

Pediatric Shock & Trauma

COMMON PEDIATRIC PROBLEMS: SHOCK (HYPOPERFUSION)

Common Causes

- Diarrhea/dehydration
- Vomiting/dehydration
- Trauma/blood loss
- Abdominal injury
- Bacterial infection

Uncommon Causes

- Allergic reactions
- Poisoning
- Cardiac:
 - Congenital
 - Injury

SHOCK: CLINICAL SIGNS

- Rapid heart rate (HR):
 - Infants 160 – 200/ min
 - Children 140 – 160/min
 - HR > these values, or < 100 with other signs of shock present, signals impending cardiac arrest
- Rapid respiratory rate, often without other signs of respiratory distress

SHOCK: CLINICAL SIGNS (Cont'd)

- ↓circulation to the skin
 - Pale, mottled, cool, clammy skin



SHOCK: CLINICAL SIGNS (Cont'd)

- ↓circulation to the skin:
 - Delayed capillary refill



Finger pressing thigh, infant in septic shock



5 seconds later

SHOCK: CLINICAL SIGNS (Cont'd)

- Quality of pulses:
 - Weak or absent peripheral pulses implies unstable shock
 - Weak or absent central pulses implies critical shock
- Mental status changes
- Absence of tears
- ↓Urine output (fewer wet diapers in infants)

**SHOCK:
EMERGENCY MEDICAL
CARE**

- Assure airway patency
- Provide high-flow oxygen by nonrebreather reservoir mask
- Be prepared to ventilate with B-V-M
- Control bleeding
- Elevate legs

**SHOCK:
EMERGENCY MEDICAL
CARE (Cont'd)**

- Keep warm
- Rapid transport with secondary survey en route
- Consider ALS assistance, if available, for children with unstable or critical shock

**COMMON PEDIATRIC
PROBLEMS:
NEAR DROWNING**

- Assisted ventilation is top priority
- Consider possible trauma
- Consider possible hypothermia
- Consider alcohol in adolescents
- Be prepared to suction vomitus
- Transport all victims to hospital

**COMMON PEDIATRIC
PROBLEMS:
SUDDEN INFANT DEATH
SYNDROME**

- SIDS occurs in first year of life
- Cause(s) not known
- Baby most often discovered in early AM
- Diagnosis requires complete autopsy and death scene investigation
- May be difficult to distinguish between SIDS and abuse

**SIDS: EMERGENCY
MEDICAL CARE**

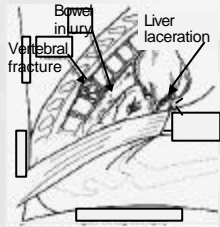
- Resuscitate, unless rigor mortis
- Parents suffer grief, remorse and guilt
- Avoid comments suggesting blame
- Document thoroughly:
 - Position of patient at first discovery
 - Surface on which infant was sleeping
 - Position of patient when EMS arrived
 - Caretaker resuscitation attempts
 - Temperature of room/infant clothing
 - Recent illness/medication

**PEDIATRIC TRAUMA:
GENERAL FEATURES**

- Injuries cause $\frac{2}{3}$ of deaths for Wisconsin children ages 1-19
- Blunt injury most common in children
- Head injury leading cause of trauma death
- Causes of death, children < 18 years old:
 - MV, including pedestrians and bike 32%
 - Homicide or suicide 28%
 - Fire 5%
 - Choking/suffocation 5%
 - Drowning 4%

PEDIATRIC TRAUMA: PATTERNS OF INJURY

- Motor vehicle crashes
 - Unrestrained passengers: head and neck injuries
 - Restrained passengers: abdominal, lower spine injuries



PEDIATRIC TRAUMA: PATTERNS OF INJURY

(Cont'd)

- Pedestrian vs. MV:
 - Abdominal injury, with internal bleeding
 - Femur fracture with bleeding, swelling, pain
 - Head injury



PEDIATRIC TRAUMA: PATTERNS OF INJURY

(Cont'd)

- Bicycle crash, with or without MV:
 - Abdominal injury
 - Head injury
 - Spinal injury



PEDIATRIC TRAUMA: PATTERNS OF INJURY

(Cont'd)

