ORLANDO HEALTH®
1414 Kuhl Ave.
Orlando, FL 32806

PHARMACOTHERAPY GUIDELINE

Title: **Orlando Health Arnold Palmer Hospital Asthma Guideline**	Number: **GUID-(4710)-8180**

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Revision dates: **9/18/2020, 9/08/2022, 5/17/2024**	Developed by: Christine Bessett, DO Pediatric Hospitalists, Pharmacy, Pulmonology, Respiratory Therapy, Nursing, Pediatric Critical Care Associates
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Department Numbers: **1422, 2422, 3422, 6422, 8422, 9422**	

I. PURPOSE:

A. This department guideline provides guidance for the management of asthma at Orlando Health Arnold Palmer Hospital for Children.

II. DEFINITIONS:

A. Respiratory Score Tool: scoring tool consisting of four elements Respiratory Rate, Retractions, Dyspnea, and Auscultation

III. DEPARTMENT PROCESS:

A. Asthma Criteria and Respiratory Score

1. Inclusion Criteria: 1-18 years old with an asthma exacerbation
2. Exclusion Criteria: Provider dependent. See examples below:
    a. Acute illnesses:
        i. Patients with pneumonia, bronchiolitis, or croup as their primary diagnosis
    b. Chronic Conditions:
        i. Chronic lung disease
        ii. Cardiac disease requiring baseline medication
        iii. Airway complications (vocal cord paralysis, tracheomalacia, tracheostomy dependent, etc)
        iv. Sickle cell anemia
3. Respiratory Scoring Tool Consists of four elements: Respiratory Rate, Retractions, Dyspnea, and Auscultation.
    a. You assess each of the four elements and add up the total score: Score between 1-12.
    b. Once you have the total score, you apply it to the appropriate phase and follow the protocol.

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Respiratory Score (RS)

Variable	0 points	1 points	2 points	3 points
RESPIRATORY RATE				
< 2months		≤60	61-69	≥70
2-12 months		≤50	51-59	≥60
1-2 years		≤40	41-44	≥45
2-3 years		≤34	35-39	≥40
4-5 years		≤30	31-35	≥36
6-12 years		≤26	27-30	≥31
>12 years		≤23	24-27	≥28
RETRACTIONS	None	Subcostal or intercostal	2 of the following: subcostal, intercostal, substernal OR nasal flaring (infant)	3 of the following: subcostal, intercostal, substernal, suprasternal, supraclavicular OR nasal flaring/head bobbing (infant)
DYSPNEA				
0-2 years	Normal feeding, vocalizations and activity	1 of the following: difficulty feeding, decreased vocalization, or agitated	2 of the flowing: difficulty feeding, decreased vocalization or agitated.	Stops feeding, no vocalization, drowsy or confused
2-4 years	Normal feeding, vocalizations, and play	1 of the following: decreased appetite, increased coughing after play, hyperactivity	2 of the following: decreased appetite, increased coughing after play, hyperactivity	Stops eating or drinking, stops playing, OR drowsy and confused.
>4 years	Counts to ≥ 10 in one breath	Counts to 7-9 in one breath	Counts to 4-6 in one breath	Counts to ≤ 3 in one breath
AUSCULTATION	Normal breathing, no wheezing present	End-expiratory wheezes only	Expiratory wheeze only (greater than end-expiratory wheeze)	Inspiratory and expiratory wheeze OR diminished breath sounds OR both.

B. Appropriate Use of the Asthma Pathway:

1. Upon evaluation in the ED or admission to Arnold Palmer Hospital, if the patient meets inclusion criteria proceed to the outlined asthma pathways.
2. In the ED, if it is anticipated that the patient will score reliably the Respiratory Scores may be completed by the Resident physician, RT, or RN. Phase changes will be implemented based off their score per pathway.
3. Upon admission, if it is anticipated that the patient will score reliably, the Respiratory Scores will be completed by RT unless otherwise specified. Phase changes will be implemented based off their score per pathway.
4. If it is anticipated that the patient will not score reliably due to a clinical condition that may complicate their asthma treatment, discuss scores and phase changes with physician/provider as directed.
    a. RT will score the patient; however, phase advancement must be done by physician/provider.
5. Phase change by respiratory score is the standard of care for patients on the inpatient asthma pathway.
    a. Scoring performed by RT unless otherwise specified.
6. If patient is transferred from an outside facility and meets inclusion criteria:
    a. Transferred to the Emergency Department. If patient is transferred from outside hospital/treatment facility, physician/provider is to assist in determining the most appropriate initiating Phase I level after reviewing history/medical records provided and evaluating the patient.
    b. Transferred to the ICU/PSCU. Start Phase II per ICU Attending.
    c. Transferred to the General Pediatric Floors. Start Phase III.

