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MEMORANDUM

TO: MA Licensed Ambulance Services
FROM: Jon Burstein, State EMS Medical Director
Abdullah Rehayem, Director
DATE: April 9, 2010 (Update of memorandum dated November 19, 2007)
RE: EMT- Basics and Intermediates: Update of Assisted Albuterol Program for
Treatment for Known Asthmatics/COPD

As listed in Appendix I of the Statewide Treatment Protocols, the Massachusetts Department of Public Health's (Department's) Office of Emergency Medical Services (OEMS) has a statewide Assisted Albuterol Program. This program allows certified EMTs at the Basic and Intermediate levels of care, while employed by a participating Massachusetts licensed ambulance service, to provide Albuterol to known asthmatics who meet the eligibility criteria. The Albuterol Program was last updated in April 1, 2005, to include all patients over 6 months old and to include chronic obstructive pulmonary disease (COPD) patients.

Effective February 1, 2007, the conditions of participation for ambulance services have been revised. In order to provide this level of care and treatment, your service must comply with all of the following conditions:

1. The **ambulance service's affiliate hospital medical director, as described in 105 CMR 170.300, must have authorized** your Basic and/or Intermediate EMTs to utilize this protocol while employed by the ambulance service.
2. The **ambulance service must** have a current signed comprehensive medical control **Affiliation Agreement** with their affiliate hospital for medical control and medical direction.
3. The **ambulance service must** comply with the Department's **Drug Control Program** regulations, at 105 CMR 700.000.
4. The **ambulance service must** provide training to its EMTs as set out in the EMS Assisted Albuterol Program document. (**Attached**)
5. The **ambulance service must** provide regular quality assurance/quality improvement (QA/QI), collect data and perform chart reviews as set out in the EMS Assisted Albuterol

Program document, and submit reports to the Department upon request. For any questions regarding this program, please contact OEMS Clinical Coordinator Patricia Reilly, RN, at (617) 753-7318.

Update of Assisted Albuterol Program

NOTE: Your medical director must have authorized you as an EMT to utilize this protocol.

The EMT must be properly trained and authorized to perform the following treatment as outlined in the attached letter from the Department.

Introduction

As of November 1, 2003 Massachusetts began a statewide program, as an ambulance service option, for EMTs to assist patients, known to be asthmatics, with administration of nebulized medication, when such patients were in crisis. EMTs functioning at the Basic and Intermediate level of certification, are allowed to assist patients with a nebulized bronchodilator, albuterol sulfate, in the course of their evaluation and treatment.

The population is restricted to those patients over 6 months of age, who have no cardiac history and who have a medical diagnosis of asthma or COPD. Additionally, they must have a prescribed *beta* agonist which they would normally use during an asthma attack which they may normally self-administer their medication via either nebulizer or inhaler.

This program has been updated to now include all patients over 6 months old and to include COPD patients. Your service must now comply with these changes, effective February 1, 2007.

BLS ambulances participating in this program must be stocked with both adult and pediatric nebulizer setups and must carry pre-packaged unit doses of albuterol sulfate for adult and pediatric patients. A patient eligibility checklist will be stored with the albuterol unit doses for reference onsite during calls. Clear criteria are established for patient eligibility with assistive medication and the various subjects surrounding this issue. This includes dosage, documentation, hospital notification and rendezvous with ALS units.

This program has significantly lowered the number of asthmatics who are suffering an exacerbation of their disease who have not receive appropriate nebulizer therapy previously while en route to the hospital. The program has several critical areas including: ensuring that the patient is a member of the “eligible” population; a good physical patient assessment; an adequate notification of the receiving facility; the ALS/BLS interface; and continual reassessment of the patient during transport.

