

Environmental Emergencies

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LEARNING OBJECTIVES

After mastering the contents of this lecture, the student should be able to:

- **1.** Define the terminologies.
- 2. Describe the causes of environmental emergencies
- **3. Explain the Risk factors for environmental emergencies**
- 4. List the assessment and diagnostic findings for environmental emergencies
- 5. Describe the management of environmental emergencies



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1. Heat stroke

Heat stroke is an acute medical emergency caused by failure of the heatregulating mechanisms of the body.

The most common cause of heat stroke is prolonged exposure to an environmental temperature of greater than 39.2°C (102.5°F). It usually occurs during extended heat waves, especially when they are accompanied by high humidity.

Risk factors for heat stroke:

- 1. People are not acclimatized to heat,
- 2. People who are elderly or very young,
- 3. People unable to care for themselves,
- 4. People with chronic and debilitating diseases,
- 5. People taking certain medications (eg, major tranquilizers, anticholinergic, diuretics, and beta-blockers).
- 6. Healthy individuals during sports or work activities (eg, exercising in extreme heat and humidity).
- 7. Inadequate heat loss can also cause death.
- Heat exhaustion in which the patient's temperature may be normal to 40°C (104°F) the patient demonstrates weakness, hypotension, increased heart rate, and increased thirst.
- Elderly people do not drink adequate amounts of fluid, partly because of fear of incontinence.
- 10. Elderly people fear being victims of crime, so they tend to keep windows closed, even when the temperature and humidity levels are high.

Assessment and Diagnostic Findings:

- 1. Recent patient history reveals exposure to elevated ambient temperature or excessive exercise during extreme heat.
- 2. When assessing the patient, the nurse notes the following symptoms:
- a. Profound central nervous system (CNS) dysfunction (manifested by confusion, delirium, bizarre behavior, coma);
- b. Elevated body temperature (40.6°C [105°F] or higher);
- c. Hot,
- d. Dry skin;

- e. an hidrosis (absence of sweating),
- f. Tachypnea,
- g. Hypotension,
- h. Tachycardia.

Management:

The primary goal is to reduce the high body temperature as quickly as possible, because mortality is directly related to the duration of hyperthermia.

Treatment focuses on stabilizing oxygenation using the ABCs (airway, breathing, and circulation) of basic life support. This includes:

- 1. Establishing IV access for fluid administration.
- 2. The patient's clothing is removed,
- 3. The core (internal) temperature is reduced to 39°C (102°F) as rapidly as possible, preferably within 1 hour by One or more of the following methods may be used as prescribed:
- a. Cool sheets and towels or continuous sponging with cool water,
- b. Ice applied to the neck, groin, chest, and axillae while spraying with tepid water
- c. Cooling blankets
- d. Immersion of the patient in a cold water bath.
- e. During cooling procedures, an electric fan is positioned.
- f. The patient's temperature is constantly monitored with a thermistor placed in the rectum, bladder, or esophagus to evaluate core temperature.
- g. Caution is used to avoid hypothermia and to prevent hyperthermia, which may recur spontaneously within 3 to 4 hours.
- h. The cooling process should stop at 38.8°C (102°F) in order to avoid iatrogenic hypothermia.
- i. Throughout treatment, the patient's status is monitored carefully including:
- 1. Vital signs,
- 2. ECG findings (for possible myocardial ischemia, myocardial infarction, and dysrhythmias),
- 3. Central venous pressure (CVP),
- 4. Level of responsiveness, all of which may change with rapid alterations in body temperature.

Special consideration:

- 1. A seizure may be followed by recurrence of hypothermia. To meet tissue needs exaggerated by the hypermetabolic condition,
- 2. 100% oxygen is administered. Endotracheal incubation and mechanical ventilation to support failing cardiopulmonary systems may be required.
- 3. IV infusion therapy of normal saline or lactated Ringer's solution is initiated as directed to replace fluid losses and maintain adequate circulation.
- 4. Fluids are administered carefully because of the dangers of myocardial injury from high body temperature and poor renal function.
- 5. Cooling redistributes fluid volume from the periphery to the core.
- 6. Urine output is also measured frequently, because acute tubular necrosis may occur as a complication of heat stroke from rhabdomyolysis (myoglobin in the urine).
- 7. Blood specimens are obtained for serial testing to detect bleeding disorders, such as disseminated intravascular coagulation (DIC),
- 8. Serial enzyme studies to estimate thermal hypoxic injury to the liver, heart, and muscle tissue.