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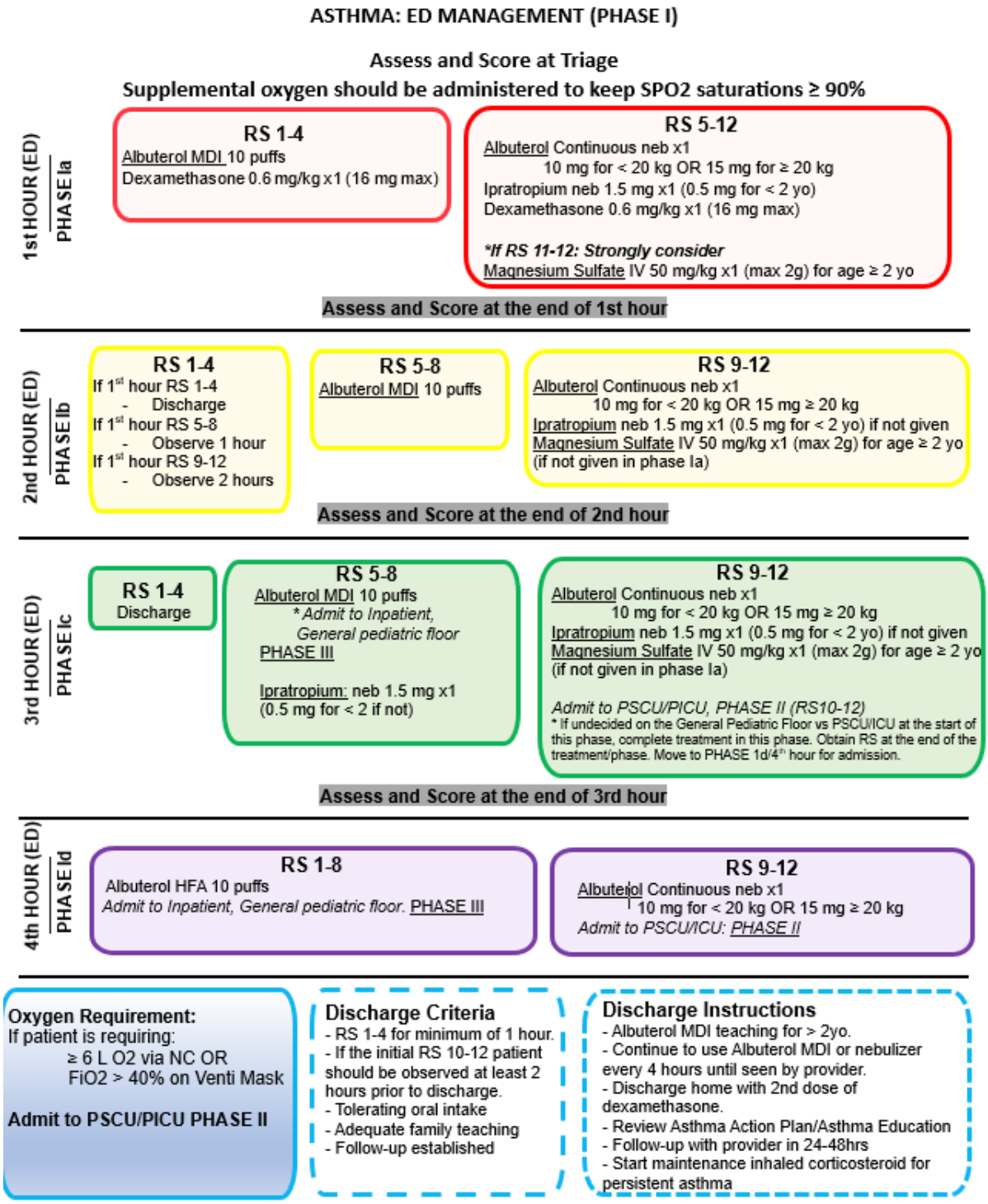
C. Emergency Department Pathway: PHASE I



