

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?

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

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



Meds down ETT:

Naloxone
Atropine
Valium
Epinephrine
Lidocaine
IV or IO preferred!

**Blood Products:
 10ml/kg PRBC's**

**Neonate?
 Remember to warm /dry/suction!!**

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)



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

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

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

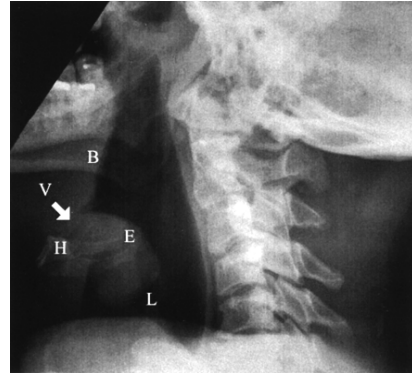
- Also termed laryngotracheitis or laryngotracheobronchitis
- Viral respiratory tract infections generally affect the larynx and trachea but may extend to the bronchi
- Most common etiology for stridor in febrile children
- Age 6 months to 6 years old
- Organism: Parainfluenza (less common: influenza, 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