Supportive care may include:

- 1. Dialysis for renal failure,
- 2. Antiseizure medications to control seizures,
- 3. Potassium for hypokalemia,
- 4. Sodium bicarbonate to correct metabolic acidosis.
- 5. Benzodiazepines (eg, diazepam [Valium]) or chlorpromazine (Thorazine) may be prescribed to suppress seizure activity.

2. Frostbite

Frostbite is trauma from exposure to freezing temperatures and freezing of the intracellular fluid and fluids in the intercellular spaces. It results in cellular and vascular damage. Frostbite can result in venous stasis and thrombosis.

Body parts most frequently affected by frostbite include the feet, hands, nose, and ears.

Frostbite ranges from first degree (redness and erythema) to fourth degree (fulldepth tissue destruction).

Assessment and Diagnostic Findings:

- 1. A frozen extremity may be hard, cold, and insensitive to touch and may appear white or mottled blue-white.
- 2. The patient history should include environmental temperature, duration of exposure, humidity, and the presence of wet conditions.

Management:

The goal of management is to restore normal body temperature.

- 1. Constrictive clothing and jewelry that could impair circulation are removed.
- 2. Wet clothing is removed as rapidly as possible.
- 3. If the lower extremities are involved, the patient should not be allowed to ambulate.
- 4. Controlled yet rapid rewarming is instituted.
- 5. Frozen extremities are usually placed in a 37°C to 40°C (98.6°F to 104°F) Circulating bath for 30- to 40-minute spans.
- 6. This treatment is repeated until circulation is effectively restored. Early rewarming appears to decrease the amount of ultimate tissue loss.
- 7. During rewarming, an analgesic for pain is administered as prescribed, because the rewarming process may be very painful.
- 8. To avoid further mechanical injury, the body part is not handled.
- 9. Once rewarmed, the part is protected from further injury and is elevated to help control swelling.
- 10. Sterile gauze or cotton is placed between affected fingers or toes to prevent maceration, and a bulky dressing is placed on the extremity.
- 11. A foot cradle may be used to prevent contact with bedclothes if the feet are involved.
- 12. Hemorrhagic blebs, which may develop 1 hour to a few days after rewarming, are left intact and not ruptured.
- 13. Nonhemorrhagic blisters are debrided to decrease the inflammatory mediators found in the blister fluid.
- 14. A physical assessment is conducted with rewarming to observe for concomitant injury, such as soft tissue injury, dehydration, alcohol coma, or fat embolism.

Special consideration:

1. Problems such as hyperkalemia (eg, from release of potassium in the damaged cells) and hypovolemia, which occur frequently in people with frostbite, are corrected.

- 2. Risk of infection is also great; therefore, strict aseptic technique is used during dressing changes,
- 3. Tetanus prophylaxis is administered as indicated.
- 4. Nonsteroidal anti-inflammatory medication is prescribed for its anti-inflammatory effects and to control pain.
- 5. Additional measures that may be carried out when appropriate include the following:
- a. Whirlpool bath for the affected body parts to aid circulation and debridement of necrotic tissue to help prevent infection.
- b. Escharotomy (incision through the eschar) to prevent further tissue damage, to allow for normal circulation, and to permit joint motion.
- c. Fasciotomy to treat compartment syndrome

6. After rewarming, hourly active motion of any affected digits is encouraged to promote maximal restoration of function and to prevent contractures.

7. Discharge instructions also include: encouraging the patient to avoid tobacco, alcohol, and caffeine because of their vasoconstrictive effects, which further reduce the already deficient blood supply to injured tissues.

3. Hypothermia

Hypothermia is a condition in which the core (internal) temperature is 35°C (95°F) or less as a result of exposure to cold or an inability to maintain body temperature in the absence of low ambient temperatures.

Risk factors for hypothermia:

- 1. Elderly people, infants, people with concurrent illnesses, and the homeless are particularly susceptible.
- 2. Alcohol ingestion increases susceptibility because it causes systemic vasodilation.
- 3. Some medications (eg, phenothiazines) or medical conditions (eg, hypothyroidism, spinal cord injury) decrease the ability to shiver,
- 4. Hampering the body's innate ability to generate body heat.
- 5. Trauma victims are also at risk for hypothermia resulting from treatment with cold fluids,
- 6. un warmed oxygen,
- 7. Exposure during examination.

