

ASTHMA EXACERBATION MANAGEMENT

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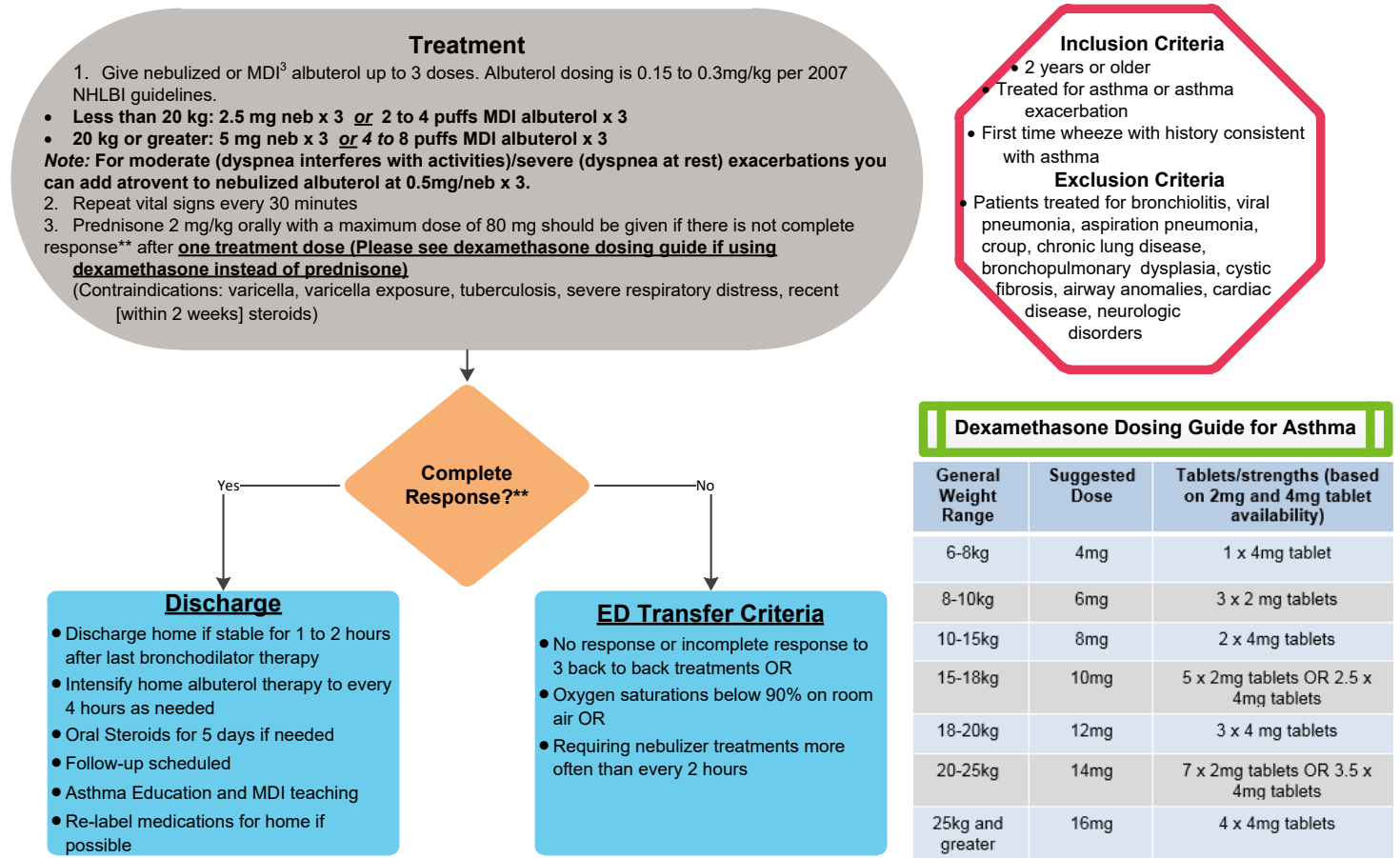
FIGURE 1. ALGORITHM FOR ASTHMA EXACERBATION MANAGEMENT – OUTPATIENT CLINIC

Triage RN/MA:

- Check HR, RR, temp, pulse ox. Triage level as appropriate
- Notify attending physician if patient in severe distress (RR greater than 35, oxygen saturation less than 90%, speaks in single words/trouble breathing at rest)

Primary RN:

- Give oxygen to keep pulse oximetry greater than 90%



** Complete response is defined as oxygen saturations over 90%, no significant increased work of breathing, (PAS less than 7)**

FIGURE 2. ALGORITHM FOR ASTHMA MANAGEMENT – EMERGENCY DEPARTMENT

Intended for: Children 2 years or older with acute wheeze or cough AND A HISTORY OF:

- Asthma OR
- Episodic symptoms of airflow obstruction (recurrent cough and/or wheeze)—including anaphylaxis—that are **at least partially reversible** with bronchodilator treatment

NOT Intended for: Children less than 2 years old; co-morbid conditions, including: chronic lung disease, cystic fibrosis, cardiac disease, bronchiolitis, stridor, aspiration or neuromuscular disorders

Triage RN/Primary RN:

Routine vital signs and check saturation, blood pressure

- Perform Pediatric Asthma Score (PAS)
- If PAS score is 8 or above *and* the patient has a history of asthma, reactive airway disease, recurrent albuterol use or recurrent wheezing, initiate the ED asthma nurse standing order including oral steroids (dexamethasone)
- Oxygen to keep SpO₂ greater than 90%
- Notify respiratory therapy

RT or RN:

- Give up to three initial inhaled albuterol or combination ipratropium - albuterol treatments, either nebulized or via MDIs.^{8,9} See weigh specific dosing below. Refer to [standing order](#).
- Repeat PAS pre and post nebulizer.
- Dexamethasone (or equivalent) 0.6mg/kg orally with a maximum dose of 16 mg to any child with a PAS score over 7 if not contraindicated. **Goal is administration within 60 min of arrival.**
- Initiate asthma bundle (RT assess and treat flowsheet).

***See algorithm on next page**

FIGURE 2. ALGORITHM FOR ASTHMA MANAGEMENT – EMERGENCY DEPARTMENT (CONTINUED)