- Falls from height (most common injury), diving into shallow water: head and neck injuries
- Burns: 70% pediatric burns are hot liquids
- Sports injuries: Head and neck
- Child abuse: multi-trauma
- Interpersonal violence in adolescents: much is penetrating trauma

PEDIATRIC TRAUMA: PATTERNS OF INJURY





PEDIATRIC TRAUMA: HEAD TRAUMA

- The leading killer of children: 75% of multi-trauma involves head injury
- The most common cause of hypoxia in the head injured patient is the tongue obstructing the airway
- Respiratory arrest due to head injury is common, and may occur during transport

PEDIATRIC TRAUMA: HEAD TRAUMA (Cont'd)

- Shock in the head injured patient is due to another injury, usually from bleeding
- Vomiting, seizures and altered mental status are common signs
- **MOST IMPORTANT** is to assure an open airway by jaw thrust, maintaining neck stabilization in neutral position
- Use rolled towels, not sandbags to stabilize the head

PEDIATRIC TRAUMA: CHEST TRAUMA

- Significant chest injury in children carries 15% mortality!
- Children have pliable ribs
- Significant internal chest injury may be present without external signs or rib fractures

PEDIATRIC TRAUMA: ABDOMINAL INJURY

- More common site of injury than in adults
- Often site of unseen internal bleeding
- Multi-trauma victim deteriorating without external signs, think of the abdomen
- Air in stomach from crying or assisted ventilation can distend abdomen:
 - This makes exam difficult
 - Interferes with ventilation





PEDIATRIC TRAUMA: EXTREMITY INJURY

- Infant or young child can lose up to a “unit” of blood (~ 450 ml) into the thigh from femur fracture → shock
- Blood volume (BV) = 80 ml/kg:
 - 6 month old, BV = 550 ml
 - 1 yr old, BV = 800 ml
 - 3 yr old, BV = 1100 ml
- Manage as for adults
- Monitor circulation, sensation

PEDIATRIC TRAUMA: SPECIAL CONSIDERATIONS

- Pediatric “MAST”:
 - Not indicated for hypovolemic shock
 - May help to stabilize lower extremity and pelvic fractures
 - Do not inflate abdominal compartment
- Burns:
 - “Rule of 9’s” not for infants and children
 - Cover with dry (non-stick) sterile dressing
 - Local protocol for triage to burn center

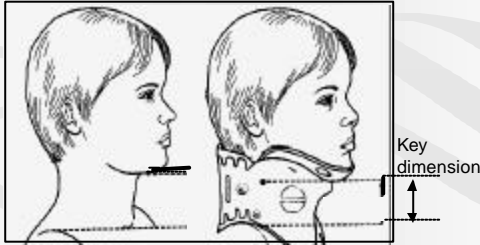
PEDIATRIC TRAUMA: EMERGENCY MEDICAL CARE

- Assure airway: jaw thrust with C-spine stabilization
- Suction PRN: large-bore suction device
- Severe resp distress: assist ventilation with BVM
- Respiratory arrest: ventilate with BVM



**PEDIATRIC TRAUMA:
EMERGENCY MEDICAL
CARE (Cont'd)**

- Spinal immobilization: sizing C-collar:



**PEDIATRIC TRAUMA:
EMERGENCY MEDICAL
CARE (Cont'd)**

- Spinal immobilization (cont'd):



Large occiput produces neck flexion on flat surface



Folded towel under chest promotes neutral neck position

**PEDIATRIC TRAUMA:
EMERGENCY MEDICAL
CARE (Cont'd)**

- Spinal immobilization (cont'd):
 - Stabilize head with rolled towels and tape
 - Fix patient to longboard or equivalent, using rolled towels PRN for stabilization
- Immediate transport with secondary survey en route for significant injury



CHILD ABUSE AND NEGLECT

- Abuse: improper or excessive action to injure or cause harm to child
- Neglect: Insufficient attention to, or care of child by responsible caretaker
- If you don't think of it, you won't see it
- EMT likely to see physical abuse and neglect

SIGNS AND SYMPTOMS OF ABUSE

- Repeated injury calls to same address
- Delay between injury and call
- Child's caretaker unconcerned, or acts inappropriately
- Conflicting histories given by those present at time of injury
- Child afraid to talk about how injury occurred

SIGNS AND SYMPTOMS OF ABUSE (Cont'd)

