INPATIENT ASTHMA CARE PROTOCOL

When ordered by a physician, an eligible child 2 years of age or older who is admitted to the General Pediatric Inpatient Unit at the Children’s Hospital of Georgia with a primary diagnosis of asthma exacerbation will be managed according to a standards set of orders which will include the following:

- O2/oximetry protocol
- Beta Agonist (albuterol) Protocol for Asthma
- Ipratropium bromide (Atrovent)
- Systemic steroids
- Inhaled steroids
- Peak flow monitoring for patients ≥5 years of age
- Patient/family education
- Appointment for follow-up care with primary care physician

The following will be utilized in the evaluation and management of patients:

I. Physician orders
   a. Patient will be admitted with primary diagnosis of asthma exacerbation and must have a 493 ICD-9 code. All known secondary diagnoses and/or co-morbidities should be documented as well.¹
   b. Physicians will order Beta2 Agonist Protocol using the Asthma Order Set.
   c. Physician will identify the patient’s classification of asthma upon admission.²
   d. Upon admission, all patients will be monitored and managed according to the O2/Oximeter Protocol to keep saturations ≥92%.
   e. All patients will be treated with systemic steroids. The guidelines are listed on admission orders. If the physician orders a different dose, documentation on the orders should include the desired dose and the mg/kg.⁴
   f. Home/maintenance steroids (preventative asthma medications) will be continued on admission. Newly prescribed inhaled steroids will be initiated when the beta agonist aerosol treatments reach Q3 hour intervals.
   g. When beta agonist aerosol treatments reach Q3 hour intervals, peak flow monitoring will be done TID pre and post treatments for those ≥5 years of age that are capable of coordinating appropriate effort.
   h. Atrovent will be nebulized Q4 hours until the albuterol treatment frequency has extended to Q3 hour intervals. A patient will receive no more than six (6) total doses of Atrovent.
   i. Any respiratory therapy provided that is not part of this protocol must have a written physician’s order and disqualifies the patient from being on the protocol.

II. Initial Assessment for Asthma Protocol
   a. A respiratory therapist (RT) will be notified of the order and will review the patient’s chart for eligibility.
   b. Inclusion criteria include any child ≥2 years of age with an admitting primary diagnosis of asthma exacerbation.
   c. Exclusion criteria includes any child <2 years of age, any child without a primary diagnosis of acute asthma exacerbation, or any child with documented chronic lung disease other than asthma.
   d. Patients who are ordered levalbuterol (Xopenex) will be given such medicines only with a physician order to use home supply (usually if this is the only B2 agonist the patient uses at home).

III. Initiation of aerosol therapy
   a. Upon admission from the ED, patients will be assessed, scored, assigned a frequency, and given an initial treatment. If the patient is coming from the PICU, the treatment will be given at the frequency established by their last scoring in PICU.
b. If the house staff is unable to score the patient within 30 minutes of admission, the RT will score the patient and begin therapy utilizing the “order management process and recovery for emergent jet nebulizer treatments”.

c. Patient’s Clinical Asthma Score is to be determined by an assessment which meets the following criteria:
   i. Assessment done prior to the beginning of the treatment.
   ii. Assessment done while patient is awake.
   iii. Assessment done with patient on room air. There is no need to allow SpO2 to fall below 90% for scoring purposes. Patient should receive supplemental O2 if SpO2 falls below 92%.

d. Therapy is initiated using the frequency and drug dosage according to the pre-treatment clinical asthma score (CAS).

e. The patient’s clinical asthma score is to be determined by assessment while the patient is awake and on room air.

f. All nebulized beta agonist aerosols will be delivered with 100% oxygen by aerosol mask or mouthpiece unless patient has a condition that contraindicates this FiO2.

g. MDI therapy will be initiated during waking hours to patients who have successfully increased treatment intervals to Q3 hour therapy. Patients with a treatment frequency of Q3 or Q4 hours will be given all inhaled beta agonist therapy with an MDI and spacer. If the patient does not tolerate MDI therapy, the RCP will document the problem, give the treatment using a nebulizer, and continue treatment under the protocol. Consider ordering a nebulizer (compressor) for home use and adding this to the patient’s education plan.

h. If the higher albuterol doses used in this pathway are not tolerated, the physician may choose to order a lower dose and document the reasons for doing so.

i. Levalbuterol will be restricted to use with patients who have cardiac arrhythmias, are unable to tolerate the effects of albuterol, or who routinely use levalbuterol at home. The physician will make the determination to order levalbuterol. Home medication supply may be used, and the patient may continue to be on the protocol.