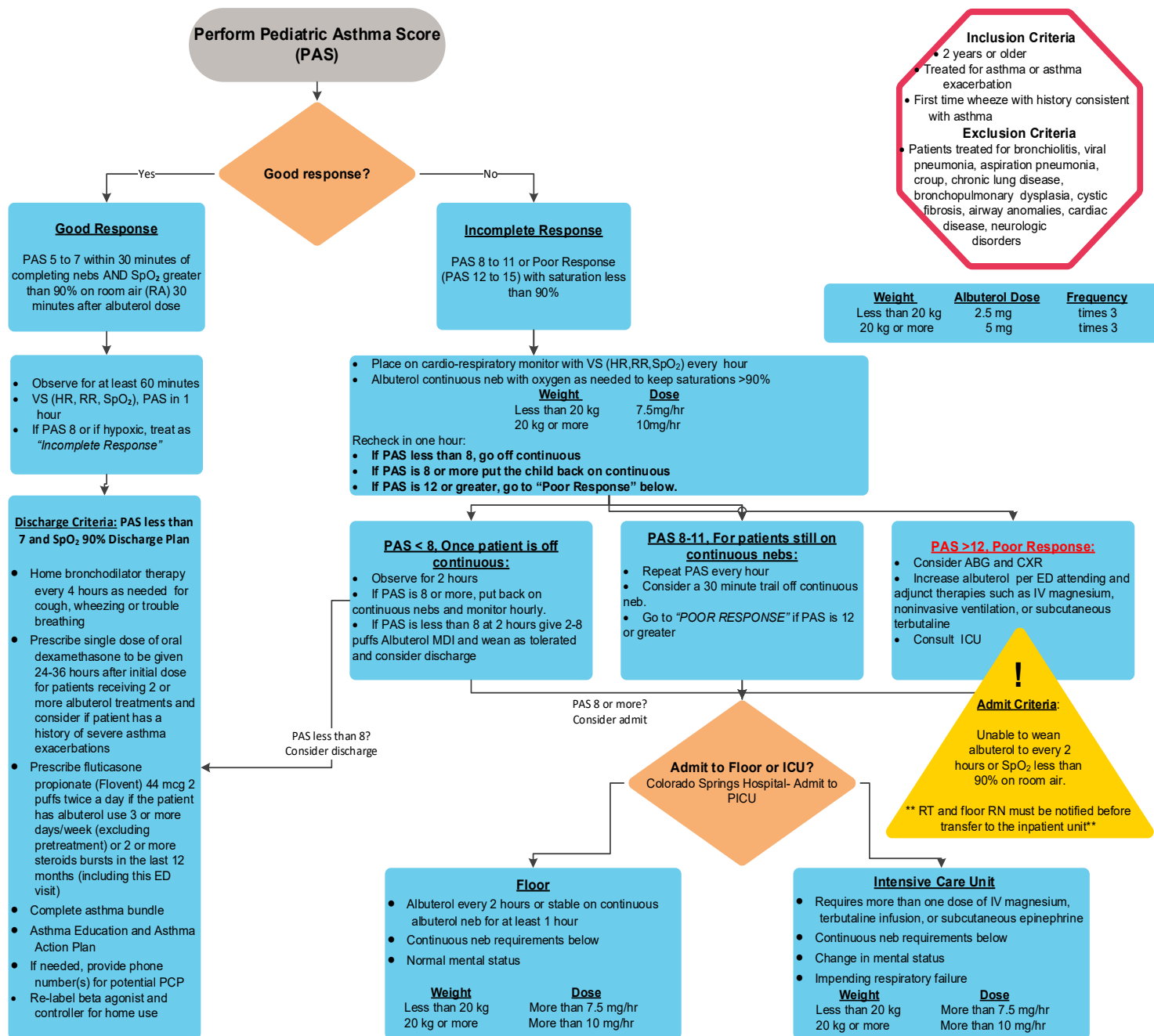


FIGURE 3. ALGORITHM FOR ASTHMA MANAGEMENT – INPATIENT AND NOC

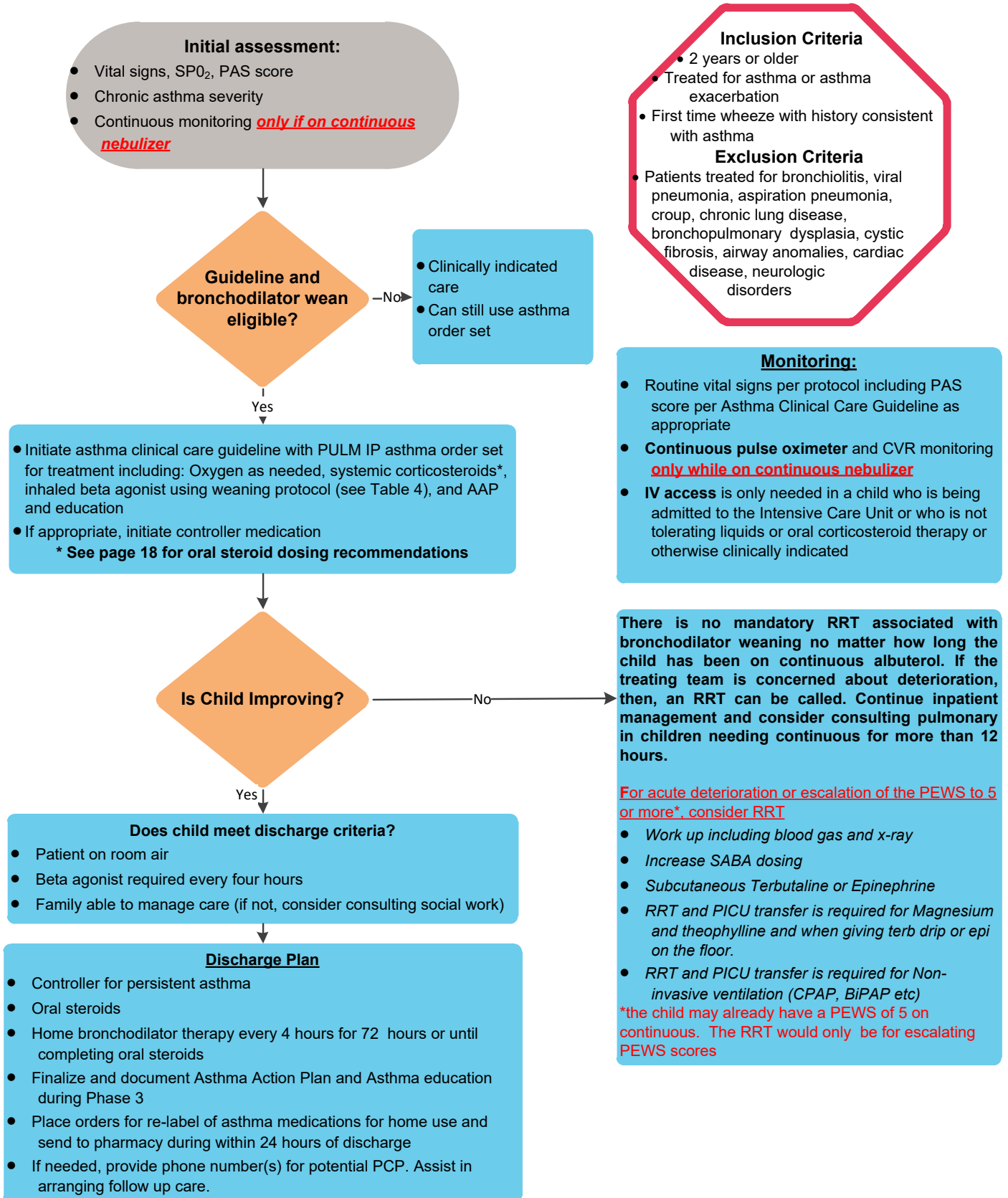


FIGURE 4. PROGRESSION THROUGH THE BRONCHODILATOR WEANING PROTOCOL

Intended for: patients 2 years or older who are being treated for asthma or an asthma exacerbation, including first time wheeze

NOT Intended for: patients less than 2 years old; co-morbid conditions, including but not limited to: chronic lung disease, cystic fibrosis, cardiac disease, bronchiolitis, croup/stridor, aspiration, neurological disorder

