I-MAG-108 (Rejected)

ATTACHMENT A

(New Hampshire Radiological Health Program Module 23A
Hospital Management Of Contaminated and Injured Patients)

Written By: _____ Procedure No. _____

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NEW HAMPSHIRE RADIOLOGICAL HEALTH PROGRAM

MODULE 23A

HOSPITAL MANAGEMENT OF CONTAMINATED AND INJURED PATIENTS

SEABROOK STATION

FEBRUARY 1988

TRAINING REQUIREMENTS

Key hospital personnel will require the following training:

Training Module 23A - Hospital Management of Contaminated and Injured Patients

Upon completion of the above module hospital personnel will participate in an annual refresher which will consist of a review of procedures including any changes made since the last exercise.

COURSE SCOPE AND OBJECTIVES

SCOPE

This training module provides instruction for key hospital personnel in the management of trauma and radioactive contamination. Topics include medical priorities, contamination control, personal protection and survey techniques. The Emergency Classification Levels (ECL) will also be taught.

OBJECTIVES

At the conclusion of this program, the participant should be able to do the following:

1. Explain the difference between exposure and contamination with regard to radiation and radioactive materials.

2. Understand why basic life support measure have priority over contamination control measures.

3. Recite to basic equipment needed for personal protection from radioactive contamination.

4. Emergency Department personnel should be able to act on vital information from Ambulance Personnel with regard to patient status and degree of contamination.,

5. Emergency Departments should understand basic principles of contamination control for personnel and environment and be able to explain the rationale for sample taking and labeling.

6. Turn on survey meters, check batteries, check background, and do a survey for contamination.

7. Explain the Emergency Classification Levels (ECL) system.

GENERAL COURSE INFORMATION

COURSE TITLE: Hospital Management of Contaminated and Injured

AUDIENCE: Hospital Personnel

DURATION: 1.5 Hours

SCOPE: This training module provides instruction for key hospital personnel in the management of trauma and radioactive contamination. Topics include medical priorities, contamination control, personal protection and survey techniques. The Emergency Classification Levels (ECL) system will also be taught. Emphasis in each section will vary depending on staff background and role in facility RERP.

MATERIALS:
Screen
Slides
Projector and Spare Bulb
Videotape
VCR and Monitor Screen
Survey Meter
Dosimetry Kit
Attendance Form
Participant Handouts

REFERENCES:

1. NUREG 0654/FEMA -REP-1, Rev. 1

2. Title 10, Code of Federal Regulations, Part 50.47(b)(12)

3. FEMA Guidance Memorandum MS-1

4. Joint Committee on the Accreditation of Hospitals, Emergency Services ERS.1.2.20 1987

5. NCRP Report No. 65, Management of Persons Contaminated with Radionuclides

6. Department of Health and Human Services, Food and Drug Administration 83-8211, Preparedness and Response in Radiation Accidents, August 1983

7. Medical Health Physics, Fourteenth Mid-Year Topical Synposium, 1980

8. Hafen and Karren, Prehospital Emergency Care and Crisis Intervention, 1983

COURSE OUTLINE

Management of Contaminated and Injured Patients - Hospital Personnel

Section	Topics	Time
I.	Introduction	2 min.
II.	Basic Concepts and Definitions	15 min.
III.	Concepts of Exposure and Contamination	10 min.
IV.	Radiation Detection and Instrumentation	5 min.
V.	Protective Clothing	2 min.
VI.	Priorities in Trauma Management and Contamination Control	5 min.
VII.	Preparing an Ambulance for Accepting a Contaminated Injured Patient	2 min.
VIII.	Trauma Management, Decontamination & Sample Taking	15 min.
IX.	Management of Severe Exposures	5 min.
X.	Emergency Classification Levels	5 min.
XI.	Video Tape - Hospital Emergency Department Response to Radiation Accidents	25 min.
XII.	Summary	10 min.
XIII.	Questions and Course Evaluation	

