

Return to Discharge Medication Options

Return to New Asthma Dx Algorithm

Return to Existing Asthma Dx Algorithm

Return to PICU Algorithm

ICS + Long-Acting Beta Agonist (LABA) – Low and Medium Dose

BOLD = Preferred, no PA required for Medicaid patients

Inhaler Mechanism	Drug	Age (years)	Low Dose Inhaler Strength	Medium Dose Inhaler Strength	Dose and Frequency	Cost per Inhaler
Metered-dose Inhalers (MDI) • Aerosolized inhalation that is pushed to activate • Shake before use • Needs primed • Spacer compatible	**Symbicort® HFA** **Budesonide / formoterol**	0-4*	80-4.5 mcg	160-4.5 mcg	1-2 puffs BID	$359
		5-11	80-4.5 mcg	160-4.5 mcg	2 puffs BID	
		≥ 12	80-4.5 mcg	160-4.5 mcg		
	Dulera® HFA **Mometasone / formoterol**	0-4*	50-5 mcg	50-5 mcg	1-2 puffs BID	$374
		5-11				
		≥ 12	100-5 mcg	100-5 mcg		
	Advair® HFA **Fluticasone/ salmeterol**	0-4*	45-21 mcg	115-21 mcg	1-2 puffs BID	$327
		5-11				
		≥ 12	45-21 mcg	115-21 mcg	2 puffs BID	
Dry Powder Inhalers (DPI) • Breath-actuated • Spacer Incompatible	**Advair® Diskus®** **Fluticasone / salmeterol**	≥ 12`	100-50 mcg	250-50 mcg	1 inhalation BID	$182
	Airduo® Respiclick® Fluticasone / salmeterol	≥ 12	55-14 mcg	113-14 mcg	1 inhalation BID	$120

*Dosages for products used in these age groups are not referenced in clinical guidelines and there are limited studies available. The suggested reference doses provided are the expert opinion of clinicians at Nationwide Children's Hospital.

For patients ages 5 and older, the medium and low doses are suggestions based on the 2020 GINA guidelines or Lexicomp® reference doses. These doses are based on available studies and product information, and are not steroid equivalencies.

Global Initiative for Asthma. Global Strategy for Asthma Management and. Prevention, 2020. Available from: www.ginasthma.org

Return to Discharge Medication Options

Return to New Asthma Dx Algorithm

Return to Existing Asthma Dx Algorithm

Return to PICU Algorithm

ICS + Long-Acting Beta Agonist (LABA) – High Dose

BOLD = Preferred, no PA required for Medicaid patients

Inhaler Mechanism	Drug	High Dose Inhaler Strength	Dose and Frequency	Cost per Inhaler
Metered-dose Inhalers (MDI) • Aerosolized inhalation that is pushed to activate • Shake before use • Needs primed • **Use with spacer**	**Dulera® HFA** **Mometasone / formoterol**	200-5 mcg	2 puffs BID	$374
	Advair® HFA **Fluticasone/ salmeterol**	230-21 mcg	2 puffs BID	$327
Dry Powder Inhalers (DPI) • Breath-actuated • Spacer Incompatible	**Advair® Diskus®** **Fluticasone / salmeterol**	500-50 mcg	1 inhalation BID	$182
	Airduo® Respiclick® Fluticasone / salmeterol	232-14 mcg	1 inhalation BID	$120

Ages are not specified on this chart. If a patient has progressed to step 5 or 6 and requires a high dose ICS-LABA, consult with or refer patient to an asthma specialist to assess patient specific dosing.

Return to Discharge Medication Options

Return to New Asthma Dx Algorithm

Return to Existing Asthma Dx Algorithm

Return to PICU Algorithm

Single Maintenance and Reliever Therapy (SMART)

New initiation of SMART therapy should be considered outside of an acute exacerbation at PCP or subspecialty follow up through shared decision making with the family.

