DELL CHILDREN'S MEDICAL CENTER
EVIDENCE-BASED OUTCOMES CENTER

ASTHMA PATHWAY GUIDELINES

Definition:
Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing. Symptoms may worsen in the evening or in the morning. (GINA Global Strategy for Asthma Management and Prevention, 2012) Asthma is one of the most common chronic disorders in children and is one of the leading causes of school absenteeism.

Etiology:
Although the exact etiology of asthma is unknown, environmental factors and allergens are known factors influencing exacerbations.

Differential Diagnosis:
GERD
Other causes of chronic aspiration
Recurrent VLR
Sinusitis
Foreign body aspiration

Guideline Eligibility Criteria:
Patients 2 to 18 years of age with acute asthma exacerbation

Guideline Exclusion Criteria:
Bronchiolitis
Cystic Fibrosis
Tracheostomy
Neuromuscular disease
Immunodeficiency
Cardiac disease
Other Chronic Lung Disease (unless otherwise specified)

Diagnostic Evaluation:
History and physical pertinent to the exacerbation should be completed concurrently with prompt initiation of treatment. (GINA Global Strategy for Asthma Management and Prevention, 2012)
History:
Assess for severity and duration of symptoms, medication history, risk factors and common times or exacerbations to an onset of symptoms.

Physical Examination:
To include- assessment of dyspnea, respiratory rate, work of breathing, presence and location of wheezing, need for oxygen
Laboratory Tests:
None recommended for uncomplicated asthma exacerbation

Critical Points of Evidence
Evidence Supports
Use of a common scoring tool and pathway to categorize severity and improve clinical outcomes
Oxygen for saturation consistently below 90%
Short acting beta-agonist as soon as treatment can be started
Glucocorticosteriods within the first hour of arrival to hospital/ED
Ipratropium bromide for moderate to severe asthma
Intravenous magnesium sulfate for treatment of moderate to severe asthma
Evidence Lacking/Inconclusive
Terbutaline and epinephrine should be given only if aerosolized treatments are not tolerated or patient has not been response to treatments listed above
Non-Invasive positive pressure ventilation prior to intubation
Evidence Against
Chest x-ray not recommended for routine cases
Blood gas
Heliox

Practice Recommendations
Treatments for asthma have been widely studied and recommendations adopted based on studied and recommended standards of care. Many of these standards of care have been adopted by the Joint Commission since 2007 and were set forth as Orynx measures for pediatric healthcare agencies.

Common Asthma Scoring Tool: Modified Quereshi PAS
Measuring response to therapy can be a very useful tool in the management of asthma. No universal pediatric asthma scoring tool has been identified as superior, but there are several in the literature that have been validated and implemented in clinical practice. Our institution has adopted a modified version of the Quereshi Pediatric Asthma Score.

Treatment Recommendations
(for full recommendations see attached pathway and addendums)

Beta-agonist dosing (albuterol)

Emergency Department (PAS score Q1 hour)

1st hour

- Mild (PAS 0): No treatment required
- Mild (PAS 1-2): Albuterol 5mg Neb
- Moderate (PAS 3-5): Albuterol Neb over 1 hour (<20 kg- 10mg Neb or ≥20kg- 15mg Neb)
- Moderate to Severe (PAS 6-10): Albuterol Continuous (<20 kg- 10mg Neb or ≥20kg- 15mg)

2nd hour

- Mild (PAS 0-2): Discharge home
- Moderate (PAS 3-5): Albuterol Neb over 2 hours (<20 kg- 10mg Neb or ≥20kg- 15mg Neb)
- Moderate to Severe (PAS 6-7): Albuterol over 1 hour (<20 kg- 10mg Neb or ≥20kg- 15mg)
- Severe (PAS 8-10): Albuterol Continuous
- (<20 kg- 10mg Neb or ≥20kg- 15mg)

3rd hour

- Mild (PAS 0-2): Discharge home
- Moderate (PAS 3-5): Albuterol Neb over 1 hour (<20 kg- 10mg Neb or ≥20kg- 15mg Neb)
- Moderate to Severe (PAS 6-7): Albuterol over 1 hour (<20 kg- 10mg Neb or ≥20kg- 15mg)
- Severe (PAS 8-10): Albuterol Continuous
- (<20 kg- 15mg Neb or ≥20kg- 20mg)

Inpatient (PAS score Q4hr unless otherwise noted)

- Mild: Albuterol Q4 hours (8 puffs w/inhaler)
- Moderate: Albuterol Q3 hours (<20 kg- 5 mg Neb or ≥20kg- 7.5 mg Neb)
- Moderate to Severe: Albuterol Continuous (<20 kg- 10 mg Neb or ≥20kg- 15 mg Neb, with Q2hr PAS scores at minimum)
- Severe: Albuterol Continuous (<20 kg- 15 mg Neb or ≥20kg- 20 mg Neb, with Q2hr PAS scores at minimum)

Steroids

There is strong evidence that corticosteroids speed the resolution of airflow obstruction and reduce rate of relapse, especially if given within the first hour of admission to ED.