D. ED ASTHMA PATHWAY OVERVIEW: PHASE I (a-d)

1. **PHASE Ia:** Time 0:
   a. Upon arrival to the ED, the patient should be assessed and scored via the Respiratory Scoring (RS) system. Treatments given at home prior to arrival to the ED are not factored in to the patient's initial evaluation.
   b. Supplemental oxygen should be administered to keep SpO2 ≥ 90%.
   c. RS 1-4: Mild Asthma Exacerbation:
      i. Give patient Albuterol MDI 6 puffs with spacer
      ii. Give a dose of Dexamethasone 0.6mg/kg x1 (max dose 16mg)
   d. RS 5-12: Moderate to Severe Asthma Exacerbation:
      i. Give continuous Albuterol nebulized treatment, dose is determined by patient's weight.
         1. Albuterol 15mg neb for weight ≥20kg
         2. Albuterol 10mg neb for weight <20kg
      ii. Give Ipratropium, dose is determined by patient's age.
         1. 1.5mg for patients ≥2 years old
         2. 0.5mg for patients <2years old.
      iii. Give Dexamethasone 0.6mg/kg x1 (max dose 16mg)
      iv. If RS 11-12, strongly consider giving Magnesium sulfate IV 50 mg/kg x1 (max 2g) for age ≥ 2 years old.
   e. After medical treatments are completed, re-assess patient at the 1 hour (60-minute) mark and calculate a RS. Using the new RS, move into PHASE Ib

2. **PHASE Ib**: Time ~60 min.
   a. RS 1-4:
      i. If in Phase Ia patient RS 1-4 (mild exacerbation)
         1. Discharge patient home
      ii. If in Phase Ia patient RS 5-8 (moderate exacerbation)
         1. Observe 1 hour then repeat RS and move to PHASE Ic.
      iii. If in Phase Ia patient RS 9-12 (severe exacerbation)
         1. Observe patient for 2 hours. (Continue to obtain RS at the end of each hour).
         2. Repeat RS in one hour (end of 1st observational hour)
            a. If repeat RS 5-12. Move to PHASE Ic.
            b. If repeat RS is 1-4: Observe another hour and prepare for discharge home.
               i. Repeat RS at the end of the 2nd observation hour and continue to PHASE 1c.
   b. RS 5-8
      i. Give Albuterol MDI 10 puffs with spacer
      ii. Reassess at the end of the hour, obtain RS. Move to PHASE Ic.
   c. RS 9-12

i. Give continuous Albuterol nebulized treatment, dose is determined by patient's weight.
   1. Albuterol 15mg neb for weight ≥20kg
   2. Albuterol 10mg neb for weight <20kg
ii. Give Ipratropium if not given yet, dose is determined by patient's age.
   1. 1.5mg for patients ≥2 years old
   2. 0.5mg for patients <2years old.
iii. Give Magnesium sulfate IV 50mg/kg x1 (max 2g) for age ≥2 years old.
iv. Reassess at the end of the hour. Obtain RS and move to PHASE 1c.

3. **PHASE Ic:** Time ~120 minutes.
   a. For most patients, the decision to discharge or admit will be made during this phase.
   b. Start the treatment in the ED as indicated by the pathway.
   c. If the decision is made to admit the patient (Inpatient vs PSCU/ICU), call for admission.
      i. You do **not** need to wait for the Phase Ic treatment to be finished and/or the next respiratory score to be completed prior to calling for admission.
   d. RS 1-4:
      i. Discharge to home.
   e. RS 5-8
      i. Give Albuterol MDI 10 puffs with spacer
      ii. Strongly consider giving Ipratropium if not given yet, dose is determined by patient's age.
         1. 1.5mg for patients ≥2 years old
         2. 0.5mg for patients <2years old.
      iii. Admit to general pediatric floor, PHASE III.
   f. RS 9-12
      i. Give continuous albuterol neb, dose is determined by patient's weight.
         1. Albuterol 15mg neb for weight ≥20kg
         2. Albuterol 10mg neb for weight <20kg
      ii. Give Ipratropium if not given yet. dose is determined by patient's age.
         1. 1.5mg for patients ≥2 years old
         2. 0.5mg for patients <2years old.
      iii. Give Magnesium sulfate IV 50mg/kg x1 (max 2g) for age ≥2 years old if it not given yet.
      iv. Admit to PSCU/ICU, PHASE II
      v. If undecided on admission to the general pediatric inpatient floor vs PSCU/ICU, score at the end of the 3rd hour and move to phase Id.