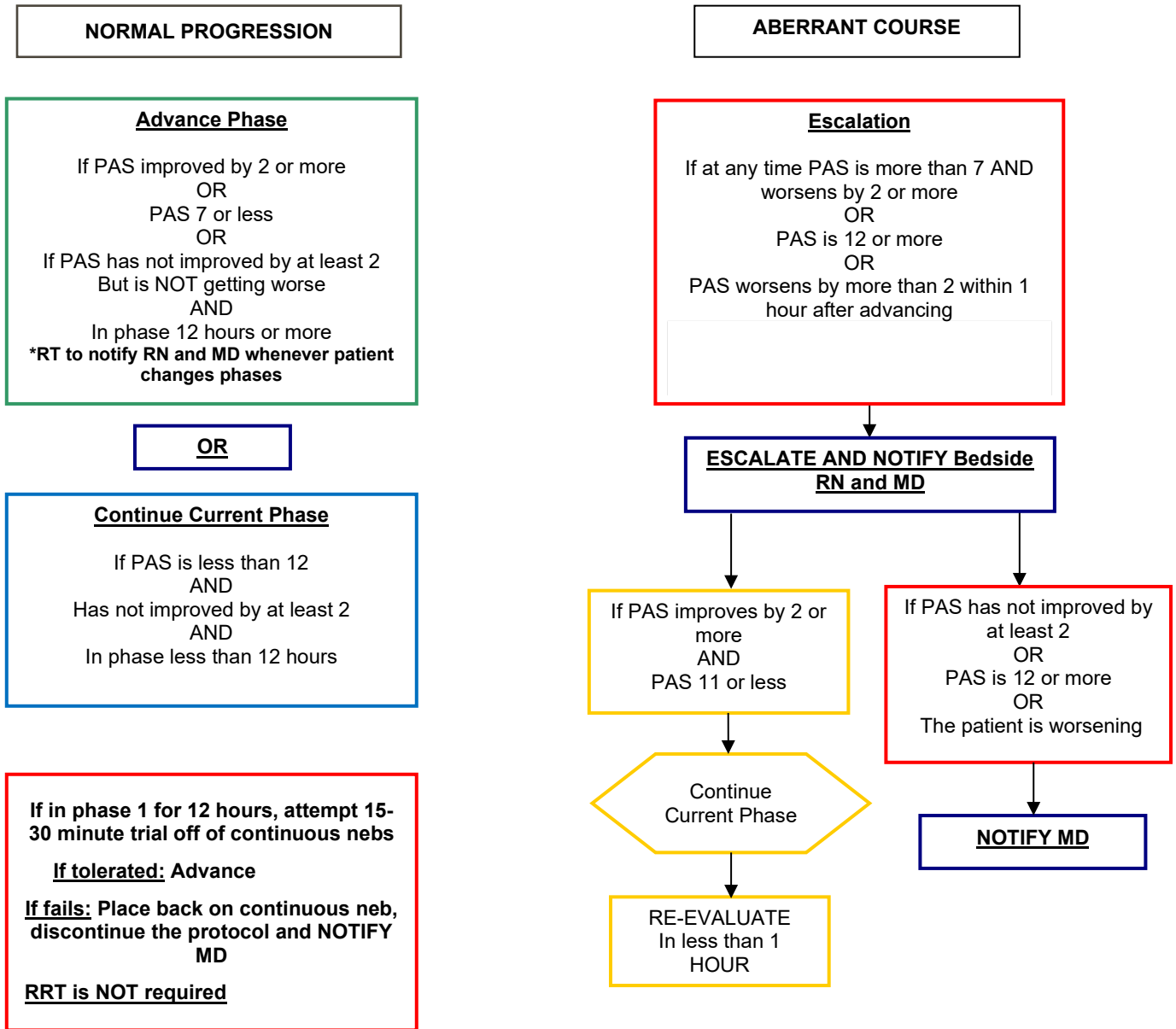


TABLE 1. PEDIATRIC ASTHMA SEVERITY (PAS) SCORE

NOTE: Use PAS Score to guide intervention and response to treatment. *Older* pediatric asthma patients may exhibit lower PAS scoring during an exacerbation.

| Score | 1 | 2 | 3 |
|---|--|--|--|
| Respiratory rate 2 to 3 years 4 to 5 years 6 to 12 years older than 12 years | 34 or less 30 or less 26 or less 23 or less | 35 to 39 31 to 35 27 to 30 24 to 27 | 40 or greater 36 or greater 31 or greater 28 or greater |
| Oxygen requirements | Greater than 90% on room air | 85% to 90% on room air | Less than 85% on room air |
| Auscultation | Normal breath sounds to end-expiratory wheeze only | Expiratory wheezing | Inspiratory and expiratory wheezing to diminished breath sounds or poor aeration |
| Retractions | Zero to one site | Two sites | Three or more sites |
| Dyspnea | Speaks in sentences, coos and babbles | Speaks in partial sentences, short cry | Speaks in single words/short phrases/grunting |

TABLE 2. BRONCHODILATOR WEANING PROTOCOL

For patients 2 years or older, who are being treated for asthma or an asthma exacerbation. Any patient with asthma on the floor (including PICU transfers) can be placed on this protocol. Children should be taken off of the protocol if they require more than one intensification per phase, fail a trial off of continuous, or by provider discretion. Once taken off the protocol, the Provider will determine/order timing of bronchodilator wean.

| PHASE 1 | PHASE 2 | PHASE 3 | PHASE 4 | INTENSIFICATION |
|--|---|---|---|---|
| <p>Continuous Nebulizer: Albuterol Weight: Dose More than 20 kg: 10 mg/hour Less than 20 kg: 7.5 mg/hour</p> <p><u>**Anschutz- Patients requiring higher doses of continuous albuterol must be transferred to the PICU</u> <u>**Colorado Springs Hospital- Patients requiring continuous albuterol must be transferred to the PICU**</u></p> | <p>Albuterol every 2 hours via MDI/VHC Weight: Dose More than 20 kg: 8 puffs Less than 20 kg: 4 puffs</p> <p style="text-align: center;">-OR-</p> <p>Albuterol every 2 hours via neb Weight: Dose More than 20 kg: 5 mg Less than 20 kg: 2.5 mg</p> | <p>Albuterol every 3 hours via MDI/VHC Weight: Dose More than 20 kg: 8 puffs Less than 20 kg: 4 puffs</p> <p style="text-align: center;">-OR-</p> <p>Albuterol every 3 hours via neb Weight: Dose More than 20 kg: 5 mg Less than 20 kg: 2.5 mg</p> | <p>Albuterol every 4 hours via MDI/VHC Weight: Dose More than 20 kg: 4 puffs Less than 20 kg: 2 puffs</p> <p style="text-align: center;">-OR-</p> <p>Albuterol 2.5 mg every 4 hours via neb</p> | <p>Albuterol via nebulizer times one Weight: Dose More than 20 kg: 10 mg Less than 20 kg: 7.5 mg –</p> <p>OR- Albuterol via MDI/VHC Weight: Dose More than 20 kg: 10 puffs Less than 20 kg: 6 puffs <u>**Consider subcutaneous terbutaline if intensifying while on continuous nebulizer.</u> <u>(See Table 4 for dosing and requirements.)**</u></p> |
| Systemic Corticosteroids | | | | |
| <p>RT evaluate every hour</p> <ul style="list-style-type: none"> • HR, RR, SpO₂, RA. • Pediatric Asthma Severity Score (PAS) • Initiate education on “what is asthma”, signs and symptoms, and triggers | <p>RT evaluate every 2 hours</p> <ul style="list-style-type: none"> • HR, RR, SpO₂, RA. • Pediatric Asthma Severity Score (PAS) • Initiate education on MDI with VHC use (handout) | <p>RT evaluate every 3 hours</p> <ul style="list-style-type: none"> • HR, RR, SpO₂, RA. • Pediatric Asthma Severity Score (PAS) • Peak flow Education (>6 yrs.) • BPA triggers for AAP and asthma teaching. • Finalize AAP and Asthma education. Check understanding of key concepts, device technique, review meds, and AAP with patient/family. | <p>RT evaluate every 4 hours</p> <ul style="list-style-type: none"> • HR, RR, SpO₂, RA, • Pediatric Asthma Severity Score (PAS) • Peak flow Education (>6 yrs.) • BPA triggers for RT to re-label meds for home use. | <p>RT evaluate in 1 hour</p> <ul style="list-style-type: none"> • HR, RR, SpO₂, RA. • Pediatric Asthma Severity Score (PAS) • Peak flow Education (>6 yrs.) |
| <p>RN evaluate every hour</p> <ul style="list-style-type: none"> • Continuous SpO₂, HR, RR, with full cardiorespiratory assessment. Temp & BP Q4hr | <p>RN evaluate every 2 hours</p> <ul style="list-style-type: none"> • Spot check SpO₂, HR, RR, with full cardiorespiratory assessment. Temp & BP Q4hr | <p>RN evaluate every 4 hours</p> <ul style="list-style-type: none"> • Spot check SpO₂, HR, RR, with full cardiorespiratory assessment. Temp & BP Q4hr | <p>RN evaluate every 4 hours</p> <ul style="list-style-type: none"> • Spot check SpO₂, full set of VS , with full cardiorespiratory assessment. • Review AAP is complete and reconciled with DC orders. Ensure Asthma education documented. | <p>RN evaluate in 1 hour</p> <ul style="list-style-type: none"> • Continuous SpO₂ HR, RR, check BP, full cardiorespiratory assessment |
| <p>Provider</p> <ul style="list-style-type: none"> • Add controller medications. • Verify orders for AAP/Education | | | <p>Provider</p> <ul style="list-style-type: none"> • Review AAP | |