- **Recommended: Dexamethasone** has shown to be just as effective as prednisolone and has the added benefit of decreased vomiting and less doses, thus increasing compliance.
  - Dosing: Dexamethasone 0.6 mg/kg PO/IM/IV (max: 16 mg) every day x2 doses (*Separate the 2 doses by 24-36 hours)*
- For dexamethasone allergy or intolerance: Prednisolone
  - Dosing: Prednisolone 1 mg/kg (max: 30 mg/dose) for <12 yrs OR 40 mg/dose for ≥ 12 yrs) PO Q12hr For 5 days
- Severe exacerbations
  Methylprednisolone
  - Initial Dose: Methylprednisolone 2 mg/kg IV x1 (max: 60 mg)
    - (skip this step **if** methylprednisolone or dexamethasone already given)
  - 6 hours later: methylprednisolone 1 mg/kg IV Q6hr (max: 60mg/dose)
- Full recommendations and methylprednisolone weaning instructions are supplied in addendum 1

Ipratropium Bromide

Strongly recommended as an adjunctive therapy for patients with moderate to severe symptoms

- Dosing: Ipratropium 1 mg via neb- in conjunction with Albuterol in the 1st hour

Magnesium Sulfate

Strong recommendation to be used as an adjunctive therapy when there is no response to conventional therapies.

- Dosing: Magnesium Sulfate 50 mg/kg IV (max 2 g) over 20-30 min. x1
  - Strongly consider NS bolus if not already given
  - Only one dose may be administered on acute care units, other than pediatric intensive care, in a 24 hour period

Terbutaline

Terbutaline and epinephrine should be given only if aerosolized treatments are not tolerated or patient has not been response to treatments listed above

- Dosing: 10mcg/kg SQ (Max 250mcg=0.25ml) X1 for child in extremis (can be given Q 20minutes x3 doses until IV established)
  - If considering IV Terbutaline it must be ordered in concert with STAT PICU consult
    - Recommended starting dose: 10 mcg/kg (max 250 mcg) IV load over 15 minutes
    - followed by continuous IV drip 0.4 mcg/kg/min
  - STAT call to Pharmacy for IV drip Terbutaline

Pediatric Intensive Care ONLY
Pepcid PO or IV per Protocol

- Pepcid should be administered PO when the patient is tolerating feeds/diet, discontinue upon transfer to floor

Ketamine

- Dosing Ketamine 2mg/ml, 5 mcg/kg/minute continuous IV drip (t*itrate per protocol to meet sedation needs*)

Admission Criteria
Supplemental oxygen requirement
No improvement to baseline after multiple respiratory treatments
Stage 1 (Score 1-2) = Acute Care Unit
**Note: Discharge is recommended for scores of 0-2, admission will only occur for score 0-2 if oxygen is required or there is concern for deterioration*
Stage 2 (Score 3-5) = Acute Care Unit
Stage 4 (Score 6-7) = Pulmonary Unit
Stage 5 (Score 8-10) = Pediatric Intensive Care Unit

Consults and Referrals
Pulmonology for patients with chronic symptoms and multiple admissions

Infection Control
Standard isolation only unless viral factors are suspected

Caregiver Education
Children should not be exposed to passive smoke, explore smoking cessation opportunities as indicated
Emphasize importance of follow-up appointments
Emphasize importance of following recommendations on the Home Management Plan of Care (HMPOC)

Discharge Criteria
Albuterol- 8 puffs or 5 mg Q4 times 1 dose
Oxygen Saturation >90 for more than 2 hours

Follow-Up Care
Generally follow-up care is 1- 2 days post discharge with the primary care doctor

Prevention
Caregiver and patient knowledge of HMPOC
Knowledge of common triggers and how to prepare or avoid
Proper use and understanding of inhaled corticosteroids and controller medications
Asthma Action Plan

Outcome Measures
Emergency Department (ED):
Time from ED triage to administration of beta agonist
Time form ED triage to administration of steroids
Proportion receiving 1st neb within 60 minutes of arrival
Proportion receiving steroid within 60 minutes of arrival
Proportion of patients assessed for understanding of HMPOC
Readmissions to ED within 30 days and within 12 months
Inpatient (IP):
Proportion of patients with a documented home management plan of care
Proportion of patients assessed for their understanding of HMPOC
Average length of stay

If RESPIRATORY ARREST IMMINENT-
Triage and Initiate care in resuscitation room

EMERGENCY DEPARTMENT Entry Assessment for **ASTHMA PATHWAY**

Exclusion Criteria:
bronchiolitis, cystic fibrosis, tracheostomy patients, neuromuscular diseases, immunodeficiency & cardiac patients (unless ordered), and other chronic lung disease (unless ordered)

Inclusion Criteria:
Patients 2-18 years of age with acute asthma exacerbation

Albuterol to MDI w/ Spacer Puff Conversions

5mg neb = 8 puffs
10mg neb= 16 puffs
Q3 hours= 5 puffs Q1 hour x3
Continuous= 5 puffs Q20min. X3
15mg neb= 24 puffs
Q3 hours= 8 puffs Q1 hour x3
Continuous= 8 puffs Q20min. X3