4. **PHASE Id:** Time ~180 minutes.
   a. During this phase, all patients will be admitted.
   b. Start medication therapy based off the last RS per the protocol and call for admission to appropriate level of care.

a. You do **not** need to wait for the treatment to be finished and/or the next respiratory score to be completed prior to calling for admission.

c. RS 1-8:
   a. Give Albuterol MDI 10 puffs with spacer
   b. Admit to the General Pediatric Floor. Move to PHASE III

d. RS: 9-12:
   a. Give continuous albuterol neb, dose is determined by patient's weight.
      i. Albuterol 15mg neb for weight ≥20kg
      ii. Albuterol 10mg neb for weight <20kg
   b. Admit to the PSCU/ICU

5. SUPPLEMENTAL OXYGEN AND APPROPRIATE LEVEL OF CARE:

a. All patients should be placed on a continuous pulse oximetry while in the ED.
b. Supplemental oxygen should be provided to maintain SpO2 saturations ≥90%.
c. Supplemental oxygen is administered with all continuous nebulizer therapy.
d. If patient is requiring ≥6L oxygen via NC (HFNC) OR FiO2 ≥40% on venti mask, admit patient to PSCU/ICU regardless of RS and current treatment requirements.

6. LABS AND IMAGING:

a. Routine laboratory and imaging is not indicated on patients with a known asthma history.
b. Consider CXR if this is patients first wheezing episode or clinical exam findings are suggestive of other complications (ex pneumonia, pneumothorax, worsening oxygen requirements, etc).
c. Consider laboratory work-up if patient is clinically ill appearing, appears moderate-severely dehydrated, or has any other concerning signs/symptoms suggestive for additional complications or etiology for wheezing/respiratory distress.

7. DISCHARGE CRITERIA FOR ED:

a. RS 1-4 for minimum of 1 hour, except for patients with initial RS of 9-12, they should be observed for at least 2 hours prior to discharge.
b. Patient is tolerating good oral intake.
c. Albuterol MDI teaching should be provided for all patients ≥ 2 years old.
d. Family and patients have been provided with adequate asthma education/teaching.
e. If patient is diagnosed with persistent asthma or requires additional medications at discharge, the appropriate medication should be prescribed and reviewed with the family prior to discharge.

8. DISCHARGE INSTRUCTIONS FROM THE ED:

a. Patients are instructed to continue to use Albuterol MDI/Nebulizer every 4 hours until seen by a provider/PCP.
b. Patients discharged home from the ED will be provided the 2nd dose of Dexamethasone and appropriate direction on when/how to take the medication.

c. Asthma education/Asthma Action plan must be completed and reviewed with patient/family prior to discharge.
d. Patient is instructed to follow-up with their Provider/PCP in 24-48hours, sooner if needed.
e. Seek medical attention if patient is requiring albuterol treatments every 2 hours, has worsening symptoms/respiratory distress, or any additional concerning signs/symptoms as discussed prior to discharge.

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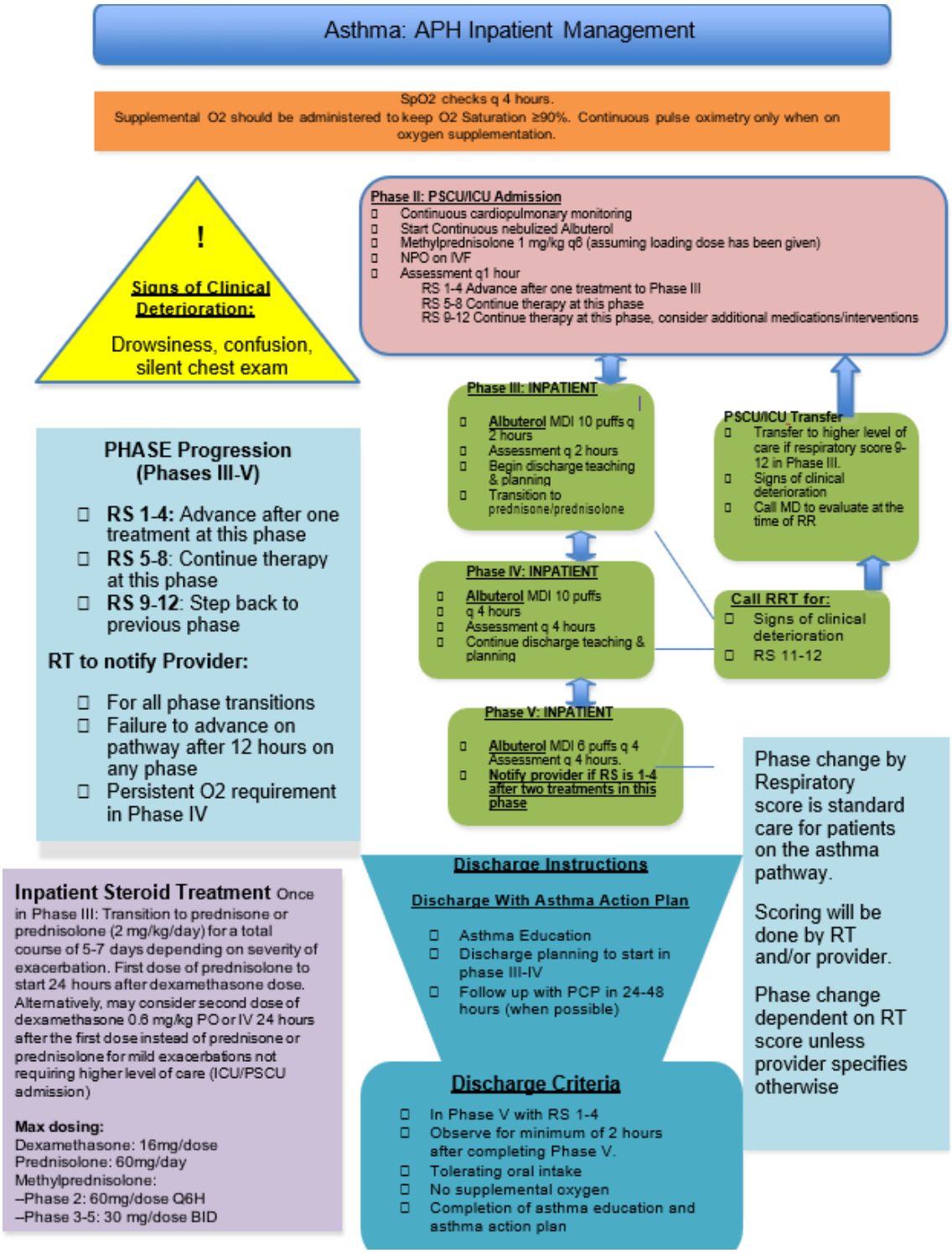
E. APH INPATIANT PATHWAY OVERVIEW: PHASES II-V