Assessment and Diagnostic Findings:

- Observe signs and symptoms include: apathy, poor judgment, ataxia, dysarthria, drowsiness, pulmonary edema, acid–base abnormalities, coagulopathy, and eventual coma.
- 2. Shivering may be suppressed at a temperature of less than 32.2°C (90°F), because the body's self-warming mechanisms become ineffective.
- 3. The heartbeat and blood pressure may be so weak that peripheral pulses become undetectable.
- 4. Cardiac dysrhythmias may also occur.
- 5. Other physiologic abnormalities include hypoxemia and acidosis.

Management:

- 1. Removal of wet clothing,
- 2. Monitoring
- a. Vital signs,
- b. CVP,
- c. Urine output,
- d. Arterial blood gas levels,
- e. Blood chemistry determinations (blood urea nitrogen, creatinine, glucose, electrolytes),
- f. Chest x-rays are evaluated frequently.
- g. Body temperature is monitored with an esophageal, bladder, or rectal thermistor.
- h. Continuous ECG monitoring is performed, because cold-induced myocardial irritability leads to conduction disturbances, especially ventricular fibrillation.
- i. An arterial line is inserted and maintained to record blood pressure and to facilitate blood sampling.
- 3. Rewarming
- 1. Active internal (core) rewarming methods are used for moderate to severe hypothermia (less than 28°C to 32.2°C [82.5°F to 90'F]) and include:
- a. Cardiopulmonary bypass,
- b. Warm fluid administration,
- c. Warm humidified oxygen by ventilator,
- d. Warmed peritoneal lavage.
- e. Monitoring for ventricular fibrillation as the patient's temperature increases from 31°C to 32°C (88°F to 90°F) is essential.

- Passive or active external rewarming is used for mild hypothermia (32.2°C to 35°C [90°F to 95'F]).
- a. Passive active rewarming uses over-the-bed heaters to the extremities and increases blood flow to the acidotic, anaerobic extremities.
- b. Active external rewarming uses forced air warm blankets.
- c. Care must be taken to prevent extremity burn from these devices, because the patient may not have effective sensation to feel the burn.
- 4. Supportive Care

Supportive care during rewarming includes the following as directed:

- a. External cardiac compression (typically performed only as directed in patients with temperatures higher than 31°C [88'F]).
- b. Defibrillation of ventricular fibrillation. A patient whose temperature is less than 32°C [90°F] experiences spontaneous ventricular fibrillation if moved or touched.
- c. Mechanical ventilation with positive end-expiratory pressure (PEEP) and heated humidified oxygen to maintain tissue oxygenation.
- d. Administration of warmed IV fluids to correct hypotension and to maintain urine output and core re-warming, as described previously.
- e. Administration of sodium bicarbonate to correct metabolic acidosis if necessary.
- f. Administration of antiarrhythmic medications.
- g. Insertion of an indwelling urinary catheter to monitor urinary output and renal function.

4. Near drowning

Near drowning is defined as survival for at least 24 hours after submersion that caused a respiratory arrest. The most common consequence is hypoxemia. Drowning is the second most common cause of unintentional death in children younger than 14 years.

Factors associated with drowning and near drowning include:

- 1. Alcohol ingestion,
- 2. Inability to swim,
- 3. Diving injuries,
- 4. Hypothermia,
- 5. Exhaustion.

Assessment:

1. Observe signs and symptom of hypoxia, hypercapnia, bradycardia, and dysrhythmias.

2. If there is a violent struggle associated with the near-drowning episode,

3. When the victim loses consciousness and makes a final effort to breathe, the terminal gasp occurs.

4. Resultant pathophysiologic changes and pulmonary injury depend on the type of fluid (fresh or salt water) and the volume aspirated.

Management:

Therapeutic goals include maintaining cerebral perfusion and adequate oxygenation to prevent further damage to vital organs.

1. Immediate cardiopulmonary resuscitation is the factor with the greatest influence on survival.

2. Prevention and management of hypoxia are accomplished by:

- a. Ensuring an adequate airway and respiration,
- b. Arterial blood gases are monitored to evaluate oxygen, carbon dioxide, bicarbonate levels, and pH.
- c. Use of endotracheal intubation with PEEP improves oxygenation, prevents aspiration, and corrects intrapulmonary shunting and ventilation-perfusion abnormalities (caused by aspiration of water).
- d. If the patient is breathing spontaneously, supplemental oxygen may be administered by mask.

