Pediatric Emergencies

Accidental injury is the number one cause of illness and death of children in the United States. In fact, over 9 million children are seen in emergency departments each year aft er such incidences as accidental or intentional consumption of poisons, traffic accidents, immersion in water, and falls. Of that number, well over 10,000 will die. In addition, children may need immediate intervention because of a disease process. Th e nurse must be prepared to intervene if he or she should be a witness to a child in immediate need of care. Figure 2.1 specifies the American Heart Association's protocol for pediatric basic life support.

II. EMERGENT CARE

1. Check for safety.

- Before a nurse performs any intervention, he or she should make sure that there is nothing in the vicinity of the child that could injure the nurse. If the area is not safe, the nurse should contact emergency services immediately and report that a child is in distress but that the scene is unsafe.

2. Awaken the child.

- If the environment is safe, the nurse should attempt to awaken the victim.
- Th e nurse should pat the child and ask the child if he or she is okay. Adding the child's name, if it is known, may improve the possibility of the child responding.
- When attempting to arouse the child, the nurse should be careful not to cause additional injury. In the case of a fall, for example, the neck should not be moved, if possible, to prevent injury to the spinal cord.

3. Get help.

- If the child fails to respond, the nurse should assume the worst and should shout "Help!" to attract the attention of others who can assist in the care of the child.
- If no one is available to assist, the nurse should care for the child for 2 full minutes, then leave the child and go to call for emergency personnel (e.g., call 911).

4. Assess for breathing.

- The nurse must next determine whether the child is breathing. A head tilt may need to be performed in order to open the child's airway.
- If the child is not breathing at all or is only gasping for breath, the nurse should assume that the child is in need of resuscitation.

5. Assess for a pulse: this procedure should take no longer than 10 sec.

- This procedure differs depending on the age of the child.

Infants: because carotid and femoral pulses are difficult to assess, the brachial pulse is assessed.

All children over 1 year of age: either the carotid or femoral pulses should be assessed.

- If the pulse rate is greater than or equal to 60 bpm, rescue breaths should be administered at a rate of one every 3 to 5 sec (i.e., 12 to 20 per min).
- If the pulse rate is less than 60 bpm, and the child is exhibiting signs of poor oxygenation (e.g., pale, cyanotic), cardiopulmonary resuscitation (CPR) should be begun.

6. Perform age-appropriate CPR.

- The acronym CAB (chest compression, airway, breathing) should be used in order to remember the intervention sequence.
- Infants:

- The one rescuer procedure should be performed as follows:

    - Thirty chest compressions followed by two rescue breaths through an open airway. Compressions should be performed:
        - Using two fingers placed just below an imaginary line drawn between the nipples (i.e., on the lower one-third of the sternum).
        - To an approximate depth of 1½ in.
        - Rapidly at an average of 100 compressions per min.
        - So that the thorax is allowed to return to its original height aft er each compression.

    - CPR should be continued in the 30 to 2 pattern for 2 min. At that time, if it has not already been done, the rescuer should call for emergency assistance (i.e., call 911 in most areas of the United States). In addition, the nurse should obtain an automated external defi brillator (AED), if available.
    - Th e AED should be used as soon as it is acquired.
        - CPR should be stopped aft er the compression phase.
        - The machine should be turned on.
        - The AED pads should be applied to the infant’s chest, per machine instructions. (Adult pads may be used if the machine is not equipped with infant pads.)
        - The AED prompts should be followed.
        - After the AED sequence is complete, CPR should be resumed.
        - An AED reanalysis and shock, if applicable, should be performed every 2 min or as prompted by the machine.

    - Th e rescuer should continue CPR until emergency personnel arrive or until the child responds.

- Two rescuers.
    - At the time the infant is discovered:
        - Rescuer one should begin CPR, as detailed earlier.
        - Rescuer two should immediately call for emergency assistance and obtain an AED, if available.

- Once rescuer two returns:
  - Rescuer one should stop CPR, ending with the compression phase, and the AED procedure should be followed, as stated earlier.

- Following each AED intervention, rescuers one and two should alternate positions between performing chest compressions and rescue breaths.
- It is important to note that in two-rescuer CPR:
  - A 15 compression to 2 rescue breath ratio and the two-thumb compression technique are recommended.
  - Every 2 min, or as prompted by the machine, an AED analysis and intervention should be performed.

