What's Up With That Cough?

Pediatric Respiratory Emergencies
October 2008
Continuing Education

Objectives

1. Review the pediatric airway anatomy
2. Discuss current challenges in managing the pediatric respiratory patient
3. Review the differences in croup, asthma, epiglottitis, whooping cough, and RSV, bronchiolitis, foreign body aspiration and ALTE.
4. Discuss current trends in the treatment of these respiratory complaints and the application of current Region 8 SOP's as they apply to these complaints.

Pediatric Airway

Over 30 million children seek emergency care each year in our emergency departments. Children represent 30% of emergency department visits but only 10% of all prehospital calls. Respiratory complaints comprise $1/10^{th}$ of all pediatric prehospital calls. Because prehospital sees such a small percentage of pediatric calls many competent and experienced EMT's and paramedics are often uncomfortable with the assessment and care of the acutely ill or injured pediatric patient.
Why is the pediatric prehospital airway management different from that of the adult patient? There are numerous anatomical differences in children versus adults in relation to airway management.

Anatomical Considerations

- A proportionately larger occiput causing the head to flex on the neck
- Larger tongue: source of obstruction where there is loss of muscle tone
- An epiglottis that is floppy, long and more U-shaped making visualization of the vocal cords difficult
- A larger mass of adenoidal tissues which can result, especially in infants, in greater bleeding from nasotracheal intubation or placement of a nasopharyngeal airway in infants younger than a year
- A larynx(glottis) that is located higher and more forward in the neck
- A cricoid ring that is the narrowest portion of the airway up to 5 years of age. Uncuffed tubes are used in infants and in children otherwise the cuff will cause pressure on the cartilaginous ring limiting the blood supply.
- A narrow tracheal diameter and shorter distance between the rings makes performing a tracheostomy more difficult in infants and young children
- A shorter tracheal length in children can lead to intubation of the right mainstem bronchus or dislodgement of the endotracheal tube
- Narrower large airways which result in greater airway resistance
- Less mature chest and abdominal musculature which can result in easy fatigue of the diaphragm.

Physiological and Behavioral Considerations

- Preferential nose breathing for the first several months of life which can create respiratory distress if the nasal passages are blocked
- Higher metabolic requirements which increase the need for oxygen and nutrients, resulting in higher normal respiratory rates in infants and children
- Inefficient immune system in small infants which results in the greater likelihood of respiratory infections
- Behavioral immaturity resulting in the infant or young child's inability to verbalize respiratory distress or its cause

Definitions

- Respiratory distress: characterized by increased work of breathing. The use of accessory muscles, retractions and nasal flaring indicate increased work of breathing. These are the child's attempt to make up for decreased gas exchange.
- Respiratory failure: A condition in which compensatory mechanisms are no longer able to maintain adequate oxygenation or ventilation. The effects of the respiratory insult overwhelm the child's ability to respond and they begin to decompensate.
- Respiratory arrest; Absence of spontaneous respirations
- Upper airway obstruction: Obstruction of airflow from the level of the oropharynx to the mainstem bronchi
- Lower airway obstruction: Obstruction of airflow from the mainstem bronchi to the end of the smallest air passages (bronchioles)

Sick or Not Sick!

Assessing the pediatric patient requires a systematic, consistent pattern of assessment. The Pediatric Assessment Triangle (PAT) is a useful tool for assessing the pediatric patient. The PAT relies on three key components—appearance, work of breathing and circulation.

Appearance: A general impression of appearance quickly reflects adequacy of ventilation, oxygenation, brain perfusion and central nervous system function.[1] Loud crying is a great sound versus the child who has poor muscle tone or is unresponsive and has a fixed gaze. What does this child's appearance say?

[1] American Academy of Pediatrics: Pediatric Education for Prehospital Professionals. Jones & Bartlett

The **TICLS** mnemonic is a useful tool when assessing appearance.