3. A rectal probe is used to determine the degree of hypothermia.

4. Prescribed rewarming procedures (eg, extracorporeal warming, warmed peritoneal dialysis, inhalation of warm aerosolized oxygen, torso warming) are started during resuscitation.

5. Intravascular volume expansion and inotropic agents are used to treat hypotension and impaired tissue perfusion.

6. ECG monitoring is initiated, because dysrhythmias frequently occur.

7. An indwelling urinary catheter is inserted to measure urine output.

8. Nasogastric intubation is used to decompress the stomach and to prevent the patient from aspirating gastric contents.

Even if the patient appears healthy, close monitoring continues with serial vital signs, serial arterial blood gas values, ECG monitoring, intracranial pressure assessments, serum electrolyte levels, intake and output, and serial chest x-rays. After

a near-drowning, the patient is at risk for complications such as hypoxic or ischemic cerebral injury, ARDS, pulmonary damage secondary to aspiration, and life-threatening cardiac arrest.

5. Decompression sickness

Decompression sickness, also called "the bends," occurs in patients who have engaged in diving (lake, as well as ocean, diving), high-altitude flying, or flying in commercial aircraft within 24 hours after diving.

Decompression sickness results from formation of nitrogen bubbles that occur with rapid changes in atmospheric pressure. They may occur in joint or muscle spaces, resulting in musculoskeletal pain, numbness, or hypesthesia. More significantly, nitrogen bubbles can become air emboli in the bloodstream and thereby produce stroke, paralysis, or death.

Assessment and Diagnostic Findings:

- 1. a detailed history is obtained from the patient or diving partner.
- 2. Observe or ask about:
 - a. rapid ascent,
 - b. loss of air in the tank,
 - c. buddy breathing,
 - d. recent alcohol intake or lack of sleep,
 - e. a flight within 24 hours after diving .
- 3. Observe signs and symptoms include:
 - a. Joint or extremity pain,
 - b. Numbness,
 - c. Hypesthesia,
 - d. Loss of range of motion.
 - e. Neurologic symptoms mimicking those of a stroke or spinal cord injury can indicate an air embolus.
 - f. Cardiopulmonary arrest can also occur in severe cases and is usually fatal.

Management:

- 1. Airway and adequate ventilation are established,
- 2. 100% oxygen is administered throughout treatment and transport.

- 3. A chest x-ray is obtained to identify aspiration,
- 4. at least one IV line is started with lactated Ringer's or normal saline solution.
- 5. The cardiopulmonary and neurologic systems are supported as needed.
- 6. If an air embolus is suspected, the head of the bed should be lowered.
- 7. The patient's wet clothing is removed,
- 8. The patient is kept warm.
- 9. Transfer to the closest hyperbaric chamber for treatment is initiated.
- 10. Throughout treatment, the patient is continually assessed,
- 11. Changes are documented.
- 12. If aspiration is suspected, antibiotics and other treatment may be prescribed.

6. Anaphylactic reaction

An anaphylactic reaction is an acute systemic hypersensitivity reaction that occurs within seconds or minutes after exposure to certain foreign substances, such as medications (eg, penicillin, iodinated contrast material), and other agents, such as latex, insect stings (eg, bee, wasp, yellow jacket, hornet), or foods (eg, eggs, peanuts). Repeated administration of parenteral or oral therapeutic agents (eg, repeated exposures to penicillin) may also precipitate an anaphylactic reaction when initially only a mild allergic response occurred.

An anaphylactic reaction is the result of an antigen—antibody interaction in a sensitized person who, as a consequence of previous exposure, has developed a special type of antibody (immunoglobulin) that is specific for that particular allergen. Immunoglobulin E (IgE) is responsible for most of the immediate types of human allergic responses. A second exposure to the same antigen results in a more severe and more rapid response .

An anaphylactic reaction produces a wide range of clinical manifestations, especially respiratory symptoms (difficulty breathing and stridor secondary to laryngeal edema), fainting, itching, swelling of mucous membranes, and a sudden decrease in blood pressure secondary to massive vasodilation that may progress to shock.

Nursing Interventions for Preventing Anaphylactic Reactions:

- 1. Be aware of the danger of anaphylactic reactions and the early signs of anaphylaxis.
- 2. Ask the patient about previous allergies to medications, foods, stings, latex, pollen, peanuts, nuts from trees, eggs, and so on.

