



**PATIENT DECONTAMINATION  
RECOMMENDATIONS FOR HOSPITALS**

Prepared by:

The Hospital and Healthcare System  
Disaster Interest Group

And

The California Emergency Medical Services Authority

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# PATIENT DECONTAMINATION RECOMMENDATIONS FOR HOSPITALS

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\*The California Hospital and Healthcare System Disaster Interest Group wishes to thank the State of California Water Resources Control Board and the Regional Water Quality Control Board (Region 5) for their guidance and collaboration in preparing and reviewing the information presented in Chapter V of this document (Water Containment and Run-Off)



Hospital and Health System Disaster Interest Group  
Emergency Medical Services Authority

## PATIENT DECONTAMINATION RECOMMENDATIONS FOR HOSPITALS

### I. Introduction

This document provides recommendations for protecting healthcare providers and managing patients in the event of a hazardous materials exposure. Content was compiled through nationally recognized, current practice standards and formatted into user-friendly materials. In addition, compliance with regulatory agencies such as the California Occupational Safety and Health Administration (Cal-OSHA), State of California Water Resources Control Board and the National Institute for Occupational Safety and Health (NIOSH) were considered. These recommendations, developed for hospitals by hospital experts, will be revised and updated as indicated by practice or need.

The Emergency Medical Services Authority wishes to thank the members of the Disaster Interest Group Committee for their contributions in developing these materials.

#### General Recommendations for Hospitals

1. The algorithms in this document are not intended to stand alone, but to be part of an overall emergency management plan for decontamination and should be customized to meet the needs of the healthcare facility.
2. Hospitals must regularly assess the risks to the community and perform a hazards vulnerability analysis. The level of equipment and staff protection must be based on this analysis.<sup>1</sup>
3. Hospitals are encouraged to establish relationships and notification procedures with appropriate local agencies (e.g. local EMS and public health) in order to:
  - a. Ensure communication between the field and the hospital to allow for facility preparation.
  - b. Ensure that properly trained and equipped field/prehospital responders decontaminate patients in the field in order to protect the hospital as much as possible.
  - c. Understand the local protocols and capabilities for field decontamination of patients.
  - d. Ensure proper notification of an event to appropriate local agencies.
4. The primary role of the hospital in a hazardous materials event is to triage, treat, decontaminate and medically screen patients as necessary.

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<sup>1</sup> Joint Commission on Accreditation of Healthcare Organizations, Environment of Care Standard (EC) 4.0, January 1, 2004.

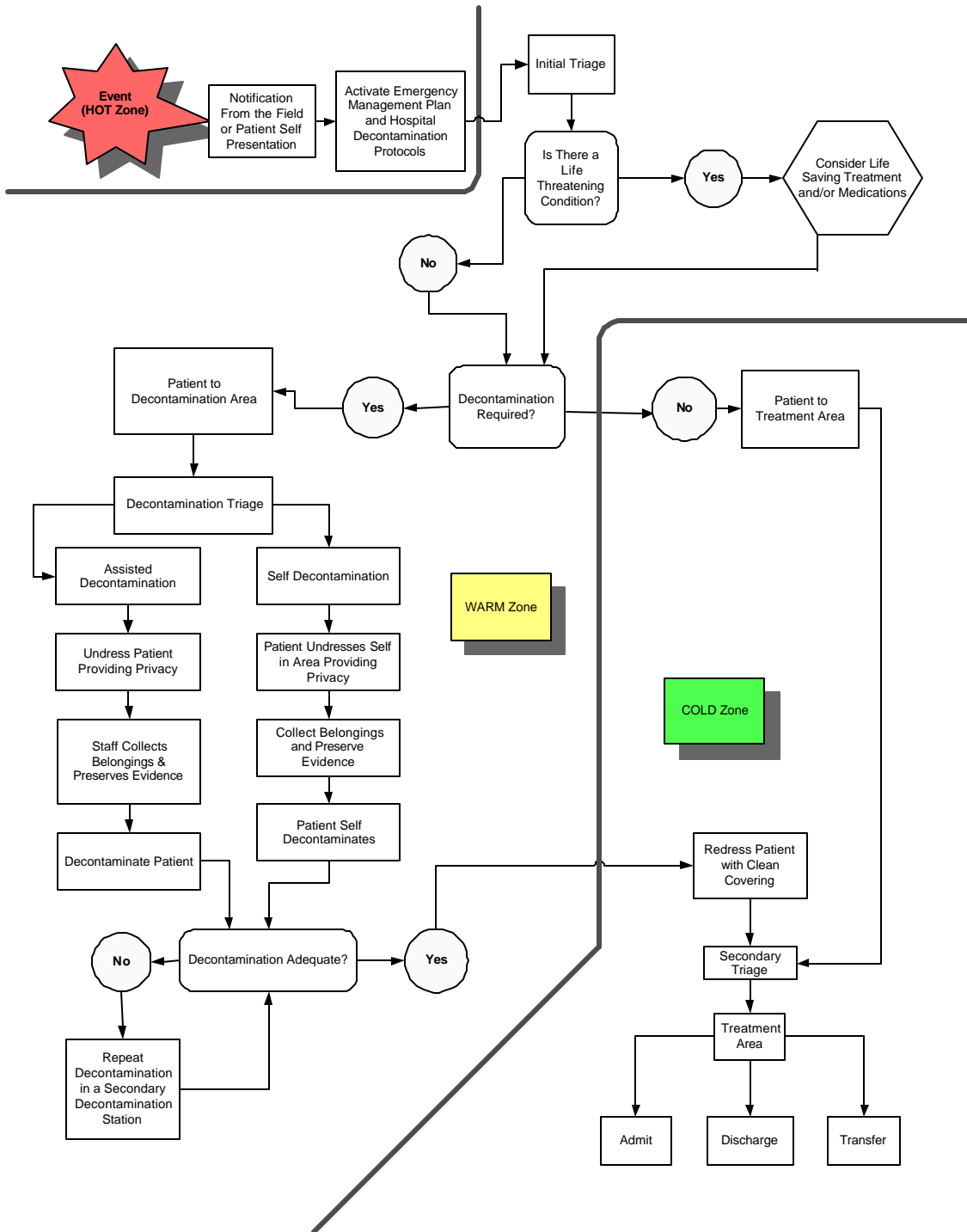
- a. An influx of contaminated patients will overwhelm any hospital and therefore hospitals must work collaboratively with community hospitals and local government to meet the challenges of a surge of contaminated patients.
- b. Hospitals must be prepared for potentially contaminated patients who self-refer and present to the hospital.
- c. Additional planning considerations may include:
  - Establishing a “fast track” decontamination line for patients with severe or life threatening symptoms, delivering basic life saving treatment during decontamination if time and situation allow. **Note** the exception for Radiological decontamination in which emergency treatment takes precedence over Radiological decontamination.
  - Establishing a separate decontamination area for patients that require secondary and /or technical decontamination if primary decontamination is not adequate.
  - Establishing a separate “lane” for patients arriving by EMS transport that have been decontaminated on scene so that these patients can be quickly assessed for adequacy of decontamination and be triaged to medical screening more quickly.