TARGET POPULATION

Inclusion Criteria

- 2 years and older
- Being treated for asthma or an asthma exacerbation
- First time wheeze with a history consistent with asthma

Exclusion Criteria

- Patients being treated primarily for bronchiolitis, viral pneumonia, aspiration pneumonia, or croup. (Patients with an asthma exacerbation who also have a viral illness will benefit from the clinical care guidelines.)
- Chronic lung disease, bronchopulmonary dysplasia (BPD), cystic fibrosis, airway anomalies (e.g. tracheomalacia), cardiac disease, or neurologic disorders

CLINICAL MANAGEMENT

Diagnosing Asthma

- **Suspect asthma** in any child with episodic symptoms of airflow obstruction (cough, wheeze, shortness of breath) that is at least partially reversible with a bronchodilator
- **Rule out other causes of airway obstruction** such as cystic fibrosis, recurrent aspiration, airway anomalies (such as tracheomalacia), GERD, sinusitis, and foreign body aspiration

Asthma Severity Assessment

Intermittent vs. Persistent asthma:

- Persistent asthma is diagnosed if the child has any of the following:
 - Symptoms more than twice per week during the day
 - Symptoms twice per month at night
 - Any exercise limitation
 - FEV1 less than 80% predicted (for children over 5 years)
 - Two or more steroid bursts for asthma in 12 months

Treat persistent asthma with a daily controller medication such as inhaled corticosteroids

- See [Appendix A. Asthma Management-Outpatient](#)
- See [Table 3. Dosage of Daily Controller Medication for Asthma Control](#)

Keys to Managing Any Asthma Exacerbations

Telephone Triage^{1,2}

- **Mild** (dyspnea with activities and/or peak flow greater than 80% of personal best) → Primary Care Provider (PCP) contact AND short acting bronchodilator every 4 hours.
- **Moderate** (Dyspnea interfering with activities and peak flow 50 to 80% of personal best) → Same day clinic visit AND short acting bronchodilator every 4 hours AND consider home prednisone/dexamethasone. .
- **Severe** (Dyspnea interfering with speech and peak flow 50 to 80% of personal best) → Emergency Department (ED) visit AND repeat short acting bronchodilator every 20 minutes up to 3 doses.

- **Life Threatening** (Severe difficulty breathing, not able to speak, cyanosis, combative, agitated or difficult to arouse) → Activate EMS.

CLINICAL ASSESSMENT

History

- Document recent exposures to asthma triggers including illness. Document recent beta agonist use and any oral steroid use. Assess the timeline of progression of the exacerbation.
- Evaluate chronic asthma severity by asking about baseline daytime and nighttime asthma symptom frequency, and bronchodilator use previous to this exacerbation, and history of previous asthma exacerbations and oral steroid bursts. Document the chronic asthma severity, chronic asthma medications, and reported medications adherence in the medical record. (For severity assessment please see appendix B).

Physical exam

- Evaluate for cough, wheeze, tachypnea, increased work of breathing, low oxygen saturation
- Use **Pediatric Asthma Severity (PAS) Score to guide intervention and response to treatment.** PAS^{2,4,5} score includes the following elements: Respiratory rate, Oxygen requirements, Auscultation, Retractions, Dyspnea

Laboratory and radiologic studies

- **Chest X-Ray:** Consider if history of choking and/or foreign body aspiration, delayed symptom resolution, persistent asymmetric lung exam.
- **NOTE:** A normal chest exam does not exclude asthma.
- **Arterial or venous blood gas:** Consider in cases with impending respiratory failure.

TREATMENT

Therapeutics

- **Oxygen:** Start supplemental oxygen for any child whose oxygen saturation is less than 90%. Increase as needed.
- **Short-acting beta-agonist (SABA):** Used for reversal of bronchospasm. **SABAs should be used in every child admitted to the hospital** for asthma.
- See [Figure 4. Progression Through the Bronchodilator Weaning Protocol](#)
- See [Table 4. Dosage of Medications for Asthma Exacerbations, and](#)
- See [Table 2. Bronchodilator Weaning Protocol](#)

Systemic corticosteroids^{6,7} should be used in all children admitted to the hospital for asthma. Steroids are recommended early in the course of an exacerbation for children who do not respond quickly or completely to inhaled beta-agonists. Oral corticosteroids have similar bioavailability to parenteral steroids. The 2007 NHLBI guidelines do not endorse doubling inhaled corticosteroid dosing. **Contraindications:** varicella, varicella exposure, tuberculosis, severe respiratory distress, recent steroid course (within 2 weeks), currently on steroids

Use the chronic asthma severity assessment to initiate or continue appropriate chronic asthma medications. (see [Appendix B](#)).

- **Emergency treatment for impending respiratory failure per Emergency Department ([Figure 2](#)) and Inpatient ([Figure 3](#)) Guidelines. For medication dosing recommendations, see [Table 3](#) and [Table 4](#).**

Education

- Provide education about asthma, exacerbations, and medications prior to discharge. Asthma education is most effective if it is delivered throughout stay and documented in an individualized action plan upon discharge. Please find a one page asthma education sheet in [Appendix C](#).
- The CHCO Asthma bundle is a standard asthma discharge package that includes chronic asthma assessment, trigger evaluation, asthma action plan creation, and standard discharge instructions

Follow up

- Follow up with patient's primary care provider should be arranged within 10 days of discharge or treatment in any setting.

Consult asthma specialists (pulmonary or allergy) for any patient with:

- ICU admission for asthma
- Exacerbation complicated or triggered by complicating illnesses such as allergies
- Need for extensive education
- Questioning the diagnosis of asthma

Please refer all high-risk asthma patients seen at Children's Hospital Colorado (CHCO) to the high risk asthma clinic at CHCO or back to their asthma specialist. (High risk = 1 or more hospitalizations or 2 or more ED visits in 12 months or an ICU admission ever)

Consult social work for any child/family that has trouble obtaining medications or complying with the recommended therapy for asthma

CLINICAL CARE GUIDELINES FOR TREATMENT OF ASTHMA EXACERBATIONS

- **Outpatient:** See [Appendix A: Outpatient Chronic Asthma Management](#), [Appendix B: Stepwise Approach to Asthma Treatment](#) and [Figure 1: Algorithm for Asthma Exacerbation Management—Outpatient Clinic](#)
- **Emergency Department:** See [Figure 2: Algorithm for Asthma Management- Emergency Department](#)
- **Inpatient:** See [Figure 3: Algorithm for Asthma Management--Inpatient](#)

CHILDREN'S HOSIPTAL COLORADO HIGH RISK ASTHMA PROGRAM

The high risk asthma program will be notified about any child who has been admitted to the hospital for asthma or who has been seen in our emergency department for asthma more than twice in 12 months. A letter to the primary care provider (PCP) will be sent after the index visit episode to notify the PCP that their patient is at high risk for another severe asthma exacerbation. If the PCP approved or if we do not hear from the PCP that they would not like to have their patient contacted, a letter will be sent to the family to reinforce asthma education and to offer an appointment in the high-risk asthma clinic to any patient not already followed by an asthma specialist.