UPDATE of the ASSISTIVE ALBUTEROL PROGRAM OUTLINE

1. INTRODUCTION
 1. The concept of “assisting” with medication
2. PATIENT ASSESSMENT
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 2. Auscultation of lung fields
3. GENERAL REVIEW OF RESPIRATORY PHYSIOLOGY
 1. Anatomy of lungs

2. Mechanics of inspiration and expiration
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5. RESPIRATORY DISTRESS VS. RESPIRATORY FAILURE
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6. TREATMENT OF ASTHMA
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 1. *beta* agonists (selective versus non-selective)
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7. “ASSISTIVE” NEBULIZER THERAPY PROTOCOL
 1. Eligibility
 2. Pre-packaged nebulizer setup
 1. Contents
 2. Protocol check off list
 3. Practical demonstration/practice setting up nebulizer
8. PROTOCOL REGARDING STORAGE, RESTOCK AND RESUPPLY
9. DOCUMENTATION
 - a. Importance
 - b. Wording
 - c. Follow-up
10. QUESTION AND ANSWER PERIOD
11. WRITTEN EXAM

Evaluation of patients with respiratory compromise

A patient with respiratory compromise will often provide many clinical clues that can be used by prehospital personnel to make an accurate assessment of respiratory status. Clues to respiratory compromise can be found by systematically examining the patient while looking at the following:

- 1) Pay attention to the patient’s posture when first meeting them. Is the patient positioned in such a way as to assist in the mechanics of respiration? Is the patient sitting/leaning forward? Does the patient have difficulty lying down or sitting back as evidenced by increasing discomfort or dyspnea?
- 2) Listen to the patient. A patient with severe dyspnea may only be able to speak in short phrases rather than in complete sentences. A patient in severe distress may be unable to speak at all. If a child or infant, is the patient distractible from their present condition?
- 3) Look at the overall appearance of the patient: The mood that the patient is displaying often

indicates how they are doing.
Does the patient look scared?
Does the patient look anxious?
Does the patient look tired?
Does the patient look uncomfortable?
Realize that all of these may be signs of underlying hypoxia.

4) Physical examination. Performed systematically as per standard procedures.

General exam:

- Use diagram showing signs of respiratory distress/respiratory failure

Chest examination:

Inspection, Palpation, Auscultation

Inspection of the chest may provide clues about underlying lung pathology. Patients with COPD will often have a barrel chest appearance (increased anterior posterior diameter). The use of accessory muscles of the neck, chest and abdomen can assist patients in the mechanics of respiration, allowing for increased air exchange during respiratory compromise.

Palpation of the rib cage during inhalation may show evidence of unequal expansion (potential pneumothorax).

Auscultation: probably the most important aspect of the chest exam. Lung sounds are essential to a complete respiratory exam and should be performed in a thorough and consistent manner.

Listen for the presence of breath sounds

- Determine the equality of breath sounds.
- Always listen in at least four different locations both anteriorly and posteriorly, while comparing the right and left sides together.
- **At minimum, listen under clavicles at midclavicular line and at bases at the midaxillary line.**

Listen for any adventitious (abnormal) breath sounds:

Wheezes are high pitched, whistling sounds made by air flowing through a constricted airway. Diffuse wheezing on exhalation is heard with asthmatic patients but is also found in other conditions that will be described later. Realize that the absence of wheezing may indicate severe respiratory distress/failure considering that a patient with severe airway compromise may not be moving enough air for wheezing to be heard.

Rhonchi are rattling noises in the throat or bronchi, often due to partial obstruction of the large airways by mucous.

Rales are fine, moist sounds that may sound like crackling or bubbling in quality, associated with fluid in the smaller airways.

NOTE: The current DOT EMT-Basic Curriculum does NOT teach students about these three breath sounds. To implement this program, your service would be responsible for so training your EMT-Basics.

General Review of Respiratory Physiology

Anatomy of respiratory system

(Use diagram to review anatomical relationships described below)

- **Nose:** The primary passageway for air to enter and leave the respiratory system.
- **Mouth:** A secondary pathway for air to move through the respiratory system.
- **Pharynx:** A passageway for food.
- **Larynx:** a passageway that connects the pharynx and trachea. The larynx is covered by the thyroid and cricoid cartilage and contains the voice box.
- **Trachea:** a cartilaginous ringed structure that connects the larynx with the lungs, the carina is the point of bifurcation that divides the trachea into right and left mainstem bronchi.
- **Bronchial tree:** the branching that occurs from the mainstem bronchi all the way down to the microscopic air sacs (alveoli) that is responsible for the exchange of oxygen and carbon dioxide.
- **Lungs:** spongy, elastic tissue containing alveoli. The right lung can be divided into three lobes (upper, middle and lower), the left lung is divided into two (upper and lower).
- **Intercostal muscles:** muscles that are attached to the ribs, which are responsible for contraction during inspiration and relaxation during expiration.
- **Diaphragm:** a dome shaped muscle forming the floor of the pleural cavities that has both voluntary and autonomic function. Contraction of the diaphragm causes the thorax to expand by forming a slight vacuum within the chest.