ICS + Long-Acting Beta Agonist (LABA)

BOLD = Preferred, no PA required for Medicaid patients

Inhaler Mechanism	Drug	Age (years)	Low Dose Inhaler Strength	Medium Dose Inhaler Strength	Dose and Frequency	Max Dose
Metered-dose Inhalers (MDI) • Aerosolized inhalation that is pushed to activate • Shake before use • Needs primed • Use with spacer	**Symbicort® HFA** **Budesonide / formoterol**	4-11	80-4.5 mcg	160-4.5 mcg	2 puffs BID and 1 puff PRN	8 puffs
		≥ 12	80-4.5 mcg	160-4.5 mcg	2 puffs BID and 2 puffs PRN	12 puffs
	Dulera® HFA Mometasone / formoterol	4-11	50-5 mcg	100-5 mcg	2 puffs BID and 1 puff PRN	8 puffs
		≥ 12	50-5 mcg	100-5 mcg	2 puffs BID and 2 puffs PRN	12 puffs

Example Prescription – Low Dose ICS + LABA

Age (years)	Drug	Strength	Directions
4-11	**Symbicort® HFA** Budesonide / formoterol	80-4.5 mcg	Inhale 2 puffs twice a day. May also inhale 1 puff every 4 hours, as needed for symptoms (Max: 8 puffs per day). Dispense 2 inhalers for 30-day supply.
≥ 12	**Symbicort® HFA** Budesonide / formoterol	80-4.5 mcg	Inhale 2 puffs twice a day. May also inhale 2 puffs every 4 hours, as needed for symptoms (Max: 12 puffs per day). Dispense 2 inhalers for 30 day supply.

Expert Panel Working Group of the National Heart, Lung, and Blood Institute (NHLBI) administered and coordinated National Asthma Education and Prevention Program Coordinating Committee (NAEPPCC), Cloutier MM, et al. 2020 Focused Updates to the Asthma Management Guidelines: A Report from the National Asthma Education and Prevention Program Coordinating Committee Expert Panel Working Group. J Allergy Clin Immunol. 2020 Dec;146(6):1217-1270.

Return to Discharge Medication Options

Return to New Asthma Dx Algorithm

Return to Existing Asthma Dx Algorithm

Return to PICU Algorithm

Asthma Action Plan

Asthma Action Plan

Caroline Zzadtdonotuse

DOB: 7/9/2017

MRN: 2277609

Asthma Type:

My Asthma Triggers:

Last Updated:

Green	**Zone: Doing Well**	**Do These Things Every Day!**
	All of these are true: • Breathing is great! • No coughing or wheezing • Asthma doesn't bother sleep or exercise	**Take these medications every day:**
Yellow	**Zone: Symptoms Start**	**Start Relief Medicine!**
	Any of these are happening: • Getting a cold • Coughing a lot • Wheezing • Having trouble breathing	**Take these medicines:** **Keep taking Green Zone Medicine!**
Orange	**Zone: IN TROUBLE**	**CALL YOUR DOCTOR FOR HELP!**
	Relief medicine isn't working: • Medicine not lasting 4 hours - symptoms coming back too soon • Constant coughing • Awake all night from asthma • Needing more than 4 doses of relief medicine in 1 day	**Call:** **Take these medicines:** **If you can't reach your doctor and symptoms continue:** Go to urgent care or ER!
Red	**Zone: IN DANGER!**	**GET HELP NOW!**
	Breathing is bad: • Gasping (breathing hard and fast) • Ribs show when breathing • Neck or stomach caving in • Hard to talk or walk	**Go to the Closest ER or DIAL 9-1-1!** **On the way take:**

[Return to New Diagnosis Algorithm]

[Return to Previously Diagnosed Algorithm]

[Return to Weaning & Escalation Algorithm]

[Return to PICU Algorithm]

Patient & Family Education

IP DC INSTRUCTIONS – ASTHMA [15291]

@FNAME@ was admitted to the hospital for an asthma attack.