Comparative Table of Terminology for Contamination Zones					
Description	Agency				
	USEPA/ USCG/ NIOSH/ OSHA*	Colloquial Term			OSHA First Receivers
Site of release/ Highest level of contamination	Exclusion Zone	Hot Zone	Red Zone	Dirty Zone	
Buffer/ Where decon occurs	Contamination Reduction Zone (Decon takes place in the Contamination Reduction Corridor)	Warm Zone	Yellow Zone	Less Dirty Zone	Hospital Decontamination Zone
Uncontaminated	Support Zone	Cold Zone	Blue or Green Zone	Clean Zone	Hospital Post-Decontamination Zone

\* Taken from “Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities”, NIOSH/ OSHA/ USCG/ EPA, October 1985 (Four-Agency Document). This is the original document upon which HAZWOPER was based and is still considered a definitive text.

## II. Chemical Decontamination

### Algorithm for Chemical Decontamination in a Hospital Setting



**Note:** This document is not intended to stand alone but is part of an overall emergency management plan for decontamination. This algorithm is a general decontamination guide and should be customized to meet unique decontamination needs of the facility and the CBRNE event.

## MINIMUM STAFF PROTECTION IN CHEMICAL DECONTAMINATION

LEVEL OF PROTECTION	PPE	TRAINING
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <b>MINIMUM PROTECTION</b>  <b>PPE Level: D</b> </div> <p>Level D is the minimum level of PPE required for securing, isolating, and denying entry of an <b>ambulatory</b> victim.</p> <p>These PPE recommendations provide minimal protection, and act primarily as a barrier in the following situations:</p> <ul style="list-style-type: none"> <li>✓ <b>No staff contact or exposure to the contaminant is anticipated</b></li> <li>✓ <b>The chemical is known <i>and</i> is a low risk contaminant</b></li> </ul> <p>Decontamination should be performed outdoors or in a well ventilated area.</p> <p>The patient must be ambulatory and able to fully understand and perform self- decontamination.</p>	<p>PPE = Personal Protective Equipment</p> <p><b><u>LIQUID SPLASH PROTECTION</u></b></p> <ul style="list-style-type: none"> <li>✓ Full face shield</li> <li>✓ Hood or hair covering</li> <li>✓ Gloves</li> <li>✓ Water-repellant gown</li> <li>✓ Water repellent boots / shoes covers</li> </ul> <p><b><u>RESPIRATORY PROTECTION</u></b></p> <ul style="list-style-type: none"> <li>✓ No respiratory protection needed for chemical decontamination</li> </ul>	<ul style="list-style-type: none"> <li>✓ <b>Awareness Training</b></li> </ul> <p>Awareness training should be structured pursuant to applicable hazardous waste operations and emergency response standards, which may include:</p> <ul style="list-style-type: none"> <li>▪ An understanding of what hazardous substances are, and the risks associated with them in an incident.</li> <li>▪ An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.</li> <li>▪ The ability to recognize the presence of hazardous substances in an emergency.</li> <li>▪ The ability to identify the hazardous substances, if possible.</li> <li>▪ An understanding of the role of the first responder in the employer's emergency response plan (including site security and control), and the U. S. Department of Transportation's Emergency Response Guidebook.</li> <li>▪ The ability to realize the need for additional resources, and to make appropriate notifications to the communication center.</li> </ul> <ul style="list-style-type: none"> <li>✓ <b>Self Decontamination module</b></li> <li>✓ <b>Hospital-specific decontamination policy and procedure training</b></li> </ul>