- CPR should be continued until emergency personnel arrive or until the child responds.

Child:

The infant CPR procedure should be followed for child CPR with the following minor changes:

- Chest compressions should be performed to a depth of 2 in.
- To achieve the desired depth, the rescuer should compress the lower one-third of the thorax using the palm of one (or two) hands.

Adolescent:

1. Adult CPR criteria should be employed when the victim is past the pubertal period.
2. Although many of the actions of adolescent rescuers are similar to those stated earlier, there are some important differences. The adult CPR procedure should be performed as follows:

- Responsiveness assessed.
- Breathing assessed.
- Emergency personnel notified and an AED obtained as soon as the victim is found to be unresponsive and not breathing or gasping.
- Pulse assessed for a maximum of 10 sec.

(a) If a pulse is present, rescue breaths should be provided every 5 sec.

(b) If a pulse is absent, CPR procedure should be begun.

Adult CPR procedure:

- AED procedure should be followed using adult-sized pads, as stated earlier.
- Compressions and rescue breaths, whether by one or two rescuers, should be performed in a 30 to 2 ratio.
- Compressions should be performed to a depth of 2 in.
- To achieve the desired depth, the rescuer should compress the lower one-third of the thorax using the palms of two hands.

7. If available, masks and/or other airway barriers should be used to deliver rescue breaths.

8. If the child's airway is obstructed, additional actions that are determined by the age of the child should be performed. i. Nursing actions that are performed are based on the age of the child.

(1) In infants.

(a) Holding the infant in a headdown position, alternately provide the baby with five slaps on the back with the palm of the hand and five two-finger chest compressions until the item is dislodged.

(b) Only if the item is seen in the mouth should the nurse attempt to remove the item by inserting a pinky finger and using it to clear the object.

(c) Once the item appears to be dislodged, rescue breaths should be performed.

(d) If the infant should become unresponsive, CPR should be started.

(2) In all children over the age of 1, the Heimlich maneuver, or abdominal thrusts, should be performed.

(a) Th e nurse should:

- Stand (or kneel) behind the child.
- Make a fist with one hand.
- Wrap his or her arms around the child and place the fist on the child's abdomen just below the rib cage.
- Cover the fist with the second hand and repeatedly thrust upward in sets of five thrusts until the object is expelled or until the child becomes unresponsiveness and CPR is needed.

B. Secondary assessment: when the child is breathing and his or her heart is beating normally, the nurse should take a full history and perform a head-to-toe assessment, as needed.

- 1. To remember all items that should be covered in the secondary assessment, the acronym SAMPLE should be used.

III. OBSTRUCTED AIRWAY

It is not uncommon for children to experience an obstructed airway. Children, who already have narrow tracheas, frequently move and play while eating snacks and insert objects into their mouths that should not be placed there. Because it is essential that the airway be patent for gas exchange to take place, immediate intervention is needed.

Incidence:

Most commonly seen in children under 5 years of age (greater than 90% of cases).

Etiology:

Objects that frequently lead to an obstructed airway in children are:

- Liquids, especially common choking item in infants.
- Food items (e.g., carrots, hot dogs, hard candies, grapes, bagels).
- Play items (e.g., uninfl ated balloons, small toys).
- Everyday items (e.g., coins, buttons).

Pathophysiology:

1. Children who are choking on objects usually present with sudden upper respiratory difficulty without any other symptoms.

2. When a mild obstruction is present, the airway is not completely occluded, and air exchange is occurring.

Signs and symptoms:

- The child may begin to cough violently and/or appear to gag, but the child is able to cough effectively enough to be able to expel the object himself or herself.

3. When a moderate or severe obstruction is present, little to no gas exchange is taking place.

Signs and symptoms:

- The conscious child will appear frightened and panicky with:
    - Inspiratory stridor and ineffective cough.
    - Little to no air exchange.
    - May wrap his or her hands around his or her own throat to indicate the presence of an obstruction (Fig. 10.4).

- Unconscious child.

(1) While attempting to perform rescue breaths, the nurse is unable to instill any air into the lungs.