Facts about Asthma
Asthma is a condition in which airways (breathing tubes) are oversensitive. An asthma flare up or "attack" occurs when a "trigger" causes the oversensitive airways to constrict, swell up on the inside and make too much mucus. These changes cause coughing, wheezing and difficulty breathing. Examples of things that can trigger an asthma flare up are viruses, allergies, weather changes, exercise, and cigarette or cigar smoke. Respiratory viruses (like the common cold) are the most common trigger that causes very severe attacks like the one your child just went through.

Treatment in the Hospital
While in the hospital, @FNAME@ was treated with {Asthma IP Meds:22117}.

Treatment at Home
Some coughing or mild wheezing will likely continue for 2-3 more days. @FNAME@ must be closely monitored for the next 1-2 days.

@FNAME@ has an increased risk of having another severe asthma flare up in the next year. To prevent this:
- Follow the instructions on @FNAME@'s Asthma Action Plan.
- {Pulm Asthma Meds:22115}
- Avoid triggers if possible. Always avoid smoke exposure.
- Get help early if quick relief medication, {Quick Acting Meds:22116} doesn't get rid of symptoms and keep the symptoms away for at least 4 hours.

GO TO YOUR CHILD'S DOCTOR OR RETURN TO THE EMERGENCY ROOM IF:
- @FNAME@ seems to need albuterol treatments more frequently than every 4 hours.
- @CAPHE@ has non-stop coughing, difficulty breathing, chest tightness and/or shortness of breath.
- You notice sucking in of the skin between the ribs when breathing (retractions).
- You notice a blue color around @HIS@ lips.
- @FNAME@ has new symptoms such as fever, poor eating and/or rashes.

Contact Information

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to Weaning & Escalation Algorithm | Return to PICU Algorithm

References

1. National Asthma Education and Prevention Program. Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma-Summary Report 2007 [published correction appears in *J Allergy Clin Immunol. 2008 Jun;121(6)*:1330]. J Allergy Clin Immunol. 2007;120(5 Suppl):S94-S138. doi:10.1016/j.jaci.2007.09.043

2. Expert Panel Working Group of the National Heart, Lung, and Blood Institute (NHLBI) administered and coordinated National Asthma Education and Prevention Program Coordinating Committee (NAEPPCC), Cloutier MM, Baptist AP, et al. 2020 Focused Updates to the Asthma Management Guidelines: A Report from the National Asthma Education and Prevention Program Coordinating Committee Expert Panel Working Group [published correction appears in *J Allergy Clin Immunol. 2021 Apr;147(4)*:1528-1530. doi: 10.1016/j.jaci.2021.02.010]. J Allergy Clin Immunol. 2020;146(6):1217-1270. doi:10.1016/j.jaci.2020.10.003

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to Weaning & Escalation Algorithm | Return to PICU Algorithm

Quality Measures

- Acute asthma patients with minimum ACS score of 2 who receive oral steroid therapy within 60 minutes of ED arrival
- Rate of asthma order set use (ED Asthma, IP Admission, IP Transfer from PICU and IP Escalation of Care)
- Rate of transfers from floor to PICU
- ALOS
- Asthma discharges that have a follow-up appointment with an asthma outpatient provider, scheduled and documented in the AVS prior to discharge
- Discharge Efficiency: Median time from 1st Q4H albuterol administration to discharge
- 30 day return to the ED after inpatient discharge

Metrics Population: Age 2-18 years

Return to New Diagnosis Algorithm	Return to Previously Diagnosed Algorithm	Return to Weaning & Escalation Algorithm	Return to PICU Algorithm

Team & Process

Pathway Development Team

Leader(s):
Hospital Pediatrics:
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Pharmacy:
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Partners For Kids:
Kelin Wheaton, PharmD

PICU:
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Clinical Pathways Program:

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Program Coordinators:
Tahje Brown, MBA
Tara Dinh, BS

Clinical Pathway Approved

Associate Chief Quality Officer, Center for Clinical Excellence:
Ryan Bode, MD, MBOE

Advisory Committee Date: *October, 2023*

Origination Date: *July, 2017*

Last Revision Date: *May, 2024*

Next Revision Date: *May, 2027*

Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2022. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therapy. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

For more information about our pathways and program please contact:
ClinicalPathwaysProgram@NationwideChildrens.org

Return to New Diagnosis Algorithm | Return to Previously Diagnosed Algorithm | Return to Weaning & Escalation Algorithm | Return to PICU Algorithm

Overview & Workflow - Floor Continuous Albuterol (Level 3 care)

- **MCED patient** with asthma exacerbation who is stable or improving after >45 minutes of continuous albuterol.
- **PICU patient** with asthma exacerbation who is improving after >4 hours of continuous albuterol.
- Meets **Criteria for Floor Continuous Albuterol Protocol.**

- **Floor patient with asthma exacerbation, requiring continuous albuterol** (ACS ≥ 5 after albuterol burst for 2 hours ***and*** one Mg bolus).
- ACT completed and patient meets **Criteria for Floor Continuous Albuterol Protocol.**

- Contact **SOD or Pulmonologist on call** to accept patient. Keep same service if transfer to H8A from other floor unit.
- After receiving bed request from ED, **PCTC** assigns bed in conjunction with H8A Charge RN. Max 4 patients on continuous albuterol on H8A.
- **H8A Charge RN** contacts **accepting service Senior Resident** for bedside handover in ED.

- See **ED bedside handover** for **admission on continuous albuterol from MCED**
- **PICU bedside handover** with PICU resident/NP, HP or Pulmonary senior resident & H8A charge RN and charge RT (Resident *SHOULD* step away from rounds unless prohibited by urgent patient care needs.)

- Patient **admitted** from MCED **or transferred to H8A** (from PICU or other floor unit) and made **Watcher**.
- Floor continuous albuterol is ordered, using **IP Asthma Clinical Pathway (Admission, Transfer, Escalation)** by primary resident and set up by H8A RT

- Patient assessment with **ACS Q1H x 2** by RT, bedside RN and primary team physician (senior resident and/or HP fellow/attending) and **documented in continuous albuterol note template**.

- Patient assessment with **ACS Q2H, and Q1H** PRN, by RT and bedside RN

ACS ≤3 x 2?

No
If >8hrs on floor continuous albuterol, notify resident to assess

Yes

- **Change to albuterol MDI Q2H**
- Patient assessment and **ACS Q1H x 2** after stopping continuous albuterol.

ACS ≥5? — **Yes**

- Wean has failed.
- RT notifies resident of failed wean
- Resident re-orders continuous albuterol

No

- Wean successful.
- **Albuterol MDI Q2H for 2 more hours.**

ACS ≥5? — **Yes**

No

Continue wean per Asthma Clinical Pathway

4/14/2025

Continuous Albuterol - MCED Bedside Handover

ED Asthma Clinical Pathway

Main Campus Emergency Department (MCED) patient with asthma exacerbation who requires continuous albuterol

Patient meets Criteria for Floor Continuous Albuterol Protocol ?

No → Consider admission to PICU

Yes

ED pages the Safety Officer of the Day (SOD) or Pulmonologis on call to request admission to Hospital Pediatrics or Pulmonary Service on Asthma Clinical Pathway and Continuous Albuterol (Max 4 patients on continuous albuterol on H8A)

ED to place **bed request** for Hospital Pediatrics or Pulmonary

Bed assigned by PCTC in conjunction with H8A Charge RN

H8A Charge RN notifies **Senior Resident**

Senior Resident calls for sign-out **and** arranges to meet ED team for direct handoff

In person evaluation by charge RN and/or charge RT & senior resident (attending optional) **within 30 minutes** of receiving the admission notification.