TABLE 3. DOSAGE OF DAILY CONTROLLER MEDICATION FOR ASTHMA CONTROL

NOTE: Products that are underlined bold text are available on the inpatient formulary at Children's Hospital Colorado

| Inhaled Corticosteroid Controller Medications On Children's Hospital Colorado Formulary | FDA Approved Age (yrs) | Dosage (Total Daily Inhalations) | | | | | |
|--|------------------------|----------------------------------|-------------------------------------|---------------------------|-------------------------------------|---------------------------|-------------------------------------|
| | | Low Dose | | Medium Dose | | High Dose | |
| | | less than 12 years of age | greater than 12 years of age/adults | less than 12 years of age | greater than 12 years of age/adults | less than 12 years of age | greater than 12 years of age/adults |
| <u>Advair HFA (fluticasone/salmeterol) MDI</u> | 12+ | N/A | (45/21) 4 | N/A | (115/21) 4 | N/A | (230/21) 4 |
| <u>Asmanex® (mometasone) 110 mcg DPI*</u> | 4+ | N/A | 1 | 2 | 2 | greater than 2 | greater than 2 |
| <u>Flovent® HFA (fluticasone) 44 mcg MDI</u> | 4+ | 2 to 4 | 2 to 6 | 4 to 8 | 7 to 10 | greater than 8 | greater than 10 |
| <u>Flovent® HFA (fluticasone) 110 mcg MDI*</u> | 4+ | N/A | 2 | 2-3 | 2 to 4 | greater than 3 | greater than 4 |
| <u>Pulmicort Respules® (budesonide) 0.25, 0.5, or 1 mg*</u> | 1+ | 0.25 - 0.5 mg | 0.5 mg | 0.5 - 1 mg | 1 mg | 2 mg | 2 mg |
| <u>Dulera® (mometasone/formoterol) MDI</u> | 12+ | N/A | N/A | (100/5) 4 | (100/5) 4 | (200/5) 4 | (200/5) 4 |
| Not on Children's Hospital Colorado Formulary | | | | | | | |
| <u>Advair® Diskus® (fluticasone/salmeterol) DPI*</u> | 4+ | (100/50) 1-2 | (100/50) 2 | (250/50) 1-2 | (250/50) 2 | (500/50) 2 | (500/50) 2 |
| <u>Flovent® HFA (fluticasone) 220 mcg MDI</u> | 4+ | N/A | 1 | 1 | 2 | greater than 1 | greater than 2 |
| <u>Flovent® Diskus® (fluticasone) 50 mcg DPI</u> | 4+ | 2 to 4 | 2 to 6 | 4 to 8 | 7 to 10 | greater than 8 | greater than 10 |
| <u>Pulmicort Flexhaler® (budesonide) 90 mcg DPI</u> | 6+ | 2 to 4 | 2 to 6 | 4 to 8 | 6 to 13 | greater than 8 | greater than 13 |
| <u>Pulmicort Flexhaler® (budesonide) 180 mcg DPI</u> | 6+ | 1 to 2 | 1 to 3 | 2 to 4 | 3 to 6 | greater than 4 | greater than 6 |
| <u>QVAR® HFA (beclomethasone) 40 mcg MDI</u> | 5+ | 2 to 4 | 2 to 6 | 4 to 8 | 6 to 12 | greater than 8 | greater than 12 |
| <u>QVAR® HFA (beclomethasone) 80 mcg MDI</u> | 5+ | 1 to 2 | 1 to 3 | 2 to 4 | 3 to 6 | greater than 4 | greater than 6 |
| <u>Symbicort® (budesonide/formoterol) 80/4.5 MDI*</u> | 12+ | 2 to 4 | 4 | 4 | 4 | N/A | N/A |
| <u>Symbicort® (budesonide/formoterol) 160/4.5 MDI*</u> | 12+ | N/A | N/A | 4 | 4 | 4 | 4 |
| <u>Alvesco (ciclesonide) 80 mcg MDI</u> | 12+ | N/A | 1 to 2 | N/A | 3 to 4 | N/A | greater than 4 |
| <u>Alvesco (ciclesonide) 160 mcg MDI</u> | 12+ | N/A | 1 | N/A | 2 | N/A | greater than 2 |
| <u>Arnuity Ellipta (fluticasone furorate) 100 mcg DPI</u> | 12+ | N/A | N/A | N/A | 1 | N/A | 1 to 2 |
| <u>Arnuity Ellipta (fluticasone furorate) 200 mcg DPI</u> | 12+ | N/A | N/A | N/A | N/A | N/A | 1 |
| <u>Asmanex HFA (mometasone) 100 mcg MDI</u> | 4+ | 1 | 2 | 2 to 4 | 4 | greater than 4 | greater than 4 |
| <u>Asmanex HFA (mometasone) 200 mcg MDI</u> | 12+ | N/A | 1 | N/A | 2 | N/A | greater than 4 |
| <u>Breo Ellipta (fluticasone/vilanterol) 100/25, 200/25</u> | 18+ | N/A | N/A | N/A | 100/25 1 inh QD | N/A | 200/25 1 inh QD |

TABLE 4. DOSAGE OF MEDICATIONS FOR ASTHMA EXACERBATIONS

| Inhaled Short-Acting Beta ₂ -Agonists (SABA) | | | |
|--|--|---|--|
| Medication | Children 12 years and younger | Adult or Children over 12 years | Comments |
| Albuterol: Intermittent Nebulizer solution (Available 2.5mg/3mL, 5 mg/mL) | 0.15 mg/kg (minimum dose 2.5 mg) every 20 Minutes for 3 doses the 0.15 to 0.3 mg/kg up to 10 mg every 1 to 4 hours as needed | 2.5 to 5 mg every 20 minutes for 3 doses, then 2.5 to 10 mg every 1 to 4 hours as needed | Only selective beta ₂ -agonists are recommended. For optimal delivery, dilute aerosols to minimum of 3 mL at gas flow of 8 L/min. May mix with ipratropium nebulizer solution. |
| Albuterol: Continuous Nebulizer solution (Available 5 mg/mL) | 20 kg or more: 10 mg/hour Less than 20 kg: 7.5 mg/hour | 10 mg/hour continuously | Use large volume nebulizers for continuous administration. May mix with ipratropium nebulizer solution. For higher doses, ICU transfer is required at CHCO |
| Albuterol: MDI (Available 90 mcg/puff) | 4 to 8 puffs every 20 minutes for 3 doses, then every 1 to 4 hours. Use valved holding chamber (VHC); add mask in children less than 4-6 years of age. | 4 to 8 puffs every 20 minutes up to 4 hours, then every 1 to 4 as needed. | In mild to moderate exacerbations, MDI plus VHC is as effective as nebulized therapy with appropriate administration technique and coaching by trained personnel |
| Levalbuterol/R-albuterol^{10,11} (See Restrictions): Nebulizer solution (Available 0.63 mg/3 mL, 1.25 mg/3 mL) | 0.075 mg/kg (minimum dose 1.25 mg) every 20 minutes for 3 doses, then 0.075 to 0.15 mg/kg up to 5 mg every 1 to 4 hours as needed. | 1.25 to 2.5 mg every 20 minutes for 3 doses, then 1.25 to 5 mg every 1 to 4 hours as needed | Levalbuterol administered in one-half the mg dose of albuterol provides comparable efficacy and safety. Has not been evaluated by continuous nebulization. The following restrictions apply to the use of Levalbuterol: a) The patient has failed albuterol therapy b) The patient has experienced side effects from albuterol c) The patient has allergies to the preservatives in albuterol d) The patient is on Levalbuterol therapy on admission |
| Levalbuterol /R-albuterol (See Restrictions): MDI (Available 45mcg/puff) | See albuterol MDI dosing | See albuterol MDI dosing | See restrictions for Levalbuterol nebulizer solution above. |