[2]

T: Tone (muscle) Is the child reactive or listless?
I: Interactiveness: How alert is the child?
C. Consolability: Can the child be consoled by her mother or another caregiver?
L: Look/Gaze: Do they focus on objects or is the gaze fixed and unfocused
S. Speech/Cry: Is the crying strong and loud or weak and hoarse?

When you assess the general appearance, you develop an overall impression of how sick the child is at that moment.

Work of Breathing: Unlike the adult patient, **a child's work of breathing is often a better assessment of oxygenation and ventilation status than breath sounds and respiratory rate**.[3] Work of breathing reflects the child's ability to exchange gas. Many times this can be accomplished without a stethoscope. Abnormal, audible airway sounds can quickly alert you to a problem with the upper airway. Snoring, difficulty swallowing, secretions or a hoarse voice is subtle indicators of upper airway obstruction.
FYI: Respiratory rate may be affected by level of activity, fever, anxiety and metabolic state. A respiratory rate of greater than 60 breaths/min is abnormal in a child of any age and should be a signal for careful evaluation of signs of respiratory or circulatory problems. More dangerous is a rate that is to slow for the patient's age. A respiratory rate of less than 20 breathes/minute in a sick child under 6 years of age, or a rate less than

[2] Pediatric Education for Prehsopital ,2006 "Initial Assessment"
[3] JEMS: June 2008 "The Young Airway" by Murphy, MD.

12 breaths/min in a sick child under 15 years of age may be a sign of respiratory failure, and immediate intervention is required.

Stridor (a high-pitched, audible sound on inspiration) is an ominous finding and may indicate increasing narrowing of the upper airway structures. Croup, bacterial infections, foreign bodies, edema and bleeding can all result in upper airway obstructions.

Children who develop **grunting** may already be moderately to severely hypoxic and have poor gas exchange. Conditions associated with grunting in children include pneumonia and pulmonary edema.

The **sniffing position** is when the patient spontaneously flexes their neck their neck slightly forward and extends their head up and back in order to open a partially obstructed upper airway. The **tripod position** is when the patient has an erect body and plants their arms firmly on a flat surface to maximize the use of the accessory muscles in the chest and neck. **Head bobbing** is typically in response to the child's use of accessory muscles and the attempt to produce maximum negative intrathoraic pressure for inspiration.[4]
Because a child's chest is so small, stethoscope placement differs slightly from that of the adult chest. Place the stethoscope bell near the armpit to maximize transmitted breath sounds.[5]
Wheezing, the movement of air through partially blocked smaller airways, is the most common lower airway sound heard in children with respiratory compromise. Initially, wheezing is heard only on exhalation or upon auscultation with a stethoscope. As the degree of obstruction increases, it may be heard on both inspiration and expiration, and may be audible to the naked ear. It is necessary to treat wheezing in the field early before the increased work of breathing leads to fatigue and respiratory arrest.[6]

Circulation: The third component of the assessment triangle is circulation. While circulatory assessment may include counting the heart rate, it is more important to look at the patient's skin. If the pediatric patient has inadequate blood volume in the circulatory system or when the heart is unable to maintain output to the body, blood supply to vital organs is conserved by shutting down circulation to the less essential areas of the body. The signs of inadequate perfusion include pallor, cyanosis and mottling (caused by uneven constriction of capillary beds in the skin).

[4] JEMS: June 2008, "The Young Airway", Murphy, M. MD
[5] Bledsoe B, Porter R, Cherry R: Paramedic Care Principles & Practice. Prentice Hall p.59
[6] JEMS: June 2008, The Young Airway,", Murphy, M. MD

The PAT gives you a rapid overall impression of whether the child's illness or injury is severe and life threatening and how rapidly you need to intervene.

So What's Out There?

