** On May 1, 2014 REMAC Protocol revisions take effect – see below **

From the Editor

** On May 1, 2014 REMAC Protocol revisions take effect **

REMEMBER: the protocols on the street are the protocols on the exam!

Beginning May 1, 2014, protocols revisions are in effect in the field and on REMAC certification exams (See page 2 for outline of changes)

Always see nycremsco.org for the current approved protocols

** Online Registration for REMAC Refresher Exam **

Go to http://www.planetReg.com/E91194150131422

or www.nycremsco.org & click the REGISTER link under “News & Announcements”

See the last page of this journal for details

** Mandatory REMAC Card Fee **

A $25 fee has been instituted by NYC REMAC for all new or recertifying paramedic credentials. No fee is collected at the exam. After successfully completing a REMAC exam, candidates will receive an email directly from NYC REMSCO requiring a completed application and credentialing fee by money order only. On receipt, a permanent NYC REMAC certification card will be issued.

For inquiries on cards call NYC REMSCO at 212-870-2301
Outline of May 2014 NYC REMAC protocol changes
see REMAC Advisories 2014-01 & 2014-02 at nycremsco.org

General Operating Procedures

- Medical Control at the Scene
  - deletes AED note
  - clarifies non-solicited intervention

- Prehospital Sedation
  - increases Etomidate dose
  - adds O₂ via nasal cannula

- Transport Procedures
  - deletes stroke center distance
  - deletes LBBB to PCI facility
  - adds LVAD as specialty care

- CPR
  - adds medical criteria
  - clarifies CPR for pediatrics

- Pediatric Patients
  - clarifies age of patients

- IO Administration
  - adds shock indication
  - limits attempts
  - adds Lidocaine

- IN Administration
  - adds Glucagon & Fentanyl

- Drug Guidelines
  - adds Ondansetron caution

- Pediatric Protocols
  - adds Broselow tape

BLS Protocols

- 400 – WMD
  - updates table

- 411 – AMS, 413 – Seizures, 415 – Shock
  - removes note on immobilization

- 414 – Poison/Drug Overdose
  - removes obtaining sample
  - updates venomous bite

- 426 – Soft Tissue Injuries
  - adds tourniquet

ALS Protocols

- 503A, 503-B – Cardiac Arrests
  - changes vasopressin to if available

- 507, 554 – Adult & Pediatric Asthma
  - clarifies MCO epinephrine

- 510 – Allergic/Anaphylactic Reaction
  - changes name of protocol

- 515-B – Septic Shock
  - new protocol

Appendices

- Appendix H – Specialty Care
  - updates specialties

- Appendix I – Hospital Listings
  - adds available services

- Appendix U – Septic Shock
  - new appendix
REMAC Exam Study Tips

REMAC candidates have difficulty with:

- Epinephrine use for peds patients 15% Protocol GOP
- 12-lead EKG interpretation 10% BLS
- ventilation rates for peds & neonates 10% Adult Arrest

REMAC Written exams are approximately:

- 15% Adult Trauma
- 15% Pediatrics

Certification & CME Information

- Failure to maintain a valid NYS EMT-P card will invalidate your REMAC certification.
- By the day of their refresher exam all candidates must present a letter from their Medical Director verifying fulfillment of CME requirements. Failure to do so will prevent recertification.
- FDNY paramedics, see your ALS coordinator or Division Medical Director for CME letters.
- CME letters must indicate the proper number of hours, per REMAC Advisory # 2007-11:
  - 36 hours - Physician Directed Call Review
    - ACR Review
    - QA/I Session
    - Emergency Department Teaching Rounds - Maximum of 18 hours
  - 36 hours - Alternative Source CME - Maximum of 12 hours per venue
    - Online CME (see examples below) - Clinical rotations
    - Lectures / Symposia / Conferences - Associated Certifications:
    - Journal CME

REMAC Refresher Written examinations are held monthly, and may be attended up to 6 months before your expiration date. See the exam calendar at the end of this Journal. To register, by the first day of the month of your exam go to http://www.planetReg.com/E91194150131422 or www.nycremsco.org & click the REGISTER link under “News & Announcements.”

REMAC Basic Written and Scenario examinations are held monthly. Registration is limited to the first 25 applicants with a postmarked deadline of the first day of the month. See the exam calendar at the end of this journal.

REMAC CME and Protocol information is available and suggestions or questions about the newsletter are welcome. Call 718-999-2671 or email Christopher.Swanson@fdny.nyc.gov

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FDNY OLMC Physicians and ID Numbers

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ALL THAT WHEEZES MAY NOT BE ASTHMA…. BUT FOR KIDS IT USUALLY IS

We’ve all heard that phrase… “Remember, all that wheezes isn’t asthma.” And that is certainly true, as we all know. Aspirated foreign bodies, respiratory infections such as bronchiolitis and pneumonia, airway obstructions due to tumors, pulmonary edema, inhalation of irritant gases and allergic reactions are among the list of things that can cause a patient to wheeze. And we must consider all of those things when assessing the patient who is short of breath and wheezing. But when it comes to pediatric respiratory distress, asthma remains at the top of the list.