Floor senior resident (attending optional) documents handover.
Note template:
IP Asthma Evaluation for floor continuous albuterol

Any concerns over stability or suitability for the floor must be reconciled by the Primary Attending or SOD along with ED Attending.

"Care Complete" if the following criteria are met:

- Patient demonstrates >90 minutes of improvement/stability after Continuous albuterol initiation **AND**
- The floor physician and RN have completed bedside evaluation and communicated acceptance to ED physician team.

Return to Overview & Workflow - Floor Continuous Albuterol

Continuous Albuterol Floor Protocol

(aka Level 3 care)

Asthma Pathway - Continuous Albuterol Floor Protocol

Hospital Pediatrics and Pulmonary Service, H8A unit

Inclusion Criteria

- Patient must have primary condition of asthma exacerbation with no exclusion criteria as below
- Patient must be between 2 - 18 years of age
- No more than 4 patients on H8A on continuous albuterol. “Safety Officer of the Day”(SOD) or Pulmonologist on call, along with Respiratory Therapy, will ensure that no more than 4 patients are on continuous albuterol at any one time

Indication/Usage

- **PICU transfer** of established, stable, and ideally weaning, asthma pathway patient on continuous albuterol for >4 hours
- **Admission from MCED** of stable or improving asthma pathway patient on continuous albuterol for >45 minutes and with ACS stable or decreasing at time of bedside handover
- **Floor patient with asthma exacerbation** and continued respiratory distress, increased work of breathing and/or ACS ≥ 5 after albuterol burst for 2 hours ***and*** one Mg bolus ***and*** approved by ACT.

Exclusion Criteria

- Age <2 or >18 yrs
- Patients in severe respiratory failure (PPV requirement, altered mental status, bradycardia, poor perfusion)
- FiO_2 requirement ≥50%
- MCED patient that received epinephrine, ketamine or continuous magnesium.
- History of recent intubation for current illness
- Known concurrent bacterial pneumonia
- Patients with significant comorbidities (cardiac, pulmonary, or neuromuscular disease, craniofacial abnormalities, immunodeficiency)

Return to Overview & Workflow – Floor Continuous Albuterol

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Continuous Albuterol Floor Protocol

Initiation

- **PICU transfers**
  - The following criteria should be followed as closely as possible when accepting potential PICU transfer:
    - Hospital Pediatrics or Pulmonology service and transfer to H8A
    - >4 hours stability on continuous albuterol
    - Meeting all other inclusion/exclusion criteria
    - >4 hours removed from non-invasive ventilation requirement (i.e. BiPap)
    - No history of recent intubation for current illness
    - No (off) magnesium drip
    - No active sedation wean
    - Patient made “Watcher” status for “escalating respiratory support”
    - Communication/agreement by Safety Officer/Hospital Pediatrics attending or Pulmonologist on call, admit senior resident, accepting unit charge nurse and RT

- **Admission from MCED**
  - The following criteria should be followed as closely as possible when accepting potential ED Admission:
    - > 45 minutes stability on continuous albuterol per ED provider assessment
    - ACS stable or decreasing at time of bedside handover
    - Meeting all other inclusion/exclusion criteria including:
      - No magnesium drip
      - No active sedation
      - Did not receive Epinephrine or Ketamine
    - Communication/agreement by Safety Officer/Hospital Pediatrics attending or Pulmonologist on call, admit senior resident, accepting unit charge nurse and RT.