Mechanics of respiration

Breathing is accomplished through pressure changes in the lungs which are brought about by activity of the respiratory muscles (both the intercostal muscles and diaphragm).

Inhalation

Inhalation is an **active** process that requires muscular contraction. As the volume of the thoracic cavity increases, the pressure drops, allowing air to rush into the lungs.

Muscular activity includes the diaphragm flattening and descending, thus increasing the vertical dimensions of the thorax, and the intercostal muscles contracting, causing the ribs and sternum to move upward and outward, increasing the horizontal dimensions of the chest cavity.

Exhalation

Exhalation is a **passive** process that occurs at the end of inspiration as the respiratory muscles relax, the chest wall recoils, intrathoracic pressure rises, and air is expelled from the lungs.

Accessory muscles are used to aid a patient in respiratory distress. The neck, chest and abdominal muscles are primarily involved. (Use diagrams).

Pathophysiology of Asthma

Asthma is a chronic respiratory disease where there is reversible airflow obstruction, associated with a state of increased responsiveness of the tracheobronchial tree to many different stimuli.

Asthma may be divided into three components:

- 1) bronchial smooth muscle contraction is the rapidly reversible component of airway obstruction that defines asthma.
- 2) mucus hypersecretion.
- 3) inflammatory changes, that may last for weeks once stimulated.

Bronchial hyperactivity

The extreme sensitivity of the airways to physiologic, chemical and pharmacological stimuli is felt to be a hallmark of asthma.

Traditionally, the triggers of asthma that are responsible for causing this hyperactivity have been classified as either intrinsic or extrinsic in nature.

Extrinsic asthma is said to be “allergic” or immunologic in origin.

Intrinsic asthma exists when no obvious extrinsic causes can be found.

A model that incorporates both intrinsic and extrinsic components is probably more representative of the disease process than having two separate classes of asthmatics.

Many agents have been found to cause asthma either through immunological mechanisms or through direct irritant effects. Triggers include:

- immunological reaction (exposure to antigen with mediator release).
- viral respiratory infections of the upper and lower respiratory tract.
- changes in temperature and humidity (especially cold air).
- strong odors (perfumes)
- pollutants, dusts, fumes and other irritants
- certain drugs (aspirin, NSAIDs, *beta*-blockers, sulfites)
- sinus infections
- exercise
- strong emotions, - laughing, coughing
- GERD (gastroesophageal reflux disease)

Diseases and Conditions That Mimic Reactive Airways Disease (e.g., Asthma/COPD)

- Congestive heart failure
- Upper airway obstruction
- Aspiration of foreign body or gastric acid
- Bronchogenic carcinoma with endobronchial obstruction
- Bronchiolitis
- Multiple pulmonary emboli (rare)

Remember “all that wheezes is not asthma.”

The patient's history as well as their age will often provide the information that is necessary to make a correct differential diagnosis.

It is essential to confirm that the patient has reactive airways disease (e.g. asthma, COPD) before you may assist them in nebulized *beta* agonist therapy. The patient will usually be able to acknowledge this fact, however, if it is not clear that the patient is taking *beta* agonists for asthma therapy assisting the patient with nebulized therapy is contraindicated.

COPD is a chronic respiratory disease which may have a component of reversible airway obstruction. It is typically seen in older patients and may be further subdivided into emphysema or chronic bronchitis. Exacerbations may respond to bronchodilators such as albuterol.

Respiratory distress verses respiratory failure

Respiratory distress/insufficiency is when a patient has begun to show clinical signs and symptoms suggestive of inadequate blood oxygenation. Evidence would include:

- flaring of the nostrils
- tugging of the trachea
- use of accessory muscles in the neck and abdomen
- retraction of the intercostal and suprasternal spaces during inhalation.
- tachypnea.
- anxiety.

Respiratory failure is either apnea (failure of respirations), or the reduction of normal breathing to the point where oxygen intake is not sufficient to support life.

Reassessment of the patient with respiratory compromise is essential so that proper medical therapy may be provided. Patients in respiratory failure will require ventilatory assistance and often endotracheal intubation.