IV. Reassessment

a. Patients will be reassessed prior to each treatment, assigned an asthma score, and given a treatment. If the patient’s pre-treatment score has improved to the point where they meet the criteria for adjusting the dosing interval, the next treatment will be given at the new frequency.

b. If the patient’s severity score is unchanged, the frequency will remain the same.

c. If the patient’s severity score is worse and requires a more frequent interval, a treatment will be given, the frequency will be adjusted according to the score, and the physician will be notified of the need to increase the frequency of treatments.

d. If the patient’s severity score improves, the patient will move to the next frequency without skipping a frequency, regardless of score. Example: Q2 therapy may only be weaned to Q3 hour therapy, not Q4 hours. Once a patient has reached a Q4 hour interval, that frequency will be maintained until the patient is discharged unless the patient’s condition deteriorates.

V. PRN Therapy

a. A one-time PRN treatment will not alter the frequency schedule.

b. The next scheduled treatment is given according to the current assigned treatment schedule as if the PRN has never been administered.

c. The patient will not be eligible for a frequency adjustment at this time.

d. A patient will not be eligible for a frequency adjustment until they have reached their scheduled treatment without any PRN treatments given in between scheduled treatments.

e. If the patient is being managed with albuterol via MDI, the PRN treatment will also be administered with an MDI and spacer.

VI. Physician Notification
a. The physician will be notified (paged) if any of the following occur (notification will be documented in the patient’s medical record):14
   i. If there is any significant change in patient status with special attention given to deterioration in sensorium where immediate notification is required.
   ii. If there is an increase in treatment frequency.
   iii. If more than one PRN treatment is required before the next scheduled therapy.
   iv. If the patient has an increased oxygen requirement.
   v. If the patient does not improve after six hours of therapy at a Q2 hour frequency (a total of 4 treatments). The RT will provide the physician with the latest cardio/pulmonary assessment and update the physician about the patient’s status. Consideration should be given to transfer the patient to the Pediatric Intensive Care Unit (PICU). If after 6 hours of Q2 therapy, the patient is spaced to Q3 intervals but requires a prn treatment at Q2 hours, the patient should be transferred to PICU as this is now 8 hours of therapy at Q2 intervals.
   vi. If the patient does not tolerate MDI therapy. Continue on nebulizer therapy and consider ordering a nebulizer for discharge.

b. The physician will be notified when the patient’s frequency of therapy is decreased to Q3 hours. This is to alert the physician that we should consider discontinuing IV therapy, switching to PO steroids, and increasing our efforts to address any other barriers to discharge.

***This protocol does not require discharge at a specific point in the admission. There will be patients who warrant continued observation due to the severity of their asthma exacerbation, even though the intensity of their therapy has decreased to Q4 hours.

VII. Asthma Protocol Teaching Plan

a. All patients who are capable of providing their own therapy will receive asthma education provided by an institutionally-trained educator. In situations where the patient is too young or not capable of providing their own care, the patient’s parent(s) or care-giver(s) will receive the education. All education will be documented in the medical record (on protocol flow sheet and the multidisciplinary patient teaching form). Standardized teaching forms/materials will be used for continuity and distributed to patients/families as necessary.

b. Teaching will begin on the first day of the patient’s admission and will be completed prior to discharge.

c. Education will be offered to all patients capable of providing their own therapy or the patient’s immediate caregiver (i.e. parent).

d. The physician will be notified in the event that teaching cannot be completed due to patient/family barriers to education

e. Return demonstration should be used as a means to verify successful instruction.

f. Education will include the following as applicable:
   i. Basic overview of asthma as a disease process
   ii. Ordered medications
   iii. Jet nebulizer and/or metered dose inhaler
   iv. Peak flow meter as applicable including peak flow zones

g. The Asthma Action Plan will be written by a respiratory therapist as part of the education plan.
### CLINICAL ASTHMA SCORE (CAS)\textsuperscript{15,16}

<table>
<thead>
<tr>
<th>Score</th>
<th>Respiratory Rate</th>
<th>Room Air Saturations*</th>
<th>Auscultation</th>
<th>Retractions**</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal Range</td>
<td>95-100%</td>
<td>No wheezing in all fields</td>
<td>No retractions noted</td>
</tr>
<tr>
<td></td>
<td>(See age specific chart)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Increased by 30%</td>
<td>93-94%</td>
<td>End-expiratory Wheezing</td>
<td>Only one of the four</td>
</tr>
<tr>
<td></td>
<td>(See age specific chart)</td>
<td></td>
<td></td>
<td>noted</td>
</tr>
<tr>
<td>2</td>
<td>Increased by 65%</td>
<td>91-92%</td>
<td>Wheezing through entire expiration</td>
<td>Two of the four noted</td>
</tr>
<tr>
<td></td>
<td>(See age specific chart)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Increased by 100%</td>
<td>≤90%</td>
<td>I&amp;E wheezing or no audible air</td>
<td>Three or more noted</td>
</tr>
<tr>
<td></td>
<td>(See age specific chart)</td>
<td></td>
<td>movement</td>
<td></td>
</tr>
</tbody>
</table>

* A return to baseline O2 requirement for five minutes or until saturation drops below 91%. Room air saturations are for patients without pneumonia, without a supplemental O2 requirement at baseline, or significant (lobar) atelectasis on chest x-ray. RT should consider other conditions such as obstructive sleep apnea, pneumonia, DKA, Sickle Cell Disease, CHD, and fever that may affect scoring.