When a call comes into 9-1-1 for a child who can’t breathe, it is more likely than not that the child is suffering from an asthma exacerbation. Because while many severe pediatric illnesses are now less common because of factors such as improved primary care and childhood immunizations, the situation with asthma is actually worsening.

Asthma is one of the most common chronic diseases in children and today affects more than 7 million kids in the U.S. And so it is not surprising that asthma is also one of the most common reasons for pediatric emergency department visits (>750,000 annually) and hospital admissions (>200,000 each year). And those numbers will likely only continue to get worse, given that the incidence of childhood asthma has more than doubled in the past 25 years, making it one of the only pediatric diseases for which prevalence, morbidity and mortality have all worsened.

And this increasing incidence means that you see more asthma in the prehospital realm as well. From 2006-2012, FDNY EMS providers alone cared for more than half-a-million pediatric patients, and more than 30,000 of those were suffering from asthma exacerbations.

In addition to its increasing incidence, pediatric asthma is particularly concerning because of the racial disparity that exists with this disease, with asthma affecting black and Asian children at a much higher rate than...
white children. For instance, as compared to a white child, a black child is 60% more likely to have asthma, is greater than 2.5 times more likely to have to visit the emergency department because of their asthma, and is 2.5 times more likely to be admitted to the hospital if they are seen in the emergency department because of their asthma.

Today, the majority of pediatric asthma patients in this City are properly cared for and transported by BLS providers, most often receiving nebulized albuterol for their exacerbation. In rare cases, those patients are found to be in severe respiratory distress with impending respiratory failure and are administered an epinephrine auto-injector. It is worth pointing out that the ability to deliver this level of care at a BLS level is the result of prehospital research done in New York City over a decade ago – research that expanded the use of a proven therapy into a new realm, moving nebulized albuterol into the BLS scope of practice.

Interestingly, when paramedics are called to care for a typical pediatric asthmatic patient, they have little else to offer the patient beyond what BLS can today provide. The existing ALS pediatric asthma protocol contains only albuterol, ipratropium and epinephrine, and yet nearly 40% of the patients cared for by paramedics meet the definition of a moderate to severe asthma exacerbation in that they receive two or more nebulized albuterol treatments. Adult patients with moderate to severe asthma exacerbations would be given steroids (e.g. corticosteroids such as methylprednisolone or dexamethasone), but this treatment option does not exist in the pediatric protocols. In part, this is because IVs are not routinely established in pediatric patients and so these IV medications have been excluded from the protocol. Perhaps it is time to look for a more “advanced” way to care for these patients. More on that in a moment . . . .

In this month’s CME article, we will review the anatomy and physiology of the pediatric respiratory system, discuss the pathophysiology of asthma, describe the evaluation of the pediatric asthma patient, and explore the pharmacology of drugs used to treat pediatric asthma patients. For both BLS and ALS providers, these sections will be equally applicable. Finally, we will discuss an ALS-specific issue, including a new ALS
pediatric asthma protocol change approved by REMAC and SEMAC and an FDNY ALS-specific research project that will seek to describe the utility of this new treatment option for pediatric asthma patients.

The Pediatric Airway and Respiratory System

When discussing the pediatric airway and respiratory system, especially with pediatric asthma, it makes sense to divide the discussion into three parts: the anatomic differences as compared to adults, the physical size of the airways and the implications for asthma, and the muscles of respiration and their relevance to pediatric asthma emergencies.

The Anatomy of the Pediatric Airway

While not all children are exactly the same size or grow at the same rate, there are a number of anatomic differences between the pediatric airway and that of the adult. Most of these differences are most prominent in the first years of life, and most have resolved (the airway becoming like that of an adult) by the time the child reaches eight years of age. And while this is not meant to be an all-encompassing list, there are seven differences that are worth mentioning for the purpose of this review: the head, tongue, tonsils, larynx, epiglottis, cricoid ring and ribs. Each of these differences has implications for the prehospital management of the pediatric airway, particularly in the event of respiratory failure.

The size of the head itself is the first significant anatomic difference between adults and children. As you no doubt remember from the Rule of Nines in burn care the head of an adult comprises 9% of the total body surface area. But in children, this number increases to 13% in children and adolescents and 18% in infants. Because the head is physically so much larger, the occiput becomes more
prominent and extends further in a posterior direction than the posterior aspect of the thorax, meaning that a child who lies or is placed in a supine position will flex their neck forward because of the larger occiput with the potential to effectively close their airway. For this reason, placing the child in a “sniffing” position (as shown in the second image in Figure 3) and placing padding beneath the child’s shoulders will help to align and open the airway in the unconscious or unresponsive child.

The second anatomic difference of note between adults and infants or children is the size of the tongue. As compared to adults the tongue is proportionally larger and occupies more of the oral cavity and protrudes further into the posterior pharynx, something that is particularly true in infants. When combined with the potential for improper head positioning as described in the last paragraph, the tongue represents a significant potential for airway obstruction.