INSTRUCTORS GUIDE

Module Number: 23A

Course Title: Hospital Management of Contaminated and Injured Patients

	Lecture Time	Slide
I. Introduction		
A. The purpose of this program is to instruct you how to manage contaminated and injured patients. The program is designed to meet the standards of:	2 min.	Title Slide
1. NUREG-0654/FEMA-REP-1 Planning Standard; 2. 10CFR50.47 (b)(12); 3. FEMA Guidance Memorandum MS-1; and 4. JCAH Standards for Emergency Services ER.5.1.2.20		Regulations
B. The three main areas of concern we will be talking about include management of the patient, protection of the staff, and protection of the environment.		Priorities
II. Basic Definitions and Terms in Radiological Physics	15 min.	
We need to discuss some basic terms and definitions to clearly identify what radiation and radioactive materials are and how they behave.		Radiation
A. The electromagnetic spectrum includes all radiation which is without mass or particulate nature and moves at the speed of light. This includes electric power at the low end through radio waves; visible light; infrared; and ultraviolet, to ionizing x-rays, gamma rays, and cosmic rays from outer space at the high end. The energy of the rays at the upper end		EM Spectrum

Lecture Time	Slide

of the scale from x-rays to cosmic rays is high enough to cause ionization of atoms causing disruption of chemical bonds which results in damage.

B. For our purposes, we will be talking about radiation that comes from atoms which are radioactive. This picture of an atom is not radioactive; we call it stable because it does not give off any excess energy. The parts of an atom include a very dense nucleus of neutrons and protons. Neutrons have no charge and protons have a positive charge of +1. Electrons, which have a negative charge of -1 and normally balance off the positive charge of the nucleus, orbit around the nucleus. The electrons have a mass only about 1/1800 of a nucleon so they do not take up much space in their orbits around the nucleus.

Atomic Structure

C. A radioactive atom has a surplus or deficiency of one of the nucleons and this results in an unstable configuration. This leads to a number of different ways the atom can transform to become stable and thereby release energy in the form of radiation. There are many types of radiation that can be emitted and more than one type can be emitted from the same atom.

Radioactive Atom

D. Let us look at the types of radiation we will be concerned with in the most likely types of radiological emergencies.

Alpha Radiation

1. Alpha radiation is 2 protons and 2 neutrons with a +2 charge. It is actually a Helium atom stripped of its electrons. Comparatively speaking, in the atomic world it is very large and heavy and does not go very far even in air. It carries a lot of energy and can do a lot of internal damage to live tissue; it will not, however, penetrate the dead skin layer outside of our bodies.

	Lecture Time	Slide
2. Beta radiation is an electron with a negative charge called a beta particle or a positive charge called a positron. It can be emitted directly from the nucleus or, under certain conditions, possibly from the orbits. It can travel a few feet in air and penetrate the skin but is dependent upon the amount of energy available.		Beta Radiation
3. Gamma radiation is the high energy electromagnetic radiation we spoke of earlier. It is emitted from the nucleus and sometimes accompanies alpha and beta radiations. It is more dangerous than the other types because it is so penetrating. Remember, atoms are mostly empty space and gamma radiation has no mass or charge so it travels a long way before it interacts. Gamma radiation is a threat both internally and externally.		Gamma Radiation
X-rays are physically exactly like gamma rays except that they are usually of lower energy. The energy spectrums overlap. The difference in physics is where they originate: gamma rays originate in the nucleus and x-rays originate in the orbital shells of the electrons.		X-Rays
E. The term used to describe how many radioactive atoms we have is called a curie. This tells us how many radioactive atoms are disintegrating each second or minute, or how many unstable atoms are releasing radiation and going to a stable state.		Curie
F. A Roentgen tells us how much radiation is passing through a given volume or space of air. We are actually measuring how much ionization is being produced. This can be measured with a survey meter.		Roentgen
G. A Rad (Radiation Absorbed Dose) is how much energy is being absorbed in a given medium. As the radiation bumps into molecules, it causes ionizations and dissipates its energy along a path through the material.		Rad

	Lecture Time	Slide
H. A Rem relates the amount of energy in Rads being deposited in living tissue by multiplying a quality factor times the Rads. This QF equates the biological damage to 200-300 KeV x-rays which can be easily measured, controlled, and reproduced.		Rem
III. Concepts of Exposure and Contamination	10 min.	
A. Exposure and contamination are two important terms that are used often and easily confused so we will make a comparison to fire for simplicity. Ignore the smoke component. If you sit near a fire, you absorb radiant heat which can be controlled by distance. You also can control it by using a barrier for shielding the heat. This is called exposure and is analagous to radiation principles of more energetic radiation. If you step into the fire and an ember sticks to your shoe, you have been contaminated and obviously your exposure to heat is being dramatically increased as well. You also can be contaminated by having the wind blow embers or hot ashes on you. (Note: There are several other comparisons that can be made if warranted.)		Fire Illustrations
B. Exposure control is managed by three principles already mentioned. The total amount of time you spend in a radiation area or with a radioactive patient should be short. Only a few feet between you and a source make a dramatic difference in the exposure rate. Shielding with vehicles, concrete, or lead is only practical when you have a very intense but stationery source of radiation. For transferable radioactive contamination, coveralls and/or your clothing is adequate protection when used in conjunction with other protection principles.		Exposure Control. Time Distance Shielding
C. Contamination control is achieved by assuming that everything that touches a contaminated object will become contaminated. That is, you wear protective clothing or protective		Decontamination Teams Suiting Up