## PREFERRED STAFF PROTECTION IN CHEMICAL DECONTAMINATION

LEVEL OF PROTECTION	PPE	TRAINING
<div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <b>PREFERRED PROTECTION</b>  <b>PPE Level: C</b> </div> <p>These preferred PPE recommendations provide hazardous materials protection in the following situations:</p> <ul style="list-style-type: none"> <li>✓ <b>Non-ambulatory patients or ambulatory patients requiring direct assistance.</b></li> <li>✓ <b>Potential or actual staff contact or exposure to the contaminant is anticipated</b></li> <li>✓ <b>For decontamination purposes, Level C is adequate unless there is a known contraindication for the filter cartridge in the PAPR or APR.</b></li> </ul> <p><b>Note:</b> If the event or the chemical exposure exceeds the preferred protection and safe patient decontamination, and staff protection cannot be assured, policy decisions should include:</p> <ul style="list-style-type: none"> <li>✓ Remove staff and uncontaminated patients from the area and do not provide decontamination. Lock down of facility to protect patients and staff may be required.</li> <li>✓ Call for assistance from 9-1-1 or hazardous materials teams.</li> <li>✓ Provide personal protective equipment listed in "Specialized Protection".</li> </ul>	<p>PPE = Personal Protective Equipment</p> <p style="text-align: center;"><b><u>LIQUID SPLASH PROTECTION</u></b></p> <ul style="list-style-type: none"> <li>✓ Full face shield</li> <li>✓ Chemical-resistant gloves*</li> <li>✓ Chemical-resistant suit*</li> <li>✓ Waterproof, chemical-resistant boots*</li> </ul> <p style="text-align: center;"><b><u>RESPIRATORY PROTECTION</u></b></p> <ul style="list-style-type: none"> <li>✓ Powered Air Purifying Respirator (PAPR) with loose fitting hood and appropriate filter cartridge* <i>or</i></li> <li>✓ Air Purifying Respirator (APR) with appropriate filter cartridge* <i>or</i></li> <li>✓ Supplied Air Respirator (SAR) with loose fitting hood</li> </ul> <p>* <b>Note:</b> The selection of specific types of cartridges or filters, chemical resistant suits, gloves and boots are determined by the contaminant to which exposure is encountered. The type of equipment obtained and utilized by the hospital should be based on the hazard vulnerability analysis and community risk.</p> <p style="text-align: center;"><b><i>All respiratory PPE plans should include staff monitoring pre-event, during, and post-event</i></b></p>	<ul style="list-style-type: none"> <li>✓ <b>Operations Training</b> should be structured pursuant to applicable hazardous waste operations and emergency response standards, which may include: <ul style="list-style-type: none"> <li>▪ Knowledge of the basic hazard and risk assessment techniques.</li> <li>▪ Know how to select and use proper PPE provided to the first responder operational level.</li> <li>▪ An understanding of basic hazardous materials terms.</li> <li>▪ Know how to perform basic control, containment, and/or confinement operations and rescue injured or contaminated persons within the capabilities of the resources and PPE available with their unit.</li> <li>▪ Know how to implement basic equipment, victim, and rescue personnel decontamination procedures.</li> <li>▪ An understanding of the relevant standard operating procedures and termination procedures.</li> </ul> </li> <li>✓ <b>Awareness Training</b> as outlined under Minimum Level Protection</li> <li>✓ <b>Respiratory protection program (OSHA)</b></li> <li>✓ <b>Hospital-specific decontamination policy and procedure training</b></li> </ul>