Posterior to the tongue lie the tonsils – another airway difference that is important to consider for pediatric patients. Although tonsils are present in adults and children (unless they have been surgically removed), the tonsils of an infant or young child are larger and more vascular than those of an adolescent or adult. They are, therefore, more at risk for trauma, hemorrhage, and airway compromise.

The two items just mentioned, the pediatric patient’s tongue and tonsils, are the reason that oropharyngeal (OP) airways are inserted differently in children. If an OP airway was used for a pediatric patient in the way that we use it for adult patients (inserting it upside down until it hits the palate, rotating it into position, and further inserting it until the flange rests at the teeth), it would likely push the larger tongue back into the pharynx (further obstructing the airway) and risk traumatizing the tonsils, leading to significant bleeding and potential inability to manage the patient’s airway. And so, when necessary, OP airways should be placed in a pediatric patient using a tongue depressor (to pull the tongue forward and allow space to insert the OP airway) and in its natural position (to avoid traumatizing the tonsils).
As children grow older, the larynx (voice box) changes with regard to its location in the neck. While the adult larynx sits anterior of the 4th–5th cervical vertebrae, a young child’s larynx is one level higher (C3-4) and an infant’s larynx is one level even higher still (anterior to C2-3). This fact is important not just for ALS providers who must recognize that the airway is more anterior and superior when attempting an intubation or trying to visualize a foreign body obstruction via direct laryngoscopy, but it is important for the BLS providers who may be assisting in those procedures in applying pressure to the correct area for cricoid pressure or the BURP maneuver (described in prior CMEs).

One area of pediatric airway anatomic difference that is more important for ALS providers to recognize than it may be for BLS providers is the epiglottis. In adults, a Macintosh (“mac”) laryngoscope blade is often used to intubate, with the tip of the blade ideally sliding into the vallecula, pressing on the hyoepiglottic ligament, and indirectly elevating the epiglottis anteriorly, away from the larynx so that the vocal cords can be visualized. In infants and children, however, the epiglottis is relatively larger, shaped like an omega (Ω) instead of a ‘U’ and has less cartilaginous support (making it “floppy” as compared to that of an adult). This is why a Miller blade is recommended for pediatric intubation, allowing the epiglottis to be directly lifted up and out of the desired visual field.

Whereas the vocal cords are the narrowest portion of the adult airway, the cricoid ring is the narrowest point of a child’s airway. Located just “below” (inferior to) the vocal cords, the cricoid ring is the first ring of cartilage in the trachea and is the only “complete” ring (the rest of the rings actually being more ‘U’ shaped). This is an important
difference because it means that obstruction below the level of the vocal cords (aka “subglottic”) is more likely in children. It is also important for intubation because the cricoid rings acts as a “physiologic cuff” in children, meaning that an uncuffed endotracheal tube may be used.

The final anatomic airway difference between children and adults is actually not in the airway at all. As compared to adults, the ribs of infants and children are more horizontally arranged. Because they lack the downward angle that the ribs assume in adulthood, accessory muscles are of less use to children because they are not able to generate as much force to assist in air movement. And because these accessory muscles which include the muscles between each pair of ribs (the intercostals) are less developed, the tissue in those areas are more pliable, allowing retractions to be seen on physical examination in the right circumstance (see below).

**Airway Size – Pediatrics vs. Adults**

If you were to look at a cross-section of a bronchiole in an infant, you would find that these small airways are half the size of that found in an adult. Where the inner diameter of an adult bronchiole measures ~8mm, an infant’s are only 4mm across. When we discuss the pathophysiology of asthma below, you will see that changes in the airways at the level of the bronchioles are the primary problem for asthmatic patients. If these changes result in just 1mm of additional wall thickness of the bronchioles, this will cause a 25% reduction in the width of the space through which air must be moved to reach the alveoli in order for gas exchange to take place. That same 1mm change for an infant, however, will reduce the airway’s width by 50%. Without going through the math, the effects that this has on airway resistance are impressive. While that type of change increases airway resistance 16 times in an adult, the infant would suffer an increase in airway resistance of 250 times or more. Couple that fact with the airway differences described above (particularly the more horizontal ribs and the lack of benefit from the accessory muscles), and it is no wonder that children with severe asthma exacerbations can quickly progress from mild distress to respiratory arrest if not properly treated.
Pediatric Musculature of Breathing

As mentioned above, a child’s accessory muscles are less useful in overcoming the respiratory distress in an asthma exacerbation because their ribs are more horizontal. This means that the primary muscle used to overcome an asthma exacerbation in smaller children and infants is the diaphragm. If the child also becomes upset and begins to cry, the air swallowing that occurs will lead to gastric distension, making it more difficult for the diaphragm to contract and worsening the situation even further.