- Injury inconsistent with child's development, or described mechanism. Examples:
 - Unconscious 1 month old infant with depressed skull fracture, reported to have fallen from a bed to carpeted floor
 - 4 month old infant with broken arm, reported to have been found in crib crying in pain
 - Unconscious toddler, fixed dilated pupils, reported to have fallen down flight of 6 stairs









SIGNS AND SYMPTOMS OF ABUSE (Cont'd)

- Inflicted bruises:



Normal toddler bruises



vs. Inflicted bruises

SIGNS AND SYMPTOMS OF ABUSE (Cont'd)

- Obviously intentional burns:



Heater grate burn



Immersion burns



Cigarette burns

SIGNS AND SYMPTOMS OF ABUSE (Cont'd)

- Unusual or bizarre injuries:



Loop marks



Hand print



Bite marks

SIGNS AND SYMPTOMS OF ABUSE (Cont'd)

- Brain injuries → the most serious consequences.
- Shaken baby syndrome:
 - 30% mortality
 - Most of rest have severe developmental delay



SIGNS OF NEGLECT

- Malnourished appearing child:



SIGNS OF NEGLECT (Cont'd)

- Lack of adult supervision
- Unsafe living environment
- Untreated chronic illness, i.e., asthmatic with no meds

CHILD ABUSE AND NEGLECT: MANAGEMENT

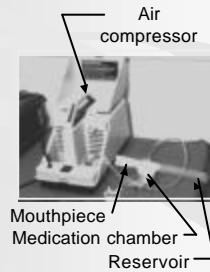
- Provide needed medical care
- Remain objective and nonjudgmental
- Document thoroughly:
 - History as given, use quotes
 - Your observations, not conclusions
- Report suspicions as required by law

INFANTS AND CHILDREN WITH SPECIAL MEDICAL NEEDS

- Children with a variety of problems:
 - Premature infants with chronic lung disease
 - Children with congenital heart disease
 - Children with neurologic abnormalities
 - Children with chronic illnesses or anomalies
- Often at home, technology dependent
- Parents usually very knowledgeable

HOME-BASED TECHNOLOGY: NEBULIZER

- Device for nebulizing medications for inhalation
- Used in chronic airway or lung disease, i.e., asthma, cystic fibrosis, BPD
- Parents know meds, doses and operation
- Can use for emergency airway meds



HOME-BASED TECHNOLOGY: NEBULIZER USE



Using nebulizer

Giving treatment by bag



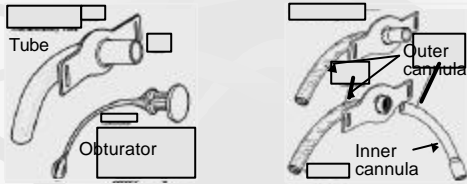
HOME-BASED TECHNOLOGY: TRACHEOSTOMY TUBE



HOME-BASED TECHNOLOGY: TRACHEOSTOMY TUBE

(Cont'd)

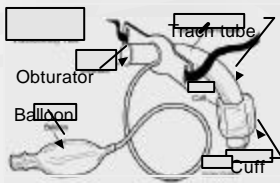
- Infant trachs are usually uncuffed



HOME-BASED TECHNOLOGY: TRACHEOSTOMY TUBE

(Cont'd)

- Child-size trachs may be cuffed or uncuffed



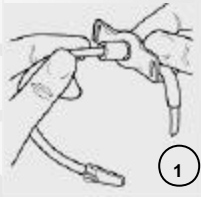
TRACHEOSTOMY TUBE: COMPLICATIONS

- Obstruction
- Bleeding
- Air leak
- Dislodgement
- Infection

TRACHEOSTOMY TUBE: EMERGENCY MEDICAL

CARE

- Maintain airway, replacing trach tube PRN



Insert suction catheter through trach tube as a guide

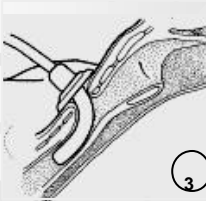


Insert catheter through stoma into airway

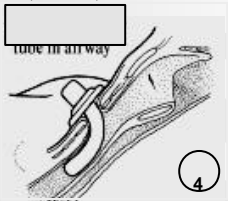
TRACHEOSTOMY TUBE: EMERGENCY MEDICAL

CARE (Cont'd)

