Responding to A Radiological Dispersal Device (RDD)

Medical Aspects of Response
Initial Concerns

❖ Who is the radiation “accident victim”? Is he radioactive?

❖ What are the main types of radiation injury/illness?

❖ What are the risks to myself, colleagues/staff, ambulance, or hospital in responding to a radiation accident or treating a radiation accident victim?

❖ How are radiation injuries treated?
Triage at the Scene

Start triage and rapid treatment

Life threatening?

YES

Stabilize/treat without concern for contamination

NO

Contaminated?

YES

Decontaminate

NO

Transport to hospital

NO

Register and release for medical treatment
Rescue Injured

- Assess and treat life-threatening injuries immediately. Treatment of such patients takes priority over all other activities including decontamination.
- Do not delay advanced life support to assess contamination status.
- Perform routine emergency care during extrication procedures.
Rescue Injured

- Rescuers should move victims out of the hazard area into a low radiation area using proper patient transfer techniques.
- Stay within the controlled area if contamination is suspected.
- Victims should be monitored at the control line for external contamination only after they are medically stable.
Rescue Injured

Methods for handling contaminated victims will vary depending on the medical condition of the individual.

*Universal precautions* should be used in any situation where the presence of radioactive materials is suspected to help prevent the spread of contamination from injured victims to emergency personnel.
Rescue Injured

- Life threatening injuries
  - Stabilize patient
  - Transport immediately to hospital, if possible

- Other injured victims
  - Sort & treat according to standard medical triage guidelines
  - Separate contaminated patients
  - Apply preliminary decontamination in the field or enroute to hospital
Rescue Injured

- Uninjured contaminated persons should NOT be directed to a medical facility.

- Contamination is NOT an immediate medical issue when there are no physical injuries.
Patient Transport

- If possible, ambulances should be lined with plastic or paper so that contamination may be easily removed.

- The ambulance is considered contaminated until it has been surveyed and released.

- Potentially contaminated ambulances may be reused for patient transfer from the incident site.
Patient Transport

☞ Inform hospital that radiation victims are coming.

☞ Follow the hospital’s radiological protocol upon arrival.

☞ To minimize spread of contamination at the hospital, decontaminate injured victims to <1000 cpm if decontamination efforts do not interfere with medical treatment.
Patient Transport

- Move stretcher to clean side of control line and unfold a sheet or blanket over it.

- Package victim by folding the sheet or blanket over the patient and securing it.

- Handoff patients in a manner that reduces the likelihood of spreading contamination.

- Wrap the patient in a second sheet for transfer at the hospital.
Monitoring and Decontamination

❖ Only persons in the immediate vicinity of the blast are likely to be contaminated.

❖ A person who is contaminated or has been exposed to radiation is unlikely to pose a radiological health risk to any other person.

❖ You may not be able to perform decontamination onsite if a large number of people are affected.
Assessing External Contamination
(Non-injured persons)

Use pancake GM probe
1” from surface moving at 2-4 inch/second

Contamination < 1000 cpm
or
Lack of decon resources
and
Contamination <10,000 cpm

Go home & shower

Contamination > 10,000 cpm

Go to designated decon area

Contamination > 100,000 cpm

Internal contamination likely
Refer for evaluation and send to designated decon area
Monitoring and Decontamination

- Initial monitoring and decontamination efforts of individuals at the scene should primarily focus on preventing acute radiation effects to the affected individual.

- Cross contamination issues are a secondary concern, especially if the contaminated area and the number of evacuees is large.
Decontamination

Decontamination of victims can be accomplished by removal of clothing and a thorough, careful washing with warm water and soap, followed by a radiation survey to determine if the washing procedure was sufficiently effective.

- Removing clothing will eliminate up to 90% of contamination
- Cut clothing and remove downward.
- Hold breath if clothing taken off over the head.
- Place clothing into a plastic bag
Assessing Internal Contamination

Although is unlikely that an RDD will result in significant internal contamination, victims with extensive contamination in the head and neck area should be evaluated.

Persons with contamination levels greater than 100,000 cpm or 0.5 mR/hr on the face and/or in the nasal area will likely have some degree of internal contamination.
Assessing Internal Contamination

- A nasal swab or blow can be used to determine if there is contamination in the nose.

- A gamma reading of 0.1 mR/hr in contact with the decontaminated chest is another indication of internal contamination.
Assessing Internal Contamination

- Internal contamination requires assessment and treatment by medical personnel at a hospital.
  - Contact the Radiation Safety Officer and/or a nuclear medicine physician at the hospital.
- The degree of internal contamination can be evaluated by whole body counting and/or with excreta analysis.
- Internal contamination does not cause early signs or symptoms.
At the Hospital...

❖ Necessary medical care is the highest priority

❖ Radiation exposure and contamination are secondary considerations

❖ Never delay critical care because a patient is contaminated
At the Hospital...

- All patients should be medically stabilized from their traumatic injuries before radiation injuries are considered.
- Remove contaminated clothing, from the head downward.
- Decontaminate skin and wounds.
Cuts/Wounds

- Radioactive contamination in wound or burns should be handled as if it were simple dirt. Do not damage skin by scrubbing.
- Use ample water or sterile saline to insure removal of radioactive materials.
- Cuts/wounds should be covered with clean cloth or gauze to reduce contact with loose dust and debris.
- Flush eyes with water or sterile saline if contamination is suspected.
Assessing Health Impacts

- For any suspected radiation injury, notify the state radiation control program.

- For serious radiation injuries, also notify REACT/S:
  - They provide 24/7 availability to deploy and provide emergency medical services at incidents involving radiation anywhere in the world.
  - They provide advice and consultation on radiation emergency medicine from its Oak Ridge, TN, headquarters or at the scene of an incident.
Assessing Health Impacts

- Take nasal swab to check for internal contamination
- Follow-up with appropriate bioassay (excreta analysis) to quantify internal contamination
- Take initial and repeat blood samples for cell counts (CBC with differential)
  - Lymphocyte counts can be used to quantify radiation exposure
Assessing Health Impacts

If a relatively high activity gamma source (external exposure) is present at the emergency site, it is possible for an individual to receive a radiation dose that could pose a health risk.

If very high doses are likely, look for signs of Acute Radiation Syndrome…

- Nausea
- Vomiting
- Diarrhea
Acute Radiation Syndrome

Dose, Rem

0  200  400  600  800  1000  1200

Bone Marrow Depression

GI Death

No Treatment

Antibiotics, transfusions, nursing

Potential for bone marrow transplant

LD_{50,60} with no treatment

LD_{50} with antibiotics and nursing
Medical Intervention: Acute Radiation Syndrome

- Treat patients symptomatically

- Prevent and manage infections
  - Hematopoietic growth factors, e.g., GM-CSF, G-CSF (24-48 hr) (Neupogen®)
  - Irradiated blood products
  - Antibiotics/reverse isolation
  - Electrolytes

- Bone marrow transplantation has not been effective in increasing survival
Medical Intervention: Large Internal Contamination

- **Potassium Iodide (KI)** - Protects the thyroid gland from exposure to radioactive iodine

- **Prussian Blue** - Binds and removes cesium and thallium from the body

- **Ca- or Zn-DTPA** - Chelating agents used to remove plutonium and other transuranics
QUESTIONS?

Remember, medical care takes priority over contamination concerns.