## SPECIALIZED STAFF PROTECTION IN CHEMICAL DECONTAMINATION

LEVEL OF PROTECTION	PPE	TRAINING
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>SPECIALIZED PROTECTION</b> PPE Level: B or A</p> </div> <p>These PPE recommendations provide the specialized hazardous materials protection in the following situations:</p> <ul style="list-style-type: none"> <li>✓ <b>Potential or actual staff contact with patient or contaminant is anticipated</b></li> <li>✓ <b>There is a known contraindication for the use of the PAPR or APR</b></li> </ul> <p>The provision by each facility of specialized personal protection should be based on:</p> <ul style="list-style-type: none"> <li>✓ Hazard Vulnerability Assessment</li> <li>✓ Community Risk</li> <li>✓ Facility choice to enhance the facility capacity</li> </ul>	<p>PPE = Personal Protective Equipment</p> <p style="text-align: center;"><b><u>LIQUID SPLASH PROTECTION</u></b></p> <p><b>Level A</b></p> <ul style="list-style-type: none"> <li>✓ Vapor protective suit</li> </ul> <p><b>Level B</b></p> <ul style="list-style-type: none"> <li>✓ Chemical-resistant suit* with hood</li> <li>✓ Chemical-resistant gloves* and boots*</li> </ul> <p><b>Level A &amp; B</b></p> <ul style="list-style-type: none"> <li>✓ Waterproof-chemical resistant boots*</li> </ul> <p style="text-align: center;"><b><u>RESPIRATORY PROTECTION</u></b></p> <ul style="list-style-type: none"> <li>✓ Atmosphere supplying respirator (ASR) such as:               <ul style="list-style-type: none"> <li>• Supplied Air Respirator (SAR)</li> <li style="text-align: center;"><i>or</i></li> <li>• Self-Contained Breathing Apparatus (SCBA)</li> </ul> </li> </ul> <p>* <b>Note:</b> The selection of specific types of chemical resistant suits, gloves and boots is determined by the contaminant to which exposure is encountered. The type of equipment obtained and utilized by the hospital should be based on the hazard vulnerability analysis and community risk.</p> <p style="text-align: center;"><b><i>All respiratory PPE plans should include staff monitoring pre-event, during, and post-event</i></b></p>	<ul style="list-style-type: none"> <li>✓ <b>Awareness Training</b> as outlined under Minimum Level training</li> <li>✓ <b>Operations training</b> as outlined under Preferred Level Training</li> <li>✓ <b>Respiratory protection program (OSHA)</b> as outlined under Preferred Level Training</li> <li>✓ <b>Hospital-specific decontamination policy and procedure training</b></li> <li>✓ <b>Technician Level training and competencies</b> as outlined in:               <p style="margin-left: 20px;">California Code of Regulations Title 8 Section 5192 Q</p> </li> </ul>



## RECOMMENDED EQUIPMENT FOR PATIENT DECONTAMINATION

### LEVEL D

### MINIMUM LEVEL EQUIPMENT

#### Staff Personal Protective Equipment (PPE)

- Full face shield (for inadvertent facial contact contamination)
- Hood or hair covering
- Gloves
- Water-repellant gown
- Water repellent boots / shoe covers

#### Equipment

##### Patient Identification and Belongings

- Waterproof triage tags
- Sealable plastic bags, size small and large to accommodate belongings and clothing
- Labels
- Permanent marker

##### Decontamination Supplies:

- Mild soap
- Sterile Saline to irrigate wounds
- Sponges / Sterile Gauze
- Long handled soft bristle brushes
- Buckets / Plastic bowls

##### Water Sources/Containment Devices: (use any type below)

- Hoses with gentle flow, controlled nozzles with hot and cold water
- Shower:
  - . Single with flex head (minimal)
  - . Multiple heads (recommended)
- Plastic pallets to prevent slippage (minimum of 3)
- Water containment/collection system
  - . Wading pools, barrels and pump
  - . Built-in decontamination collection and storage systems

##### Patient Privacy:

- Gowns and/or suits for patient to don post decontamination
- Towels and blankets
- Self Decon "trash bag" kits (optional)
- Tents or pre-fabricated decon tents
- Modesty screens, portable screens
- Ropes and tarps, barrier tapes

##### Miscellaneous Supplies:

- Duct Tape
- Scissors
- Traffic cones
- Megaphones
- Plastic totes for hospital equipment

##### Patient Education:

- Laminated decon instructions in different languages (community specific) **and** interpreter services

**RECOMMENDED EQUIPMENT FOR PATIENT DECONTAMINATION**

<b>LEVEL C</b>	<p align="center"><b><u>Staff Personal Protective Equipment (PPE)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Full face shield</li> <li><input type="checkbox"/> Chemical-resistant gloves*</li> <li><input type="checkbox"/> Chemical-resistant suit*</li> <li><input type="checkbox"/> Waterproof chemical-resistant boots*</li> <li><input type="checkbox"/> Respirator*:             <ul style="list-style-type: none"> <li>. Air Purifying Respirator (APR)</li> <li>. Powered Air Purifying Respirator (PAPR) with loose-fitting hood</li> <li>. Supplied Air Respirator (SAR) with loose fitting hood</li> </ul> </li> <li><input type="checkbox"/> Appropriate filter cartridge for APR or PAPR</li> </ul> <p align="center"><b><u>Equipment</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> All equipment listed in minimum level (Level D)</li> </ul> <p><b>Plus:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ambulation assistance and transportation devices</li> <li><input type="checkbox"/> Instant developer camera for evidence collection or identification of patient belongings. (optional) See evidence collection procedure for more information.</li> </ul> <p>* <b>Note:</b> The selection of specific types of cartridges or filters, chemical resistant suits, gloves and boots is determined by the contaminant to which exposure is encountered. The type of equipment obtained and utilized by the hospital should be based on the hazard vulnerability analysis and community risk</p>
<b>LEVELS A &amp; B</b>	<p align="center"><b><u>Staff Personal Protective Equipment (PPE)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Level A:             <ul style="list-style-type: none"> <li>. Vapor protective suit with hood</li> <li>. Self-Contained Breathing Apparatus (SCBA)</li> </ul> </li> <li><input type="checkbox"/> Level B:             <ul style="list-style-type: none"> <li>. Chemical-resistant gloves*</li> <li>. Chemical-resistant suit with hood*</li> <li>. Waterproof chemical-resistant boots*</li> <li>. SAR or SCBA *</li> </ul> </li> </ul> <p align="center"><b><u>Equipment</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> All items listed in minimum and preferred levels (Levels C and D)</li> </ul> <p><b>Plus:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Chemical resistant and water proof litters (i.e. Raven, Stokes, Morgue) or gurneys</li> <li><input type="checkbox"/> Plastic (non-porous) backboard</li> </ul> <p>* <b>Note:</b> The selection of specific types of chemical resistant suits, gloves and boots is determined by the contaminant to which exposure is encountered. The type of equipment obtained and utilized by the hospital should be based on the hazard vulnerability analysis and community risk</p>