4. If the obstruction is not life threatening, it may not be diagnosed in a timely fashion and, therefore, may remain in place over time. Eventually, the child will develop pneumonitis with diminished breath sounds, wheezing, and coughing.

Treatment:

1. Prevention.

- Because many obstructions are caused by items that are unsafe for young children to eat, to play with, or have access to, the majority of airway obstructions are preventable.

2. Treatment.

- Mild obstruction.
    - Unless the obstruction should worsen, emotional support should be provided while the child coughs up the obstruction.
- Moderate to severe obstructions.

- In infants.
  - Back blows and chest compressions.
- In children over 1 year of age.
  - Heimlich maneuver, if the child is conscious.
  - CPR, if the child is unconscious.
  - The child may require bronchoscopy or laryngoscopy for removal of the object.

Nursing Interventions:
1. Risk for Injury/Deficient Knowledge.

- Parents must be educated regarding safety precautions to take in order to prevent airway obstructions.
- Parents should be strongly encouraged to become certified in CPR and other first aid skills.

2. Ineffective Airway Clearance/Impaired Gas Exchange.

- Th e nurse must perform emergency interventions, as needed.
- Because the tissues in the child's airway may become dangerously swollen, if emergency personnel have not already been summoned, the nurse should have the child seen aft er the object is expelled.

IV. SHOCK

Incidence:

Statistics are unavailable, but the younger the child, the more serious the diagnosis.

Etiology:

1. Hypovolemic shock, caused by extensive loss of blood.

2. Distributive shock.

- Most commonly caused by a massive infection (e.g., Escherichia coli, Streptococcus pyogenes (group A strep), Neisseria meningitides).
- Also may be caused by anaphylaxis or drug overdose.

3. Cardiogenic shock, caused by severe injury to the heart muscle.

Pathophysiology:

1. Regardless of the etiology, the resulting pathophysiology is characterized by markedly reduced circulatory perfusion to the vital organs and the periphery.

2. Signs and symptoms.

a. Initially, the body attempts to compensate for the inadequate perfusion by:

- Tachycardia, tachypnea, and vasoconstriction.
- Infants' and young children's abilities to compensate are limited.

b. If the cause of shock is not treated effectively, the physiological status rapidly deteriorates resulting in:

- Bradycardia, apnea, hypotension, and cardiac arrest.

Diagnosis:

1. Clinical picture in conjunction with:
2. X-rays and a variety of laboratory data, including blood cultures, complete blood counts (CBC), lumbar puncture, blood gases, and serum electrolytes.

Treatment:

1. Emergency intervention (see earlier).
2. Control bleeding, if present.
3. Oxygen.
4. Intravenous (IV) therapy.
5. Blood transfusion.
6. Identify pathogen and treat, if present.
7. Medications (e.g., epinephrine).
8. Extracorporeal membrane oxygenation (ECMO): treatment similar to cardiopulmonary bypass, usually only used as treatment for infants and young children.

Nursing Interventions:

1. Risk for Ineffective Airway Clearance/Risk for Impaired Gas Exchange/Risk for Decreased Cardiac Output/Risk for Ineffective Perfusion/ Risk for Deficient Fluid Volume.

- Perform emergency interventions, as needed (see earlier).
- Control source of shock (i.e., source of bleeding, infection).
- Assist with intubation, as needed.
- Administer oxygen, as needed.
- Carefully monitor vital signs.
- Keep child NPO (i.e., give the child nothing by mouth).
- Administer IV therapy, as ordered.
- Administer blood transfusion, as ordered.
- Maintain strict intake and output.
- Monitor laboratory values, including blood gases, serum electrolytes, complete blood count, glucose levels, and blood urea nitrogen.

2. Risk for Altered Coping/Anxiety.

- Calmly provide the child and parents with information regarding trauma care, employing simple and concise language.

- Provide opportunities for the child and parents to express fears, concerns, and guilt.
- Encourage the parents to assist with the child's care, as able.
- Refer the family, as needed, to social services.
- Encourage the family, if appropriate, to seek spiritual guidance from a clergyperson.
- Assist the family to identify support systems and coping strategies.

V. TRAUMA

The term trauma refers to a major, potentially life-threatening injury to the body.