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Continuous Albuterol Floor Protocol

Initiation *(continued)*

- **Floor Escalation of Care**
  - The following criteria should be followed as closely as possible when escalating care on floor patients:
    - Hospital Pediatrics or Pulmonary Service and patient on H8A
    - Patient made “Watcher” status for “escalating respiratory support”
    - **Bedside ACT** with RN, charge nurse, RT, resident(s), PICU fellow/attending and SOD **is required for initiation**. Involvement/communication with primary Hospital Pediatrics attending/ fellow or Pulmonary attending/fellow as appropriate based on time of day.
    - ACT team must agree on treatment strategy of continuous albuterol on H8A. No need for NIPPV per ACT team assessment
    - Communication by charge RN to H8B ICU charge RN to ensure awareness of number of continuous albuterol patients on the floor
    - Safety Officer to report number of patients on continuous albuterol on H8A on the daily safety call Mon-Fri to increase awareness of the acuity on the floor
    - Patient made NPO and IV access established. Continuous cardiac and pulse oximetry monitoring in place.
    - Obtain CXR
    - Patient will be set up on continuous albuterol by Respiratory Therapy and bedside RN
    - Supplemental O2 and continuous SpO2 if saturation is <90%
    - Nebulized albuterol: 10 mg/hr
    - Place IV. NPO and IV fluids.
    - If not already given: IV magnesium sulfate: 50mg/kg over 20min (Max. 2 gram & 1 dose)
    - Methylprednisolone 1mg/kg/Q6H (max dose: 30mg Q6H) iv if > 6hrs since last dose

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Continuous Albuterol Floor Protocol

Reassessment/Monitoring

- Respiratory therapist, bedside RN, and physician (senior resident and/or fellow/attending) will assess the patient every hour for two occurrences with documentation of vital signs and Assessment/Plan (**Note template:** IP Asthma continuous albuterol Initiation and Reassessment Note). RT and bedside RN will continue to assess every 1-2 hours thereafter.
- RT will document albuterol dose and ACS with every patient assessment. RT to notify resident if increasing ACS or any other concern.
- Indications for **ACT** and potential ICU transfer: ACS ≥7, PEWS score > 7, requiring ≥ 50% FiO2 for more than 10 minutes to maintain SpO2 ≥ 90%, non-response to continuous albuterol therapy where response is defined as improvement in ACS to ≤ 5, systolic hypotension or diastolic hypotension not resolved by single IVF bolus. In addition, team may initiate ACT/ICU transfer on the basis of other clinical concerns.

Weaning

- RT will page resident if patient does not meet weaning criteria for >8 hours.
- Wean albuterol to Q2H when ACS has been ≤ 3 for 2 assessments. Continue Q1H reassessment with documentation of ACS x 2 after stopping continuous albuterol.
- If ACS increases to ≥ 5 the wean has failed. RT To notify resident of failed wean and need for re-starting continuous albuterol for ≥ 4-6 hours before re-attempting wean.
- If wean successful, continue albuterol q2h for at least 4 hrs, then wean and monitor per asthma pathway.

Fluid, Electrolytes and Feeding Considerations

- Patient should remain NPO with isotonic maintenance IV fluids (D5LR preferred, alternatively D5NS with 20mEq/L K) until weaned to Q2H albuterol.
- Check chem7 after 4 hours on continuous albuterol then QAM, to monitor for hypokalemia.
- A 0.9NS IVF bolus of 20 mL/kg may be warranted if diastolic hypotension < 30 mm Hg. If given, resident should reassessment in 1-hr. Continue treatment per protocol if hypotension has resolved and UOP is adequate. ACT is patient has sustained or recurrent hypotension.

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm

Continuous Albuterol Floor Protocol

Protocol Disclaimer:

Clinical practice guidelines and algorithms at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice and clinician judgment remain central to the selection of diagnostic tests and therapy. The ordering provider is ultimately responsible for care decisions. NCH's guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.

During periods of extremely high census and exceeding capacity within PICU, Medical-Surgical Units and Emergency Department – patient safety clearly takes priority and adjustments to the above protocol recommendations may be necessary including number of patients on HFNC on the floor, units able to administer HFNC and inclusion/exclusion criteria.

Return to Weaning & Escalation Algorithm

Return to PICU Algorithm