| Systemic (Injected) Beta ₂ -Agonists and Adjunct Medications | | | |
|---|--|--|---|
| Medication | Children 12 years and younger | Adult or Children over 12 years | Comments |
| Epinephrine: (Available 1:1,000 1mg/mL) | IM: 0.01 mg/kg (0.01 mL/kg/dose of 1mg/mL solution) not to exceed 0.5 mg every 20 minutes for 3 doses | IM: 0.3 to 0.5 mg every 20 minutes for 3 doses | No proven advantage of systemic therapy over aerosol. |
| Terbutaline: <i>RRT required to administer on the floor</i> (Available 1mg/mL) One dose can be given on the floor for acute deterioration or poor response to inhaled beta-agonist therapy. A 2 nd dose can ONLY be given if transfer to the PICU is delayed. | 0.01 mg/kg every 20 minutes for 3 doses, then every 2 to 6 hours as need subcutaneously. Maximum 0.3mg/dose | 0.25 mg every 20 minutes for 3 doses subcutaneously | No proven advantage of systemic therapy over aerosol. Subcutaneous Terbutaline can be used to intensify a patient who is on continuously nebulized albuterol. |
| Theophylline: <i>RRT required to administer on the floor.</i> Can be started on the floor only after an RRT has been called, Pulmonary Team has been consulted <i>and</i> transfer to the PICU is delayed. | If no theophylline given in the last 24 hours, initial dose is 5 mg/kg. If theophylline has been given in the last 24 hours; initial dose is 2.5 mg/kg. Maintenance dose and monitoring per CHCO pharmacy formulary. | | Not recommended by the national asthma guidelines due to the narrow window of clinical efficacy and risk of adverse effects. |
| Ipratropium Nebulizer solution (Available in 2.5 mL vial containing 0.5 mg ipratropium bromide, may be mixed with Albuterol) OR Ipratropium with albuterol: Nebulizer solution (Available 3 mL vial containing 0.5 mg ipratropium bromide and 2.5 mg albuterol) | 0.5mg can be given up to 3 times and then as needed. | 0.5mg can be given up to 3 times and then as needed. | May be used for up to 3 times in the initial management of severe exacerbations. The addition of Ipratropium to albuterol has not been shown to provide further benefit once the patient is hospitalized. |
| Adjunct Treatments for Exacerbation: Only to be used in the <u>Emergency Department or PICU. If used on the floor, RRT is required.</u> | | | |
| Magnesium sulfate ¹²⁻¹⁴ : <i>RRT required</i> Can be started on the floor for acute deterioration or poor response to inhaled beta-agonist therapy while arranging transfer to the PICU. | 40 mg/kg IV over 30 minutes. Maximum: 2g | 40 mg/kg IV over 30 minutes. Maximum: 2g | <i>For use in life-threatening exacerbations and in those whose exacerbations remains severe after 1 hour of intensive conventional therapy.</i> <i>Patients given one dose of Magnesium in the ED and stable 1 hour after administration can be transferred to the General Care floors.</i> |

Systemic Corticosteroids

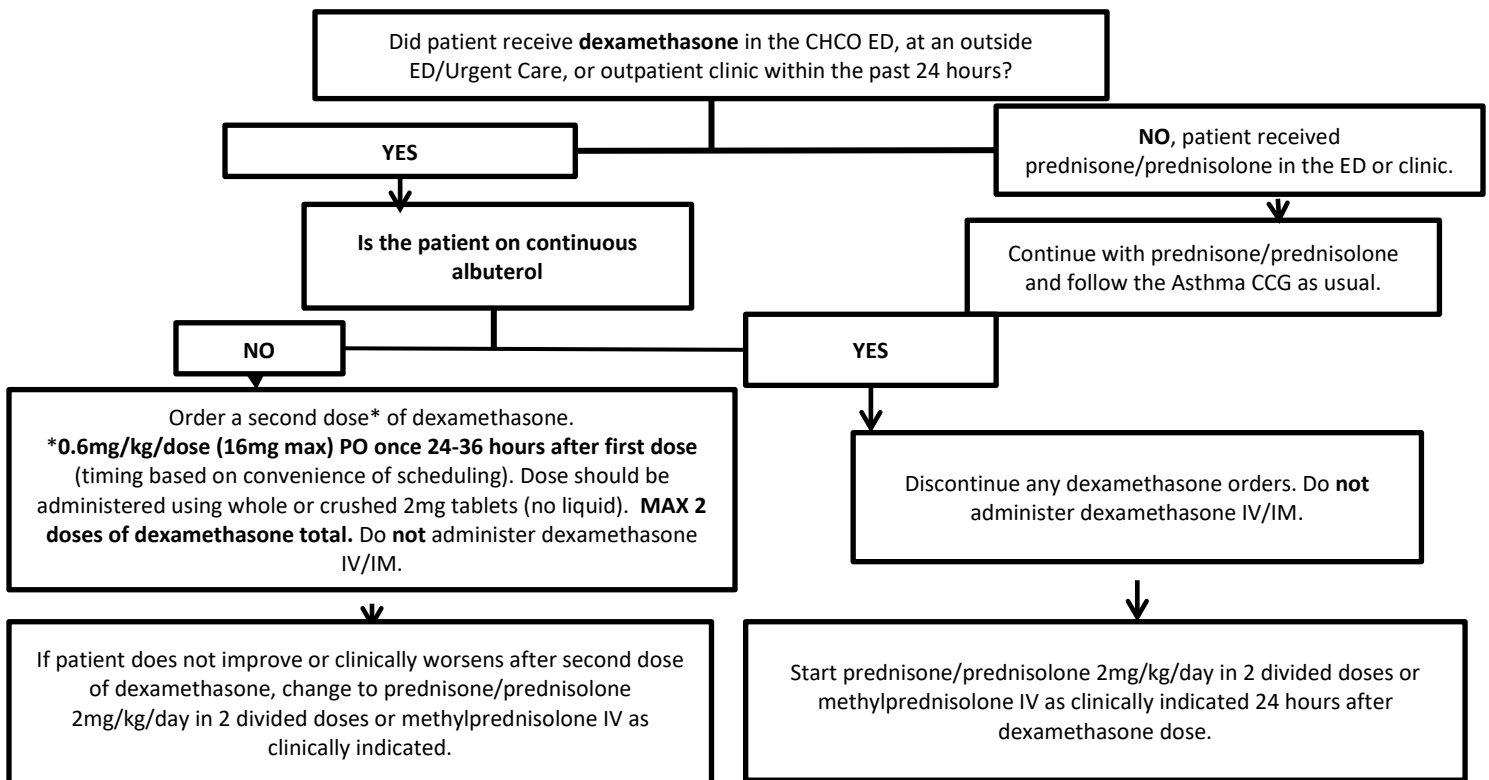
Note: Intravenous route should only be used if patient is unable to tolerate oral intake or in cases of impending respiratory failure

| Medication | Children 12 years and younger | Adult or Children over 12 years | Comments |
|---|--|---|--|
| <u>Dexamethasone</u> | 0.6mg/kg (Maximum 16mg) one dose per day for 48 hours (two doses total) | 0.6mg/kg (Maximum 16mg) one dose per day for 48 hours (two doses total) | Dexamethasone should be started in the emergency department or in primary care clinics by the treating provider. It is not recommended as a medication to keep at home due to risk of immunosuppression with multiple doses. |
| <u>Prednisone or Methylprednisolone or Prednisolone</u> | 2 mg/kg in 2 divided doses (Maximum = 60 mg/day outpatient and 80 mg/day inpatient/ED) | 40 to 80 mg/day in 1 to 2 divided doses | For outpatient "bursts": In adults, can be dosed in single or 2 divided doses for total of 5 to 10 days. In children: 1 to 2 mg/kg/day for 3 to 10 days |