Asthma and the Pediatric Airway

Despite the many differences that exist between the pediatric and adult airways, the three central changes that occur with asthma are the same, regardless of age. During an asthma exacerbation (“attack”), (1) the small airways (bronchioles) are narrowed by contraction of the smooth muscle within those airways (aka bronchoconstriction), (2) chronic airway inflammation, and (3) fluid secreted into the airway as a result of the exacerbation (mucosal edema). These three things combine to narrow the airway, making it difficult for the patient to move air in and out of the lungs due to resistance to air flow through the narrowed bronchioles. And, as noted above, even 1mm of narrowing of the walls of a patient’s bronchioles can result in impressive increases in resistance – 16x in adults and up to 250x in an infant.

Asthma can have a number of “triggers” that lead to an acute exacerbation or worsening of the patient’s chronic lung disease. Some of the more common triggers include cold air, allergies, aspirin and other NSAID medications (i.e. ibuprofen, Naprosyn), menstruation, exercise and psychological stress. Regardless of which trigger a patient may have (and patients will vary with regard to their particular triggers and sensitivities to each), the underlying problem is an immune system response that leads to the three components of asthma described earlier in this section.
Asthma exacerbations in children can be more complex than those in adults. Children have a higher baseline use of oxygen – up to double that seen in adults. When the patient then experiences respiratory distress, up to 15% of that patient’s oxygen consumption is required just to maintain breathing. If the asthma exacerbation is severe enough to cause hypoxia, that requirement for additional oxygen to maintain the patient’s breathing only further worsens their condition. This is why children can very rapidly progress from mild respiratory distress to respiratory failure and arrest.

**Assessing the Pediatric Asthma Patient**

**History of Present Illness**

The assessment of a pediatric asthma patient, after the ABCs are addressed, starts with the patient’s history. This should begin with a standard SAMPLE history (symptoms, allergies, medications, past medical history, last oral intake, and events leading up to the 911 call). Particularly for pediatric asthma patients, it is important to specifically ask about the history of their asthma (number of prior hospital admissions, prior ICU admissions, and prior intubations) as this will provide a measure of how severe their asthma may be. The patient (or their parent/guardian) should be asked how this “attack” compares to prior exacerbations, and how long it has been since their last “attack.” Finally, ask about possible “triggers” for their asthma and for the duration of the child’s symptoms (including anything that may have been done to try to relieve the symptoms) prior to the 9-1-1 call.

It is also important to focus in on the patient’s past medical history with particular attention to those things that may be related to the current emergency. What asthma medications does the child use? (Don’t forget to ask about over-the-counter medications such as Primatene Mist, which is unfortunately still used by many children.) Have there been any recent changes to the patient’s asthma medications? Has the child been taking their medications as prescribed or, if not why (ran out, lost, didn’t have it with them, can’t afford it, etc.)? How often during an average week does the patient use their “rescue” inhaler or nebulizer (e.g. albuterol, Xopenex)? And specific to this exacerbation, ask about the number of metered dose inhaler (MDI) inhalations or nebulizer
treatments that the child has had and whether the patient is currently taking any oral steroids (Prelone, prednisolone, Ora-Pred, prednisone).

Physical Exam

With the history obtained, attention then turns to the physical exam. Beyond the generalities of the focused and detailed physical exam that we do for all patients, the examination of the pediatric asthma patient should focus on a few particular areas. In obtaining the patient’s vital signs, a measurement of pulse oximetry is a must (on an ALS level) for any pediatric asthma patient. This is because one of the findings that is most highly suggestive of the need for more aggressive care is the patient’s initial pulse oximetry reading (on room air). While oxygen and therapy should never be withheld, the ideal is to quickly obtain a room air pulse oximetry reading. If this value is less than 93%, it is important not only to document but to communicate this finding to the receiving facility. A high index of suspicion for a serious asthma exacerbation should be maintained for these patients as they are very likely to require admission to the hospital.

One more comment on pulse oximetry: A phenomenon that makes it particularly important to measure pulse oximetry before initiating nebulized albuterol therapy (when doing so is not a detriment to the patient) is “after drop.” The very same pharmacologic action that relieves bronchospasm also causes dilation of the patient’s pulmonary vasculature. This causes an increase in air movement (particularly in the upper portions of the lungs) as well as a change in blood flow distribution in the lungs (particularly to the lower portions of the lungs), and the combination of these two things (a so-called ventilation-perfusion mismatch) typically causes a temporary decline in pulse oximetry after nebulized albuterol is administered. This is why, ideally, a pulse oximetry measurement should be taken before oxygen and albuterol are administered.

With regard to the physical examination, there
are several signs of respiratory distress and potential impending respiratory failure that are important to look for and recognize: lethargy or decreased mental status, restlessness, bradycardia, cyanosis, head bobbing, audible wheezing (without a stethoscope) or a silent chest on auscultation, and retractions. This last finding (retractions) is the result of the patient’s attempt to inhale against severe bronchoconstriction. The dramatic increase in the patient’s negative intrathoracic pressure causes the soft tissues adjacent to the lungs to be “sucked in” on inspiration. This can be seen in the area above the collar bones (supraclavicular), between the ribs (intercostal), along the lower edge of the rib cage (subcostal/infracostal) or inferior to the sternum (substernal).

