

Pediatrics

Pediatric Advance Life Support

You are working in the ED and are notified that a 1-year-old child is being transported by BLS ambulance with CPR in progress. The child is unresponsive, limp, not breathing, and cyanotic.....Do you know appropriate medications and doses you need?

ABC's

- **Airway:** anatomic differences in children versus adults
 - Larynx is anterior, cricoid ring is narrowest portion of airway
 - ETT size= (age in years + 16)/4; straight blade (Miller) best for intubation; uncuffed may be best (but literature changing)
 - Do not perform a cricothyroidotomy for children < 10 (the membrane is too small); use needle jet insufflation instead
 - Drugs down ETT are last resort - use IV or IO first!
 - **NAVEL-** naloxone, atropine, valium, epinephrine, lidocaine
 - ETT doses: Use 2-3x IV dose for all except epinephrine (10x dose!!)
- **Breathing:** assess breathing rate based on age
 - During CPR give 8-10 breaths/minute
- **Circulation:**
 - CPR chest compressions at 100/min; 30 compressions to 2 breaths (if trained in CPR, 15:2)
 - Defibrillation: shock at 2 J/kg initially, then increase to 4 J/kg
 - Synchronized cardioversion: 0.5-1 J/kg initially, then increase to 2 J/kg
 - Consider IO placement for failed IV access: place 2 cm below tibial tuberosity or in the distal femur
 - Single IVF bolus 20 ml/kg NS, repeat as necessary
 - Maintenance: "4-2-1" Rule

Drug Doses for PALS

- Epinephrine: 0.01mg/kg (1:10,000 → 0.1mL/kg) IV or IO (roughly speaking adult dose is 10ml for 100 kg person, so 10 kg child gets 1ml of crash cart epinephrine)
ETT dose: 0.1mg/kg (1:1,000 → 0.1mL/kg)
- Atropine: 0.02 mg/kg
 - Minimum dose 0.1mg (to avoid paradoxical bradycardia)
 - Maximum dose 1mg
- Amiodarone: 5 mg/kg IV (bolus for pulseless VT/VF; give over 20-60 min in VT with pulse or SVT)
- Procainamide: 15 mg/kg IV
- Adenosine: 0.1 mg/kg (max first dose 6mg; second dose 12 mg)
- Lidocaine: 1 mg/kg IV/IO
- Magnesium 25-30 mg/kg IV/IO
- Glucose 0.25-0.5 g/kg (infants: D10W 2.5-5 ml/kg, children: D25W 1-2 ml/kg, adolescents: D50W 1ml/kg)

Algorithms

- **VF/pulseless VT**
 - BLS/CPR → Shock (2 J/kg) → CPR → shock (4 J/kg) → epi (every 3-5 min) → shock → amiodarone or lidocaine → CPR → consider magnesium

Most cardiac arrest in kids is a primary **RESPIRATORY** (not cardiac) problem

Meds down ETT:



Naloxone
Atropine
Valium
Epinephrine
Lidocaine
IV or IO preferred!

Blood Products:
10ml/kg PRBC's

Neonate?
Remember to warm /dry/suction!!



D10 used in neonates/infants to avoid IC hemorrhage, vein damage

Unstable SVT
↓
0.5J/kg
synchronized
cardioversion

6 mo old heart rate
48, poor cap refill,
shocky, EMS
cannot attain IV
access.
Next step?
↓
CPR

3 m/o old healthy
child with stridor
while crying
↓
Laryngomalacia
(floppy trachea)
↓
Reassure parents it
will resolve



Steeple sign =
narrowing on
x-ray

↓
Epinephrine for
stridor at rest



- **Asystole/PEA**
 - BLS/CPR → epi (every 3-5 min) → CPR and consider causes (H's and T's— Hypothermia, Hypoxia, Hydrogen ion (acidosis), Hypo/Hperkalemia, Hypoglycemia, Hypovolemia, Toxin, Tamponade, Tension pneumo, Trauma, Thrombosis)
- **Supraventricular Tachycardia**
 - Consider if infant heart rate >220 bpm; child heart rate >180 bpm
 - If stable attempt vagal maneuvers (ice to face, valsalva, bear down) → adenosine or synchronized cardioversion (don't give verapamil in <2 years old due to risk of causing asystole)
- **VT with pulse**
 - Synchronized cardioversion +/- adenosine → amiodarone or procainamide
- **Bradycardia**
 - CPR for HR < 60 bpm → epi → atropine → consider pacing
 - Dopamine, 5-20 mcg/kg/min
 - Epinephrine, 0.1-1.0 mcg/kg/min
 - Consider underlying cause: hypoxemia, hypothermia, heart block, head injury, toxin/poison/drugs

The Stridorous Child

A 15 month old male presents with cough and normal vitals. No significant past history, birth history, and his immunizations are up to date. The physical exam reveals a normal cardiovascular and respiratory exam. The CXR is normal and the child is discharged with follow up with his primary care doctor.