1st HOUR

- Supplemental Oxygen should be administered to maintain SaO2 >90%
-Initial PAS score done at triage and on room placement
NOTE: CXR and Blood Gas are not recommended for Routine Asthma Exacerbation

PAS 1-2
- Albuterol 5 mg Neb
- Repeat per clinician discretion
- Consider Steroids in some cases- consult with physician

PAS 3-5
- Albuterol Neb over 1 hour
<20 kg: Albuterol 10 mg/ ≥20 kg: Albuterol 15 mg

•Ipratropium 1 mg via neb- in conjunction with Albuterol
•Dexamethasone 0.6 mg/kg (max 16 mg) PO/ IM or Methylprednisolone 2mg/kg (max 60mg) IV for PO intolerant

PAS 6-10
- Albuterol Neb over 1 hour
<20 kg: Albuterol 10 mg/ ≥20 kg: Albuterol 15 mg

• Ipratropium 1 mg via neb- in conjunction with Albuterol
• Dexamethasone 0.6 mg/kg (max 16 mg) PO/ IM or Methylprednisolone 2mg/kg (max 60mg) IV for PO intolerant
**Consider early adjunctive therapy

2nd HOUR

*Reassess PAS Score

PAS 0-2
Discharge to HOME
- □ Asthma Action Plan
- □ Asthma Education to include Smoking Cessation referral if indicated
- □ Re-label Albuterol
- □ Script for Controller Meds, if applicable
- □ Script for Dexamethasone Dose #2- 0.6mg/kg (max 16mg) PO x 1 to be given 24 hours after 1st dose, if applicable

PAS 3-5
- Albuterol Neb over 1 hour
<20 kg: Albuterol 10 mg
≥20 kg: Albuterol 15 mg

PAS 6-7
- Albuterol Neb over 1 hour
<20 kg: Albuterol 10 mg
≥20 kg: Albuterol 15 mg
**Consider adjunctive therapy

PAS 8-10
POOR RESPONDER
- Albuterol Neb over 1 hour (continuous) as necessary
<20 kg: Albuterol 10 mg/ ≥20 kg: Albuterol 15 mg

**Administer adjunctive therapy if not already done
Contact PICU for Admission if Terbutaline used in 2nd hour

3rd HOUR

*Reassess PAS Score

PAS 0-2
Discharge to HOME
See above recommendations

PAS 3-5
Admit to FLOOR
<20 kg: Albuterol 10 mg Neb Q2h
≥20 kg: Albuterol 15 mg Neb Q2h

PAS 6-7
Admit to Pulmonary Unit
(see Addendum 5 for Pulmonary Unit exclusion criteria)
<20 kg: Albuterol 10 mg Neb over 1 hour
≥20 kg: Albuterol 15 mg Neb over 1 hour
**Consider adjunctive therapy

PAS 8-10
POOR RESPONDER- **Admit to PICU**
<20 kg: Albuterol 15 mg Neb over 1 hour/Continuous
≥20 kg: Albuterol 20 mg Neb over 1 hour/Continuous
**Administer adjunctive therapy if not already given

***Reassess PAS Score-** *If completing a continuous neb and considering discharge home it is RECOMMENDED that you observe the patient for at least 60 minutes after the completion of the neb, then rescore the patient for discharge readiness.*

Assessment		0	1	2
RR	Respiratory Rate (Obtain over 30 seconds and multiply x2)			
	2-3 years old	≤34	35-39	≥40
	4-5 years old	≤30	31-35	≥36
	6-12 years old	≤26	27-30	≥31
	>12 years old	≤23	24-27	≥28
O2	Oxygen Requirement *(RA for 2min- return O2 if Sats <90)*	>95% RA	90-95% RA	<90% RA
A	Auscultation	BBS clear to End exp. wheeze	Expiratory Wheezes	Insp. & Exp. wheeze or Diminished BS
WOB	Work of Breathing- *nasal flaring, suprasternal, intercostal or subcostal muscle use*	≤1 accessory muscle	2 accessory muscles	≥3 accessory muscles
D	Dyspnea	speaks full sentences, playful, babbles	Speaks partial sentences, short cry	Speaks short phrases, single words, grunting

PAS (Qureshi, et al) Pediatric Asthma Score – modified version (for patients >2yrs of age)

ADJUNCTIVE THERAPY OPTIONS
- O **IV NS bolus** (20ml/kg, max 1L)
- O **Magnesium Sulfate** 50 mg/kg IV (max 2 g) over 20-30 min. x1
Strongly consider NS bolus if not already given
- O **Terbutaline** 10mcg/kg SQ (Max 250mcg=0.25ml) X1 for child in extremis (can be given Q 20minutes x3 doses until IV established)
- O If considering IV Terbutaline
  - o **Must be ordered in concert with STAT PICU consult**
  - o Recommended starting dose:
    - 10 mcg/kg (max 250 mcg) IV load over 15 minutes, followed by: Terbutaline continuous IV drip 0.4 mcg/kg/min
  - o STAT call to Pharmacy for IV drip Terbutaline