- 3. Before giving a foreign serum or other type of antigenic agent, ask the patient or caregiver whether the agent was received at some earlier time.
- 4. Avoid giving medications to patients with hay fever, asthma, or other allergic disorders unless necessary.
- 5. Avoid giving parenteral medications unless absolutely necessary, because anaphylactic reactions are more likely to occur when the agent is given parenterally.
- 6. Perform a skin test before administration of certain materials known to produce anaphylactic reactions (eg, horse serum). Remember that negative skin test results do not always indicate safety and that skin testing can precipitate anaphylaxis in highly sensitive patients. Have epinephrine, intravenous infusions, and intubation and tracheostomy equipment available as precautionary measures.
- If the patient is an outpatient, keep him or her in the office, hospital, or clinic for at least 30 minutes after injection of any agent. Caution the patient to return if symptoms develop.
- 8. Caution patients who are highly sensitive (eg, to insect bites and stings) to carry kits equipped to treat insect stings (epinephrine). Instruct the patient, family, and significant others in the use of the emergency supplies.
- 9. Encourage patients with allergies to wear medical identification tags or bracelets.

7. Insect stings

A person may have an extreme sensitivity to the venoms of insects in the order Hymenoptera (bees, hornets, yellow jackets, fire ants, and wasps). Venom allergy is thought to be an IgE-mediated reaction, and it constitutes an acute emergency. Although stings in any area of the body can trigger anaphylaxis, stings of the head and neck or multiple stings are especially serious.

Clinical manifestations:

- 1. Generalized urticaria,
- 2. Itching,
- 3. Malaise,
- 4. Anxiety due to laryngeal edema to severe bronchospasm,
- 5. Shock

Management includes:

- 1. The stinger is removed with one quick scrape of a fingernail over the site.
- 2. Wound care with soap and water is sufficient for stings.
- 3. Scratching is avoided because it results in a histamine response.
- 4. Ice application reduces swelling and also decreases venom absorption.
- 5. An oral antihistamine and analgesic will decrease the itching and pain.
- 6. Desensitization therapy should be given to people who have had systemic or significant local reactions.

8. Animal and human bites

Bites are a common reason for visits to the ED. Dog bites constitute 90% of these bites and are responsible for the majority of deaths from bites by a nonvenomous animal.

Cat bites have a high risk of infection because of the presence of Pasteurella in their saliva. If the animal cannot be located and rabies vaccination verified, rabies prophylaxis for the person who has been bitten must be instituted.

Human bites are frequently associated with rapes, sexual assaults, or other forms of battery. The human mouth contains more bacteria than that of most other animals, so a high risk of bite-related infection exists. Depending on the circumstances surrounding the event, the victim may delay seeking treatment.

- 1. The ED nurse should inspect any bitten tissue for pus, erythema, or necrosis.
- 2. A health care provider should take photographs, which can be used as evidence in criminal and legal proceedings.
- 3. Cleansing with soap and water is then necessary,
- 4. Followed by the administration of antibiotics and tetanus toxoid as prescribed.

8.1. Snake bites

The most frequent poisonous snake bite occurs from pit vipers (Crotalidae). The most common site is the upper extremity. Of these bites, only 20% to 25% result in envenomation (injection of a poisonous material by sting, spine, bite, or other means). Venomous snake bites are medical emergencies.

Nineteen different species of venomous snakes are found. Nurses should be familiar with the types of snakes common to the geographic region in which they practice.

Clinical Manifestations:

1. Classic clinical signs of envenomation are edema, ecchymosis, and hemorrhagic bullae, leading to necrosis at the site of envenomation.

2. Symptoms include: lymph node tenderness, nausea, vomiting, numbness, and a metallic taste in the mouth.

Without decisive treatment, these clinical manifestations may progress to include fasciculation, hypotension, paresthesias, seizures, and coma.

Management:

Initial first aid at the site of the snake bite includes:

- 1. Having the person lie down,
- 2. Removing constrictive items such as rings,
- 3. Providing warmth,
- 4. Cleansing the wound,
- 5. Covering the wound with a light sterile dressing,
- 6. Immobilizing the injured body part below the level of the heart.
- 7. Airway, breathing, and circulation are the priorities of care.
- 8. Ice or a tourniquet is not applied.
- 9. Initial evaluation in the ED is performed quickly and includes information about the following:
- a. Whether the snake was venomous or nonvenomous; if the snake is dead, it should be transported to the ED with the patient for identification. However, caution should be taken when handling the transported snake. Frequently, the patient and family transport the snake in a stunned, not dead, state.
- b. Where and when the bite occurred and the circumstances of the bite
- c. Sequence of events, signs and symptoms (fang punctures, pain, edema, and erythema of the bite and nearby tissues)
- d. Severity of poisonous effects
- e. Vital signs
- f. Circumference of the bitten extremity or area at several points; the circumference of the extremity that was bitten is compared with the circumference of the opposite extremity
- g. Laboratory data (complete blood count, urinalysis, and coagulation studies)

Parenteral fluids may be used to treat hypotension.