Signs/Symptoms

- Inspiratory stridor suggests an obstruction at or above the larynx (high pitched)
- Expiratory stridor is likely from an obstruction below the larynx (i.e. bronchial or lower trachea) causing a wheeze
- Croup: most common cause of acute stridor
- Laryngomalacia: most common cause of congenital chronic stridor
- Normal respiratory rates for age: Newborn <60 (yes— up to 60!); 1-6 months old 24-35; 1-5 years old 20-30; 6-12 years old 12-25
- Signs of impending respiratory failure:
 - Reduced level of consciousness or lethargy
 - Quiet, shallow breathing
 - Apnea

Croup

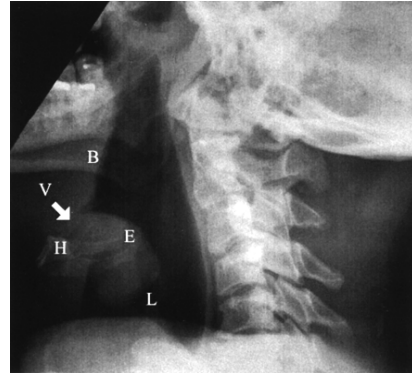
- Also termed laryngotracheitis or laryngotracheobronchitis
- Viral respiratory tract infections generally affect the larynx and trachea but may extend to the bronchi
- Most common etiology for stridor in febrile children
- Age 6 months to 6 years old
- Organism: Parainfluenza (less common: influenza, RSV, adenovirus)
- Presentation: characteristic signs of hoarseness, "barking cough," and inspiratory stridor develop along with a variable degree of respiratory distress. Most ED visits occur at night from 10 pm to 4 am because symptoms are perceived to worsen at night. Symptoms typically resolve within 3-7 days but can last as long as 2 weeks
 - Parents often report that symptoms suddenly improved while walking to the car to bring the child to the ED
- X-rays may show "Steeple Sign"- subglottic narrowing of the tracheal air column (on AP film)
 - Caveat: Diagnosis may be made clinically- obtain x-ray only if atypical presentation

Treatment

- Supportive care with cool mist and O2
- Racemic aerosolized epinephrine
 - Observe for 2-4 hours after treatment
 - Epinephrine is typically reserved for patients in moderate or severe distress (stridor at rest)
- Steroids
 - Single dose of dexamethasone (0.15 mg/kg) is as effective as 0.3 mg/kg or 0.6 mg/kg in relieving symptoms of mild to moderate croup
 - Same efficacy if administered intravenously, intramuscularly, or orally!

Epiglottitis

- Inflammation of the epiglottis and/or the supraglottic tissues surrounding the epiglottis (aryepiglottic folds, arytenoid soft tissue, or the uvula)
- Incidence decreasing in pediatrics due to immunization for Hib
 - Concern most for unimmunized children as Hemophilus influenza B (HIB) is causative
- Classic picture: child sitting forward in bed (tripoding) with chin forward, not swallowing secretions or drooling (seen in up to 80%), stridorous breath sounds, and toxic appearing
 - Acute onset symptoms
 - Rapid progression
- Mortality rates as high as 10% can occur in children whose airways are not protected by endotracheal intubation
- Mortality with endotracheal intubation is less than 1% (7%-20% in adults)
- X-rays (lateral neck): diagnosis should be made clinically without x-ray if possible
 - "Thumbprint" epiglottitis
 - "Vallecula sign"- obscured vallecula (area where mac blade inserts during intubation) is one of the earlier findings
- **Treatment**
 - Intubation in the OR with ENT
 - Avoid upsetting the child, no IV once suspected!
 - 3rd generation cephalosporin



E "thumb print" sign
V "vallecula" sign
B base of tongue
H hyoid bone
L laryngeal inlet



"Thumb print" sign

Croupy cough + toxic + normal lateral neck film
 ↓
 intubate

Bacterial Tracheitis

- "My child had croup and then became a lot sicker" → due to bacterial superinfection
- Looks like croup but toxic appearing
- Usual suspect is staph aureus
- Physical findings: tracheal pseudomembrane and purulent secretions from ETT after intubation
- **Treatment**
 - Secure airway (suction pus through ET tube)
 - Antibiotics

Pertussis (Whooping Cough)

- Can occur all ages, more likely before completion of vaccination series in children <1 y/o
- Caused by Bordetella Pertussis (usually transmitted by older person due to waning immunity)
- Classic picture: paroxysmal coughing spasm ending with forceful inhalation (whoop)

Whoop = labored inspirations between coughs