	Lecture Time	Slide

coveralls with the intent of it potentially being contaminated and then discarding it into receptacles before leaving a restricted area.

(Note: Now that we have covered the basics, are there any questions before we continue?)

IV. Radiation Detection and Instrumentation — 5 min.

A. Let us move on to radiation detection to examine how a survey meter works when it "sees" radiation. As radiation passes through air or any other material, it causes ionizations by bumping into atoms. A survey probe works by collecting the electrons produced from ion pairs. If you look at the diagram, the wire in the middle of the probe has a positive charge of about 700-900 volts which strongly attract the negative electrons. Each gamma ray that penetrates the probe volume will send a cascade of electrons to the probe wire which causes a small surge of electrical current in the meter circuits. The flow of current is proportional to the amount of radiation passing through the probe.

Survey Meter

Probe Diagram

(Note: Demonstrate with survey meter.)

B. Operation of a survey meter is simple. First you check the batteries. If your meter does not respond, check to make sure they have been installed. Next check background; there should be a few counts per minute audible or about 0.02 mR/hr for natural background. Do this in a neutral area away from suspected sources. Some meters will have a check source usually mounted on the side of the meter case. There should be a significant rise in cpm when the probe is placed against the source.

Survey Meter Face

	Lecture Time	Slide
C. A frisk survey is done as in this diagram and should take about 3 minutes. Double check suspect areas and have a recorder put the cpm on a patient diagram or a Met Tag.		Frisk Diagram Patient Diagram
1. Cover the probe with a plastic bag 2. Turn off the audio 3. Do not confuse internal with external radiation		Met Tag
D. While survey meters are rate meters, dosimeters are total collected dose instruments that show dose accumulated in milliRem. There are three types with which you should be familiar. Pocket dosimeters are self-reading ionization chambers that are charged just before use and discharge at a rate proportional to the radiation passing through them. TLDs are thermoluminescent dosimeters. These are small chips which absorb the energy of radiation as it passes through and release it as light when heated in a specially designed reading instrument. The last type, which may be available and widely used in hospital radiology departments, is the film badge. Radiation exposes film and the degree of film blackness is proportional to the dose.		Dosimeters and Chargers
V. Protective Clothing for Contamination Control	2 min.	
Protective clothing is worn to prevent contamination from coming into contact with the skin or being inhaled. At a minimum, field personnel should have disposable gloves, masks, and booties. It may not be practical to put on surgical coveralls or Tyveks as will be done in an Emergency Department. The decision should be made on practical considerations and time constraints.		Decontamination Technicians Suiting Up
VI. Priorities in Management of Trauma and Radioactive Contamination	5 min.	
A. First responders who will be transporting patients need to be familiar with contamination control procedures and manage the medical problems as well.		Medical Priorities Contamination Control

	Lecture Time	Slide

Remember!!! The medical problem is the first priority. The contamination is a secondary consideration, handled after the patient has been stabilized.

B. When you get a call involving radioactive materials, have your dispatcher get as much information as possible from personnel at the scene and pass the information along to the hospital as well. Try to get hold of someone to respond with a survey meter if possible. However, a survey meter is not absolutely necessary to manage the patient.

VII. Preparing the Ambulance/Hospital for Accepting a Contaminated Injured Patient — 2 min.

A. While enroute to the scene, get the ambulance prepared by laying floor covers and getting out coveralls and gloves, etc.

