Managing the Radiologically Contaminated Patient

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Objectives

At the completion of this session, the student should be able to:

• List the basic types of radiation that might be encountered in an emergency setting.

• Differentiate between radiation exposure and contamination.

• Dispel some of the common misconceptions and misinformation about dealing patients exposed to or contaminated by radiation.

• Perform packaging of the radiologically contaminated patient for safe transport.
Radiation

According to the Health Physics Journal (HPJ-60), radiation is the emission and propagation of energy through space or through a medium in the form of waves.
Radiation
WASHINGTON _ The federal government will not give anti-radiation pills to millions of people who live 10 to 20 miles from a nuclear plant because there are more effective ways to protect people in case of an accident or terrorist attack, the White House said Monday.

The pills "offer negligible additional protection" against radiation exposure for those who live outside a 10-mile radius of a reactor, said John Marburger, President Bush's top science adviser.


The government already stockpiles the pills, which protect against thyroid cancer after radiation exposure, for the 4.7 million people who live within 10 miles of a plant.
Antiradiation Pills Are Urged for Children

By THE ASSOCIATED PRESS
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CHICAGO, April 7 — Households, schools and child-care centers near nuclear power plants should keep potassium iodide pills on hand to protect children from thyroid cancer in the event of a release of radiation, the American Academy of Pediatrics has recommended.

The academy posted the policy late last week on its Web site (aap.org/policy/radiation.htm) and plans to publish it in June in its journal, Pediatrics. Dr. Sophie J. Balk, a New York pediatrician who leads the committee that wrote the policy, said today that it was prompted by concerns about terrorism and the war in Iraq.

Potassium iodide, known by its chemical abbreviation, KI, can block the body's absorption of harmful radiation. The federal Food and Drug Administration has recommended that it be taken as soon as a radioactive cloud containing iodine is close by. The pills may still have some protective effect even three to four hours after exposure.

Since the terrorist attacks of Sept. 11, 2001, federal nuclear regulators have made potassium iodide available to states with nuclear plants. Pills are available over the counter at drugstores, on the Internet and by telephone from some distributors.

Children are especially vulnerable to the effects of radiation, in part because they are closer to the ground, where fallout settles and because their bodies absorb and metabolize substances differently, the pediatrics academy said.
Radiation

• Lack of experience with radioactive material
• Exposure occurs without contact
• Cannot see, feel, smell or hear radiation
• Health effects may not appear for days, weeks or years
• Public, media and responders have exaggerated fear of radiation
Radiation

Comparison with other hazards:
Biological, Chemical, Radiological
Ionizing Radiation

• Alpha: Internal hazard only
  Shielded by paper or small amount fluid

• Beta: Hazard to skin and lens of eye
  Shielded by plastic

• Gamma: Very penetrating
  Shielded by a couple of inches of lead
Ionizing Radiation

• X-Ray: Similar to gamma, but energy is emitted from outside the nucleus. Similar shielding and penetrating powers.

• Neutron: Neutral particle emitted from the nucleus. Very penetrating and requires special considerations for shielding.
Irradiation

- With irradiation, there is no radioactive material transferred.
- An irradiated patient is NOT radioactive and cannot transfer contamination or radiation to a health care provider.
Contamination

• Contamination is simply the presence of radioactive material where it is not wanted.
• Persons may be contaminated externally, internally or both.
• Exposure does NOT imply contamination.
The Radiation Hazard

• Any item that can cause exposure is a source. Do NOT handle sources!
  – Radioactive material can be in multiple forms including dust, smoke, and liquids.
  – If not contained, it is contamination.

• Fire, explosion, and other hazards may be a greater health risk.
Reduction of External Dose

- Time
- Distance
- Shielding
- Quantity*
Reduction of Internal Dose

• Minimize and control contamination.
• Properly use protective clothing.
• Do not eat, drink or smoke in potentially contaminated areas.
• Check yourself for contamination prior to leaving a potentially contaminated area.
Radiological Emergencies

- Industrial and medical source incidents
- Public exposures and contamination
- Malicious threats and acts
- Transportation emergencies
- Reactor emergencies
- Criticality emergencies
Complicating Factors

- Law enforcement concerns
- Public health and safety
- Mass casualties
- Infrastructure damage
- Environmental concerns
- Psychosocial impacts
Major Goals-All Hazards

- Protect Emergency Personnel
- Protect Public/Casualties
- Protect Property
All Hazards PPE Challenges

• Selection varies on threat
  Immediate danger to life? What was released? Expected roles/job duties? NIOSH/OSHA/agency regulations?