Incidence:

There are a number of ways that children may experience trauma up to and including gun violence. Th e most common traumatic events in children of all ages, however, are caused by automobile accidents.

Etiology:

1. Automobile accidents.

- When the child is a passenger in the car.
- When the child is a pedestrian.

2. Falls.

3. Violence, especially common etiology of adolescent trauma.

Pathophysiology:

1. The precise nature and severity of the trauma is dependent on the type of injury sustained by the child.
2. **Waddell's triad**, which is important to highlight, refers to the traumatic injuries sustained by pedestrian children who are hit by a car. The children are injured in three distinctly serious ways.

- Abdominal injuries that occur during the initial strike.
- Injuries to the extremities that occur when the child lands on the ground aft er being thrown through the air.
- Head injuries that occur when the child lands on his or her head aft er being thrown through the air. Because children's heads are often the heaviest parts of their bodies, their heads frequently sustain serious injury.

Diagnosis:

1. Clinical picture in conjunction with:
2. X-rays and a variety of laboratory data, including blood cultures, CBCs, lumbar puncture, blood gases, and serum electrolytes.

Treatment:

1. Prevention.

- The parents and child must be educated regarding car and pedestrian safety practices.
- Infants and young children should be supervised whenever on elevated surfaces.
- All firearms and ammunition should be kept in separate, locked safes.

2. Treatment.

a. Depends on the etiology of the trauma but will likely include:

- Emergency intervention (see earlier).
- Control of bleeding, if present.
- Oxygen therapy.
- IV therapy.
- Surgery.

Nursing Interventions:
1. Deficient Knowledge.

- Parents must be educated regarding safety precautions to take to prevent traumatic injury.
- Parents should strongly be encouraged to become certified in CPR and other first aid skills.

2. Injury/Risk for Ineffective Airway Clearance/Risk for Impaired Gas Exchange/Risk for Decreased Cardiac Output/Risk for Ineffective Perfusion/ Risk for Deficient Fluid Volume.

- Carefully assess the child for traumatic injury, including the Glasgow assessment for possible central nervous system impairment.
- Th e nurse must perform emergency interventions, as needed (see earlier).
- Assist with intubation, as needed.
- Administer oxygen, as needed. e. Carefully monitor vital signs.
- Keep the child NPO. g. Administer IV therapy, as ordered.
- Maintain strict intake and output.
- Monitor laboratory values, including blood gases, serum electrolytes, CBCs, glucose levels, and blood urea nitrogen.

3. Risk for Infection.

- Employing the five rights of medication administration, administer safe dosages of antibiotics/antivirals/antifungals, as prescribed.
- Carefully monitor vital signs.
- Employing the five rights of medication administration, administer safe dosages of antipyretics, as prescribed.
- Provide hydration and nourishment, as prescribed.

4. Risk for Altered Coping/Anxiety.

- Calmly provide the child and parents with information regarding trauma care, employing

simple and concise language.
- Provide opportunities for the child and parents to express fears, concerns, and guilt.
- Encourage the parents to assist with the child's care, as able.
- Refer the family, as needed, to social services.
- Encourage the family, if desired, to seek spiritual guidance from a clergyperson.
- Assist the family to identify support systems and coping strategies.
- Depending on the source of injury/emergency, the parents should be educated regarding prevention strategies to prevent future trauma.

5. Risk for Altered Parenting.

Depending on the source of the injury/ emergency, and if applicable, the nurse should notify child protective services of child abuse

VI. ACUTE POISONING

Incidence:

1. Accidental poisoning (e.g., from the ingestion of medications, cleaning products, or plants) most commonly is seen in the toddler and preschool populations.
2. Intentional poisoning (i.e., from the ingestion of alcohol and/or prescription medications) most commonly is seen in the adolescent population.

Etiology:

1. Medication ingestion.

- Tylenol (acetaminophen), aspirin (acetylsalicylic acid), and vitamins are the most common poisons in toddlers and preschoolers.
- Prescription medications (e.g., analgesics, narcotics, antidepressants, antianxiety medications, as well as illicit drugs) oft en are purposefully ingested by older school-age and adolescent children.

2. Other poisons that may be ingested.

- Cleaning products, gasoline, and kerosene most commonly are ingested by toddlers and preschoolers.
- Alcohol most commonly is ingested by older school-age and adolescent children.