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1. **OVERVIEW OF PHASE PROGRESSIONS:**
    a. RS 1-4: Advance after one treatment at this phase.
    b. RS 5-8: Continue current treatment at this phase.
    c. RS 9-12: Step back to previous phase.
    d. RT to notify physician/provider:
        i. For every phase change, prior to advancing to the next phase.
        ii. For any phase regression requiring a step back in therapy. (ex/ PHASE III to II)
        iii. Failure to advance on a pathway after 12 hours in any phase.
        iv. Escalation of oxygen therapy requirement requiring transfer to higher level of care.
        v. Persistent oxygen therapy requirement in PHASE IV
    e. Rapid Response Team (RRT):
        i. RRT can be called by RT, RN, or Physician/Provider.
        ii. Call when/if patient has signs of clinical deterioration.
            1. Drowsiness, confusion (altered mental status)
            2. Silent chest exam: absence of breath sounds in a patient with respiratory distress
        iii. Consider calling with RS 9-12 and/or on patients requiring higher level of care transfer.

2. **PHASE II:** Admission or transfer to higher level of care (PSCU/PICU)
    a. Patient is to be admitted to PSCU or ICU from the emergency department or outside facility.
    b. Management upon admission:
        i. Continuous cardiopulmonary monitoring.
        ii. Continuous nebulized albuterol treatments, dose is determined by patient's weight.
            1. 15mg/hr of nebulized albuterol for patients ≥20kg
            2. 10mg/hr of nebulized albuterol for patients <20kg
    c. Methylprednisolone 1mg/kg every 6 hours (Max dose 60 mg/dose), if patient was given dexamethasone or a loading dose of methylprednisolone (2mg/kg) in the Emergency Department or outside facility.
        i. If no steroids were given, give methylprednisolone 2mg/kg for the first dose (max dose 125mg/dose), followed by 1mg/kg (max 60mg/dose) every 6 hours.
    d. Placed NPO and started on IVF
    e. Patient's medical management may vary upon the Intensivist caring for the patient.
    f. Assessment will be made after each 1-hour of continuous Albuterol treatment by the RT unless otherwise specified.
        i. If RS 1-4: Notify provider and Advance to Phase III.
        ii. If RS 5-8: Patient will continue on current management.
        iii. If RS 9-12: Physician/Provider is to be notified.
            1. Patient will continue with current nebulized continuous Albuterol treatment
            2. Consider additional medications (ex: terbutaline, Magnesium sulfate, etc.)
    g. Strongly consider Pulmonology consult if admitted to PSCU/ICU for Asthma management.