**Retractions include: 1) intercostal, 2) subcostal, 3) suprasternal, and/or 4) nasal flaring\textsuperscript{4}

### Age Specific Respiratory Rate Scale\textsuperscript{17}

<table>
<thead>
<tr>
<th>SCORE</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 years old</td>
<td>&lt;40 bpm</td>
<td>40-55 bpm</td>
<td>56-65 bpm</td>
<td>&gt;65 bpm</td>
</tr>
<tr>
<td>6-8 years old</td>
<td>&lt;30 bpm</td>
<td>30-40 bpm</td>
<td>41-50 bpm</td>
<td>&gt;50 bpm</td>
</tr>
<tr>
<td>9-14 years old</td>
<td>&lt;25 bpm</td>
<td>26-35 bpm</td>
<td>36-40 bpm</td>
<td>&gt;40 bpm</td>
</tr>
<tr>
<td>&gt;14 years old</td>
<td>&lt;20 bpm</td>
<td>21-25 bpm</td>
<td>26-35 bpm</td>
<td>&gt;35 bpm</td>
</tr>
</tbody>
</table>

*Protocol is for patients ≥2 years of age. These values are included for information only.

If the patient’s breath sounds are ambiguous when assigning scores, consult with a more experienced respiratory therapist or the physician. Always consider the entire patient and be sure the patient’s condition is determining the intensity of therapy.
ALBUTEROL AND ATROVENT DOSES

CONTINUOUS JET NEBULIZER THERAPY\textsuperscript{18}. Patient must be in Pediatric Intensive Care Unit

<table>
<thead>
<tr>
<th>Clinical Asthma Score (CAS)</th>
<th>Albuterol Dosage</th>
<th>Atrovent Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥10</td>
<td>20 mg/hr</td>
<td>Q4 x 6 doses</td>
</tr>
<tr>
<td>8-9</td>
<td>15 mg/hr</td>
<td>Q4 x 6 doses</td>
</tr>
<tr>
<td>7</td>
<td>10 mg/hr</td>
<td>Q4 x 6 doses</td>
</tr>
<tr>
<td>6</td>
<td>5 mg/hr</td>
<td>Q4 x 6 doses</td>
</tr>
</tbody>
</table>

- Consider intravenous steroids
- Consider magnesium sulfate
- For CAS ≥8, consider use of heliox, high-flow nasal cannula, non-invasive ventilation.
- For CAS >10, consider ketamine, terbutaline, intubation.

Q2 HOUR THERAPY\textsuperscript{18}. Severity score of 5 with no individual category score of 3

<table>
<thead>
<tr>
<th>Weight</th>
<th>Albuterol Dosage</th>
<th>Alrovent Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤10 kg</td>
<td>2.5 mg/0.5 mL</td>
<td>250 mcg</td>
</tr>
<tr>
<td>10.1-20 kg</td>
<td>5 mg/1 mL</td>
<td>250 mcg</td>
</tr>
<tr>
<td>&gt;20 kg</td>
<td>5 mg/1 mL</td>
<td>500 mcg</td>
</tr>
</tbody>
</table>

- Albuterol will be given via nebulizer.
- Atrovent will be administered Q4 not to exceed 6 total doses including doses given in PICU.
- Begin inhaled steroids if appropriate.

Q3 HOUR THERAPY\textsuperscript{19}. Severity score of 4 with no individual category score of 3

<table>
<thead>
<tr>
<th>Weight</th>
<th>Albuterol MDI Dosage</th>
<th>Albuterol Jet Nebulizer Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 kg</td>
<td>4 puffs</td>
<td>2.5 mg/0.5 mL</td>
</tr>
<tr>
<td>10.1-20 kg</td>
<td>6 puffs</td>
<td>5 mg/1 mL</td>
</tr>
<tr>
<td>&gt;20 kg</td>
<td>8 puffs</td>
<td>5 mg/1 mL</td>
</tr>
</tbody>
</table>

- Initiate MDI therapy in waking hours (8am-10pm) or when the parent/child is awake and able to understand and follow instructions. Notify the physician at this point with an update.
- Discontinue Atrovent.