Whooping Cough: Whooping cough (pertussis) is a highly contagious bacterial infection of the upper respiratory system specifically, the area where the nasal passages meet the back of the throat (nasopharynx). The infection causes irritation in breathing passages, resulting in severe coughing spells.
Whooping cough is caused by infection with *Bordetella pertussis* or *B. parapertussis* bacteria. The infection spreads from person to person through respiratory secretions or mucus which can be emitted during coughing or sneezing. The incubation period is about 7 to 14 days and the symptoms start in about 1-2 weeks after exposure.
Symptoms of whooping cough typically last 6 to 10 weeks and can occur in three stages.
Stage 1: Coldlike symptoms-such as sneezing, runny nose, mild coughing, watery eyes and sometimes a mild fever that can last from several days to 2 weeks. An infected person is most contagious during this stage.
Stage 2: Coldlike symptoms fade, but the cough gets worse. It changes from a dry, hacking cough to bursts of uncontrollable, often violent coughing. During a coughing episode, it may be impossible to take a breath because of the intensity of the coughing. When the patient can finally take a breath, they may take a sudden gasp of air through airways narrowed by inflammation, and this sometimes causes a whooping noise. During an attack the person may appear cyanotic. The attacks occur more frequently during the night with an average of 15-24 attacks per 24 hours. Vomiting and severe exhaustion often follow a coughing spell. This is the most serious stage of whooping cough usually lasting from 2-4 weeks.
Stage 3: The person improves and gains strength; the cough may become louder and sound worse. Coughing spells may occur off and on for weeks to months and may flare up if a cold or upper respiratory illness develops. This stage may last longer in someone who has never been vaccinated.

Respiratory Syncytial Virus (RSV): Is a major cause of respiratory illness in young children. It is the most common cause of **bronchiolitis** and pneumonia among infants and children under 1 year of age. RSV causes infection of the lungs and breathing passages. The illness begins most frequently with fever, runny nose, cough, mild headache and sometimes wheezing. RSV can lead to more serious illness in premature babies and children with diseases that affect the lungs, heart, or immune system. During their first RSV infection, between 25% and 40% of infants and young children have signs or symptoms of bronchiolitis or pneumonia and up to 2% require hospitalization. Most children recover from the illness in 8-15 days. Most children hospitalized for RSV infection are under 6 months of age.

RSV is highly contagious and is spread from respiratory secretions, from droplets when a person coughs or sneezes, or through close contact with infected persons. It can also occur through contact with contaminated surfaces such as countertops, clothing or doorknobs. RSV infections often occur in epidemics that last from late fall through early spring. RSV also causes repeated infections throughout life usually associated with moderate to sever cold like symptoms. Almost all kids are infected with RSV at least once by the time they are two. Severe lower respiratory tract disease may occur at any age especially among the elderly or among those with a compromised cardiac, pulmonary, or immune system.[7] It is thought that RSV infection is the first trigger for asthma to develop.
Development of an RSV vaccine is a high research priority, but none is yet available.

Bronchiolitis: Is a lung infection usually caused by the respiratory syncytial virus which produces swelling and increased mucus production in the bronchioles. It occurs most commonly in infants and is most common during the winter months. Infants ages two to twelve months are the most likely to develop bronchiolitis. For children with bronchiolitis, initially they develop a runny nose and cough. Over the next several days the cough will worsen and they may develop a fever, wheezing and difficulty breathing. There is no cure for bronchiolitis. The treatment is symptomatic. Some children with bronchiolitis may need to be hospitalized, either for respiratory distress or dehydration

Reactive Airway Disease: Reactive airway disease has a large differential diagnosis and must not be confused with asthma. Not all children who wheeze have asthma. Most children younger than 3 years who wheeze are not predisposed to asthma. Only 30% of infants who wheeze go on to develop asthma.

Recurrent wheezing was often called asthma in the past and more recently is called Reactive Airway Disease (RAD). This new term attempts to get across the points that the wheezing is a reaction that can be triggered by many factors (such as viral upper respiratory infections, inhalant allergies to pollens and molds, cold air, exercise, emotion, cigarette smoke, paint fumes, ozone) and the site of the problem is obstruction to airflow in the lower airways of the lungs. In infants and children younger than 3 years of age, the intrapulmonary airways are so small that any lower airway infection results in a decrease in airway function.

