Pediatric Advanced Life Support Overview
2006

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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
Injuries 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
- 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
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
BCLS

- **Breaths**
  - Effective defined as chest rise
  - May have to adjust several times to achieve effective ventilation

- **Barrier devices** have not reduced the risk of transmission of infections and some increase resistance to airflow
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
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
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
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 half-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
Emergency Meds

- **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
Emergency Medications

- **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
Pulseless Arrest

- 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
- 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
Need for Resuscitation

- 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
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 hypovolemic
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