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IF TRANSFER BED UNAVAILABLE FOLLOW THE Inpatient Asthma Pathway Guidelines

Last Updated November 2022

Inpatient Asthma Pathway Guidelines

● Reassess PAS score with every treatment ● Supplemental O2 to maintain SaO2 >90% ● Smoking cessation counseling when indicated

PEDIATRIC EBOC

STAGE 1
PAS Score 1-2
Acute Care
Mild

Albuterol Q4 hours
8 puffs w/inhaler

- Order Steroids per Addendum 1
- Day team to classify patient: if symptoms qualify, order controller (see addendum 2&3)

Clinical Readiness for Discharge

- Albuterol- 8 puffs or 5 mg Q4 times 1 dose
- Oxygen Saturation >90 for more than 2 hours

Items Required for Discharge Home (see addendum 4)

STAGE 2
PAS Score 3-5
Acute Care
Moderate

Albuterol Q3 hours
<20 kg- 5 mg Neb
≥20kg- 7.5 mg Neb

- Order Steroids per Addendum 1
- Day team to classify patient: if symptoms qualify, order controller (see addendum 2&3)

Comorbidity
Patients scoring a zero(0) will continue to receive an RT PAS score Q4 hours, if not clinically ready to discharge home

STAGE 3
WEANING Guidelines:
From PU or PICU to moderate score treatments

PAS SCORE ≤ 5 at Q2 RT Assessment
(RT will suspend continuous neb, rescore the pt in 2 hours, and begin Q2 hour dosing)

Albuterol Q2 hours x2
<20 kg- 10 mg Neb
≥20kg- 15 mg Neb

STAGE 4
PAS Score 6-7
Pulmonary Unit
Moderate to Severe

see addendum 5 for Pulmonary Unit EXCLUSION CRITERIA

Albuterol Continuous
<20 kg- 10 mg Neb
≥20kg- 15 mg Neb
(with Q2hr PAS scores at minimum)

- Order Steroids per Addendum 1
- Day team to classify patient: if symptoms qualify, order controller (see addendum 2&3)

Magnesium Sulfate: 50 mg/kg IV (max: 2 grams) may be given over 20-30 minutes x1 if not given in ED
Max: 2 dose per 24 hour period

Patients should show score improvement within 12 hours of admission. If no improvement, contact physician for reevaluation consider CC consult

STAGE 5
PAS Score 8-10
PICU
Severe

Albuterol Continuous
<20 kg- 15 mg Neb
≥20kg- 20 mg Neb
(with Q2hr PAS scores at minimum)

See Pediatric Intensive Care Asthma Pathway Guidelines

Note: When weaning, a patient must be "stepped down" from last dose, including doses given in different units.

Ex. If last dose given in ED was a 15mg over an hour and the patient now scores a PAS of 2, utilize the next dose down 10mg Q2 x 2 then change to Q3 Albuterol, then Q4 Albuterol

Do not skip steps of the pathway regardless of score

Units for Admission and Transfer

Stage 1 (Score 1-2) = Acute Care Unit
Stage 2 (Score 3-5) = Acute Care Unit
Stage 4 (Score 6-7) = Pulmonary Unit
Stage 5 (Score 8-10) = PICU team

Albuterol to MDI w/ Spacer Puff Conversions

5mg neb = 8 puffs
10mg neb= 16 puffs
Continuous= 5 puffs Q20min. x3
Q2 hours= 4 puffs Q30 minutes x4
Q3 hour= 5 puffs Q1 hour x 3
15mg neb= 24 puffs
Continuous= 8 puffs Q20min. x3
Q2 hours= 6 puffs Q30 minutes x4
Q3 hour= 8 puffs Q1 hour x3

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Pediatric Intensive Care Asthma Pathway Guidelines

Inclusion criteria:

- Patients 2-18 years of age with acute asthma exacerbation
- Poor responders to treatment
- Patients in Extremis
- Patients Scoring 8 or higher on the PAS
- Patients not showing improvement within 6 hours of admission to the Pulmonary High Acuity Unit

Standards of Care (care every patient will receive)

□ Albuterol Continuous Nebulizer:
PAS 8-10= <20kg= 15 mg/hr or ≥20kg= 20 mg/hr
PAS 6-7= <20kg= 10 mg/hr or ≥20kg= 15 mg/hr once patient is weaned from terbutaline & magnesium sulfate drip
Respiratory Therapy will score the patient, at a minimum, every two hours
Respiratory Therapy will contact the Physician/ Mid-level/ Resident for weaning orders
Please see the Inpatient Asthma Pathway Guidelines for dosing once patient is deemed ready to be off continuous nebs

□ Methylprednisolone: 1 mg/kg IV Q6 hours x 24 hours (max: 60mg per dose)
(see Addendum 1 for methylprednisolone management and weaning guidelines)

□ Pepcid PO or IV per protocol
(Pepcid should be administered PO when the patient is tolerating feeds/diet, discontinue upon transfer to floor)