3. **PHASE III:**
    a. Give Albuterol MDI 10 puffs with spacer device every 2 hours.
    b. Transition to prednisolone or prednisone 1mg/kg/dose BID (Max of 30mg/dose) for 5-7 days depending on severity of exacerbation.
    c. Alternatively, may consider second dose of dexamethasone 0.6 mg/kg (max 16 mg) PO or IV 24 hours after the first dose (total steroid course = 2 doses of dexamethasone) instead of prednisone or prednisolone for mild exacerbations NOT requiring higher level of care (ICU/PSCU admission)
        a. If dexamethasone was given in the ED or outside facility, start the first dose of prednisone or prednisolone (1mg/kg BID, Max dose 30mg), 24 hours after the dexamethasone dose was given or give the second dose of dexamethasone (0.6 mg/kg, max 16 mg) 24 hours after the first dose of dexamethasone was given
        b. If a loading dose of prednisone/prednisolone (2mg/kg/dose) was given, start the first dose of prednisone/prednisolone (1mg/kg BID, Max dose 30mg) 12 hours after the loading dose was given.
        c. If dexamethasone or a loading dose of another steroid (methylprednisolone, prednisone/prednisolone) was given and patient is unable to tolerate PO medications, start methylprednisolone IV 1mg/kg q12hrs (Max dose 30mg) or dexamethasone IV 0.6 mg/kg (Max 16 mg), 24 hours after the last dose of dexamethasone was given or 12 hours after the last dose of prednisone/prednisolone/methylprednisolone was given.
            i. If no steroids were given, load with methylprednisolone 2mg/kg/dose (Max 125mg/dose) then start methylprednisolone 1mg/kg BID (Max dose 30mg) 12 hours after loading dose.
            ii. Transition to oral steroids once patient is able to tolerate PO.
    d. Supplemental oxygen should be administered to keep SpO2 ≥90%
    e. If patient is on room air, change to pulse oximetry spot checks q4hrs.
    f. Advance patient's diet as tolerated if they were previously NPO.
        a. If on IVF, wean off IVF as PO intake improves.
    g. Discharge planning and education should start during this phase.
    h. If not done already, physician/provider is to classify asthma severity and determine if additional medical management (i.e. Inhaled corticosteroids) are indicated at the time of discharge.
    i. Asthma action plan should be started (and completed if possible).
    j. If indicated, consider pulmonology consult to assist with medication management and discharge recommendations
    k. RT to assess RS every 2 hours.
        a. If RS 1-4: Advance to Phase IV after one treatment at this phase.
        b. If RS 5-8: Continue with current therapy, Albuterol MDI 10 puffs with spacer every 2 hours.
        c. If RS 9-12. Notify Physician/Provider. Step back to previous phase.
            i. Start a continuous albuterol treatment and step back to PHASE II.
            ii. If patient is on the general pediatrics floor

1. Patient is to receive a continuous albuterol treatment on the general pediatrics floor while waiting for transfer to higher level of care.
2. Provider is to transfer patient to higher level of care (PSCU/ICU) so that continuous albuterol treatments can be administered.

iii. If patient is in the pediatric special care unit
1. Transition patient from MDI to continuous albuterol with no change in location.
2. RT is to Notify physician/provider that patient stepped back to PHASE II.

4. PHASE IV:

a. Give Albuterol MDI 10 puffs with spacer device every 4 hours.
b. Continue on current steroids.
   a. Change to Prednisolone/Prednisone if not done in previous phase (1mg/kg BID, Max dose 30mg/dose)
c. RT to assess RS every 4 hours
   a. If RS 1-4. Advance to PHASE V after one treatment in this phase.
   b. If RS 5-8. Continue Albuterol MDI 10 puffs every 4 hours.
   c. If RS 9-12. Step back to PHASE III. Notify Physician/Provider.
d. Prescriptions for discharge medications to be completed and sent to pharmacy if not done already.
   a. Prescriptions may also be printed and signed by Physician/Provider and placed in patient's chart.

5. PHASE V:

a. Give Albuterol MDI 6 puffs with spacer device every 4 hours.
b. Continue on current steroids.
c. RT to assess RS every 4 hours.
   a. If RS 1-4 after completing one treatment in this phase (not including the first initial phase change treatment), re-assess RS in a minimum of 2 hours.
   b. If RS remains ≤ 4, patient is on room air, and is tolerating good PO, patient may be discharged. Notify provider.
   c. If RS 5-8: continue current therapy at this phase.
   d. If RS 9-12: Step back to PHASE IV. Notify physician/provider.