In the United States the risk of developing asthma is 7% if neither parent has asthma, 20% if one parent has asthma, and 64 % if both parents have asthma.[8] In the United States approximately one-half of all ED and clinic visits for asthma are for children under 18. There are approximately 2.7 million children with asthma in the United States alone. Asthma prevalence is increasing worldwide. Asthma is more common in Western countries than in developing countries. Asthma is more prevalent in English speaking countries. Air pollutants may play a role. Also a correlation exists between high levels

[7] http://www.cdc.gov/ncidod/dvrd/revb/respiratory/rsvfeat.htm
[8] http://www.emedicine.com/emerg/topic363.htm

of cockroach exposure and the frequency of asthma related health problems in inner city children. The male to female ratio is 1.5:1 and the peak prevalence is between 6-11 years old.

Precipitants of asthma exacerbation:

- Infection-RSV is one of the most common
- Tobacco smoke
- Pet dander, cockroach and dust mite allergen
- Molds and Pollen
- Weather changes or exposure to very cold air
- Stress and exercise
- Drugs

History is important. The following information is important:

- Initiation of symptoms (More than a few days decreases the chance of quick reversal because of prolonged inflammation and mucous plug formation.)
- Upper respiratory infection symptoms, fever, and production of phlegm
- Use of inhalers: how often was it used in the past 24-48 hours
- Other current medications
- Ability to tolerate fluids
- Recent mental status changes
- Wheezing or coughing after active play
- Dry cough that is worse at night
- History of previous hospitalizations or intubations

Physical findings: Children who have a history of Reactive Airway Disease or diagnosed with asthma when having an inflammatory reaction may show different degrees of

- Tachycardia
- Tachypnea
- Increased work of breathing (use of accessory muscles, nasal flaring retractions)
- Wheezing on exhalation
- Pulse oximetry may be normal or low
- Careful assessment of air movement by auscultation. The asthmatic complaining of shortness of breath, but without wheezing on auscultation, may have to much airway obstruction to wheeze

If during the initial assessment your patient shows signs of

- Altered appearance
- Exhaustion
- Inability to recline

Severe retractions

Decreased air movement

Interrupted speech

This suggests severe bronchospasm and respiratory failure. It is important to provide high flow oxygen during transport, cardiac monitoring, pulse oximetry, beta-agonist (albuterol) nebulizer, and intravenous access for rehydration.

Croup: Croup is an infection that often comes after a child experiences an acute viral infection of the upper respiratory tract. The infection may extend from the vocal cords to the trachea and bronchi. This infection results in inflammation and increased mucus production. Most croup is caused by viruses, but similar symptoms may be caused by bacteria or an allergic reaction. The viruses most commonly involved are the parainfluenza virus, adenovirus, respiratory syncytial virus, influenza and measles. Some children appear to be particularly prone to croup and have a large number of infections. Boys are more prone than girls, with peak seasonal outbreaks in the late fall and winter.[9]

Children between the ages of 6 months and 3 years are the most likely to get croup. This common viral illness is estimated to occur in 5% of children between the ages of 1-2 years and is the most common cause of stridor in this age group. **Stridor** is a harsh, raspy, upper airway wheezing when a breath is taken in. Some children are more prone

[9] http://www.emedicinehealth.com/croup

to developing croup, especially those who were born prematurely or with narrowed upper airways, and babies with a history of breathing problems like asthma.

Croup is characterized by a loud cough that may sound like a barking seal and may be accompanied by fast or difficult breathing or wheezing while breathing. Initially the child may have cold symptoms for a few days with a low grade fever. As the upper airway becomes more inflamed and swollen, the child may become hoarse, with a harsh, barking cough. If the upper airway becomes swollen to the point of a partial obstruction, the child may develop a high pitched or squeaking noise when breathing in called **stridor.** The child tends to breathe very fast and may be retracting because he or she is working hard to get air in to the lungs. The child may appear pale or bluish in color from not getting enough oxygen. Symptoms of croup often worsen at night or when the child is upset and crying.