□ Ipratropium: <20kg- 0.25 mg or ≥20kg- 0.5 mg inhaled Q6 hours x 24 hours

□ Magnesium Sulfate: 50 mg/kg IV (2 grams max) over 20-30 minutes (if not given in ED or Pulmonary High Acuity Unit)

Medications for Refractory Treatment

□ Ipratropium: <20kg- 0.25 mg or ≥20kg- 0.5 mg inhaled Q6 hours, may continue per physician discretion if necessary

□ Terbutaline 1mg/ml: Loading dose 10mcg/kg (max: 250mcg) over 15 minutes followed by continuous IV drip 0.4 mcg/kg/minute
Terbutaline drip should be weaned completely before weaning continuous Albuterol

□ Magnesium Sulfate 50mg/ml: <30kg- 25 mg/kg/hr or ≥30kg- 20 mg/kg/hr continuous IV drip (max: 2g per hour)
Check serum magnesium 2 hours after the drip is started then Q8 hours (serum magnesium target = 3-5 mg/dL)
Titrate by 5mg/kg/hr based on serum levels

□ Ketamine 2mg/ml: 5 mcg/kg/minute continuous IV drip
Titrate per protocol to meet sedation needs

Recommendations for Discharge or Transfer out of the Pediatric Intensive Care Unit

- **DISCHARGE HOME**
  PAS 1-2 (ready for discharge home)- See addendum 4 for Discharge Readiness Criteria and Requirements
- **ADMIT TO FLOOR**
  PAS 1-2 (NOT ready for discharge home)
  PAS 3-5
- **ADMIT TO PULMONARY UNIT**
  PAS 6-7 (for patients exhibiting steady improvement)
- **ADMIT TO IMC**
  PAS 6-7 (not exhibiting steady improvement, but no longer requiring PICU care)

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patient label

Dell Children's Medical Center of Central Texas

Pediatric Asthma Albuterol Titration Protocol Severity Score Sheet

Year:	**Date (month &day)**										
	Time										
	Initials										
	Credentials (example: RN, RT)										
	Pre or Post Score? RT ONLY										
Respiratory Rate	**Enter Respiratory Rate** *(Obtain over 30 sec, multiply by 2)*	**Rate**	**Rate**	**Rate**	**Rate**	**Rate**	**Rate**	**Rate**	**Rate**	**Rate**	**Rate**
	2-3 yrs: 34 or Less Breaths per Minute 4-5 yrs: 30 or Less Breaths per Minute **6-12 yrs: 26 or Less Breaths per Minute** >12 yrs: 23 or Less Breaths per Minute	0	0	0	0	0	0	0	0	0	0
	2-3 yrs: 35-39 Breaths per Minute 4-5 yrs: 31-35 Breaths per Minute **6-12 yrs: 27-30 Breaths per Minute** >12 yrs: 24-27 Breaths per Minute	1	1	1	1	1	1	1	1	1	1
	2-3 yrs: 40 or Greater Breaths per Minute 4-5 yrs: 36 or Greater Breaths per Minute **6-12 yrs: 31 or Greater Breaths per Minute** >12 yrs: 28 or Greater Breaths per Minute	2	2	2	2	2	2	2	2	2	2
Room Air SpO_2 (obtain c pt on RA for 2min.- return to O@ if Sats <90%)	RA SpO_2 Greater Than 95%	0	0	0	0	0	0	0	0	0	0
	RA SpO_2 90-95%	1	1	1	1	1	1	1	1	1	1
	RA SpO_2 Less than 90%	2	2	2	2	2	2	2	2	2	2
Auscultation	Clear Breath Sounds to End Expiratory Wheezes Only	0	0	0	0	0	0	0	0	0	0
	Expiratory Wheezes	1	1	1	1	1	1	1	1	1	1
	Inspiratory & Expiratory Wheezes or Dimished Breath Sounds	2	2	2	2	2	2	2	2	2	2
Work of Breathing	Use of 0-1 Accessory Muscles Assessed	0	0	0	0	0	0	0	0	0	0
	Use of 2 Accessory Muscles Assessed	1	1	1	1	1	1	1	1	1	1
	Use of 3 or Greater Accessory Muscles Assessed	2	2	2	2	2	2	2	2	2	2
Dyspnea	Speaks Full Sentences, Playful, Babbles	0	0	0	0	0	0	0	0	0	0
	Speaks Partial Sentences, Short Cry	1	1	1	1	1	1	1	1	1	1
	Speaks Short Phrases, Single Words, Grunting	2	2	2	2	2	2	2	2	2	2
Total Asthma Severity Score (0-10)											
Asthma Protocol Stage RT ONLY											
Albuterol Dose Given (mg) RT ONLY											
Next Assessment Time											

Signature		Signature	
Signature		Signature	
Signature		Signature	

ADDENDUM 1 :

Ordering and Weaning Instructions for Steroid Management in Asthma

Mild to Moderate
PAS Score 3-7
In 2nd hour

NO → **Severe Exacerbation**
PICU

YES

Dexamethasone 0.6 mg/kg PO/IM/IV
(max: 16 mg) Qday X2 doses
(includes the dose in ED)
Separate the 2 doses by 24-36 hours.