If vasopressors are used to treat hypotension, their use should be short term.

Surgical exploration of the bite is rarely indicated.

Typically, the patient is observed closely for at least 6 hours. The patient is never left unattended.

10. Administration of Antivenin (Antitoxin)

Although envenomation is rare, it can occur with snake bites. An assessment of progressive signs and symptoms is essential before considering administration of antivenin, which is most effective if administered within 4 hours and no greater than 12 hours after the snake bite. Two antivenins are available: Antivenin Polyvalent (ACP) and Crotalidae Polyvalent Immune Fab Antivenin (FabAV)

8.2. Spider Bites

There are two venomous spiders that typically interact with humans: the brown recluse and the black widow. Both are usually found in dark places such as closets, woodpiles, and attics, as well as in shoes.

Brown recluse spider bites are painless. Systemic effects such as:

- 1. Fever and chills,
- 2. Nausea and vomiting,
- 3. Malaise,
- 4. Joint pains develop within 24 to 72 hours.
- 5. The site of the bite may appear reddish to purple in color within 2 to 8 hours after the bite.
- 6. Necrosis occurs in the next 2 to 4 days.
- 7. The center of the bite may become necrotic.

Management:

- 1. Wound care consists of cleansing with soap and water,
- 2. Hyperbaric oxygen treatments may be helpful. Most wounds heal within 2 to 3 months.

Black widow spider bites feel like pinpricks. Systemic effects usually occur within 30 minutes—much more rapidly than with brown recluse spider bites. Signs and symptoms include:

1. Abdominal rigidity,

- 2. Nausea and vomiting,
- 3. Hypertension,
- 4. Tachycardia,
- 5. Paresthesias,

6. Severe pain also develops within 60 minutes and increases over 1 to 2 days.

Management:

- 1. Application of ice to the site to decrease systemic toxin delivery.
- 2. Cardiopulmonary monitoring is essential.
- 3. Antivenin is effective for black widow spider bites.

8.3. Tick Bites

The patient may demonstrate weakness; joint pain; skin rash, especially on the palms and soles of feet; headache; and fever.

Ticks can carry diseases such as Rocky Mountain spotted fever, tularemia, and Lyme disease.

The tick bite itself is not usually the problem; rather, it is the pathogen transmitted by the tick that can cause serious disease. The tick should be removed, and the patient should be informed of the signs and symptoms of diseases carried by ticks, especially if the patient lives in an area endemic for tick-related diseases (eg, Lyme disease).

9. Poisoning

A poison is any substance that, when ingested, inhaled, absorbed, applied to the skin, or produced within the body in relatively small amounts, injures the body by its chemical action. Poisoning from inhalation and ingestion of toxic materials, both intentional and unintentional, constitutes a major health hazard and an emergency situation.

Emergency treatment is initiated with the following goals:

- 1. To remove or inactivate the poison before it is absorbed
- 2. To provide supportive care in maintaining vital organ function
- 3. To administer a specific antidote to neutralize a specific poison
- 4. To implement treatment that hastens the elimination of the absorbed poison

9.1. Ingested (Swallowed) Poisons

Swallowed poisons may be corrosive. Corrosive poisons include alkaline and acid agents that can cause tissue destruction after coming in contact with mucous membranes.

Alkaline products include lye, drain cleaners, toilet bowl cleaners, bleach, nonphosphate detergents, oven cleaners, and button batteries (batteries used to power watches, calculators, or cameras).

Acid products include toilet bowl cleaners, pool cleaners, metal cleaners, rust removers, and battery acid.

Assessment and Diagnostic Findings:

- 1. Observe the signs and symptoms, such as:
- a. Pain or burning sensations,
- b. Any evidence of redness or burn in the mouth or throat,
- c. Pain on swallowing or an inability to swallow,
- d. Vomiting,
- e. Drooling;
- 2. Age and weight of the patient;
- 3. Pertinent health history.
- 4. Blood specimens are obtained to determine the concentration of drug or poison.