TABLE 5. DEXAMETHASONE DOSING GUIDE FOR ASTHMA

| General Weight Range | Suggested Dose | Tablets/strengths (based on 2mg and 4mg tablet availability) |
|----------------------|----------------|--|
| 6-8kg | 4mg | 1 x 4mg tablet |
| 8-10kg | 6mg | 3 x 2 mg tablets |
| 10-15kg | 8mg | 2 x 4mg tablets |
| 15-18kg | 10mg | 5 x 2mg tablets OR 2.5 x 4mg tablets |
| 18-20kg | 12mg | 3 x 4 mg tablets |
| 20-25kg | 14mg | 7 x 2mg tablets OR 3.5 x 4mg tablets |
| 25kg and greater | 16mg | 4 x 4mg tablets |

FIGURE 5. ALGORITHM FOR DEXAMETHASONE DOSING FOR INPATIENT ASTHMA



PARENT | CAREGIVER EDUCATION^{15,16}

- Asthma education will be provided throughout episode of treatment including PCP, specialist visit, ED and inpatient.
- Best Practice Alerts (BPAs) will be triggered at phase 3 to alert the RT to complete the asthma action plan (AAP) and to finalize discharge asthma education; and at phase 4 to remind RT to re-label asthma medications and to send to pharmacy.
- An asthma action plan will be completed for all children who are discharged from the hospital with a primary diagnosis of asthma. Any child diagnosed with reactive airway disease (RAD) in the medical record is considered to have the same diagnosis as asthma. *Creation of an AAP for any patient receiving scheduled albuterol treatments should be considered¹⁷.*
- The action plan should include controller medications (or “no controller indicated”), triggers (check the Allergy section and H&P note for known environmental allergens), and follow up provider and phone number (cannot state “Parent Smart Number.”) May use Child Health Clinic and phone number for all non-established PCP’s at discharge. At any site where EPIC is used, the action plan can be found under the RT Navigator (for RTs) or the Dispo/Discharge Navigator (for RNs) under “Asthma Plan.” (Please remember to fully complete the form and Mark as Reviewed)
- Patient and primary caregiver need to demonstrate understanding of signs and symptoms, medication and device use, patient specific asthma triggers, peak flow education/monitoring (when applicable) and the Asthma Action Plan.
- The RN/RT who completes the AAP needs to document it was given to the family under the Education/LRA Navigator, pull in “Asthma” and document appropriate education under “asthma action plan.”

| English | Spanish |
|---|---|
| Asthma Triggers | Asthma Triggers |
| Asthma: What is it? | Asthma: What is it? |
| Diskus | Diskus |
| Home nebulizer treatments | Home nebulizer treatments |
| Metered dose inhaler | Metered dose inhaler |
| Peak flow meter | Peak flow meter |

- Smoke avoidance and cessation counseling referral will be provided to patients and primary caregivers.

RELATED CHILDREN’S HOSPITAL COLORADO DOCUMENTS

- [Noninvasive Positive Pressure Ventilation](#)
- [Code Blue Activation and Rapid Response Team \(RRT\) \(Anschutz Medical Campus\)](#)
- [Code Blue Activation and Rapid Response Team \(RRT\) \(Colorado Springs\)](#)
- Monitoring Procedure

APPENDIX A. ASTHMA MANAGEMENT – OUTPATIENT



Asthma Management for Children and Adults (age 5+ yrs)

Good asthma control reduces the risk of exacerbations and long-term pulmonary damage.

Make the Diagnosis

1. Consider the diagnosis of asthma if symptoms include: **recurrent** coughing, wheezing or shortness of breath relieved by a bronchodilator.
2. Spirometry: $\geq 12\%$ increase of FEV₁ post-bronchodilator.
3. Consider co-morbidities or alternate diagnosis, especially if poor control: GERD, aspiration, airway anomaly, foreign body, cystic fibrosis, vocal cord dysfunction, tobacco/secondhand smoke exposure, or COPD. GERD is a common co-morbidity.
4. If diagnosis in doubt, consult with an asthma specialist.

Exercise-Induced Bronchospasm (EIB)

- If symptoms resolve without treatment after 5 minutes of rest, it is more likely poor conditioning.
- If EIB is unresponsive to albuterol and the patient has allergies, consider starting an inhaled steroid (see *Stepwise Treatment table on page 2*).
- If still unresponsive after starting inhaled steroid, refer to specialist.

Key Points of Assessment and Treatment

1. Asthma is a variable disease and needs to be assessed at **every** visit.
2. Use the Assess Asthma Control box to guide your assessment and make treatment decisions.
3. The goal of asthma therapy is to keep the patient in control as much as possible with the least amount of medication.
4. If at the first visit the patient is not well-controlled (see below), begin controller therapy. A patient should be diagnosed with Persistent Asthma if he/she needs a daily controller medication to stay in control.

Assess Asthma Control (determination of level of control is dictated by the criterion at the lowest level of control)

| Criterion | Well-Controlled | Not Well-Controlled | Very Poorly Controlled | |
|---|------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|
| Daytime symptoms | ≤ 2 days/week | > 2 days/week | Throughout the day | |
| Nighttime awakenings | ≤ 2 times/month | 1-3 times/week | ≥ 4 times/night | |
| Limitation of activities | None | Some limitation | Extremely limited | |
| Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB) | ≤ 2 days/week | > 2 days/week | Several times per day | |
| Asthma Control Test (ACT) [†] | Score of ≥ 20 | Score of 16-19 | Score of ≤ 15 | |
| Courses of prednisone in last year | < 2 | ≥ 2 | ≥ 2 | |
| Spirometry [‡] | FEV ₁ % predicted | $> 80\%$ predicted or personal best | 60-80% predicted or personal best | $< 60\%$ predicted or personal best |
| | FEV ₁ /FVC ratio | Normal ratio for age | $\leq 5\%$ decrease in ratio for age | $> 5\%$ decrease in ratio for age |

FEV₁/FVC:
 5-19 yrs $\geq 85\%$
 20-39 yrs $\geq 80\%$
 40-59 yrs $\geq 75\%$
 60-80 yrs $\geq 70\%$

If Well-Controlled:
 Follow the **Stepwise Approach Guideline** (see page 2). Consider *step down* if well-controlled for 3 consecutive months. **Re-assess every 1 to 6 months.**

If Not Well-Controlled:
 Follow the **Stepwise Approach Guideline**. If initial visit, start at Step 2. *Step up* until well-controlled. **Re-assess in 2 to 6 weeks.** For side effects, consider alternative treatment.

If Very Poorly Controlled:
 Consider course of prednisone (1-2 mg/kg, daily max 60 kg). If initial visit, start at Step 2. *Step up* 1-2 steps using **Stepwise Approach Guideline**. **Re-assess in 2 weeks.**

Consider Referral to a Specialist
 If not well-controlled within 3-6 months using stepwise approach **OR** if 2 or more ED visits or hospitalizations for asthma in a year.