3. Poisons may also be "ingested" via the respiratory system in the form of a gas or aerated particles or via the skin in the form of a topical substance.

Pathophysiology:

1. Acetaminophen.

a. Ingestion of greater than 150 mg/kg is considered toxic. Therapeutic dose is 10 to 15 mg/kg every 6 to 8 hr.

b. Hepatotoxicity can develop from the physiological metabolism of the medication.

c. Signs and symptoms depend on the quantity ingested.

- Initially, nausea and vomiting and flu-like symptoms.
- After 24 hours:
    - Elevated liver enzymes.
    - Elevated bilirubin.
    - Right upper quadrant pain.

- In 3 to 7 days, the child may develop liver failure. iv. Aft er 1 week, either the child will recover or the child's health will deteriorate further.

2. Aspirin.

a. Ingestion of greater than 150 mg/kg is considered toxic. Therapeutic dose is 10 to 15 mg/kg every 4 to 6 hr.

b. Many organ systems may be adversely affected.

- Initially, the child will exhibit respiratory alkalosis in an attempt to compensate for the ingestion.
- Th e alkalosis quickly shift s to metabolic acidosis with hypokalemia and dehydration when the salicylic acidemia overwhelms the compensatory response.

c. Signs and symptoms.

- Initially, nausea and vomiting with hyperpnea.
- Followed by:
    - Central nervous system changes (i.e., confusion, seizures, coma)
    - Renal failure.
    - Bleeding.
    - Hyponatremia, hypokalemia, hypoglycemia.
    - Dehydration.
    - Tinnitus or deafness.

3. Cleaning supplies, gasoline, and other such substances.

a. Severe damage to the mouth, esophagus, and stomach.

b. Respiratory compromise.

c. Blood chemistry disruptions.

4. Alcohol: a physiological depressant.

a. Signs and symptoms.

- Confusion.

- Vomiting.
- Stupor.
- Respiratory compromise.

Diagnosis:

1. Clinical picture and clinical evidence.

2. Serum assays and nomogram evaluation.

a. Nomogram analyses (see Interactive RumackMatthew Nomogram for Acetaminophen Toxicity at www.ars-informatica.ca/ toxicitynomogram.php?calc=acetamin and Interactive Done Nomogram for Salicylate Toxicity at www.ars-informatica.ca/ toxicitynomogram.php?calc=salic).

- Th e blood level of acetaminophen and salicylate, respectively, and the time since the ingestion of the drug are inputted into the appropriate nomogram.
- Th e potential for toxicity is calculated, and the recommended treatments are reported. b. Blood alcohol levels.

3. Laryngoscopy.

4. X-ray, MRI, CT.

Treatment:

1. Immediate care at the scene.

a. Assess the child.

- Th e child must be assessed for responsiveness and for the need of emergency intervention. Th e child’s immediate, physiological needs must be met (see the previous “Emergent Care” section).

b. Terminate the exposure: depending on the situation, for the safety of the child and/or the nurse, this action may take precedence over the assessment of the child.

- If possible, exposure to the poison should be terminated.
    - Medications or alcohol: if safe to perform, remove all of the residual substance from the child’s mouth.
    - Gas or topical: if safe to perform, the child must immediately be removed from the area where the gas or topical is being emitted, the source of the gas or topical must be shut off , and/or contaminated clothing must be removed.

c. Identify the poison.

- Th e exact identity of the poison must be determined. Th e victim and/or witnesses should be queried. Any empty containers should be located, inspected, and saved.

d. Call the poison control center (PCC).

- PCC should be called and notified of the identity of the substance.
- Any actions recommended by the PCC should be implemented (e.g., drinking a full glass of water or milk, flushing the eyes and/or skin with water).

e. Seek emergency medical assistance. Following immediate intervention and if recommended by PCC, the child should be seen and evaluated in an emergency department.

2. Follow-up treatment.

a. All evidence of the exposure should be taken to the emergency department for analysis, such as: Vomitus, urine, empty bottles, and containers.

b. Specific treatment is dependent on the exact poison.

