Pediatric Advanced Life Support Overview 2006
Judy Haluka
BS, RCIS, EMT-P

General
- Our Database is lacking in pediatrics
- Pediatrics are DIFFERENT than Adults not just smaller
- The same procedure may require an entirely different skill set

Prevention
- Injures are the leading cause of Death
  - Motor Vehicle Passenger Injuries
  - Pedestrian Injuries
  - Bicycle Injuries
  - Drowning
  - Burns
  - Firearm Injuries

Motor Vehicle
- 50% of Deaths are from
  - Failure to use proper restraints
  - Inexperienced Adolescent Drivers
  - Alcohol

Restraint Guidelines
- Rear Facing <20 lbs and 1 year of age
- Forward facing Children 1-4
- Booster seats for children 4-7 years
- ALL IN BACK SEAT
- Front seat not acceptable until 12 years of age

Sudden Infant Death
- Up to one year with Peak 2-4 months
- Etiology Unknown
- Risk factors include
  - Sleeping prone
  - Soft surface
  - Second hand smoke
- Decline 40% since change in sleeping position
Basic Cardiac Life Support

Age Definition
- Infant = less than one year
- Child = 1 year to beginning of puberty
  - Armpit hair in boys
  - Breast development in girls

BCLS
- Responsiveness
- Call for help and AED
- If alone begin CPR for 2 minutes
- Compression Rate 30:2
- If alone carry child with you to phone

BCLS
- Open Airway – jaw thrust if trauma
  - 2% of victims with blunt trauma requiring spinal imaging have a spinal injury
  - Do not sacrifice airway
  - Risk is tripled if craniofacial injury or Glasgow coma scale of less than 8

BVM - Precautions
- Avoid hyperventilation
- Pause after 30 compressions for ventilation or 15 compressions if two rescuers
- No pause once advanced airway in place
- Ventilation no more than 8–10/min
- If perfusing – 10–12/min

Bag Valve Mask
- As effective as intubation for short periods of time
- Requires training
- If anesthesia not available it is the preferred method of intubation – especially prehospital with short transport time
Hyperventilation
- Impedes venous return and decreases cardiac output
- Causes air trapping and baro trauma in patients with small airway obstruction
- Increases risk of regurgitation and aspiration

Defibrillation
- VF can be cause of sudden collapse or develop during resuscitation
- AEDs available for pediatrics 1-8

Respiratory Failure
- An increased respiratory rate, particularly with signs of distress
- An inadequate respiratory rate, effort or chest excursion

Shock
- Inadequate blood flow and oxygen delivery to meet tissue metabolic demands
- Compensated – this is where you want to be
- Decompensated

Compensated Shock
- Tachycardia
- Cool extremities
- Prolonged capillary refill
- Weak peripheral pulses compared with central pulses
- Normal blood pressure

Decompensated
- Compensated signs plus
- Depressed mental status
- Decreased urine output
- Metabolic acidosis
- Tachypnea
- Weak central pulses
- Hypotension
**Shock**
- Most Common is Hypovolemia
- Hypotension Defined
  - <60 in term neonates (<28 days)
  - <70 in infants (1 to 12 months)
  - <70 + 2x age in years (1-10)
  - <90 in children older than 10 years

**Laryngeal Mask Airway**
- Insufficient evidence to recommend for or against the routine use of LMA during arrest
- If unable to Intubate it is acceptable but associated with high complications

**Endotracheal Intubation**
- When at all possible should be done by those specially trained – anesthesia personnel
- Success and low complication rates are directly related to length of training, supervised experience and number per year

**Cuffed Versus Uncuffed**
- In hospital setting a cuffed endotracheal tube is as safe as an uncuffed tube for infants beyond newly born and children

**Tube Size**
- Roughly equal to the size of the child’s little finger
- Estimation, may be difficult or unreliable

**Deterioration**
- Displacement
- Obstruction
- Pneumothorax
- Equipment
Circulation
- Backboard – or hard surface
- Consider Extracorporeal Membrane oxygenation if reversible or amenable to heart transplant
- If arterial line present – use to guide compression technique

Vascular Access
- In arrest – immediate IO if IV not in place
- Limit time in unstable patients – if not easy stick go to IO
- Central line following resuscitation for more secure long term access
  - Does not offer better drug availability

Emergency Fluids and Meds
- Estimating weight
  - Use a tape or in hospital document weight and emergency doses and have them readily available
- Fluids
  - Isotonic solutions to treat shock
  - No benefit to colloids
  - Do not use glucose containing unless for hypoglycemia

Emergency Medications
- Adenosine
  - Causes temporary AV nodal conduction block
  - Wide margin of safety because of short have life
  - Higher dose may be required for peripheral administration
  - Use stopcock method

Emergency Meds
- Amiodarone
  - Slows AV conduction
  - Prolongs refractory period
  - Slows ventricular conduction
  - Caution – monitor BP and administer as slowly as patient’s condition allows
  - Give rapidly in arrest

Atropine
- Accelerates sinus or atrial pacemakers and increases AV conduction
- Small doses <0.1mg may produce Bradycardia
- Larger than recommended doses may be required in special circumstances (organophosphate poisoning)
**Emergency Meds**

- **Calcium**
  - Routine administration does not improve outcome

- **Epinephrine**
  - Increases aortic diastolic pressure thus coronary perfusion pressure, critical determinant of successful resuscitation