The Pharmacology of Pediatric Asthma

The drugs used to treat pediatric asthma by BLS and ALS providers in our EMS system today are nearly identical. Both can provide nebulized albuterol and, for the critical patient, both can provide intramuscular epinephrine. And while ALS providers can also administer ipratropium, the mainstay of asthma therapy for all patients remains these two drugs.

Albuterol is an inhaled beta (β) agonist. By activating β2 receptors, it causes smooth muscle relaxation that, in the lungs, reverses the bronchospasm component of an asthma exacerbation. (Importantly, it does not treat the airway inflammation or mucosal edema.) The dosing for nebulized albuterol is 2.5mg, with repeat doses allowed for both BLS and ALS. By definition, patients who require two or more treatments are considered to be having a moderate to severe “attack.”

A question sometimes raised by providers, patients and/or parents is: why don’t we use levalbuterol (Xopenex) instead of albuterol? While some clinicians will advocate strongly for its use, we remain an evidence-based EMS system, and so our answer is that there is no science to support it.

Albuterol is a chemical mix of the two chemical structures of albuterol. If you will, think of it like your hands – both have five fingers, both have thumbs, both can perform similar tasks – but their orientation is different. You have a left-hand version and a right-hand version. Molecules are much the same. And so while
albuterol is a mix of those two versions (R-albuterol and S-albuterol), levalbuterol is purely the R version. This was thought to be important because the S-albuterol was long thought to be inert (to cause no clinical effects), but it was later found that it may actually promote inflammation and bronchoconstriction. So while using just the R-albuterol sounds like a great idea, like many things, it is a little harder to prove that in patients.

One of the often-cited advantages of Xopenex is its ability to produce fewer side effects. But the muscle tremor that occurs with albuterol is caused by the R-albuterol, so this is actually the same for the two drugs. Heart rate is often said to be less effected by Xopenex, but clinical studies have found that when the two drugs are administered to critically ill patients, the difference in heart rate between the two drugs varies by only four (4) beats per minute. Given the ability of children to tolerate higher heart rates, this is certainly an inconsequential difference. Finally, and most importantly, no study has found that the use of Xopenex results in any improvement (pulmonary function testing, hospital admission or discharge rates) as compared to albuterol.

Xopenex may be marketed better (as it can cost 10-30x more than albuterol), but the reality is that the two drugs are equivalent. And so, though a patient or parent may request to only be given Xopenex or say that their doctor has advised them to only use this drug, the only contraindication to administering albuterol to a patient experiencing an asthma exacerbation is an allergy to albuterol.

For the critical patient with impending or active respiratory failure, epinephrine is the drug of choice. Like albuterol, this drug is useful in the management of asthma because of its action on β2 receptors, causing smooth muscle relaxation which (in the lungs) translates to relief of bronchoconstriction. (And, also like albuterol, its effects are limited to this one aspect of asthma as it produces no mucosal edema or airway inflammation.) For BLS providers, the intramuscular administration of an epinephrine autoinjector is appropriate (an adult autoinjector for children over 9 years of age or 66lbs, a pediatric autoinjector for those under 9 years of age or 66 lbs) for patients with severe distress. For ALS providers, the intramuscular injection of 0.01mg/kg (which equals 0.01mL/kg) of a 1:1,000 solution (up to a max of 0.3mg) is appropriate for pediatric patients over one year of age who are in impending or active respiratory failure secondary to asthma.

However, unlike albuterol, only about 25% of epinephrine’s effects are β2 – with the remainder of its effects coming through the activation of alpha (α) receptors and β1 receptors. Through these actions, the drug
causes its known adverse effects including tremor, vomiting, tachycardia and hypertension which is why we limit its use to the most ill of all asthma patients. That said, there may not be great cause for concern as the FDNY’s internal data, as presented by Dr. Doug Isaacs several years ago, found that such patients’ heart rates and blood pressure actually improved after being given epinephrine. (Perhaps because they were finally able to breathe and could relax a little?)

Our ALS protocols for pediatric asthma also include the use of ipratropium, an anticholinergic drug that acts by decreasing bronchoconstriction. When combined with albuterol, it has been shown to decrease the rate of hospitalization among asthma patients and to improve their pulmonary function. Administered with each of the first three albuterol nebulizer treatments, the dose is 2.5mL of a 0.02% solution for children age six (6) or older, and the dose is reduced to 1.25mL for patients less than six.

Ipratropium, as mentioned above, has been shown to be of clinical benefit and is administered along with albuterol in the exact same nebulized fashion. It also has essentially no adverse effects because less than 1% of the drug is absorbed systemically. And so while there have been discussions about adding this drug to the BLS care we provide to asthma patients of all ages, this has not yet received state approval. But stay tuned for more on that ….

NOTE: At this point, BLS providers may choose to skip to the end of the article as the remaining two sections apply to ALS personnel only, though we always encourage you to read such information for your own education and to expand your knowledge base.