Most cases of viral croup are mild. Breathing humidified air helps relieve the symptoms, either by a cool-mist humidifier or sitting in a steam filled bathroom. The child needs to be evaluated if they are having difficulty breathing, has any stridor, or seems less alert than usual. Management of croup in the pre-hospital setting is appropriate airway management. Medications such as epinephrine and corticosteroids may be given to reduce the swelling in the airways. The symptoms of croup generally peak 2 to 3 days after the symptoms of the infection start. Croup usually lasts from 3-7 days.

Symptoms of Croup and Epiglottitis

Croup	**Epiglottitis**
Slow onset	Rapid onset
Generally wants to sit up	Prefers to sit up
Barking cough	No barking cough
No drooling	Drooling, painful to swallow
Fever approx. 101-102 degrees	Fever 102-104 degrees
	Occasional stridor

Epiglottitis: The epiglottis is a flap of tissue that sits at the base of the tongue and whose job is to keep food from going into the trachea during swallowing. When it becomes infected and inflamed, it can obstruct, or close off the trachea. Epiglottitis was first described in the 18th century. In fact, although George Washington's death in 1796 was attributed to quinsy (peritonsillar abscess), it was actually due to epiglottitis.

- A slight narrowing in the trachea can dramatically increase the resistance of an airway, making breathing more difficult.

- In the past, epiglottitis was more common in children than in adults

- Since 1985, with the widespread vaccination against *Haemophilus influenzae* type b (or Hib), which is the most common organism related to epiglottitis, the overall occurrence of the disease has dropped dramatically.

- Epiglottitis occurs with different peaks in both children and adults. In children it typically peaks in children aged 2-4 years. In adults, it peaks between ages 20-40 years.

- The clinical triad of drooling, dysphagia, and distress is the classic presentation. Drooling occurs in up to 80% of the cases.

Epiglottitis is a true emergency because it develops rapidly and can result in a compromised airway. Patients frequently present with respiratory distress of sudden onset, sitting upright, leaning forward with their jaw jutted forward and often drooling. Additional signs and symptoms include stridor, hoarseness or muffled voice, sore throat, dysphagia, fever, perioral cyanosis, tachycardia, tachypnea and retractions. They are often anxious but may appear lethargic or fatigued due to exhaustion from their efforts to breathe. Every effort should be made to keep the child calm because any agitation or crying may lead to laryngospasm and complete airway obstruction.

Apparent Life Threatening Event (ALTE)

An ALTE, formerly referred to as "near-miss SIDS," is defined as a sudden event often characterized by apnea or other abrupt changes in the child's appearance or behavior.[10] The child exhibits some combination of apnea, change in color, change in muscle tone, coughing or gagging. The incidence of ALTE is unknown but estimated at 0.05 to 6%. It occurs in children less than a year old, with a peak incidence between two weeks and two months of age and most events occurring at less than 10 months of age.[11] Approximately 50% of these children are diagnosed with an underlying condition that explains the apparent life threatening event. Commonly, the problems are digestive (up to 50 percent), neurologic (30 percent), respiratory (20 percent), cardiac (5 percent), and endocrine or metabolic (less than 5 percent).

Premature infants, premature infants with respiratory syncytial virus (RSV) infections, and premature infants who undergo general anesthesia are at an increased risk for an ALTE. Children who feed rapidly, cough frequently, or choke during feeding also are at an increased risk, and more boys than girls experience ALTE's.

[10] European Journal of Pediatrics. 163:108-115, 2004
[11] Emergency Medicine Journal. 19:11-16, 2002

Information to Obtain in Children with ALTE's

- Description of event: Condition of child, activity at the time of the event, breathing efforts, color, movement and tone, observations of productive cough, vomiting, duration of the event.

- Interventions: none, gentle stimulation, blowing air in face, vigorous stimulation, mouth to mouth breathing, CPR by trained medical personnel.

- History of present illness: Ill in days or hours leading up to event, fever, poor feeding, weight loss, rash, irritability, lethargy, or contact with someone who is sick, medications administered, immunizations.