Alternative for allergies and Intolerance only

Prednisolone 1 mg/kg
(max: 30mg/dose <12 yrs or 40 mg/dose ≥12 yrs)
PO Q12hr for 5 days

YES

Initial Dose: Methylprednisolone 2 mg/kg IV x1 *(max: 60 mg)*
(skip this step **if** Methylprednisolone or Dexamethasone already given)

THEN 6 hour later

Methylprednisolone 1 mg/kg IV Q6hr *(max: 60mg/dose)*

When patient off Terbutaline gtt AND continuous Albuterol

Methylprednisolone Q6hr **< 5 days** wean to

Methylprednisolone 1 mg/kg IV
(max: 60mg/dose) OR
Prednisolone 1mg/kg PO
(max: 30mg/dose <12 yrs or 40 mg/dose ≥12 yrs)
Q8hr for 1 day
(May skip this step if the patient is improving rapidly.)

Wean to

Prednisolone 1 mg/kg PO Q12hr
(max: 30mg/dose <12 yrs or 40 mg/dose ≥12 yrs)
Continue 3-8 days- duration based on severity of asthma exacerbation

Methylprednisolone Q6hr **≥ 5 days** wean to

Methylprednisolone 1 mg/kg IV
(max: 60mg/dose) OR
Prednisolone 1mg/kg PO
(max: 30mg/dose <12 yrs or 40 mg/dose ≥12 yrs) Q8hr for 2 days

Wean to

Prednisolone 1 mg/kg PO Q12hr for 3-5 days
(max: 30mg/dose <12 yrs or 40 mg/dose ≥12 yrs)

Wean to

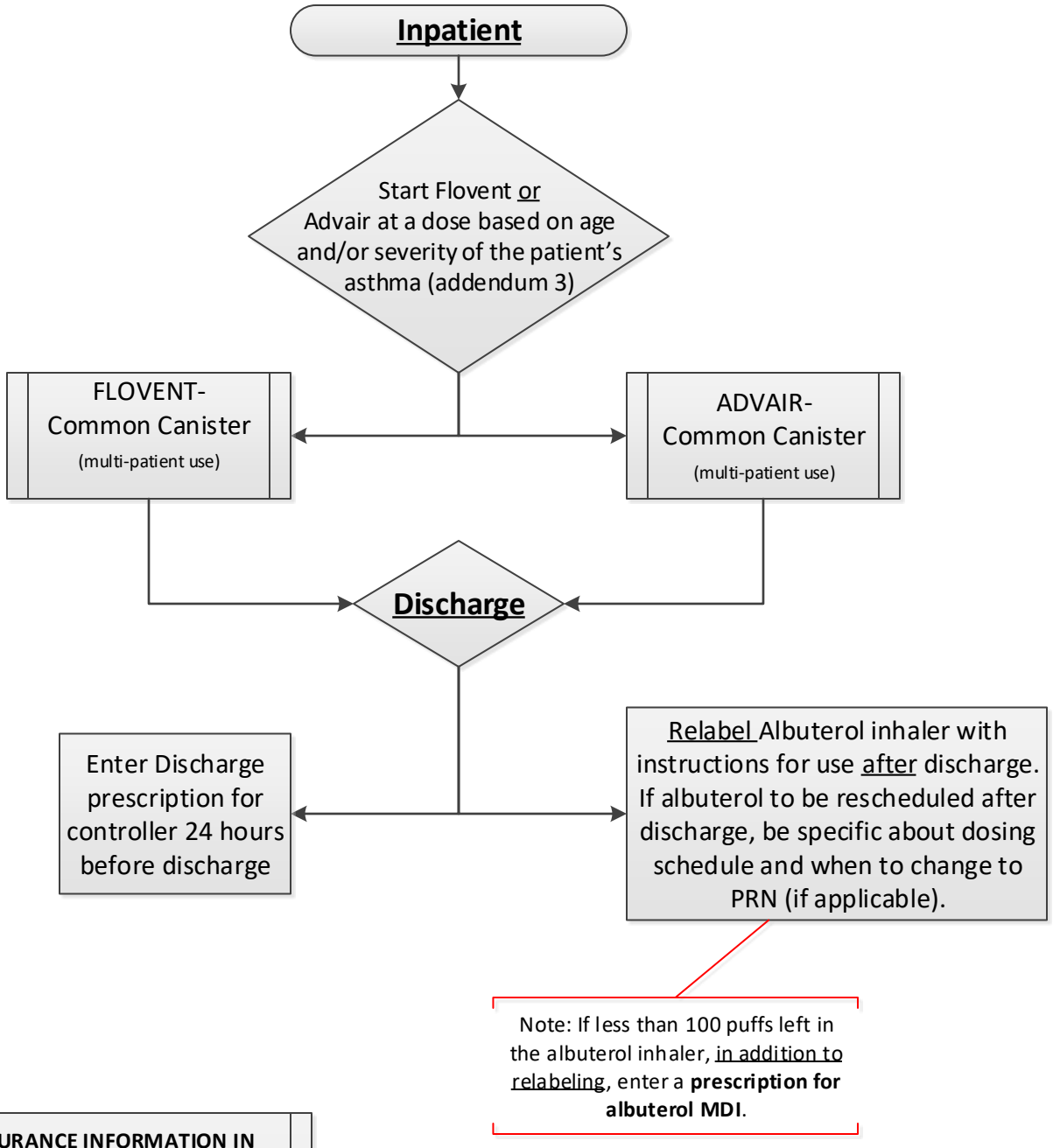
Prednisolone 0.5 mg/kg PO
(max: 20mg/ dose)
Q12hr for 3-5 days

Patients started on methylprednisolone (Solumedrol) should complete their steroid course with prednisolone (Orapred).