A New ALS Protocol

As we mentioned at the start of this article, we have a problem. Using data from the FDNY system, we know that about 40% of pediatric asthma patients (>1,500 each year) who are treated by paramedics receive two or more albuterol treatments. As such,
they meet the definition of a moderate to severe asthma exacerbation and, if they were adults, we would be treating them with steroids (dexamethasone or methylprednisolone). But given the very low frequency with which pediatric patients receive IVs, steroids have not been included in the ALS pediatric asthma protocol until now.

In January 2014, the New York State Emergency Medical Advisory Committee (SEMAC) approved a change to our pediatric protocols (#554) that is in line with the national standards for pediatric prehospital asthma management – namely the inclusion of oral steroids – as an “if available” option. Unlike albuterol, ipratropium and epinephrine, corticosteroids address the other two components of an asthma exacerbation – mucosal edema and airway inflammation. At a dose of about 1 mg/kg, the use of steroids for the management of moderate to severe asthma has been shown to reduce the need for hospital admission and even the length of time that a patient spends in the emergency department.

Although most of the initial studies on the use of steroids in asthma focused on the use of intravenous steroids (as we do for adults in our current protocols), the administration of oral steroids has been shown to be equally effective in reducing the need for hospitalization. Obviously being less painful than having to establish an IV, particularly in children, oral steroids are now recommended by the National Heart, Lung and Blood Institute’s national guidelines for asthma management. In addition, they are listed as an equally acceptable alternative in the National Association of EMS Physicians and Emergency Medical Services for Children National Model Protocols, and are already in use in one upstate New York EMS region.

The timing of steroid administration is also important. While many patients wait in the emergency department to be seen by a nurse practitioner, physician assistant or physician before having steroids ordered and administered, a relatively recent study found that allowing the triage nurse to administer oral steroids to children with moderate to severe asthma resulted in even greater reductions in the need for hospital admission and the...
length of time the patient spent in the ED. What we do not yet know is whether even earlier administration of oral steroids by paramedics can improve care further.

A Study of FDNY ALS Pediatric Asthma Care

NOTE: The information in this section applies only to FDNY paramedics.

In 2013, the U.S. Department of Health and Human Services’ Health Resources and Services Administration (HRSA) offered a limited number of grants for research targeting issues specific to Emergency Medical Services for Children. Working with colleagues from Hofstra Medical School and the North Shore Long Island Jewish Medical Center’s Department of Emergency Medicine, the FDNY submitted a grant application and was one of only six EMS agencies in the country to be awarded a grant. Therefore, over the next two and a half years, the FDNY will study the implementation of the new pediatric prehospital asthma protocol, seek to validate the effect of EMS administration of oral steroids, and describe the use of our new tablet-based ePCR system for the purpose of performing prehospital medical research in a project titled the Prehospital Oral Steroids for the Treatment of Status Asthmaticus in Children (POSTSAC) Study.

Beginning this spring, utilizing the REMAC- and SEMAC-approved protocol mentioned above, FDNY paramedics will have the ability to provide oral steroids to children with moderate to severe asthma exacerbations if the oral steroids are available to them at the time of treatment. That protocol differs from the existing ALS Protocol #554 in only one respect, the addition of this step:

“If available, administer Prednisolone 1mg/kg (0.33ml/kg of a 3mg/ml solution), orally, for patients who meet the ALL of the following criteria:

a. More than one Albuterol Sulfate dose administered, via nebulizer, for on-going respiratory distress and/or wheezing.
b. Patient has a known history of asthma
c. Patient is not actively taking prednisolone, prednisone, or other oral steroid medication.”
One important thing to note about this change is the words “if available.” Because this study was approved as a randomized trial, approximately half of the pediatric patients with moderate to severe asthma will be treated with the existing standard of care (albuterol, ipratropium, and if needed epinephrine) and half will be treated with the alternative standard of care that includes the addition of oral steroids. This randomization will be accomplished by placing medication inserts that contain oral steroids on half of the FDNY ALS units and providing the other half with the existing medication inserts. So, when you are treating a pediatric asthma patient, your ability to provide them with oral steroids will depend upon “if they are available.” In both cases – whether you have or do not have the steroids – you will be providing the patient with one of the two existing standards of care for prehospital pediatric asthma management.

If steroids are available, the patient will qualify to receive them if they meet all of the following:

- Age 2-13
- Known history of asthma
- No other underlying lung disease (for example, cystic fibrosis)
- The patient is not already taking oral steroids
- The patient is being administered more than one albuterol treatment for this exacerbation

If the patient meets all of these criteria, the oral steroids should be administered before or during the second albuterol / ipratropium nebulizer treatment.
To simplify the dosing of the steroids, patients are to be given a dose corresponding to their weight.

The chart shown is the official dosing chart for this study and is consistent with the dosing described in the approved protocol, providing a 1mg/kg dose for each group. In the event that the child’s weight is not known and unable to be estimated, their age may be used instead (as shown in the chart), though weight is preferred, when possible. Importantly, if steroids are given, this should be communicated to the ED staff to whom the patient’s care is transferred in order to ensure that they are aware, particularly because not all pediatric asthma patients will receive this therapy.