Nursing Interventions:

1. Risk for Injury/Risk for Deficient Fluid Volume.

- Perform CPR, as needed.
- Take excellent history, including examining any evidence that parents and/or friends took to the emergency department.
- Assist with gastric lavage, if needed.
- Reference Rumack-Matthew Nomogram or Done Nomogram, as needed (see the previous “Diagnosis” section).
- Administer IV solution, as ordered.
- Monitor intake and output.
- Monitor bowel function if activated charcoal has been administered.
    - Activated charcoal, a tasteless powder, is mixed with a clear liquid and the resulting slurry is drunk.
    - Children are more likely to drink the slurry if a cap is placed on the cup to hide the liquid and the child is advised to drink it through a straw.
    - Because activated charcoal is desiccated, it acts by absorbing the poison from the gastrointestinal system. Common side effects of the medication are dehydration and constipation.

- Administer safe dosages of antidotes, as ordered.
    - Administer oxygen, as ordered.

2. Deficient Knowledge/Anxiety/Risk for Altered Coping/Risk for Future Poisoning.

- Allow the parents to express feelings/fears regarding the injury and future health of the child.
- Carefully explain, in an understandable language, all interventions, with rationales for each.
- Explore reasons for poisonings, and offer advice regarding means of preventing poisonings in the future, including locking away medications and poisonous substances and the use of Mr. Yuk stickers.

VII. CHRONIC HEAVY METAL POISONING

Incidence:

1. Infants, especially breast-fed infants, and young children are the most vulnerable to chronic heavy metal poisoning because:

a. Of their behaviors.

- They explore their environment through their hands and mouth (e.g., chew painted furniture, put dirt in their mouths, eat with their hands, put toys in their mouths).
- They assist fathers/mothers with home repairs.

b. Their brains are not fully developed.

2. Fetuses are vulnerable if their mothers ingest heavy metals.

Etiology:

1. Lead is internalized via two routes: oral ingestion and respiratory inhalation.

- Many indoor paints contained lead until 1978.
  - Paint chipping from furniture, walls, antique toys, and other objects can be ingested.
  - Paint sanded during renovations can be aerosolized and breathed in.

- Th e plumbing in many old homes is comprised of lead pipes and/or lead soldering.
  - Lead leaches into the water and is consumed.

- Automotive gasoline contained lead until the 1970s. Th e exhaust from automobiles contaminated the soil throughout the United States.
  - Th e contaminated dirt and dust surrounding homes can be ingested on hands that are washed infrequently.

2. Iron is usually ingested through accidental ingestion most frequently by toddlers and preschoolers.

Pathophysiology:

1. Multiple systems are affected adversely by lead.

a. Hematological system: adverse effects are reversible.

- Anemia develops because lead interferes with the biosynthesis of the heme portion of the hemoglobin molecule.

b. Gastrointestinal system: adverse effects are reversible.

- Nausea and vomiting, constipation, and anorexia.
- Lead in the GI tract can be seen on an x-ray.

c. Renal system: adverse effects are reversible unless there has been continued ingestion over a long period of time.

- Lead damages the tubules of the kidney, leading to abnormal excretion of glucose and proteins.

d . Skeletal system.

- If ingested over long periods of time, lead deposits in the bone marrow of the long bones. Lead lines can be seen on x-rays.

e. Central nervous system: adverse effects may be irreversible.

- Lead ingestion results in fluid shift s in the brain and increased intracranial pressure resulting in cortical atrophy and lead encephalopathy.
- Signs and symptoms.
    - Lower levels: hyperactivity, learning disabilities, and lowered IQ.
    - Higher levels: convulsions, paralysis, blindness, mental retardation, coma, and death.

Diagnosis:

1. In many states, it is the law to assess blood lead levels (BLLs) during early childhood.

- All children receiving Medicaid are mandated to receive a blood lead assessment at 12 months and 24 months of age.

2. CBCs, urinalyses, and x-rays.

3. BLLs.

- BLL of 5 mcg/dL or higher is considered abnormal.
- BLL greater than or equal to 45 mcg/dL is dangerously elevated and requires medical intervention (see “Treatment”).

4. Lead mobilization tests.

Treatment:

1. Prevention.

a. Healthy diet.