Exception:
If patient has received only one dose of methylprednisolone then they can receive the ***2 doses*** of dexamethasone (Decadron) as is outlined in the ED and Inpatient Pathways.

Addendum 2:
Ordering Instructions for Inhalers at Discharge

Start controller for ALL ASTHMATICS classified with mild, moderate or severe persistent asthma



HOW TO FIND INSURANCE INFORMATION IN COMPASS

1. Open patient's electronic chart
2. Go to patient information band on left hand side
3. Choose face sheet tab
4. Scroll down for **insurance information**

PEDIATRIC EBOC EVIDENCE BASED OUTCOMES CENTER

Addendum 3

Inhaled Corticosteroids for Asthma

Generic Name	Brand Name	Low Daily Dose (mcg)			Medium Daily Dose (mcg)			High Daily Dose (mcg)		
		0-4 yr	5-11 yr	≥ 12 yr	0-4 yr	5-11 yr	≥ 12 yr	0-4 yr	5-11 yr	≥ 12 yr
Beclomethasone HFA 40 or 80 mcg/puff	**Qvar,** Qvar RediHaler	N/A	40-80	80-240	N/A	160	240-480	N/A	320	> 480
Budesonide DPI 90,180,200 mcg/inh	**Pulmicort Flexhaler**	N/A	100-200	200-400	N/A	200-400	400-800	N/A	>400	>800
Budesonide neb 0.25mg/2ml, 0.5mg/2ml	**Pulmicort**	0.5mg	0.25-0.5mg	N/A	0.5-1mg	0.5-1mg	N/A	> 1mg	2mg	N/A
Budesonide/Formoterol **HFA**: 80/4.5, 160/4.6	**Symbicort**	N/A	160	160	N/A	320	320	N/A	320	640
Ciclesonide HFA 80, 160mcg/puff	**Alvesco**	N/A	80	80-160	N/A	160	160-320	N/A	320	320-640
Fluticasone HFA 44,110,220mcg/puff	**Flovent**	176 (mask)	88-176	88-220	176-440 (mask)	220-440	440	> 440 (mask)	880	880
Fluticasone/Salmeterol **HFA**: 45/21,115/21,230/21	**Advair**	180 (mask)	90-180	90-230	460 (mask)	230-460	460	920 (mask)	920	920
Fluticasone/Salmeterol **Disk**: 100/50,250/50,500/50	**Advair**	N/A	200	200	N/A	500	500	N/A	1000	1000
Mometasone DPI 110,220mcg/inh	**Asmanex**	N/A	110	110-200	N/A	220-440	220-440	N/A	> 440	>440
Mometasone/Formoterol **HFA**: 100/5, 200/5	**Dulera**	N/A	N/A	200	N/A	N/A	400	N/A	N/A	800
Triamcinolone **MDI**: 100mcg/spray	**Azmacort**	N/A	400-800	400-1000	N/A	800-1200	1000-2000	N/A	> 1200	> 2000

N/A = Dosing not available in this age group, MDI = metered dose inhaler, HFA = hydrofluoroalkane inhaler, DPI = dry powder inhaler

Addendum 4
Asthma Discharge Checklist

Clinical Readiness for Discharge

□ Albuterol- 8 puffs or 5 mg Q4 times 1 dose

□ Oxygen Saturation >90 for more than 2 hours

Items Required for Discharge Home

□ Asthma **Action Plan**

□ Asthma **Education**

□ **Influenza Vaccine** per hospital protocol if not already received for the year
(not applicable in ED- refer to primary provider)

□ Order **Albuterol MDI** and re-label for home use with applicable home instructions

- Relabel Albuterol inhaler with instructions for use after discharge. If albuterol to be rescheduled after discharge, be specific about dosing schedule and when to change to PRN (if applicable).
- Note: If less than 100 puffs left in the albuterol inhaler, in addition to relabeling, enter a **prescription for albuterol MDI**.

□ Prescription for **Controller** (addendum 2)

□ **Steroids**: Dexamethasone script for dose #2- 0.6 mg/kg PO x1 (max: 16mg rounded to nearest 1 **or** 4mg tab) if second dose was not received in the hospital

Family education/ prescription instructions:
Give 24-36 hours after initial dose.
Crush and mix in a small bite of food or a teaspoon of liquid that the child prefers.

If the patient received methylprednisolone (Solumedrol) or prednisolone (Orapred), see addendum 1 for steroid management and write an applicable prescription to finish the course of treatment.