5. Efforts are made to determine what substance was ingested; the amount; the time since ingestion;

Management:

- 1. Control of the airway, ventilation, and oxygenation are essential.
- 2. In the absence of cerebral or renal damage, the patient's prognosis depends largely on successful management of respiration and circulation.
- 3. Measures are instituted to stabilize cardiovascular and other body functions.
- 4. ECG, vital signs, and neurologic status are monitored closely for changes.
- 5. An indwelling urinary catheter is inserted to monitor renal function.
- 6. Measures are instituted to remove the toxin or decrease its absorption.
- 7. The patient who has ingested a corrosive poison, which can be a strong acid or alkaline substance, is given water or milk to drink for dilution. However, dilution is not attempted if the patient has acute airway edema or obstruction or if there is

clinical evidence of esophageal, gastric, or intestinal burn or perforation.

The following gastric emptying procedures may be used as prescribed:

- a. Syrup of ipecac to induce vomiting in the alert patient (never use with corrosive poisons)
- b. Gastric lavage for the obtunded patient; gastric aspirate is saved and sent to the laboratory for testing (toxicology screens)
- c. Activated charcoal administration if the poison is one that is absorbed by charcoal
- d. Cathartic, when appropriate
- e. If there is a specific chemical or physiologic antagonist (antidote), it is administered as early as possible to reverse or diminish the effects of the toxin.
- f. If this measure is ineffective, procedures may be initiated to remove the ingested substance. These procedures include administration of multiple doses of charcoal, diuresis (for substances excreted by the kidneys), dialysis, or hemoperfusion. Hemoperfusion involves detoxification of the blood by processing it through an extracorporeal circuit and an adsorbent cartridge containing charcoal or resin, after which the cleansed blood is returned to the patient.

Special consideration:

- 1. throughout detoxification,
- a. The patient's vital signs, CVP, and fluid and electrolyte balance are monitored closely.
- b. Hypotension and cardiac dysrhythmias are possible.
- c. Seizures are also possible because of CNS stimulation from the poison or from oxygen deprivation.
- 2. If the patient complains of pain, analgesics are administered cautiously. Severe pain causes vasomotor collapse and reflex inhibition of normal physiologic functions.
- 3. After the patient's condition has stabilized and discharge is imminent, written material should be given to the patient indicating the signs and symptoms of potential problems related to the poison ingested and signs or symptoms requiring evaluation by a physician.
- 4. If poisoning was determined to be a suicide or self-harm attempt, a psychiatric consultation should be requested before the patient is discharged.
- 5. In cases of inadvertent poison ingestion, poison prevention and home poisonproofing instructions should be provided to the patient and family.

9.2. Carbon Monoxide Poisoning

Carbon monoxide poisoning may occur as a result of industrial or household incidents or attempted suicide. It is implicated in more deaths than any other toxin except alcohol. Carbon monoxide exerts its toxic effect by binding to circulating hemoglobin and thereby reducing the oxygen-carrying capacity of the blood.

Clinical Manifestations:

- 1. CNS symptoms predominate with carbon monoxide toxicity.
- 2. A person with carbon monoxide poisoning may appear intoxicated (from cerebral hypoxia).
- 3. Other signs and symptoms include headache, muscular weakness, palpitation, dizziness, and confusion, which can progress rapidly to coma.
- 4. Skin color, which can range from pink or cherry-red to cyanotic and pale, is not a reliable sign.
- 5. Pulse oximetry is also not valid, because the hemoglobin is well saturated. It is not saturated with oxygen, but the pulse oximeter indicates only if the hemoglobin is saturated; in this case, it is saturated with carbon monoxide rather than with oxygen.

Management:

Goals of management are to reverse cerebral and myocardial hypoxia and to hasten elimination of carbon monoxide. Whenever a patient inhales a poison.

The following general measures apply:

- 1. Carry the patient to fresh air immediately; open all doors and windows.
- 2. Loosen all tight clothing.
- 3. Initiate cardiopulmonary resuscitation if required; administer 100% oxygen.
- 4. Prevent chilling; wrap the patient in blankets.
- 5. Keep the patient as quiet as possible.
- 6. Do not give alcohol in any form or permit the patient to smoke.
- 7. In addition, for the patient with carbon monoxide poisoning, carboxyhemoglobin levels are analyzed on arrival at the ED and before treatment with oxygen if possible.
- 8. One hundred percent oxygen is administered at atmospheric or preferably hyperbaric pressures to reverse hypoxia and accelerate the elimination of carbon monoxide.
- 9. Oxygen is administered until the carboxyhemoglobin level is less than 5%.
- 10. The patient is monitored continuously.