- Lead has a strong affinity for combining with the heme portion of the red blood cell. Children who consume diets that are low in iron and vitamin C are, therefore, at higher risk of developing lead toxicity than are children with diets high in iron and vitamin C.
- A diet high in calcium helps to protect the long bones from lead deposition.

b. Water.

- Water in every home, especially those with well water, should be assessed for lead contamination.
- If lead is found in the water.
    - Only cold water should be used for drinking and cooking because lead leaches more rapidly into hot than cold water.
    - Before using the cold water, it should be allowed to run into the sink for 1 full minute because lead leaches more rapidly into standing water than into flowing water.
    - If lead levels are still high aft er the above interventions, only bottled water should be consumed.

c. Other exposures.

- Dissuade pica (i.e., the ingestion of nonfood substances, such as dirt).
- Frequently cleanse such things as hands, floors, windowsills, and toys to remove lead dust.
- Remove children and pregnant and lactating women from environs undergoing renovations.

2. Treatment guidelines, as recommended by the Centers for Disease Control and Prevention (CDC), for BLL at the following levels:

a. BLL 5 to 9 mcg/dL.

- Th e health-care provider should investigate the possible sources of exposure to lead.
- Th e parents and others should be educated on ways to reduce lead exposure.
- BLL should be reassessed in 3 to 6 months.

b. BLL 10 to 14 mcg/dL - All of the above, except that the BLL should be reassessed in 1 to 3 months

c. BLL 15 to 44 mcg/dL

- A representative from the department of health may visit the home to:
    - Assess the home for possible sources of lead exposure.
    - Educate the parents about lead exposure.
    - Encourage the parents to provide the child with foods high in iron, vitamin C, and calcium.

d. BLL greater than or equal to 45 mcg/dL - All of the above plus chelation therapy.

e. Chelation therapy is performed to remove heavy metals from the body. Because the therapy itself may result in adverse effects, it should be conducted only under medical supervision.

NCLEX!!! Children who are receiving chelating agents should have their BLLs monitored carefully. In some instances, BLLs actually rise while on chelating agents because lead enters the bloodstream from the bones or gastrointestinal system for excretion through the kidneys. Nephrotoxicity and neurotoxicity may result.

Chelation medications commonly administered are:

(1) Chemet (succimer): may be administered on an outpatient basis.

- Dosage:
  - 10 mg/kg PO every 8 hr × 5 days, then every 12 hr × 14 days or
  - 350 mg/m2 PO every 8 hr × 5 days, then every 12 hr × 14 days.

- Adverse effects.
  - Serious: neutropenia and arrhythmias.
  - Common: nausea and vomiting, rash, pruritus, and elevated liver enzymes.

(2) Cuprimine (d-penicillamine) may be administered on an outpatient basis.

- Dosage:
  - 30 to 40 mg/kg/day PO divided tid to qid × 4 to 12 wk or
  - 600 to 750 mg/m2/day PO divided tid to qid × 4 to 12 wk.
  - Maximum: 1.5 g/day.

- Adverse effects:
  - Many serious side effects, including thrombocytopenia, leukopenia, aplastic anemia, hypersensitivity reaction, and pancreatitis.
  - Common side effects include anorexia, epigastric pain, nausea and vomiting, diarrhea, proteinuria, and pruritic rash.

(3) BAL in oil (dimercaprol): administered while the child is in the hospital.

- Dosage: (i) 75 mg/m2 IM every 4 hr × 3 to 7 days. (ii) Maximum: 5 mg/kg/dose. (iii) BLLs should be assessed aft er 48 hr to determine whether therapy is still needed.
- Adverse effects:
  - Severe side effect: neutropenia
  - Many common side effects, including pain at the injection site, nausea and vomiting, hypertension, tachycardia, conjunctivitis, and paresthesias.

(4) Calcium disodium versenate (edetate disodium calcium or CaNa2EDTA).

- Dosage is individualized for each child.
- Adverse effects:
  - Severe side effects include dangerously low hypoglycemia, hypocalcemia, kidney failure, and seizures.
  - Common side effect: malabsorption of vitamins, including vitamin C and the B vitamins.

NCLEX!!! CaNa2EDTA should not be confused with Na2EDTA (disodium ethylenediaminetetraacetic acid), a chemical compound that appears as a white powder.