[†]For the full ACT go to www.healthteamworks.org/guidelines/asthma.html
[‡] Spirometry is suggested annually and/or any time the clinical picture changes or does not make sense.

Other Things to Consider at Every Visit

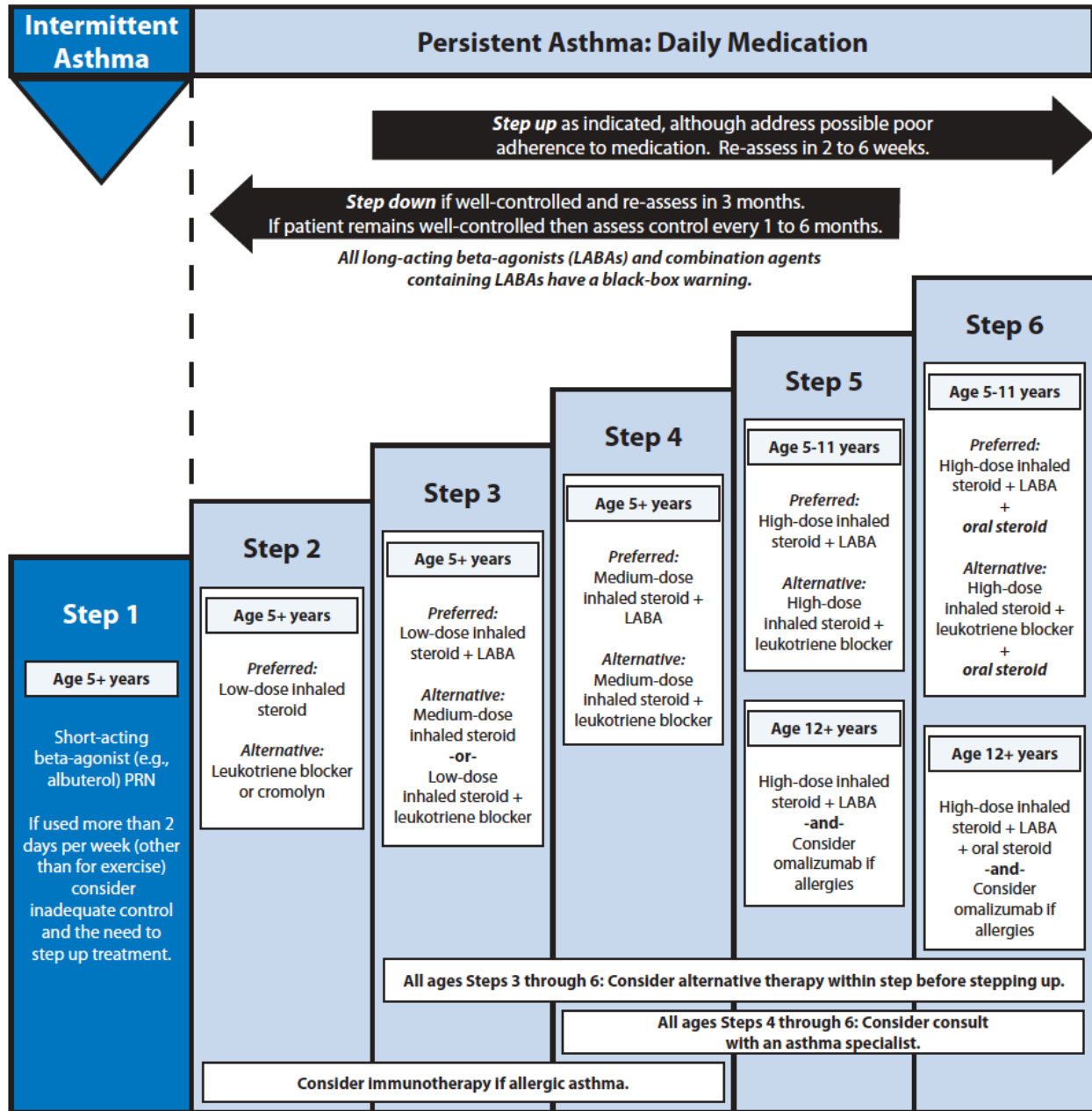
- Check adherence and address possible poor adherence to medication.
- Review environmental factors: e.g., pets, cigarette smoke, perfume, allergy season, respiratory infection.
- Provide self-management education.
- Develop and review a written asthma control plan in partnership with the patient.
- Integrate education into all points of care where healthcare professionals interact with patient.
- Review inhaler technique. Encourage use of spacers with all MDIs.
- Treat co-morbid conditions: rhinitis and sinusitis, obesity, gastroesophageal reflux, obstructive sleep apnea, stress, depression or anxiety, allergic bronchopulmonary aspergillosis.

APPENDIX B. ASTHMA STEPWISE APPROACH (AKA 'STEPS')

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Building Systems. Empowering Excellence.
page 2 of 2

Asthma Stepwise Approach

Good asthma control reduces the risk of exacerbations and long-term pulmonary damage.



Schedule Follow-Up Care

- Frequency of follow-up visits based on severity:
- Step 1-2: 1-2x per year
 - Step 3-4: Every 6 months
 - Step 5-6: Every 3 months

APPENDIX C. ASTHMA EDUCATION

What is Asthma?

Your child is in the Emergency department or Urgent care for an asthma attack. Asthma is a lung disease. Asthma causes the airways (breathing tubes in the lungs) to swell, fill with mucous and get smaller making it hard to breathe. There is no cure, but asthma can be well controlled so that your child can be healthy and join in all of their favorite activities.

How can I take care of my child?

Follow your Asthma Action Plan and come back to the Emergency Department or Urgent Care if your child has these symptoms.

- It's hard to breathe while walking or talking.
- The muscles in your child's neck, chest or ribs are pulling in or your child's nostrils are flaring with each breath.
- The quick relief inhaler isn't working and your child is getting worse.
- Hard to wake up or keep awake
- Your child's skin, or lips look blue, if they pass out from asthma or if they cannot breathe. **If this happens, call 911 right away.**

What causes an asthma attack?

The things that cause asthma attacks are called triggers. Each child has different triggers for their asthma. Common triggers for wheezing include:

- Allergens: dust, grass, pollen, animals, and others
- Infections: cold and viruses
- Irritants: **any type of smoke (including tobacco and marijuana)**, paint fumes, aerosols, and others

What type of medicines treat asthma?

Medicines used to treat asthma make symptoms better by lessening swelling and relaxing tight muscles around the airways (bronchospasm). There are three main types of medicine for asthma.

- **Quick relief inhalers**, like albuterol or levalbuterol, quickly relax the muscles around the airways and should make the asthma attack better within 5-10 minutes. These medicines are also called bronchodilators.
- **Controller medicines** (inhaled steroids). They need to be taken every day, even when your child feels good, because they prevent asthma symptoms and attacks. These medicines help to lessen swelling inside the airways but they won't work quickly enough to stop symptoms during an asthma attack.
- **Oral Steroids** are stronger steroids **taken by mouth. These are** used to lessen swelling in **the lungs. Oral steroids are** needed for most children seen in the emergency department or urgent care with an asthma attack.

All medicines may have side effects. Tell your child's primary care provider about any worries you have about side effects from your child's medicines. It is very important to follow the directions on when and how to use your child's asthma medicines to keep asthma well-controlled.

When can my child return to school or daycare?

Asthma is not contagious. Your child should go to school if he or she is having mild asthma symptoms, but should avoid gym or vigorous activity on these days.

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| | |
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REVIEW | REVISION SCHEDULE

Scheduled for full review on March 2, 2021

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