- 11. Psychoses, spastic paralysis, ataxia, visual disturbances, and deterioration of mental status and behavior may persist after resuscitation and may be symptoms of permanent brain damage.
- 12. When unintentional carbon monoxide poisoning occurs, the health department should be contacted so that the dwelling or building in question can be inspected.
- 13. A psychiatric consultation is warranted if poisoning was determined to be a suicide attempt.

9.3. Skin Contamination Poisoning (Chemical Burns)

Skin contamination injuries from exposure to chemicals are challenging because of the large number of possible offending agents with diverse actions and metabolic effects.

The severity of a chemical burn is determined by the mechanism of action, the penetrating strength and concentration, and the amount and duration of exposure of the skin to the chemical.

Management:

- 1. The skin should be drenched immediately with running water from a shower, hose, or faucet, except in the case of lye and white phosphorus, which should be brushed off the skin, dry.
- 2. The skin should be flushed with a constant stream of water as the patient's clothing is removed.
- 3. The skin of health care personnel assisting the patient should be appropriately protected if the burn is extensive or if the agent is significantly toxic or is still present.
- 4. Prolonged lavage with generous amounts of tepid water is important.
- 5. Attempts to determine the identity and characteristics of the chemical agent are necessary in order to specify future treatment.
- 6. The standard burn treatment appropriate for the size and location of the wound (antimicrobial treatment, debridement, tetanus prophylaxis, antidote administration as prescribed) is instituted.
- 7. The patient may require plastic surgery for further wound management.
- 8. The patient is instructed to have the affected area reexamined at 24 and 72 hours and in 7 days because of the risk of underestimating the extent and depth of these types

of injuries.

9.4. Food Poisoning

Food poisoning is a sudden illness that occurs after ingestion of contaminated food or drink. Botulism is a serious form of food poisoning that requires continual surveillance.

Assessment for food poisoning

1. The suspected food should be brought to the medical facility and a history obtained from the patient or family.

- 2. Ask the patient the following questions:
- a. How soon after eating did the symptoms occur? (Immediate onset suggests chemical, plant, or animal poisoning.)
- b. What was eaten in the previous meal? Did the food have an unusual odor or taste? (Most foods causing bacterial poisoning do not have unusual odor or taste.)
- c. Did anyone else become ill from eating the same food?
- d. Did vomiting occur? What was the appearance of the vomitus?
- e. Did diarrhea occur? (Diarrhea is usually absent with botulism and with shellfish or other fish poisoning.)
- f. Are any neurologic symptoms present? (These occur in botulism and in chemical, plant, and animal poisoning.)
- g. Does the patient have a fever? (Fever is characteristic in salmonella, ingestion of fava beans, and some fish poisoning.)
- 3. Food, gastric contents, vomitus, serum, and feces are collected for examination.

4. Because large volumes of electrolytes and water are lost by vomiting and diarrhea, fluid and electrolyte status should be assessed.

5. The patient is assessed for signs and symptoms of fluid and electrolyte imbalances, including lethargy, rapid pulse rate, fever, oliguria, anuria, hypotension, and delirium.

6. Weight and serum electrolyte levels are obtained for future comparisons.

Management:

- 1. The key to treatment is determining the source and type of food poisoning.
- 2. The patient's respirations, blood pressure, level of consciousness, central venous pressure (CVP) (if indicated), and muscular activity are monitored closely.

- 3. Measures are instituted to support the respiratory system.
- 4. Measures to control nausea are also important to prevent vomiting, which could exacerbate fluid and electrolyte imbalances.
- 5. An antiemetic medication is administered parenterally as prescribed if the patient cannot tolerate fluids or medications by mouth.
- 6. For mild nausea, the patient is encouraged to take sips of weak tea, carbonated drinks, or tap water.
- 7. After nausea and vomiting subside, clear liquids are usually prescribed for 12 to 24 hours, and the diet is gradually progressed to a low-residue, bland diet.

Special consideration:

- 1. Severe vomiting produces alkalosis, and severe diarrhea produces acidosis.
- 2. Hypovolemic shock may also occur from severe fluid and electrolyte losses.

10. References:

Smeltzer, S.; Bare, B.; Hinkle, J.; and Cheever, K.: Textbook of Medical-Surgical Nursing, 12th ed., 20101, Philadelphia: Lippincott Williams and Wilkins .P.P.2168-2178.