NCLEX!!! BAL and CaNa2EDTA rarely are administered for a BLL less than 70 mcg/dL unless the child is exhibiting signs of encephalopathy.

Nursing Interventions:

1. Deficient Knowledge/Risk for Altered Growth and Development.

- Educate the parents and child regarding the importance of handwashing and the avoidance of pica.
- Educate the parents regarding the importance of house cleaning and cleaning of the child's toys and furniture.
- Educate the parents regarding the need to let water run and the need to use cold rather than hot water for consumption.
- Educate the parents regarding the signs and symptoms of lead poisoning.
- Remind the parents of the importance for BLL testing. f. Monitor the child's growth and development using growth charts and development assessments (e.g., DDST II, at each well-child visit).

2. Risk for Injury related to chelation therapy.

- Monitor laboratory values carefully, including BLLs and renal function tests.
- Monitor for central nervous system changes, including Glasgow assessments. c. Monitor strict intake and output.

3. Risk for Impaired Coping/Anxiety/Guilt.

- Allow the parents and child to express concerns and fears.
- Allow the parents to ask important questions regarding prevention and treatment strategies.
- Educate the parents regarding the reason for administering chelating agents, if needed.

VIII. DROWNING

Incidence:

Drowning is the number one cause of death by injury for children aged 1 to 4

Etiology:

Children can drown in any large body of water, including pools, lakes, and creeks, or in relatively small bodies of water, including bath tubs, toilets, and mop buckets.

Pathophysiology:

1. When children are submerged, they try to hold their breath.

2. Eventually, they swallow the water, which results in a choking bronchospasm.

3. The bronchospasm results either in:

- Inhalation of water or
- Laryngospasm leading to "dry drowning."

4. Signs and symptoms.

- Dependent on the age of the child, temperature of the liquid, and the length of time submerged.
- Signs and symptoms range from mild hypothermia and slight dyspnea to full cardiopulmonary collapse.

Treatment:

1. Prevention.

- Water safety education is essential! All children, ideally beginning in the preschool period, should complete swim lessons.
- Young children should never be left unattended in bath water, near water buckets, near toilets, near any outdoor body of water, or any other potential drowning hazard.

2. Emergency intervention (see earlier).

- Airway obstruction protocols should not be performed with drowning victims because they delay the administration of rescue breaths and, if needed, cardiac compressions.

Nursing Interventions:

1. At the time of the drowning.

- a. Impaired Gas Exchange/Impaired Breathing Pattern. i. Rescue breathing and CPR should be performed, as needed. ii. When appropriate, parents should be allowed to be present during resuscitation.

2. Following resuscitation.

- Risk for Hypothermia.
    - Core temperature should be monitored carefully.
    - Wet clothing should be removed and warm blankets provided.
    - Warmed IV fluid should be administered, as needed.

- Risk for Deficient Fluid Volume.
    - Vital signs and fluid and electrolyte balance should be monitored carefully.
    - IV fluids should be administered, per order.
    - Intake and output should be monitored carefully.

- Risk for Injury/Altered Growth and Development.
    - Cardiac and oxygenation status should be monitored carefully.
    - Oxygen should be administered, per order.
    - Level of consciousness should be assessed, using the Glasgow scale.
    - The child should be carefully monitored for signs of increased intracranial pressure.
    - Head of bed should be elevated 20 to 30 degrees. vi. Th e child should be monitored for altered cognitive function.

3. Following resuscitation and/or if the child dies.

- Risk for Altered Coping/Anxiety/Guilt.
    - Parents should be provided opportunities to express fears and guilt.
    - Parents should be given clear, accurate explanations of the interventions, including the rationales for treatments.
    - Health-care practitioners should provide the parents with honest information regarding the child's status.

- Grieving/Risk for Complicated Grieving

Nursing Considerations for Grieving and the Risk for Complicated Grieving
• Provide the parents and others, if appropriate, with the opportunity to express their feelings. • Allow the parents and others, if appropriate, time to be with and to say good-bye to their child. • Educate the parents and others, if appropriate, regarding the five stages of grieving. • Encourage the parents and others, if appropriate, to seek spiritual guidance from their clergy person, if desired. • Advise the parents and others, if appropriate, to seek grief counseling, if needed.