Q4 HOUR THERAPY: Severity score ≤3 with no individual category score of >1

<table>
<thead>
<tr>
<th>Weight</th>
<th>Albuterol MDI Dosage</th>
<th>Albuterol Jet Nebulizer Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤10 kg</td>
<td>2 puffs</td>
<td>1.25 mg/0.25 mL</td>
</tr>
<tr>
<td>10.1-20 kg</td>
<td>2 puffs</td>
<td>2.5 mg/0.5 mL</td>
</tr>
<tr>
<td>20.1-30 kg</td>
<td>4 puffs</td>
<td>2.5 mg/0.5 mL</td>
</tr>
<tr>
<td>&gt;30 kg</td>
<td>4 puffs</td>
<td>5 mg/1 mL</td>
</tr>
</tbody>
</table>

- All Q4 hour therapy will be delivered via MDI.
- Patients will be evaluated for discharge at this level.

Levalbuterol is to be used as an exception for patients with cardiac arrhythmias, who are unable to tolerate the effects of albuterol, or who routinely use levalbuterol at home. Dose and frequency will be ordered according to guidelines.\textsuperscript{6}
Order Entry
1. Physician completes asthma order set that includes the order to “enter asthma protocol”.
2. As RT gives treatment per protocol guidelines according to score, RT will document the actual dosage given, the number of MDI puffs, or actual mg for jet nebulizer treatments in aerosol therapy and edit the dose in the MAR.
3. The RT that assigns or changes treatment frequency will be responsible for entering, editing, and/or discontinuing orders for aerosols, MDIs, peak flows, and pulse oximeter monitors in the asthma protocol flowsheet. The score obtained prior to the treatment will dictate the frequency for the next treatment and will be recorded as “next treatment frequency”.
4. Atrovent will be ordered to be given with alternating treatments while albuterol is being delivered via nebulizer and frequency is Q2 hours then discontinued when the patient changes to a frequency of Q3 hours.
5. Pharmacist will enter order for inhaled corticosteroids per the physician’s order. The therapist will not begin administration of inhaled steroids until the patient’s treatment frequency reaches a frequency of Q3 hours.
6. MDIs will be initiated at a frequency of Q3 hours when the patient and parent are awake and can understand and follow directions. All Q4 hour therapy will be via MDI.
7. RT will chart a full asthma severity assessment (RR, breath sounds, retractions, oxygen saturation, and use of oxygen) on aerosol therapy sheet and document asthma score. This will provide reason for asthma score.

What will these practice guidelines do?
1. Brings objective scoring to the RT assessment of the patient admitted for asthma exacerbation
2. Standardizes RT practices related to intensity of albuterol therapy
3. Standardizes doses of albuterol
4. Standardizes Atrovent dose
5. Recommends key components of asthma medical management
6. Provides clarity in physician notification requirements
7. Ensures patients are competent with MDI and holding chamber prior to discharge
8. Prepares families for self-management after discharge
9. Provides for early intervention by social work to establish primary care provider and meet discharge needs in a timely manner

How to know the treatment status of the patient
1. Review the patient’s medical record by checking the aerosol therapy flowsheet that will tell you the current frequency of treatments, O2 given, asthma score, and how the score was determined ((RR, breath sounds, and WOB).
2. Page the RT who is assigned to this patient and review the patient’s respiratory status and plan of care with him/her.

Initial Measures: Four Categories
1. Utilization of clinical practice guidelines. Four populations:
   a. Total number of eligible patients admitted to participating unit
   b. Number of patients enrolled with no deselecting** on admission day 1.
   c. Number of patients enrolled with deselecting on admission day 1.
   d. Patients enrolled after admission day 1 (this includes patients transferred from PICU).
   e. ** Deselecting means the asthma order sheet is used, but the defaulted ordered therapies are cancelled.
      For example: inhaled corticosteroids is crossed out and not ordered
2. Clinical outcomes
   a. Number of albuterol treatments
   b. Transfer to a higher level of care
   c. Length of stay
   d. Readmission to IP or ER status within 30 days of discharge
3. Monitoring of RT practices in implementing the beta agonist protocol
   a. The assigned score matches the RT documented patient assessment
   b. The documented asthma score matches the intensity of therapy according to the protocol.
   c. MDI therapy is initiated according to the protocol.
4. Patient/family satisfaction with care. Data will be collected by the Respiratory Care Department and reported to the Hospital QA Committee.
Key Contacts for these guidelines
Physicians: Reda Bassali, MD, Mary Lynn Sheram, MD
Pharmacist:
Respiratory Care: Cliff Dennis, RRT
Available in-house 24 hours a day/7 days a week:  Lead/charge respiratory therapist, pager #5006
Protocol updated 10/1/2013

REFERENCES