- Medical History: Prenatal history, use of drugs or tobacco or alcohol during pregnancy, small for gestational age, prematurity, history of birth trauma, hypoxia, presumed sepsis, feeding history, reaching appropriate developmental milestones, surgeries, hospital admissions, accidents or trauma.

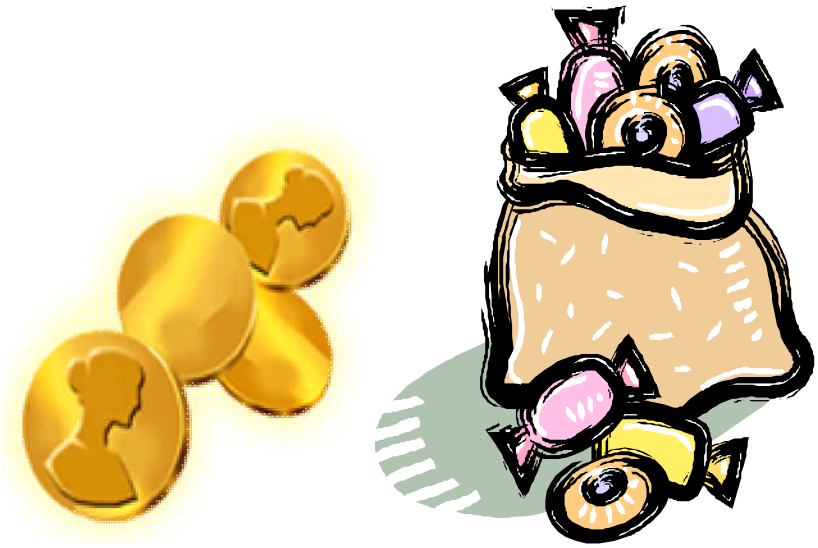
- Family history: Congenital problems, neurological conditions, neonatal and child deaths in the family. Smoking in the home, cardiac arrhythmia and SIDS.

Also it is important to consider the possibility of child abuse or Munchausen syndrome by proxy.

Despite workups and inpatient monitoring, 50 percent of the children remain undiagnosed. In terms of SIDS, the risk increases when the event is linked to central hypoventilation syndrome, seizure disorders, and cardiac arrhythmias including sinus bradycardia, Wolff-Parkinson-White syndrome, and prolonged QT syndrome.[12]

Approximately 7 percent of infants who die from SIDS have a history of ALTE's. Unlike SIDS, there has been no drop in the incidence of ALTE's with children sleeping on their backs. Children with ALTE's have a greater likelihood of sudden death.

[12] Pediatric Cardiology 2002:23:605-7.



Foreign Body Obstruction:

Physical and developmental factors put children at risk for choking. Children who choke run the risk of death, permanent brain damage caused by lack of oxygen, or other complications associated with airway blockage.

In 2001, 160 children ages 14 years or younger died from an obstruction of the respiratory tract due to inhaled or ingested foreign bodies. Of these, 41% were caused by food items and 59% by nonfood objects.

For every chocking-related death, there are more than 100 visits to U.S. emergency departments. In 2001, an estimated 17,537 children 14 years or younger were treated for choking episodes.

- 60% of nonfatal choking episodes treated in ED.'s were associated with food items; 31% were associated with nonfood items including coins; and 9% of the episodes the substance was unknown.
- Candy was associated with 19% of all choking-related ED visits. 65% were related to hard candy. Other types of candy included gummi bears and gum.
- Coins were involved in 18% of all choking related emergency visits for children ages 1-4 years. Other common objects are buttons, beads, pins, nuts, hot dogs and grapes.

- In 2001, 10.5% of all children treated in the ED for choking episodes were admitted to the hospital or transferred to a higher level of care.[13]

- Younger children are particularly at risk because of their tendency to place objects in their mouths, poor chewing ability, and narrow airways compared to those of older children.

If the obstruction due to a foreign body is complete or is partial with inadequate air exchange; follow the American Heart Association guidelines for foreign body obstruction

. (This is good time to review these procedures)

Drug of the Month

Epinephrine

Epinephrine is an endogenous catecholamine. This means it is a hormone that is normally produced, secreted, and utilized by the body. A catecholamine is a substance that acts on the autonomic nervous system. Epinephrine achieves its therapeutic benefits by stimulating the *alpha* and *beta* adrenergic receptor sites of the autonomic nervous system.

