REGION 11 CHICAGO EMS SYSTEM PROTOCOL	Title: Radiation Exposure – BLS/ALS
	Section: Toxins and Environmental
	Approved: EMS Medical Directors Consortium
	Effective: August 15, 2024

RADIATION EXPOSURE – BLS/ALS

I. PATIENT CARE GOALS

1. Prioritize identification and treatment of immediately life-threatening medical conditions and traumatic injuries above any radiation-associated injury.

2. Identify and appropriately treat acute radiation injury.

3. Reduce risk for contamination of personnel while caring for patients potentially or known to be contaminated with radioactive material.

4. Activate HAZMAT response to evaluate any potential radiation exposure.

II. PATIENT PRESENTATION

A. Inclusion Criteria

1. Patients who have been acutely exposed to ionizing radiation from accidental environmental release of a radioactive source.

2. Patients who have been acutely exposed to ionizing radiation from a non-accidental environmental release of a radioactive source.

3. Patients who have been contaminated with material emitting ionizing radiation.

B. Exclusion Criteria

1. Patients exposed to normal doses of ionizing radiation from medical imaging studies.

2. Patients exposed to normal doses of ionizing radiation from therapeutic medical procedures.

III. PATIENT MANAGEMENT

A. Assessment

1. Don standard PPE capable of preventing skin exposure to liquids and solids (gown and gloves), mucous membrane exposure to liquids and particles (face mask and eye protection), and inhalational exposure to particles (N95 face mask or respirator).

2. Identification and treatment of life-threatening injuries and medical problems takes priority over decontamination.

3. Do not eat or drink any food or beverages while caring for patients with radiation injuries until screening completed for contamination and appropriate decontamination, if needed.
4. Use caution to avoid dispersing contaminated materials.

5. Provide appropriate condition-specific care for any immediately life-threatening injuries or medical problems.

B. Treatment and Interventions

1. If patient experiences nausea, vomiting, and/or diarrhea:

   a. Provide care, per Nausea and Vomiting Protocol.
   b. Document the time gastrointestinal symptoms started.

2. If seizure occurs:

   a. Consider a primary medical cause or exposure to possible chemical agents unless indicators for a large whole-body radiation dose (greater than 20 Gy (Gray), such as rapid onset of vomiting, are present.
   b. Treat per Seizure – ALS Protocol.

C. Patient Safety Considerations

1. Treat life-threatening medical problems and traumatic injuries prior to assessing for and treating radiation injuries or performing decontamination.

IV. NOTES/EDUCATIONAL PEARLS

A. Key Considerations

1. Irradiated patients pose no threat to EMS clinicians.

2. Contaminated patients pose very little threat to EMS clinicians who use appropriate PPE including N95 masks or respirators, gloves, gowns, and face and eye protection.

3. Sources of radiation:

   a. Legal
      i. Industrial plants
      ii. Healthcare facilities that provide radiologic services
      iii. Nuclear power plants
      iv. Mobile engineering sources (i.e., construction sites that are installing cement)
   b. Illegal
      i. Weapons of mass destruction

ii. "Dirty bomb" designed to contaminate widespread areas

4. Physiology of radiation poisoning:
   a. Contamination: Material emitting radiation is present on clothing, body surface, or inside the body.
   b. Exposure: Radiation waves or particles transfer energy to the bodily tissues of the patient, which can result in damage to tissues and organs.

5. Common types of radioactivity that cause poisoning:

   a. Gamma rays, X-rays
      i. Electromagnetic radiation (photons)
      ii. Penetrates the skin deeply
      iii. Can damage internal organs
   b. Beta particles:
      i. Free electrons
      ii. Relatively small and light particles
      iii. Can penetrate 1-2cm of skin
   c. Alpha particles
      i. Relatively large and heavy
      ii. Cannot penetrate intact skin
      iii. Dangerous only if alpha emitter is ingested or inhaled
   d. Neutrons
      i. Uncharged particles
      ii. Very penetrating
      iii. Released only by certain radioactive materials such as uranium and plutonium used in nuclear reactors and nuclear weapons

6. In general, trauma patients who have been exposed to, or contaminated by, radiation should be triaged and treated based on the severity of their conventional injuries.

7. A patient who is contaminated with radioactive material (i.e., flecks of radioactive material embedded in their clothing and skin) generally poses a minimal exposure risk to medical personnel. Radioactive contamination is generally in the form of dust, and can be temporarily controlled by removing contaminated clothing, covering contaminated areas of skin with a dressing, and using a sheet to cover the patient.

8. EMS clinicians may be asked to assist public health agencies in the distribution and administration of potassium iodide in a mass casualty incident involving release of radioactive iodine (nuclear reactor breach or nuclear weapon detonation).

9. Stages of radiation sickness:

   a. Prodromal: Due to acute inflammation. Nausea, vomiting, diarrhea, fatigue, fever, , starting hours up to 4 days after initial exposure.

b. Latent: May last up to four weeks. Acute inflammation subsides, damage or organs may be progressing as damaged cells cannot reproduce.
c. Manifest illness: Patient is at risk for infection and bleeding due to immune compromise, leading to fever, sepsis, weakness. May have bloody diarrhea, fluid losses and infection due to loss of intestinal lining.
d. Recovery: May take weeks to months

B. Pertinent Assessment Findings

1. Treatment of life-threatening injuries or medical conditions takes priority over assessment for contamination or initiation of decontamination.

2. Time to nausea and vomiting is an indicator of the received dose of ionizing radiation. The more rapid the onset of vomiting, the higher the whole-body dose of radiation.

3. Tissue burns are a late finding (weeks following exposure) of ionizing radiation injury. If immediate burns are present, they are from a thermal or chemical mechanism.

4. Loss of consciousness may suggest acute radiation syndrome if accompanied by vomiting within minutes of exposure. If other clinical indicators do not suggest a whole-body dose of greater than 10 Gy, consider other causes of syncope.

5. Delayed symptoms (days to weeks after exposure or contamination):

    a. Skin burns with direct contact with radioactive source
    b. Skin burns or erythema from ionizing radiation
    c. Fever
    d. Bone marrow suppression presenting as:
        i. Immunosuppression
        ii. Petechiae
        iii. Spontaneous internal and external bleeding