• All senses impaired
• Heat stress
• Lifesaving care may difficult
PPE Challenges

• Foremost risk is being contaminated by a source
• Must protect from inhalation and ingestion of radioactive materials
• Does not protect from penetrating ionizing radiation
• Additional survey for contamination after garment removal
• Gloves should be checked for contamination
• Add radiation dosimeter to center of mass
Decontamination

- Lifesaving is a priority before radiation decontamination.
- Normal clothing is a good barrier.
- Simple baby wipes may remove contaminant.
- Strip, flush, cover.
- Prevent ingestion/inhalation of contamination.
- Wound precautions
- Survey after decontamination. May need to repeat or escalate decontamination.
Decontamination

• Stop radiological decontamination efforts when/if:
  – Patient becomes unstable
  – Damage or redness to intact skin
    • Never shave
    • Avoid abrading skin
  – Counts return to background
  – Contamination counts not dropping
  – Interference with medical and trauma treatment
  – Advised by Health Physics
Radiation Patient Treatment
Version 2, August 2012

Radiation Incident Victims
- Life Threatening Present?
  - YES: Stabilize
  - NO: Medical & incident mrtty

Contamination Pathway
- Admit to Controlled Area
- Remove Clothing (Regimen)
- Assess & Treat Medical Condition
- Determine Radiation Type (A-C)
- ID/Contaminant
- Red Survey and Document (Ward, 2 mornings, 2 Body Offsets, 2 Inspect Sites)
- Collect samples (Nasal/Wound Swabs)
- Decontamination (1st wash, 2 Body Offsets, 3 hand washes)
- Survey
- Decontaminated to Acceptable Level
- Whole Body Survey

Internal Contamination
- YES: Collect samples & Count (Nasal/Wound Swabs)
- ID/Contaminant
- Assess Initial
- Bioassay Samples (Start 24 hour time and 2nd collection)
- Dosage Assessment (Report to incident [WholeBody Count, Bioassay, Treatment])
- Document with Color Photos

External Contamination
- Admit to Regular Emergency Department
- Call REACTS

Exposure Pathway
- Internal Exposure
  - YES: Braces for ARS & Local Radiation Injury
  - ID/Rationale
  - Persistent Vomiting? Document Time to Treat
  - Sett ChCs w/diff Analyze/Off gp 343

Local External Exposure
- YES: Bioassay (Stress, Blood, Dosimetry, Decontamination)

Whole Body External Exposure
- Dosage Assessment
- Yes: Doximetry
- No: Transfer/Discharge

Radiation Emergency Assistance Center/Training Site (REAC/TS)
24-Hour Emergency Phone: 866-676-1005
Routine Work Phone: 905-670-3131
On the Web: orau.gov/reacts

* See NHQ/TS Pocket Guide http://www.orel.gov/oreac/reacts
** O.R.A.U. Internal Background or No Radiation in Core, Medical Priorities Directly Shown, Dosimetry, Health Physics Consultation Warranted
Special Decontamination

• Non-Ambulatory
  – May need 3-5 staff per patient
  – Additional transportation devices
  – Decontaminate wheelchairs and stretchers

• Children
  – Warm water to prevent hypothermia
  – Must have caretaker to accompany child
  – Time for decontamination increases
Special Decontamination

• Functional and access devices
  – Decontaminate assistive devices separately
  – Hearing aids, prosthetics, medical devices
    • Secure in plastic bags
    • Name and identifying information
    • Must be surveyed prior to return
Transport
Immediate Life Threats

• Standard precautions (dosimeter if available) and standard medical treatment (ABCs)
• Cocoon patient, protect airway
• Radiological survey is NOT performed if it interferes with stabilization
• Equipment may be used for priority calls, otherwise:
  – Decontaminate all staff and equipment. Submit dosimeters.
An understanding of basic health physics builds the foundation for understanding the mechanisms of radiation injury.

It is essential that good communications occur between the medical, both pre-hospital and in-hospital, and health physics staffs.