B. On arrival, proceed to the patient while asking as many questions as possible of fellow workers or bystanders. — EMTs "Packaging Patient"

1. Treat the injuries first.
2. Once stabilized, perform simple decontamination if possible: i.e., removal of clothing (quick and easy).
3. Transfer to backboard and wrap for transport. A plastic sheet or plain linen will be sufficient. Plastic may not be a good idea in warm weather or for obese patients.
4. Monitor the patient's vital signs as usual.
5. A face mask will prevent the patient from internalizing any contamination as long as it does not interfere with breathing.
6. Inform the Emergency Department ASAP of the following: — Hospital Information

   a. Number of patients
   b. Trauma status
   c. Exposure/contamination

	Lecture Time	Slide

d. Type of radioactive material

1. Isotope/quantity
2. Physical state

e. Estimate time of arrival

7. Check on ambulance entrance if different from usual. Upon arrival, fill in details and standby for decontamination if necessary.

C. The hospital needs this information to make a decision on whether to set up the decon area and mobilize a full team in coveralls or just standby with a nurse and a wash cloth. After notification, the physician in charge will have to make a decision. — Hospital ED

D. It may take up to 20 minutes to prep the receiving area and mobilize key personnel on the Decon Team: longer if during night shifts and people have to be called in. The key steps to be taken include the following. — Floor covers being taped down

1. Traffic control barriers and signs
2. Floor covers laid
3. HVAC systems shut down
4. Equipment mobilized to decon area
5. People mobilized and suited up

VIII. Trauma Management, Decontamination, and Sample Taking — 5 min.

A. As patients arrive at the designated entrance, they should be simultaneously assessed for vital signs and surveyed for contamination. — Decontamination in progress

B. Manage trauma first.

C. Once the patient is stabilized then more attention can be given to a thorough survey and decontamination as necessary.

1. Monitors should record initial readings on patient diagrams and final readings when decon is complete to acceptable levels.

Lecture Time | Slide

2. First prevent external contamination from being internalized. Prevent local contamination from being generalized.

3. Use water sparingly to prevent splashing.

4. Wipe with damp cloths once and save as sample. Be sure to label everything!!! When sufficient samples have been taken, dispose wipes in proper trash receptacles. Wiping more than one area with a cloth may spread contamination rather than containing it.

5. Samples should be carefully bagged and labeled and submitted for analysis. Which specimens will be held for in-house analysis and which ones will be sent out to reference labs should be worked out in advance. Timing of blood samples for CBCs are critical for whole-body dose assessment and the likely course of patient outcome.

D. Monitors should be rechecking areas on patient for effectiveness of decontamination measures. Also constant checks should be made of staff and equipment for control of any transferrable contamination.

E. At some point, trash receptacles may add to increased background and cause misleading survey readings. Trash should be removed if this becomes a problem.

F. When the patient is medically stable and all external contamination is removed to acceptable levels, the patient can be transferred to a room for further monitoring. Medical condition still has priority.

G. Consultants should be brought in to assist in strategy for patient observation, total dose assessment, decorporation of any internalized radionuclides, analysis of samples, and consideration for transfer to another facility with greater capabilities.

	Lecture Time	Slide
IX. Management of Severe Exposures	2 min.	

A. If a severe exposure is suspected, several measures must be taken to assess and monitor the patient's progress. Clinically the patient may have nausea, vomiting and diarrhea. Psychological support will be needed early on as the patient will realize how grave the situation may become. — Severe Exposure Clinical Chart

B. Acute localized exposures need to be watched for loss of function, pain, tingling, and tissue perfusion and viability just as in thermal burns.

C. Severe whole-body exposures should be transferred to a facility with isolation units for infection control and marrow transplant capabilities to head off crises in the next 30 days.

1. Before transfer, baseline blood work should be drawn and a schedule set up for redraws. Early blood counts will be the most important indicators in predicting the patient prognosis.

2. Patient dosimeters should be sent for processing if available.

3. A professional physicist should be called in to help reconstruct the accident and further quantify actual exposures.

D. All samples collected until time of transfer should be adequately labeled and any results forwarded with the patient or as soon as possible thereafter.

E. All this is being done to provide baseline information to help manage the impending crisis of bleeding disorders associated with platelet deficiencies, infections associated with leukopenia, marrow suppression, and pancytopenia.