**PREFERRED LEVEL EQUIPMENT**

**SPECIALIZED LEVEL EQUIPMENT**

### III. Radiological Decontamination

#### Treatment of Radiological Contamination

The following provides an algorithm for the triage and processing of patients, who are **radiologically contaminated**, and recommendations for personal protection of hospital staff during treatment of these patients.

Radiological emergencies have always been an area of great concern for healthcare providers, resulting in many misconceptions about the care of the contaminated patient and protection of the healthcare provider. This section of *Patient Decontamination Recommendations for Hospitals* is meant to assist hospitals in developing an appropriate and effective radiological emergency annex in their Emergency Management Plan.

This information is intended for patients contaminated with radiological materials. If there are multiple hazards or other concerns, refer to the recommendations earlier in this document regarding chemical decontamination or other appropriate guidance.

[Note: No special precautions are required for the treatment of patients who are only **exposed** to radiation and not **contaminated** with radioactive material.]

Planning recommendations for hospitals:

1. The Radiologic contamination algorithm in this document is not intended to stand alone, but is part of an overall emergency management plan. This algorithm is a general guide for care of the radiologically contaminated patient and should be customized to meet the needs of the facility.
2. Radioactive contamination (whether internal or external) is generally not life threatening and therefore, a radiological assessment or decontamination should never take precedence over life-threatening acute medical conditions. Medical stabilization of the patient is the top priority of the health care provider, even though the patient is contaminated.

Radiologically contaminated patients with **life-threatening acute medical conditions should be transported to treatment areas without delay** (e.g. Emergency Department, Radiology Department, Surgery Suite) despite the presence of contamination. Cover gurney with two clean sheets wrapping one around the patient to minimize the spread of contamination.

3. To minimize staff risks from exposure to ionizing radiation, all healthcare providers should carry out their responsibilities keeping in mind these principles:
  - a. Removing patients' clothing generally removes up to 90-95% of the contamination.
  - b. If available, have a radiological health specialist (e.g. health physicist, radiation safety officer, medical physicist, nuclear medicine personnel) assist with detecting the sources of radioactive contamination and the effectiveness of decontamination efforts.

- c. Minimize time spent in a radiological environment and maintain the maximum distance from sources of radiation consistent with appropriate patient care.
  - d. All personnel responding to the care of a radiologically contaminated patient should be given a personal dosimeter (film badge or TLD) and a self-reading dosimeter, if available.
  - e. Medical personnel who will be handling potentially contaminated patients should use PPE Level D as recommended on page six of this document.
4. Initial activities to prepare for patient arrival should include:
- a. Ascertain from the scene the type of radiological incident, number of victims and types of injuries.
  - b. Obtain and test radiation survey meters
  - c. Obtain radiation decontamination supplies. These supplies are easily accessed if they are organized and labeled and are in a separate container or cart.
  - d. Request assistance of radiological health specialist, if available.
  - e. Don PPE, including surgical mask or face-shield.
  - f. Provide personal dosimeters (film badge or TLD) and self-reading dosimeters to staff, if available
  - g. Cover floor of treatment room with non-skid plastic covering (e.g. Herculite or other appropriate floor covering) to aid in facility decontamination following the event (if there is sufficient time and if external contamination is expected).
  - h. A step-off-pad or boundary line should be established to distinguish clean areas from potentially contaminated areas.
  - i. Cover gurney with two clean sheets
  - j. Label waste containers for radioactive waste
  - k. Upon arrival of the patient (as early as possible without delaying appropriate medical care) perform a very quick survey to ascertain presence of radioactivity and exposure rate.
  - l. Patients without life-threatening conditions should receive effective decontamination prior to receiving medical care.
5. Decontamination measures should include the following considerations:
- a. Remove and bag clothing carefully to prevent spread of contamination
  - b. Locate the contamination by surveying the patient with a GM survey meter with a "pancake" probe or other suitable device.
  - c. Record the location of contamination, including the counts per minute (CPM) on the GM survey meter at one inch above the location.
  - d. Collect samples as appropriate:
    - Nasal (each nostril separately), oral
    - Skin wipes of contaminated areas
    - Foreign objects
    - Blood
    - Urine and/or feces (suspected internal contamination)
    - Contaminated wound exudates
    - Vomitus