6. **DISCHARGE CRITERIA**: Patient is cleared for discharge after

a. They complete Phase V treatment (Albuterol MDI 6 puffs every 4 hours with spacer device) and respiratory score is 1-4 for at least two hours after last treatment.
b. They demonstrate good PO intake.
c. Medications are filled at APH pharmacy OR prescriptions have been provided to patient/family.
d. They demonstrate sustained SpO2 ≥90% on room air.
   a. If they are requiring oxygen therapy, they will not be discharged unless patient has a baseline oxygen requirement OR is approved for home oxygen by Pulmonologist.
e. Asthma education and asthma action plan need to be completed prior to discharge.

7. DISCHARGE INSTRUCTION:

a. Confirm that asthma action plan has been completed.

b. Confirm asthma education has been completed.
c. Continue to use albuterol MDI with spacer or nebulizer every 4 hours as directed until seen by PCP
d. Continue Steroids for a total of 5-7 days course as directed by Physician/Provider
e. If additional medications are required at discharge, they may be filled at APH Pharmacy OR the appropriate prescriptions have been provided to patient/family.
f. Patient is to follow up with their PCP in 24-48 hours.
    a. Discuss follow up with pulmonology when indicated.

8. **ASTHMA EDUCATION TO BE PROVIDED PRIOR TO DISCHARGE**:
    a. Asthma education is to be done by the RT.
    b. Asthma Action Plan is included with the asthma education.

9. USE OF MDI VS NEBULIZER
    a. All patients will be administered bronchodilators with MDI starting in PHASE III.
    b. Nebulized bronchodilators can be used if:
        a. MDI is not tolerated by the patient and only after discussion with the physician/provider.
        b. On patients ≤ 2 years of age.
        c. Orlando Health sites that do not have albuterol MDI inhalers available

**For Orlando Health sites that do not carry albuterol MDI inhalers, the following conversion can be used to complete the pathway with albuterol nebulizer treatments:

    c. Albuterol MDI 10 puffs = Albuterol 5 mg via nebulization
    d. Albuterol MDI 6 puffs = Albuterol 2.5 mg via nebulization

10. PULSE OXIMETRY
    a. Patients in PHASE II require continuous cardiopulmonary monitoring.
    b. Patients in PHASE III-V require pulse oximetry spot checks every 4 hours, if they are not on oxygen therapy.
    c. If patient has a desaturation of ≤ 90%, oxygen supplementation is indicated.
        a. If oxygen supplementation is indicated, patient will be transitioned to continuous pulse oximetry while on oxygen.
        b. If patient is requiring FiO2 ≥ 40% via venti- mask or ≥ 6L via NC (HFNC), patient may need to be transferred to a higher level of care.

11. **PULMONLOGY CONSULTATIONS**:
    a. Pulmonology consultation may be considered (but not required) in the following cases:
        a. Severe persistent asthma – not well controlled
        b. Moderate severe asthma – not well controlled
        c. Compliance issues/concerns
        d. Admission to PICU or Pediatric Special Care Unit

12. **TRANSFERING FROM ICU SETTING (PSCU/PICU) TO THE GENERAL PEDIATRICS FLOOR**:
    a. Patients who are successfully progressing through the pathway in ICU setting can be discharged directly from the PSCU/ICU.
    b. Physician/Provider may consider transferring a patient to the general pediatrics floor if:
        a. The patient remains in phase IV for > 8 hours (without progression to phase V and no anticipated
        b. discharge that same day)
        c. Asthma Action Plan, Asthma Education, consultations, home medications, and a transfer note are to be started and if possible completed prior to transfer to the general pediatric floor
        d. The patient is in phase III, VI or V and remains on oxygen supplementation for hypoxemia
        e. The patient remains admitted due to poor PO intake and/or tolerance, requiring continued IVF hydration

13. **DIAGNOSIS OF ASTHMA:**
    a. Symptoms of asthma: Wheezing, cough, dyspnea, worsening symptoms at night, worsening symptoms with environmental triggers.
    b. Asthma can be considered controlled if patient has symptoms two times a week or less requiring the use of rescue bronchodilator, no nocturnal awakenings, and no limitations to daily activities, work or school. Patient should also have less than two exacerbations requiring systemic corticosteroids in the last 6 months.
    c. For patients that can tolerate spirometry, the ratio of peak flow to forced expiratory volume in 1 sec (PEF/FEV1) should be normal or at personal best when symptoms are considered controlled. Spirometry should not be done during inpatient admission or during acute illness.
    d. History of symptoms and current illness during hospital admission should be used to diagnose asthma for an inpatient patient.
    e. On initial diagnosis of asthma, physician can consider but is not required to obtain a CBC with differential, baseline Chest X-ray, and allergy testing.