Treatment

Therapy is directed toward **all three components** of the disease: bronchoconstriction, inflammation and mucous formation.

However, the focus of acute therapy is centered on bronchodilation of smooth muscle because of the rapid effects that can be obtained.

The airflow obstruction that is due to mucous plugging and the inflammatory changes seen in the bronchial wall does not usually resolve for days or weeks. Acute therapy to treat both of these components is typically initiated in the emergency department. The results of these interventions, including hydration and corticosteroids, are not usually seen for several hours..

Pharmacological therapy involves two different regimens of medications:

Maintenance medications: Patients take these medications to *prevent* an exacerbation of asthma.

Acute medications are used *during* an asthma exacerbation. Bronchodilators are used initially due to their rapid effect. Eventually anti-inflammatory agents may be needed with adequate hydration necessary to thin mucous secretions.

Bronchodilators particularly *beta*-agonists, are used for both acute and maintenance therapy.

Other drugs are only used exclusively in maintenance therapy such as, cromolyn sodium (mast cell stabilizer) and are of no use in acute therapy.

It is important to determine not only the medications that a patient may be taking to control their disease but also the frequency of use. You should ask them whether or not they take them on a daily or prn (as needed) basis.

PHARMACOLOGY OF ASTHMA

Bronchodilators:

Beta-agonists: Are considered the first line therapy in the treatment of acute asthma. The medication binds primarily to two different types of receptors (*beta*-1 and *beta*-2)

Beta-2 receptors Are found predominately in the lung and blood vessels and cause bronchodilation and vasodilation, respectively, when stimulated.

Beta-1 receptors are found predominately in the heart and may cause tachycardia and increased contractility when stimulated.

***Beta*-agonists** can be divided into selective (binding to *beta*-2 receptors >>*beta*-1 receptors) and nonselective medications:

Selective medications are manufactured to have their primary effect on lung tissue with minimal cardiovascular side effects. Aerosol therapy with *beta* adrenergic drugs allows local administration with minimal systemic absorption and minimal side effects. Some of these include:

- albuterol sulfate (Airet, Proventil, Ventolin)
- bitolterol mesylate (Tornalate)
- isoetharine (Bronkometer, Bronkosol)
- isoproterenol hydrochloride (Suppler)
- metaproterenol sulfate (Alupent, Metaprel)
- pirbuterol acetate (Maxair)

Side effects: The most common side effect of *beta* adrenergic medications is skeletal muscle tremor. Patients may also experience nervousness, anxiety, insomnia, headache, hyperglycemia, nausea and vomiting, palpitations, tachycardia, and hypertension.

Epinephrine is a nonselective *beta* agonist that is administered subcutaneously in the treatment of severe asthma. It also has alpha receptor effects that can cause peripheral vasoconstriction and therefore hypertension.

Side effects: (Similar to above) although with more pronounced cardiovascular side effects including tachycardia, hypertension and arrhythmia stimulation.

Theophylline is a bronchodilator that has fallen out of favor in the past few years as a first line medication in the treatment of asthma, replaced with nebulized and meter dose inhaler *beta*

agonist therapy, which provide greater bronchodilation. Today, the drug is usually prescribed when a patient is hospitalized and requires multi-drug therapy.

Side effects: The toxicity of theophylline is well known, due to the drug having a narrow therapeutic window (there is a small range of serum drug levels between the desirable (therapeutic) level and that which is toxic). Nausea, vomiting, tachycardia, arrhythmias, and seizures can occur. This is why the drug is no longer used regularly as a first line agent.

Corticosteroids (prednisone, solumedrol):

The importance of using steroids in severe asthma has been well documented. They are of utmost importance in reversing a severe asthma exacerbation as they reduce the inflammatory response, rather than just temporarily causing bronchodilation. There is a delay of several hours following administration before clinical effects are seen. They are generally reserved for patients that have been on them in the past and in any case those with a severe presentation. Patients will often be put on an oral prednisone taper (usually less than 14 days) immediately following an acute presentation to prevent a recurrence.

Anti-cholinergic (ipratropium bromide (Atrovent)):

These drugs have been used in the treatment of asthma. They are responsible for antagonizing the vagal nerve component of bronchoconstriction that is felt to exist during asthma and COPD.