Pre-planning is invaluable.
Oak Ridge Fire Department

Treatment of Radiologically Contaminated Patients

Purpose: To provide an effective means to protect the patient from further contact with radioactive contaminants and, at the same time, render safe, effective patient care.
Equipment

- Hot Patient Kit
- Hot Entry Kit
- Backboard
- EMS Response Kit
Guiding Principles

• Systematic search and rescue utilizing triage principals
• Speed and priority further depends on danger of exposure
Treatment Area

- Separate contaminated from non-contaminated
- Within hazard zone perimeter (warm area)
- < 2 mr/hr
Removal of Patient

- Initial crew of 2 firefighters in turnout gear and SCBA
- Rapid removal of patient
- Assist ambulatory
Preparing for Transport

- Treatment crew sets up contaminated treatment area
- SCBA or full face respirators
- Turnout gear or Anti-C’s
- Minimum of 3 pair surgical gloves
Preparing for Transport

- On ground/floor set up the following:
  - Tarp
  - Backboard
  - Plastic sheet
  - Cotton sheet or blanket
  - Plastic sheet
Preparing for Transport

Transfer patient from hot zone
Preparing for Transport

Place patient on radiation decontamination area
Preparing for Transport

• If facial contamination is detected:
  – Wipe patient’s face with baby wipes or place on face, leaving mouth and nose open
  – Place Anti-C hood or plastic bag over scalp/hair and secure to prevent spread of contamination
Preparing for Transport

• Cut off patient’s outer clothing:
  – Slow controlled movements
  – Cut away from face. Protect face with face shield.
  – Use good technique to minimize spread of contamination. Roll cut clothing away from patient.
Preparing for Transport

- Roll top plastic sheet under patient
  - Contain clothes inside plastic
  - Roll patient as needed
  - Discard roll
  - Patient now on cotton sheet
Preparing for Transport

- Wrap patient in cloth followed by plastic sheet
- Secure to backboard with straps
Preparing for Transport

When cleared by control line, transfer patient via backboard to transport crew. Contamination information should be attached to patient if possible.
Scenario

• Two male industrial radiographers, both in their 40s, are inspecting welds in a steel pipe at a factory.

• When they develop the x-ray film, they find that it is overexposed and realize the radiography source (Co-60) probably did not fully retract into its shielded area in the camera.
Scenario

• They have been working 20-30 feet from the source from approximately 30 minutes.

• Do they need medical evaluation?
• How could the need for evaluation/care be determined?
Scenario

- Are they exposed? Are they contaminated?
- Do they need to be decontaminated?
- Do they need to be packaged in any special way prior to transport?
- What is their initial treatment?
Scenario

• A 27 year old male industrial worker is involved in a workplace accident in a radiological recycling plant.
• A very heavy square block of radioactive metal has fallen on his lower leg and he is pinned by the block and has a compound fracture.
• A rescue team is called in and uses a high pressure air bag to raise the block and free his leg.
Scenario

• His wound is covered and stabilized, and he is then moved to the edge of the work area.
• He is treated as a “hot” patient and his clothing is removed and left in the area.
• He is transferred out of the work area and checked by a health physicist. The Geiger counter shows increased activity in the area of his wound. All other areas of his body show no increased activity.
Scenario

• The area around his open wound is cleaned using motions away from the wound.
• The wound is covered with a sterile dressing and he is transported to the local level one trauma center with the plant HP in the ambulance.
Scenario

- Is he contaminated?
- Will he get into the ED without delay?
- Could he be flown by aeromedical transport?
Conclusion

• Medical/trauma emergencies have priority over radiological decontamination. Facilitate rapid transport.
• Prevention of internal contamination is paramount.
• External contamination should be handled early to avoid secondary dispersion.
Courses

Radiation Emergency Assistance Center and Training Site (REAC/TS)
Oak Ridge, Tennessee


- Radiation Emergency Medicine (REM)
- Advanced Radiation Medicine (ARM)
- Health Physics in Radiation Emergencies
- Agents of Opportunity for Terrorism
Courses

Counterterrorism Operations Support (CTOS)
Center for Radiological/Nuclear Training at the Nevada National Security Site
Mercury, Nevada

http://www.ctosnnsa.org/
- Resident Training
- Mobile Training
Courses

Center for Domestic Preparedness
Chemical, Ordnance, Biological and Radiological Training Facility (COBRATF)
Anniston, Alabama

https://cdp.dhs.gov
References

• Radiation Emergency Assistance Center and Training Site (REAC/TS)
  http://orise.orau.gov/reacts
  – The Medical Aspects of Radiation Incidents

• National Council on Radiation Protection and Measurements (NCRP)
  http://www.ncrppublications.org
  – Commentary No. 19: Key Elements of Preparing Emergency Responders for
    Nuclear and Radiological Terrorism - Notes on Recommended PPE Guidance

• International Atomic Energy Agency (IAEA)
  http://www-pub.iaea.org
  – Manual for First Responders to a Radiological Emergency
  – Generic Procedures for Medical Response During a Nuclear or Radiological
    Emergency

• National Disaster Life Support Foundation (NDLSF)
  http://www.ndlsf.org
  – Advanced Disaster Life Support (ADLS)
Questions
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