The other change that will be implemented alongside this study is the use of peak flow meters to assess all pediatric asthma patients. While the amount of wheezing that a patient has, the degree of their respiratory distress and other physical findings noted above provide a subjective assessment of that patient’s severity, peak flow measurement is a way to provide an objective measurement of the same. These measurements will be required for all pediatric asthma patients age five (5) and older prior to the initiation of treatment (unless the patient is in extremis), upon the completion of prehospital care (ED arrival), and will be recorded in the tablet ePCR in the appropriate area.

To measure peak flow:

1. Ensure that the child’s mouth is empty
2. Ideally, have the child standing up
3. Reset the meter to “0” (manually or by shaking)
4. Have the child take in a deep breath
5. Place the mouthpiece between their teeth and have them seal their lips around the mouthpiece
6. Ask the child to exhale as hard and fast as possible (“like blowing out the candles on a birthday cake”)
7. Repeat the process three times and record the highest measurement
8. Record a second peak flow reading upon arrival in the emergency department
If the child is too ill or otherwise unable to perform a peak flow assessment, this should be documented in the narrative section of the ePCR.

Upon completion of all pediatric asthma assignments, as we do for our cardiac arrest research, FDNY paramedics will then be required to contact the FDNY’s On-Line Medical Control facility to complete a brief telephone interview in which we will obtain critical data not readily available through the existing ePCR tablets. For that interview, you should be prepared to provide the following information:

- Unit
- CAD
- ePCR booklet number
- Description of the severity of the patient’s wheezing
- Description of the patient’s work of breathing
- Whether the patient’s expiratory time was increased (expiratory time > inspiratory time)
- Whether the patient was already taking steroids for their asthma
- ED visits in the past year for asthma
- Prior hospital admissions for asthma
- Prior ICU admissions for asthma
- Does the patient have a primary care physician
- Number of times in an average week that the patient uses their rescue inhaler (albuterol)
- Initial and final peak flow
- Estimate of height
- Number of nebulizer treatments the patient received for this exacerbation
- If the patient was given prehospital oral steroids and, if so, the dose
- Adverse patient effects related to steroid administration
- Problems with steroid administration
- Any comments you would like to provide specific to this patient, study, or peds asthma care

Conclusions

Nearly a decade ago, the FDNY was at the forefront of asthma care when research from this system showed that BLS providers could safely and effectively provide nebulized albuterol to asthmatics. Over the course of the next two years, operating under a newly approved pediatric asthma protocol, we hope to again validate the ability to implement an effective prehospital approach to asthma care and, in doing so, to ensure that our patients receive the most timely, appropriate care possible.

Written by:  John Freese, M.D.
Director of Prehospital Research
Fire Department of New York (FDNY)
References

POSTSAC Study partnership:
- Fire Department of New York
- North Shore Long Island Jewish Medical Center Department of Emergency Medicine
- Hofstra School of Medicine
- Maimonides Medical Center
- Cohen’s Children’s Medical Center

Study Investigators
- Dr. Robert Silverman (Co-Principal Investigator, Research Director, NSLIJ Emergency Medicine)
- Dr. John Freese (Co-Principal Investigator, Director of Prehospital Research, FDNY)
- Dr. Doug Isaacs (Site Investigator, Deputy Medical Director, FDNY Office of Medical Affairs)

Study approvals:
- US Department of Health and Human Services’ Health Resources and Services Administration
- Institutional Review Board (North Shore Long Island Jewish Medical Center)
- New York City Regional Emergency Medical Advisory Committee (REMAC)
- New York State Emergency Medical Advisory Committee (SEMAC)

CME JOURNAL 2014_J04-05: Peds Asthma

BLS and ALS

1. All of the following are components of an asthma exacerbation EXCEPT:
   a. Bronchoconstriction
   b. Mucosal edema
   c. Airway inflammation
   d. Accessory muscle fatigue
   e. All of the items listed here are components of asthma exacerbations

2. Which of the following are important components of the past medical history that should be obtained for a pediatric patient?
   a. Past hospital and ICU admissions
   b. Prior intubations
   c. “Triggers” for the patient’s asthma
   d. Comparison of this “attack” to other previous exacerbations
   e. All of the items listed here are important

3. All of the following information should be obtained specific to the pediatric asthma patient’s medication use EXCEPT:
   a. Current medications (over the counter and prescription) and changes in those meds
   b. How much they pay for their medication
   c. Number of inhaler uses / nebulizers prior to EMS arrival
   d. Compliance with prescribed medications
   e. Number of times in an average week that the child uses “rescue” meds (e.g. albuterol)