		Lecture Time	Slide
F.	It is important to note that the life-threatening effects of severe exposure may come weeks after the incident and that efforts should first be put into trauma stabilization if indicated. If a transfusion is necessary for blood loss, do not use a relative. Their marrow may be required for a transplant later on. Use of their blood would sensitize the recipient to the donors blood components and ensure rejection of a marrow implant at a later time.		
X.	Emergency Classification Levels	5 min.	ECL
	A. Unusual Event B. Alert C. Site Area Emergency D. General Emergency		
XI.	Video Tape: Hospital Emrgency Department Response to Radiation Accidents	25 min.	
XII.	Summary of Group Responsibilities		
	(Note: Instructor should review the responsibilities of the specific audience.)		
	A. Group 1 - First Responder		First Responder Responsibilities
	1. Ambulance Preparation a. Floor covers b. Disposable clothing c. Survey meters		
	2. Patient Stabilization a. BLS first b. Decontamination second		
	3. Patient Packaging a. Backboard b. Wrap for contamination control		
	4. Hospital Notification a. Medical status b. Radiation information		
	5. Transportation a. Monitor patient b. Alternate ambulance entrance		

	Lecture Time	Slide
A. Environmental Services	10 min.	ES Responsibilities

1. Access Control

   a. Security
   b. Internal/parking
   c. Barriers
   d. Signs
   e. Verbal directions

2. Decontamination Area Setup

   a. Maintenance/housekeeping
   b. Floor covers
   c. Isolate environmental air systems in Decontamination Area
   d. Mobilize equipment

3. Contamination Control

   a. Barrels
   b. Plastic liners
   c. Tags/labels
   d. Disposables supply

4. Disposables Supply

   a. Towels
   b. Coveralls
   c. Tyveks
   d. Gloves/booties/masks

5. Waste Disposal

   a. Drum handling
   b. Labeling
   c. Contact Seabrook Station

	Lecture Time	Slide
B. Technical Personnel	10 min.	Technical Responsibilities

1. Mobilize Equipment

   a. Survey meters
   b. Decontamination carts

2. Provide Monitoring

   a. Patient surveys
   b. Environmental surveys
   c. Direct decontamination efforts

3. Control Contamination

   a. Restricted areas
   b. Monitor staff
   c. Proper disposal

4. Assist Sample Taking

   a. Blood draws
   b. Contamination wipes
   c. Sample containers
   d. Labeling

5. Process Sample Analysis

   a. Inhouse analysis
   b. Reference laboratory sendout
   c. Prepare samples/reports for transfer
   d. Assist in sample strategy

C. Professional Personnel	10 min.	Professional Responsibilities

1. Incident Assessment

   a. Physician/health physicist
   b. Scope/resources required

2. Mobilize Hospital

   a. Announce alert code
   b. Call in key personnel
   c. Set up decontamination area
   d. Gather information from scene

	Lecture Time	Slide

3. Direct Response Teams

   a. Brief teams on details
   b. Help suit up/issue dosimetry

4. Evaluate and Manage Trauma

   a. Medical priorities
   b. Contamination secondary

5. Perform Decontamination

   a. Direct personnel in techniques
   b. Determine acceptable limits

6. Sampling Strategy

   a. Order blood samples
   b. Oversee wipes for analysis

7. Patient Followup

   a. Long-term monitoring
   b. Referral
   c. Accident reconstruction

8. Consultation Requests

   a. Exposure workups/marrow transplants
   b. Health physics/dosimetry

D. Management — 10 min. — Management Responsibilities

1. Plan Development

   a. In print and available
   b. Updated periodically
   c. Key people on review committee

2. Regulatory Compliance

   a. Meets JCAH ER-5.20
   b. NRC 0654/FEMA-REP-1 Planing Standard L
   c. FEMA MS-1
   d. 10 CFR 50.47 (b) (12)

	Lecture Time	Slide

3. Community Coordination

   a. Local government agencies
   b. Ambulance companies/EMS
   c. Industry
   d. Fire services
   e. Rescue services

4. Training Programs

   a. Meet criteria of regulations
   b. Periodically offered
   c. Qualified instructors

5. Drills/Critiques

   a. Meet criteria
   b. Test systems adequately (3 shifts)
   c. Critique for improvement
   d. Deficiencies corrected

6. Systems Maintenance

   a. Decontamination area properly designed
   b. HVAC systems isolated
   c. Equipment available
   d. Survey meter in operation/calibrated
   e. Disposables stockpiled

7. Plan Implementation

   a. Hospital alerting capability
   b. Mobilization procedures (3 shifts)
   c. Call lists staff/consultants/ emergency services
   d. Patient classification/flow chart

XIII. Questions and Course Evaluation