□ **Smoking Cessation**, if indicated

Addendum 5:

Pulmonary Unit (High Acuity Beds) Exclusion Criteria

The exclusion criterion to be applied to potential Pulmonary Unit (asthma high-acuity) admissions does not supersede clinician decision making. Should the clinician feel that the child's placement would be better-suited in a higher level of care despite the presence of exclusion criteria; the clinician's decision should be honored. **None of the below criteria should delay disposition per agreed time criteria between ED/PCRS/ICU.**

- Level of Consciousness
  - If there is any question of altered mental status being present, the child is no longer appropriate for high-acuity unit placement.
- Blood Pressure
  - Common blood pressure side-effects from bronchodilators are **increased** systolic and **decreased** diastolic pressures. NS bolus should be considered once BP fall below normal range.
  - Should the child's diastolic blood pressure fall **below normal standards (*not critical low value)*** without improvement after **ONE** NS bolus, the child is excluded.
  - Should the child report chest pain in the context of low diastolic blood pressure, then the child is excluded regardless of NS bolus administration.

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	AGE GROUPS FROM COMPASS	NORMAL RANGE	CRITICAL LOW	CRITICAL HIGH
SYSTOLIC BLOOD PRESSURE	0 – 8 days	65-95	60	100
	9 – 28 days	65-95	60	100
	29d – 12m	75-95	70	100
	13m – 3yr	80-95	75	110
	4 – 6yr	85-110	80	120
	7 – 13yr	95-130	90	140
	14 – 18yr	95-140	90	150
	>18yrs	92-170	90	180
DIASTOLIC BLOOD PRESSURE	0 – 8days	35-71	30	
	9 – 28days	35-69	30	
	29d – 12mo	35-73	30	
	13mo – 3yr	35-73	30	
	4 – 6yr	45-73	40	
	7 – 13yr	45-81	40	
	14 – 18yr	45-84	40	
	>18yrs	70-100	50	110

- Pulmonary Insufficiency
  - Oxygen use alone is not a reason to exclude from admission.
  - After beta-agonist Rx has been applied and 15-20 minutes have passed to allow for equilibration of V/Q mismatch, if the child has **new onset need for** oxygen of greater than 50% FiO_2 then the patient is excluded.

Any patient in the acute care or Pulmonary Unit scoring of an 8 or more should be under the care of the PICU team.

Addendum 6:

Dexamethasone (Oral) for the Treatment of Asthma

Administration Information

Children with asthma exacerbation and a Pediatric Asthma Score (PAS) of 3 or more will be given steroids within 1 hour of arriving in the emergency department. When possible, oral dexamethasone (Decadron) will be given at a dose of 0.6mg/kg (Max 16mg) x 1 dose.

If the patient cannot swallow tablets, the dexamethasone tabs can be crushed up and mixed with 3-5 ml of Syrpalta (grape syrup) or a bite of applesauce/pudding/ice cream.

For ease of dosing, consider rounding the dexamethasone to the nearest 4mg tab using these weight ranges:

- 8 to10.9 kg = 6 mg
- 11 to 15.9 kg = 8 mg
- 16 to 23.9 kg = 12 mg
- 24 kg and above = 16 mg

Based on these ranges, the 4mg tab(s) can be used for all patients and crushed for those too young to swallow it.

One dose of dexamethasone (dosed as mentioned above) will provide anti-inflammatory treatment for 1-2 days. Most patients will not need another dose for at least 24 hours and patients with mild asthma exacerbation may not need another dose. Those with moderate exacerbation will need 2 doses separated by 24-36 hours. More than 2 doses of dexamethasone has not been studied for the treatment of asthma exacerbation.

Outpatient prescriptions for dexamethasone should be written using the 4 mg tabs and rounding to the nearest whole tab (using the weight ranges and doses above) x 1 dose po to be given 24 hrs following the ED or hospital time of administration. Pediatricians should write for a total of 2 doses to be given, separated by 24-36 hours with the first dose given as soon as possible. Additionally, there should be a sentence that states “crush tab(s) between two metal spoons and mix with 1 tsp of juice or 1 bite of food”. All outpatient pharmacies carry the 4 mg tabs.

Best Practice Points to Remember

- To meet the 1 hour metric for corticosteroids, it is best to have the 4 mg tabs loaded in your Omnicell.
- Tabs are the best dosage form for dexamethasone because the commercially available dexamethasone elixir is 30% alcohol and associated with a high rate of emesis.
- Parents should be counseled to the give the second dose with food, in the morning, 24-36 hrs after the first dose (due to the common side effect of insomnia/hyperactivity).

DELL CHILDREN'S MEDICAL CENTER
EVIDENCE-BASED OUTCOMES CENTER

Approved by the Pediatric Asthma Evidence-Based Outcomes Center Team

Revision History
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Recommendations

Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible.

Approval Process

EBOC guidelines are reviewed by DCMC content experts, the EBOC committee, and are subject to a hospital wide review prior to implementation. Recommendations are reviewed and adjusted based on local expertise.

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