Cromolyn sodium (Intal, Fivent)

These drugs reduce the release of histamine from MAST cells, (involved in the inflammatory component of asthma). It is used chronically to *prevent* acute episodes of asthma. Cromolyn is NOT a bronchodilator and is of no use in the termination of an acute asthma attack.

UPDATED BLS ASSISTIVE NEBULIZER ELIGIBILITY CHECKLIST

1. Does the patient have a diagnosis of reactive airways disease (e.g. asthma/COPD)?
If **yes**, proceed to next question.

*IF NO, PATIENT IS **NOT** ELIGIBLE*

2. Is the patient older than six months?
If **yes**, proceed to the next question.

*IF NO, PATIENT IS **NOT** ELIGIBLE.*

3. Does the patient have a known history of cardiac disease (past MI or angina)?
If **no**, proceed to the next question.

*IF YES, PATIENT IS **NOT** ELIGIBLE.*

4. Does the patient have a **current** prescription for an inhaler or nebulizer to be used when they are having an attack? (This does NOT include over-the-counter medications like Primatene mist.)

ELIGIBLE MEDICATIONS

albuterol sulfate (Airet, Proventil, Ventolin)
bitolterol mesylate (Tornalate)
isoetharine (Bronkometer, Bronkosol)
isoproterenol hydrochloride (Isuprel)
metaproterenol sulfate (Alupent, Metaprel)
pirbuterol acetate (Maxair)
other beta agonists

INELIGIBLE MEDICATIONS

beclamethosone dipropionate (Beclivent, Beconase, Vancenase, Vanceryl)
cromolyn sodium (Intal)
dexamethasone sodium (Decadron Respihaler)
flunisolide (Aerobid)
ipratropium bromide (Atrovent)
epinephrine (Primatene Mist (OTC))

If **yes**, proceed to the next question

IF NO, PATIENT IS NOT ELIGIBLE

5. Ask the patient or caregiver, “Would you like us to ASSIST (you) in taking the same type of medication that (you) take when (you) have an attack?”
If **yes**, proceed to the next step

NOTE: The EMT will use their own medication (nebulizer and oxygen), because the patient’s medication may be ineffective or out of date.

If NO, TREAT THE PATIENT APPROPRIATELY AND TRANSPORT

6. A. If the patient is between 6 months and 2 years of age: Dose = 1.25 mg
B. If the patient is older than 2 years old: Dose = 2.5 mg - 3.0 mg
7. Package and transport the patient appropriately. Notify receiving hospital

Expanded Checklist

1. Does the patient have a diagnosis of reactive airways disease (RAD)?

The intent of this question is to confirm that a patient is truly an asthmatic. The patient should be under the care of a physician who has prescribed them medications for their RAD. Patients who say “I had asthma as a child” or “I think I have asthma” or “someone told me they think I have asthma” would not be confirmed as having a diagnosis of

asthma. Most patients will be quite clear in their answer. If there is a doubt that they truly have RAD, assisting them with medication is not appropriate.

2. Is the patient older than six months?

The patient must be older than six months.

3. Does the patient have a known history of cardiac disease?

If the patient has a history of myocardial infarction or chest pain which has been diagnosed as angina, they are not eligible. This can usually be determined by asking “Have you ever been told you have had a heart attack?” and “Have you ever been prescribed nitroglycerin for your chest pain?” As it is with all of the criteria, if there is a doubt about eligibility, the patient should be treated appropriately but not given assistance with inhaled medication.

4. Does the patient have a current prescription for an inhaler or nebulizer to be used when they are having an attack?

The emphasis here is on **current** prescription. Words like “I’ve had one in the past” or “I used to take Ventolin when I was a kid” or “I’ve used my brother’s inhaler before” should be clear markers that the patient is not eligible.

The second part of this question is key in that it helps distinguish between inhalers that are used in acute episodes versus those used routinely every day. If at all possible, you should confirm the medication either visually by looking at the inhaler or nebulizer medication or by questioning the patient and then confirming it against the **Eligible Medication** list. If the patient states that they do have medication that they take either via nebulizer or inhaler when they have an attack, it can be assumed that the patient is using one of the drugs on the **Eligible** list, even if you cannot verify the medication either visually or verbally.

The question of whether they take the medication via inhaler or nebulizer is moot. If they take the medication for **acute** episodes it meets our criteria for eligibility.