14. **ASHTMA ASSESSEMENT/SEVERITY AND THE INDICATION FOR CONTROLLER MEDICATIONS AT DISCHARGE:**
    https://www.nhlbi.nih.gov/files/docs/guidelines/asthsumm.pdf
    Classifications of Asthma Severity and Control: Pages 40-45

F. Asthma Medications

Bronchodilators - Short – Acting Beta$_2$-Agonists			
Medication	**Usual Dose Range**	**Max dose**	**Notes**
Albuterol Nebulization	***Continuous*** < 20kg: 10 mg/hr ≥ 20kg: 15 – 20 mg/hr	20mg/hr	
	Intermittent 2.5 – 5 mg	5mg	
Albuterol MDI (90	6 – 10 puffs every		Valve holding chamber/spacer is

mcg/puff)	2 – 4 hours (2.5 mg neb = 4 – 8 puffs)	10 puffs	recommended
Levalbuterol Nebulization	***Intermittent*** 1.25 – 2.5 mg (1.25 mg of levalbuterol = 2.5 mg of albuterol	5 mg	Recommendation for consideration of Levalbuterol use: 1. Side effects from albuterol (severe, symptomatic tachycardia) 2. Has allergies to the preservatives in albuterol 3. On levalbuterol therapy on admission
Levalbuterol MDI (45mcg/puff) *Not on Formulary	4 – 8 puffs every 2 – 4 hours	8 puffs	
Ipratropium bromide Nebulization DuoNeb = 2.5mg albuterol + 0.5mg ipratropium	<2yr: 0.5mg ≥2yr: 1.5mg	<2yr: 0.75mg ≥2yr: 1.5mg	• May be used up to 3 doses • Not recommended for use in inpatients
Terbutaline (IV)	***Loading Dose*** 4-10 mcg/kg ***Continuous Infusion*** Usual starting dose: 0.2 - 0.4 mcg/kg/min Usual Dose Range: 0.2 - 5 mcg/kg/min	10 mcg/kg/min	Titrate by 0.1 to 0.2 mcg/kg/minute increments as frequently as every 30 minutes
Terbutaline Nebulization	***Continuous:*** 1 – 4 mg/hr	4 mg/hr	Limited data available - consider as adjunct therapy in severe exacerbations One report of 6mg/hr and 12 mg/hr
	Intermittent: 0.1 mg/kg Usual Range: 0.25 – 3mg	5 mg	Limited data available - consider as adjunct therapy in severe exacerbations **Moler et al**: Flat dosing of 2 mg in patients 1 -14 years old **Portnoy et al**: 0.25 mg – 3mg (increased dose by 0.5mg if no response to a max of 3mg/dose)
Systemic Corticosteroids			
Dexamethasone (IV/PO)	0.6mg/kg	16mg	Duration of effect up to 72 hours
Methylprednisolone (IV)	Phase II Loading Dose: 2 mg/kg x 1 then 1 mg/kg every 6 hours Phase III 1mg/kg every 12 hours	Loading Dose: 125mg Phase II – 60mg Phase III – 30mg	Transition to oral steroids should be considered when patient's respiratory status improves and child is able to tolerate PO intake Phase III: only indicated in patients who cannot tolerate oral medications or concerns for GI absorption
Prednisolone liquid			

(15mg/5mL) Prednisone (Tablet)	1 mg/kg every 12 hours	30 mg	
Adjunctive Agents			
Aminophylline (IV)	***Loading Dose*** 5.7 mg/kg ***Continuous Infusion*** *Infants 6 to 52 weeks*: Dose (mg/kg/**hour**) = [(0.008 X age in weeks) + 0.21] divided by 0.79 *Children 1 to <9 years:* 1.01 mg/kg/**hour** *Children 9 to <12 years:* 0.89 mg/kg/**hour** *Adolescents 12 to <16 years:* 0.63 mg/kg/**hour** *Adolescents 12 to <16 years (cigarette or marijuana smokers):* 0.89 mg/kg/**hour** *Adolescents ≥16 years:* 0.51 mg/kg/**hour**	1,139 mg/**day** unless serum concentrations indicate need for larger dose	Monitor serum concentrations Goal: 10-20 mcg/mL
Epinephrine 1:1,000 (1mg/mL)	0.01 mg/kg SubQ/IM every 20mins x 3 doses	0.3 – 0.5mg	
Magnesium Sulfate (IV)	50mg/kg x 1	2 grams	Use in patients ≥ 2 years
Magnesium Sulfate (IV) Continuous Infusion	20 mg/kg/hr	2 grams/hour	Limited data available Maintain magnesium levels of 3.5-4.5 mg/dL

IV. DOCUMENTATION:

A. As appropriate in the medical record

V. REFERENCES:

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