- **Glucose**
  - Infants have high glucose requirements
  - Low glycogen stores
  - Develop hypoglycemia when energy requirements rise

- **Magnesium**
  - Indeterminate during arrest
  - Useful for Torsades or prolonged QT

**Emergency Medications**

- **Sodium Bicarbonate**
  - Routine administration does not improve outcome
  - During arrest or shock, arterial blood gases may not accurately reflect tissue and venous acidosis

- **Vasopressin**
  - Limited experience with pediatric patients
  - Remains indeterminate

**Pulseless Arrest**

- **Ventricular Fibrillation**
  - 5% - 15% of out of hospital arrests; 20% of hospital arrests; incidence increases with age

- **Start CPR – get defibrillator**
- **Determine rhythm and defibrillate if indicated**
- **Immediately perform CPR for 2 minutes**
- **Perform rhythm check and administer Epinephrine if still indicated**
  - High dose not recommended unless special situation such as Beta Blocker overdose
**Pulseless Arrest**
- After two minutes of CPR - Defibrillate
- After two minutes of CPR
  - Amiodarone
- Search for reversible causes

**Defibrillation**
- Adult paddles after 1 year or 1 kg
- Anterior lateral or anterior-posterior placement is acceptable
- 2 joules per kg – doubled to 4 joules per kg

**Asystole - PEA**
- CPR with as few interruptions as possible
- Search for and treat reversible causes
- Use a standard dose of epinephrine
- Pacing not indicated

**Bradycardia**
- Bradycardia causing cardiorespiratory compromise
- Support airway, breathing and circulation
- If HR<60 with adequate ventilation, begin compressions
- If due to vagal stimuli administer Atropine

**Bradycardia**
- Pacing may be lifesaving if 3rd degree block or sinus node dysfunction.
  - Especially true if congenital or acquired heart disease
- Pacing not useful in asystole or Bradycardia post arrest

**Narrow Complex Tachycardia**
- Evaluation of 12 lead and patient’s clinical presentation
- Attempt vagal maneuvers first unless patient is unstable
- Chemical cardioversion with Adenosine is effective
**Narrow Complex Tachycardia**
- If patient unstable or no IV access, electrical cardioversion
  - 0.5 joules/kg to 1 joule/kg
- Consider Amiodarone if unresponsive to vagal maneuvers and adenosine
- Do not use Verapamil; it may cause refractory hypotension

**Wide Complex Tachycardia**
- Treat with cardioversion
  - If it does not delay cardioversion acceptable to try Adenosine
- If 2nd shock unsuccessful; or recurs quickly consider Amiodarone before third shock

**Trauma**
- Immobilize if consistent with mechanism
- Do not over ventilate even in the case of head injury
- Suspect thoracic injury even with no outward signs
- Treat shock with volume 20ml/kg up to 60ml/kg
- After 60ml/kg switch to 0-negative blood

**Birthin’ Babies Should Take Place in the Delivery Room Whenever Possible**

**Need for Resuscitation**
- 10% of newborns require some assistance to begin breathing
- 1% require extensive resuscitation
Need for Resuscitation

- Was the baby born full term?
- Is the amniotic fluid clear of meconium and evidence of infection?
- Is the baby breathing or crying?
- Does the baby have good muscle tone?
- If all answers are yes, no resuscitation is needed

If one answer is no the infant should receive one of the following:
- Initial steps of stabilization (warmth, position, clear airway, dry, stimulate)
- Ventilation
- Chest Compressions
- Administration of Epinephrine and/or volume expansion

Resuscitation

- Decision to progress to next step is based on assessment of 3 vital signs: heart rate, color and respirations
- Approximately 30 seconds is allotted to complete each step

Anticipate

- There should be at least one person whose primary responsibility is the newly born
- Either that person or someone capable of intubation and medication administration

Require Resuscitation

- <37 weeks gestation
  - Preterm babies have immature lungs – more difficult to ventilate – more vulnerable to injury
  - Immature blood vessels in brain – prone to hemorrhage
  - Thin skin, large surface area – heat loss
  - Increased infection
  - Increased risk of hypovolemia

Initial Steps

- Provide warmth – place under radiant heat
- Position head in “sniffing” position
- Clear airway with bulb syringe
- Dry baby and stimulate
Clearing Airway
- No longer recommended to intubate prior to body delivery
  - If depressed infant with meconium – intubate and suction following complete birth
  - A vigorous infant does not require intubation

Assessment
- Not unusual to have blue hands or feed
- Should not have central cyanosis
- Pallor or mottling may be decreased cardiac output, severe anemia, hypovolemia, hypothermia or acidosis

Oxygen Administration
- Possible adverse effects of 100% on respiratory and cerebral circulation and potential tissue damage from oxygen free radicals
- Reasonable to begin resuscitation with room air
- Free flow oxygen if patient is centrally cyanotic – breathing patient

Ventilation
- Apneic or gasping
- Heart rate <100; 30 seconds after initial steps
- Careful not to over expand
- Do not hyperventilate

Intubation
- Tracheal suctioning for meconium
- BVM is ineffective or prolonged
- Chest compressions are performed
- Endotracheal meds are required
- Special resuscitation situations

Medications
- Rarely required
- Epinephrine is the only drug (should be given IV)
- Volume Expansion – 10ml/kg if blood loss is suspected or infant in shock
- Narcan – no longer recommended during delivery of depressed infant
  - Only after heart rate and color are restored