5. Ask the patient, “Would you like us to ASSIST you in taking the same type of medication that you take when you have an asthma attack?”

If at all possible, this question should be asked exactly as written above. If there is a language barrier or comprehension gap, you may rephrase it but the intent is to ask if they would like us to assist them in taking the same type of medication they use during an asthma attack. It should be reiterated that if you doubt the patient takes either an inhaler or nebulizer for acute events, the patient does not meet the eligibility criteria.

Once you have established that the patient meets all of the criteria, the next step is administration of the medication.

Ages 6 months to 2 years— Pediatric Dose 1.25 mg of Albuterol Sulfate

Ages 2 years and greater – Adult dose 2.5 mg - 3.0mg of Albuterol Sulfate

Reassessment of the patient looking specifically at respiratory effort and breath sounds is critical once assistive medication has been instituted. You should look for changes in respiratory effort, tidal volume, wheezing, and level of consciousness. If possible, ask the patient to indicate whether they are getting better or worse. Changes in patient condition should be relayed to the staff at the receiving facility and clearly documented on the TRIP RECORD.

NOTE: Pulse oximetry should be used if available before, during and after patient treatment, provided there is no delay in treatment.

Reassess the patient's condition with particular emphasis on respiratory effort and breath sounds. Ask the patient whether he or she subjectively feels better. Be particularly alert for signs of increasing respiratory distress and impending respiratory failure. Be prepared to assist patient's ventilations if necessary and notify the receiving facility of any marked changes in patient condition.

STORAGE, RESTOCK AND RESUPPLY PROTOCOL

1. The albuterol unit doses shall be stored in the BLS medication box that holds the EpiPen Auto injector. There shall be no exceptions to this.
2. The par levels for unit doses per vehicle shall be a **MINIMUM** of one and a **MAXIMUM** of four. When a vehicle reaches the minimum par level, they must restock their ambulance per service policy
3. The par levels for nebulizer setups shall be:
 - A. Adult 2.5mg/3ml Unit Dose -a **MINIMUM** of two and a **MAXIMUM** of four.
 - B. Pediatric 1.25mg/3ml Unit Dose - a **MINIMUM** of two and a **MAXIMUM** of four

When a vehicle reaches a level below the minimum par level of 2 Unit Doses for either setup, they must restock their ambulance per service policy.

Documentation

1. The narrative portion of the trip record must contain certain key words or phrases.
 1. Patient has diagnosed history of RAD
2. Patient uses inhaler in times of crisis. If at all possible, the name of the inhaler should be listed under "Meds" on the trip record.
3. The physical exam must include the breath sounds and respiratory effort. Baseline vital signs should be recorded.
4. Under the Tx portion, it should be clearly documented on the trip record that the patient was asked if he would like assistive medication and that the patient responded in the affirmative.
5. Address patient refusal and/or consent issues.

6. Under the Tx portion, it should be documented that assistive nebulizer therapy was initiated and the time it was initiated.
7. It should be indicated whether ALS evaluated the patient or was cancelled and, if so, WHEN they were cancelled.
8. The reassessment of the patient and the findings should be documented clearly on the trip record.
9. It should be clearly indicated whether the receiving hospital was notified.

On the trip record document “Neb” written in with the appropriate EMT identification number, initials, or name. At the section for “Oxygen” indicate that a nebulizer was used and at what liter flow.

For **Paramedic/Advanced Life Support**, standard documentation.

For ages 2 years and greater, the time of therapy, the drug (albuterol sulfate or albuterol), the dose which is 2.5 mg - 3.0mg and the route is “neb” or “nebulizer”

For ages 6 months to 2 years, the time of therapy, the drug (albuterol sulfate or albuterol), the dose which is 1.25 mg and the route is “neb” or “nebulizer.”

Key Points to Remember

- The patient must be bronchoconstricted.
- There must be a pre-existing medical diagnosis of RAD (e.g. asthma/ COPD).
- The patient must be older than 6 months.
- There is no history of cardiac disease (MI or chest pain).
- The patient takes a prescribed inhaled medication for acute RX.
- The inhaled medication is from the Eligible List.
- The patient indicates he wants to be assisted with similar type medication.
- There is only one dose given.
- Receiving hospital is notified when appropriate.

- ALS intercept must be arranged for and confirmed whenever possible and available.
- Do not delay transport.