- e. Cover uncontaminated wounds with waterproof dressings.
  - f. Decontaminate skin by cleaning carefully with soap and tepid water, wiping toward the highest contaminated area to limit spread. Do not abrade skin.
  - g. If radioactive fragments are discovered on the patient, use long-handled tongs or forceps to remove the fragment(s). Place the fragment in a shielded container, if available.
  - h. Irrigate contaminated wounds with room temperature sterile saline and gently wash with surgical sponges. Collect run-off in plastic bowls or absorb using gauze or sponges to minimize the spread of contamination.
  - i. While it is desirable to obtain samples during the decontamination effort that can be used for analysis to determine the radionuclides present, it is not necessary to attempt to contain all the fluids generated during decontamination. The amount of radioactive material released to the sanitary sewer will likely be below the levels that are of regulatory concern.
  - j. Gently rinse contaminated burns (do not scrub).
  - k. Stop decontamination of skin and wounds when either:
    - The contamination is less than 2 to 3 times the normal background levels
    - or*
    - Attempts to decontaminate are not significantly reducing contamination levels.
  - l. Control contamination by placing all potentially contaminated material in waste containers labeled with a "caution radioactive materials" sign.
6. In a large scale event with multiple victims, prepare for the arrival of contaminated victims and establish a separate area for the uninjured ("worried well") so that the patients can be quickly assessed and triaged to medical screening. This area may be set up outside, separate from the ED so that the entrance to the ED remains easily accessible to injured victims.
  7. In the case of a medical radiation emergency, response and recovery radiation exposure limits should be established to preserve lifesaving capabilities while taking into consideration risk to staff and facility operation. Radiation dose limits to staff performing emergency procedures should be established. Additionally contamination limits for facilities should be established to avoid shutting down the facility or taking rooms out of service because of radioactive contamination.
    - a. Dose to staff should be as low as reasonably achievable (ALARA) and should not exceed 50 rem total dose equivalent for lifesaving procedures.
    - b. Pregnant staff are discouraged from providing direct patient care to radiologically contaminated patients.
    - c. During recovery, facilities should be decontaminated to the extent possible. Areas of fixed contamination (radioactive material that cannot be easily removed from surfaces) may exist in patient care areas and shall be identified.
    - d. Engineering controls such as barriers or lead shielding should be used to reduce exposure to staff from fixed contamination to less than 2 mrem/hr while decontamination efforts are completed. The goal should be to keep dose to staff to less than 100 mrem from fixed contamination while allowing the facility to remain operational.

8. The hospital's Radiological Emergency Plan (an annex of the Emergency Management Plan) should include the procedures and methods for obtaining expert consultation in the care of the patient.

***Expert radiological consultation may include the following:***

- Local Radiological Health Experts
- State of CA, Department of Health Services Radiologic Health Branch  
Phone: 916-327-5106 Monday-Friday 8am to 5pm PST  
800-852-7550 (emergency assistance only)
- REAC/TS (Radiation Emergency Assistance Center / Training Site)  
Phone: 865-576-3131 Monday-Friday 8am to 4:30 pm EST  
865-576-1005 Off-Hours (24-hour call number)  
Website: <http://www.orau.gov/reacts/procedures.htm>
- AFRRRI (Armed Forces Radiobiology Research Institute)  
Medical Radiobiology Advisory Team  
Phone: 301-295-0530 Website: <http://www.afrrri.usuhs.mil/>

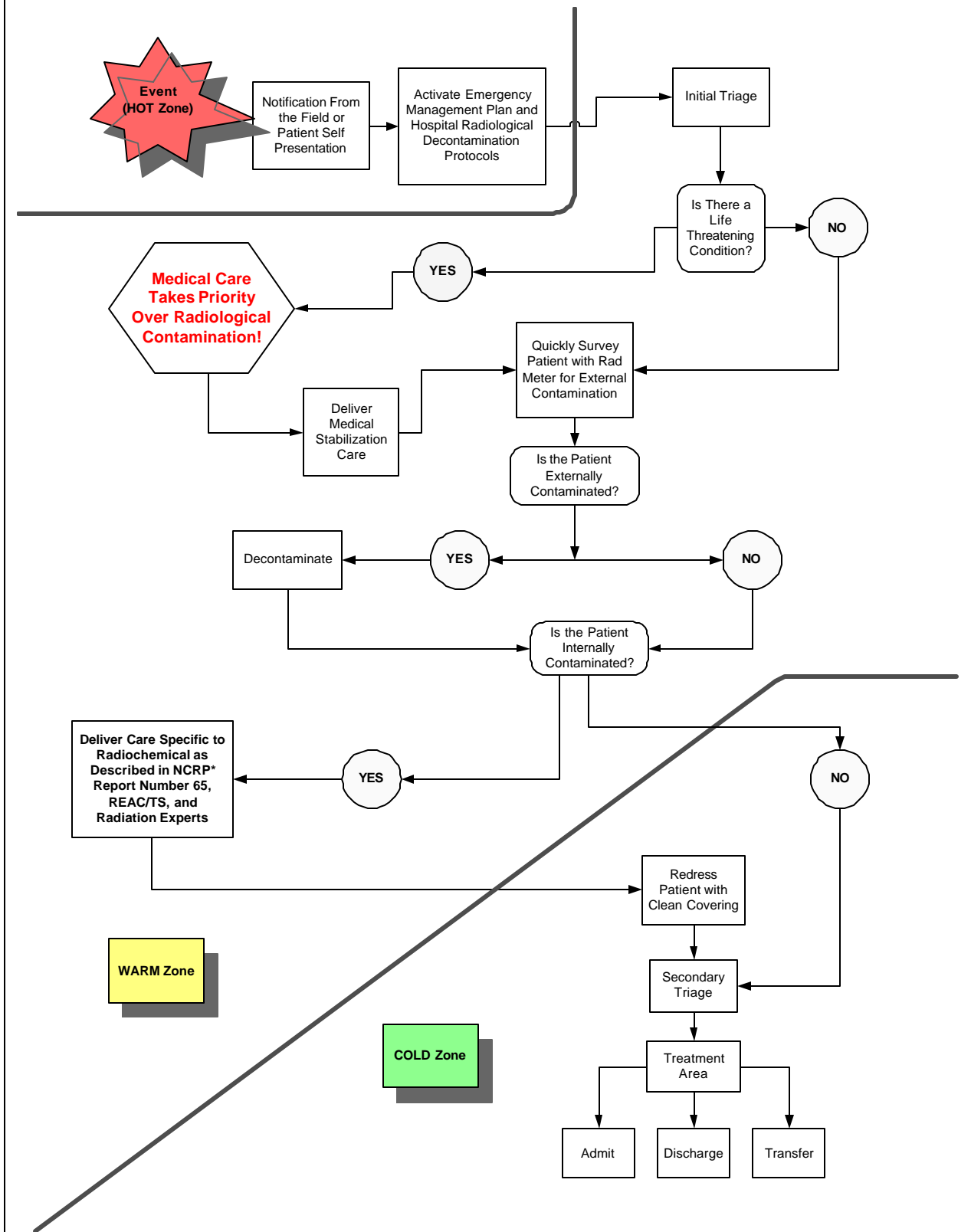
9. Staff protective clothing should be removed in the following order:

- a. Outer gloves
- b. Face shield or surgical mask
- c. Water repellent gown
- d. Cap
- e. Shoe covers
- f. Inner gloves

10. After removal, all PPE should be placed in designated waste containers labeled with a "caution radioactive materials" sign. Each staff member should be surveyed with a GM survey meter for contamination, and all personal, self-reading dosimeters should be collected and radiation doses recorded. Staff should cross over from the contaminated zone to the clean area (cold zone) after they have been monitored with GM survey instrument and readings are less than two times background.

*These recommendations were developed for hospitals by hospital experts, and will be revised and updated as indicated by practice or need.*

## Algorithm for Treatment of Radioactive Contamination



*Adapted from the University of California (Davis) Health System*

## RECOMMENDED EQUIPMENT FOR RADIOLOGIC DECONTAMINATION

### Staff Personal Protective Equipment (PPE)

- Full face shield or surgical mask (note: Respiratory protection is not needed. Masks are for inadvertent facial contact contamination.)
- Hood or hair covering
- Gloves
- Water-repellant gown
- Personal dosimeters (and self-reading dosimeters if available)
- Shoe covers

### Equipment

#### Patient Identification and Belongings

- Waterproof triage tags
- Sealable plastic bags, size small & large to accommodate belongings & clothing
- Labels with Permanent marker
- Labels for belongings such as "Caution Radioactive Materials"

#### Decontamination Supplies:

- Mild soap
- Sponges / sterile gauze (for potential localized decon)
- Sterile Saline to irrigate wounds
- Buckets / plastic bowls

#### Water Sources/Containment Devices:

- Hoses with gentle flow, controlled nozzles with hot and cold water
- Shower: Single with flex head (minimum); Multiple heads (recommended)

#### Patient Privacy:

- Gowns and/or suits for patient to don post decontamination
- Towels and blankets
- Self Decon "trash bag" kits (optional)
- Tents or pre-fabricated decon tents
- Modesty screens, portable screens
- Ropes and tarps, barrier tapes

#### Miscellaneous Supplies:

- Radiation meters and probes, including pancake probe
- Radiation survey data sheets
- Radiation caution signs and caution tape
- Lead-lined collection containers
- Long-handled tongs
- Duct tape, scissors
- Non-skid plastic floor covering (e.g. Herculite)
- Traffic cones, megaphones
- Plastic totes for hospital equipment

#### Patient Education:

- Laminated decon instructions in different languages (community specific) **and** interpreter services



## IV. Biological Decontamination

### Decontamination of Patients and Environment<sup>2</sup>

The need for decontamination depends on the suspected exposure and in most cases will not be necessary. The goal of decontamination after a potential exposure to a biological agent is to reduce the extent of external contamination of the patient and contain the contamination in order to prevent further spread. Decontamination should only be considered in instances of gross contamination. Decisions regarding the need for decontamination should be made in consultation with state and local health departments. Decontamination of exposed individuals prior to receiving them in the healthcare facility may be necessary to ensure the safety of patients and staff while providing care. When developing Bioterrorism Readiness Plans, facilities should consider available locations and procedure for patient decontamination prior to facility entry.

Depending on the agent, the likelihood for re-aerosolization or the risk associated with cutaneous exposure, clothing of exposed persons may need to be removed. After removal of contaminated clothing, patients should be instructed (or assisted if necessary) to immediately shower with soap and water. **Potentially harmful practices, such as bathing patients with bleach solutions, are unnecessary and should be avoided.** Clean water, saline solution, or commercial ophthalmic solutions are recommended for rinsing eyes. If indicated, after removal at the decontamination site, patient clothing should be handled only by personnel wearing appropriate personal protective equipment, and placed in an impervious bag to prevent further environmental contamination.