4. Which of the following is true regarding the administration of nebulized albuterol to a pediatric asthma patient?
   a. The medication causes bronchoconstriction through the activation of β2 receptors
   b. The proper dose for pediatric patients is 3mg in 2.5 mL
   c. The dose for children less than six years of age should be cut in half (to 1.25mg)
   d. Due to a lack of absorption, there are no adverse effects from albuterol
   e. Pediatric patients who require two of more treatments are having a moderate to severe “attack”
5. The administration of intramuscular epinephrine autoinjectors for severe pediatric asthma:
   a. Is not allowed under NYC REMAC protocols
   b. Is indicated for any patient requiring albuterol treatments
   c. Is age-based, with patients under 9 years of age or <66lbs receiving a peds autoinjector
   d. Should only be considered if ALS is not available
   e. Is age-based, with patients over 9 years of age or >66lbs receiving a peds autoinjector

ALS only

6. With regard to pulse oximetry and the pediatric asthma patient:
   a. Measurements should only be taken after oxygen is applied
   b. An initial measurement <93% indicates the possible need for hospital admission
   c. Prehospital measurements are of no value to emergency department staff
   d. Measurements will not be affected by commonly administered asthma medications
   e. All of the statements here are true

7. The phenomenon known as “after drop” in pediatric asthma patients:
   a. Is due to the effects of ipratropium on the bronchioles and pulmonary vasculature
   b. Is caused by a “mismatch” between ventilation and oxygenation
   c. Occurs when albuterol alters both blood flow and air movement in the lungs
   d. Is a sign of possible need for hospital admission
   e. Is the most significant reason why Xopenex is preferred over albuterol

8. Which of the following is true regarding levalbuterol (Xopenex):
   a. It is associated with significantly less tachycardia than albuterol
   b. It is associated with reduced hospitalizations as compared to albuterol
   c. It is associated with reduced pulmonary function as compared to albuterol
   d. There is no cost difference between this drug and albuterol
   e. It does not contain the S-albuterol found in “regular” albuterol

9. Which of the following is true regarding ipratropium?
   a. Systemic absorption results in significant adverse effects
   b. It may be administered by BLS and ALS personnel
   c. It produces bronchodilation through its sympathomimetic activity
   d. It has cholinergic activity that reduces mucosal edema
   e. When administered with albuterol, it is associated with lower hospital admission rates

10. Corticosteroids for the prehospital treatment of pediatric asthma:
    a. May be administered orally as this route is just as effective as IV administration Are only approved via the intravenous route
    b. Should only be provided if the patient is already taking oral steroids
    c. May be provided to children regardless of age
    d. Have not been approved by SEMAC
Based on the CME article, place your answers to the quiz on this answer sheet. Respondents with a minimum grade of 80% will receive 1 hour of Online/Journal CME.

Please submit this page only once, by one of the following methods:
- FAX to 718-999-0119 or
- MAIL to FDNY OMA, 9 MetroTech Center 4th flr, Brooklyn, NY 11201

Contact the Journal CME Coordinator at 718-999-2790:
- three months before REMAC expiration for a report of your CME hours.
- for all other inquiries.

Monthly receipts are not issued. You are strongly advised to keep a copy for your records.

Note: if your information is illegible, incorrect or omitted you will not receive CME credit.

Check one: EMT  Paramedic  ______________  other

Name

NY State / REMAC # or “n/a” (not applicable)

Work Location

Phone number

Email address

Submit answer sheet by the last day of May 2014

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Citywide CME

Sessions are subject to change without notice. Please confirm through the listed contact.

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<td>ED Conference Room</td>
<td>Dr Hew</td>
<td>Manny Delgado 718-363-6644</td>
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<td>1730-1930</td>
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<td>Dr Chitnis</td>
<td>Dale Garcia 718-630-7230</td>
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<td>Ana Doulis 212-746-0885 x2</td>
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<td>Jessica Kovac 212-263-3293</td>
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<td>1800-2100</td>
<td>Lecture or Call Review</td>
<td>25-10 30 Ave, conf room</td>
<td>Dr Dean</td>
<td>Donna Smith-Jordan 718-267-4390</td>
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<td>Dr Sample</td>
<td>Mary Ellen Zimmermann RN 718-670-2929</td>
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<td>Regina McGinn Center 475 Seaview Ave</td>
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<td>Andrea Kleboe 718-226-7878</td>
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<td>346 Seguine Ave</td>
<td>Dr Barbara</td>
<td><a href="mailto:pbarbara.md@gmail.com">pbarbara.md@gmail.com</a></td>
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### 2014 NYC REMAC Examination Schedule

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* The REMAC Refresher Written examination is offered for paramedics who meet CME requirements and whose REMAC certifications are either current or expired less than 30 days. To enroll, go to the REGISTER link under “News & Announcements” at nycremsco.org before the registration deadline above. Candidates may attend an exam no more than 6 months prior to expiration.

** REMAC Basic Written & Scenario examination is for initial certification, or inadequate CME, or certifications expired more than 30 days. Seating is limited. Registrations must be postmarked by the deadline above. Exam fee is $100 by money order. Email Christopher.Swanson@fdny.nyc.gov for instructions.

*** NYS/DOH exam dates are listed for information purposes only. Scheduling is through your paramedic program or contact NYS DOH for more information.