Its *beta* 1 effects strengthen myocardial contractions; increase cardiac rate and cardiac output.

[13] http://www.cdc.gov?ncipc/duip/spotlite/choking.htm

Its *beta* 2 effects dilate the bronchiole smooth muscle and inhibit mucus secretion that decreases overall airway resistance.

Its *alpha* effects constrict the bronchial arterioles and inhibit histamine release, thus reducing congestion and edema and increasing tidal volume and vital capacity. It also helps increase vascular tone, which helps increase blood pressure. In a cardiac emergency, the alpha properties are the chief reason for the use of epinephrine. Because it increases vascular tone, it will increase blood flow to the heart and brain during compressions.

It is also thought to increase the coarseness of ventricular fibrillation, making it more receptive to defibrillation attempts. Epinephrine normally degrades rapidly in the body. For this reason, it is necessary to administer epinephrine to the patient in continuous short intervals to keep the blood levels in a therapeutic range.

Indications

- Cardiac arrest
- Allergic reaction
- Anaphylaxis
- Acute Asthma/ COPD with wheezing

Side Effects:

- Palpitations
- Tachycardia
- Hypertension
- Angina , anxiety
- Tremors, Headache

Dosage: Cardiac Arrest 1mg (1:10,000) IV or 2mg of 1:1000 ET repeat q 3 minutes as long as patient is pulseless

Allergic Reaction/ Bronchospasm: 0.3mg of 1:1000 IM, may repeat x1 (after 15 min)

Anaphylaxis: 0.5mgof 1:10,000 IV or 1mg 1:10,000 ET

0.5mg 1:1000 IM May repeat q 3min.

Pediatric Dose: Cardiac Arrest: 0.01mg/kg of 1:10,000 IV/IO or

0.1mg/kg 1:1000 ET (dilute with 2 ml of NS) repeat

Q 3min as long as pt. pulseless

Allergic Reaction/Bronchospasm: Weight based <10kg = 0.1mg

All given I.M. 11-20kg=0.2ml

21-30kg=0.3mg

Anaphylaxis: 0.01mg/kg of 1:10,000 IVP or 0.02mg/kg 1:1000 ET or

0.01mg/kg 1:1000 IM May repeat q3min

Croup/ Epiglottitis: 3mg (3ml) of 1:1000 solution via nebulizer

STRIP OF THE MONTH

Narrow Complex Tachycardia

An irregular heart rhythm is not an unusual finding in children with or without known cardiac disease. Some irregular rhythms are normal findings in healthy children. If the heart rate is not too slow or too fast, as to limit the cardiac output, then an arrhythmia may be well tolerated. If the child has a narrow QRS tachycardia (<0.08 seconds), P waves are present, and the heart rate is variable and less than 220 beats/min in an infant or less than 180 beats/min in a child, the cause is usually sinus tachycardia from non-cardiac conditions (.e.g **hypoxia, hypovolemia, hypothermia, hypoglycemia**, metabolic **abnormalities, toxins, fear, pain or serious trauma to the chest**. Treat with fluids. oxygen, splinting, analgesia or sedation as indicated by the associated condition. If thereis no change in heart rate after treatment, consider other etiologies, such as SVT.

Supraventricular tachycardia is the most common abnormal tachycardia in the pediatric age group. SVT usually has its onset at rest but may initiate during exercise. The precipitating factor is often difficult to identify, but a febrile illness may precipitate an episode. If the QRS is less than 0.08 seconds, P waves are absent or abnormal, the rate is not variable and is greater than 220 beats/min in an infant or greater than 180 beats/min in a child, consider SVT. In general, the younger the patient the more rapid the SVT heart rate, but the longer the tachycardia is tolerated before symptoms (usually congestive heart failure) becomes obvious. Episodes of SVT begin and stop abruptly, and may last anywhere from a few minutes too many hours, which is why it is called paroxysmal.