- Replacing trach tube (cont'd):



Slide trach tube over Catheter into airway

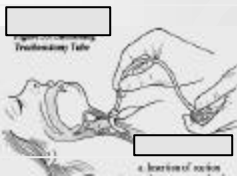


Trach tube in place in airway

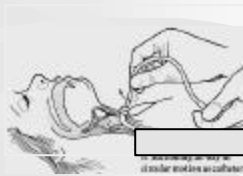
TRACHEOSTOMY TUBE: EMERGENCY MEDICAL

CARE (Cont'd)

- Suction to clear secretions:



Insert suction catheter, Leaving suction port open



Close suction port, removing Catheter with circular motion

TRACHEOSTOMY TUBE: EMERGENCY MEDICAL CARE (Cont'd)

- Position of comfort if possible
- Assist ventilation PRN
- Transport



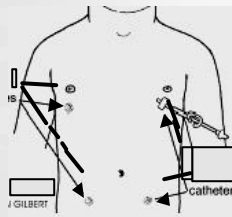
HOME-BASED TECHNOLOGY: HOME MECHANICAL VENTILATORS

- Various types
- Parents know how to operate
- Emergency medical care:
 - Assure airway
 - Ventilate with oxygen
 - Transport



HOME-BASED TECHNOLOGY: CENTRAL VENOUS LINES

- IV lines placed under skin, terminate near heart for long-term use
- Common types:
 - Broviac catheter
 - Groshon catheter
 - Hickman catheter
 - PICC line



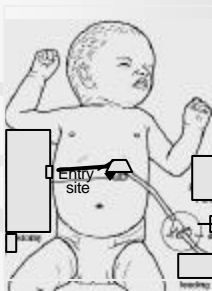
Potential sites shown by Red arrows

HOME-BASED TECHNOLOGY: CENTRAL VENOUS LINES

(Cont'd)

- Complications:
 - Cracked catheter
 - Infection
 - Clotting off
 - Bleeding
 - Partial removal
- Emergency medical care:
 - If bleeding, apply pressure
 - Transport
 - Monitor

HOME-BASED TECHNOLOGY: GASTROSTOMY TUBES



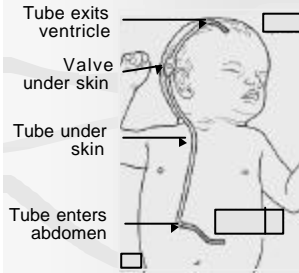
- Tube placed through abdominal wall into stomach for feeding
- May also appear as a small “button” on the abdominal wall, a “PEG” or a “Mic-Key” (mickey)

HOME-BASED TECHNOLOGY: GASTROSTOMY TUBES

(Cont'd)

- Be alert for respiratory problems:
 - Assure airway
 - Have suction ready
- Be alert for mental status changes:
 - Infants may become hypoglycemic if not fed regularly
 - Diabetic infants and children at special risk
- Provide oxygen
- Transport sitting or lying on right side with head elevated

HOME-BASED TECHNOLOGY: VENTRICULAR SHUNTS



- Tube from brain to abdomen to drain excess spinal fluid
- Tube can be felt along its path under the skin

HOME-BASED TECHNOLOGY: VENTRICULAR SHUNTS

- Shunt malfunction (Cont'd) infection → altered mental status
- Such patients are prone to respiratory arrest
- Management:
 - Assure airway
 - Assist ventilation PRN
 - Transport

FAMILY RESPONSE

- Patients = child + family
- Family anxiety results from:
 - Concern over child's pain
 - Fear for child's well-being
- Parents may react to EMT with anger, hysteria
- Calm, supportive attitude → calm(er) family and calm(er) child

FAMILY RESPONSE (Cont'd)

- Parents may not have medical training, but they know their children
- Parents should participate in child's care unless precluded by medical condition
- Parents can:
 - Calm child
 - Maintain position of comfort
 - Hold oxygen

PROVIDER RESPONSE

- Anxiety is common due to:
 - Lack of experience treating children
 - Fear of failure
 - Identifying patient with their own children
- Helpful to remember:
 - Much knowledge about adults applicable to children, just remember the differences
 - “Pediatric” skills can be learned
 - Advance preparation helps
 - CISM helps after stressful incident