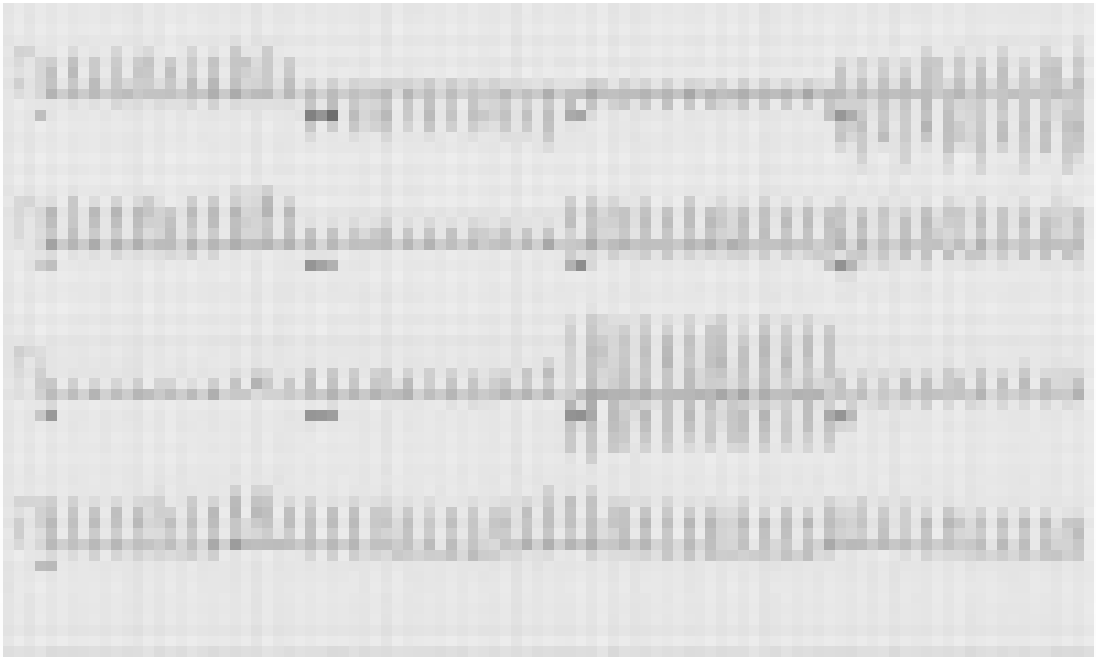
In infants, symptoms of SVT may not become apparent until the patient has been in SVT for 24 hours or longer. They will present with symptoms of congestive heart failure such as tachypnea, pallor, poor feeding, fussiness or lethargy.

In children and adolescents, symptoms may include palpitations, chest pain, shortness of breath, dizziness, syncope or near syncope, pallor, and diaphoresis.

Long term management of SVT depends on the severity and frequency of episodes. Children with frequent episodes or severe symptoms, medical management should be started with a beta-blocker, digoxin, or calcium channel blocker. Patients diagnosed in infancy often will not require continued treatment beyond 1 year of age, but may have recurrent episodes later in life. If the patient has severe symptoms, syncope, difficult to control SVT, or other situations an electrophysiology study and radiofrequency ablation can be performs with a high success rate.

Patients who present in later childhood or during adolescence will likely have recurrent episodes of SVT throughout their lifetime. Many of these patients will require medical treatment and will eventually have radiofrequency ablation. Radiofrequency ablation involves mapping out accessory conduction pathways in the heart with the use of electrodes placed in the atria, coronary sinus, and ventricles through central venous access. Once the pathway is localized a special ablation catheter is used to burn and

cause irreversible tissue injury to the accessory conduction tissue.[14] With all the recent advances in pediatric electrophysiology, the prognosis for patients with SVT is excellent.



Review the Pediatric Narrow Complex Tachycardia SOP for the stable and unstable patient.

[14] http://www.hawaii.edu/medicine/pediatrics/pedtext/s07c06.html