Development of Bioterrorism Readiness Plans should include coordination with the FBI field office. The FBI may require collection of exposed clothing and other potential evidence for submission to FBI or Department of Defense laboratories to assist in exposure investigations.

### Preferred Staff Protection in Biological Decontamination

The following includes recommendations for patient decontamination when the contaminate is a biological agent. Preferred staff protection for biological decontamination is generally at PPE Level D (described on page six of this document) with the addition of N95 masks (or greater).

#### **Gloves**

- Gloves should be worn when contact with blood or body fluids is anticipated.
- Gloves should be worn when touching environmental surfaces and/or patient care articles likely to be contaminated or soiled with blood or body fluids.
- Gloves should be put on just prior to performing a patient care task that involves contact with blood or body fluids.

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<sup>2</sup> *Bioterrorism Readiness Plan: A Template for healthcare Facilities [Prepared by: APIC Bioterrorism Task Force and the CDC Hospital Infections Program Bioterrorism Working Group] pg 8*

- Gloves should be removed immediately, without touching non-contaminated surfaces, as soon as the patient care task is complete.
- When performing multiple procedures on the same patient, gloves should be changed after contact with blood and body fluids that contain high concentrations of microorganisms (e.g., feces, wound drainage or oropharyngeal secretions) and before contact with a clean body site such as non-intact skin and vascular access sites.

### **Facial Protection**

Facial protection should be worn when performing patient care tasks likely to generate splashing or spraying of blood and body fluids onto the mucous membranes of the face. Facial protection may include:

- Disposable, fluid-resistant masks
- Eye shields (goggles with side-shields)
- Face shield
- N95 mask

### **Gowns**

- Disposable fluid-repelling gowns should be worn to protect skin and clothing when performing procedures likely to generate splashing or spraying of blood and body fluids.
- Plastic aprons may be worn for procedures likely to soil clothing but are unlikely to generate splashing or spraying of blood or body fluids (e.g., cleaning incontinent patients).
- The material composition of the gown should be appropriate to the amount of fluid penetration likely to be encountered.
- Soiled gowns must be removed after patient contact.

## V. Water Containment and Run-Off

### Addressing Water Containment and Run-Off During Decontamination Operations

It is recognized that each facility has different capacities to manage varying numbers of contaminated victims. For example, based on a current Hazard Vulnerability Assessment (HVA), some facilities may plan for decontaminating a single victim and appropriately containing the waste water. In this case, two or more victims would exceed the capacity of the facility.

There is currently no legislative or regulatory mandate to describe the details on decontamination facilities' containment procedures and capacities. Each hospital facility, however, must establish water containment capacities based on a facility HVA for determining the potential number of patients that may require decontamination. In addition, hospitals should consider community hazardous materials risks in order to identify the potential number of victims that may present to the facility.

The intent of the following matrix is to provide hospitals with planning guidance for managing the waste water and runoff generated by the decontamination of victims presenting to the facility for emergency care and treatment.

Hospitals should plan for decontamination operations that will not exceed their capacity, but should also develop a contingency plan for mass decontamination when patient numbers do exceed their capacity. It is critical that hospitals develop decontamination and waste water containment plans in collaboration with proper local regulatory authorities (Publicly Owned Treatment Works [POTW] and Municipal Separate Storm Sewer Systems [MS4]). (See glossary on page 25 for definitions of POTW and MS4).

This guidance was developed to assist hospitals in planning for the management of waste water runoff during victim decontamination procedures at the facility.

The State of California Water Resources Control Board and the Regional Water Quality Control Boards within the California Environmental Protection Agency recognize that the priorities for hospitals during a chemical, biological, radiological or nuclear event requiring decontamination are those of life safety, protection of the facility and finally protection of the environment. There is no exception to the letter of the law; however, circumstances are always a major consideration by the regulators when an emergency requires actions that technically violate the standards. All reasonable measures must be taken by hospitals to capture waste water runoff.

**WATER CONTAINMENT IN DECONTAMINATION OPERATIONS FOR PLANNED CAPACITY**

TIER	DESCRIPTION	RECOMMENDATIONS
<b>Decontamination Operations for Planned Capacity</b>	<p>Decontamination operations for the planned capacity is the provision of patient decontamination and containment of waste water based on the facility hazard vulnerability assessment.</p> <p>Each facility must provide plans and procedures for:</p> <ul style="list-style-type: none"> <li>▪ Victim/patient decontamination</li> <li>▪ Waste water containment</li> <li>▪ Waste water disposal for planned facility capacity.</li> </ul>	<p>Waste water from decontamination must be contained.</p> <p>Considerations to address in hospital policy and procedure include:</p> <ul style="list-style-type: none"> <li>▪ Identification of the agent                             <ul style="list-style-type: none"> <li>✓ Field / Fire / Hazmat reports</li> <li>✓ Laboratory testing of waste water</li> </ul> </li> <li>▪ Waste water containment</li> <li>▪ Waste water disposal that may include contracts with waste pumping and disposal companies</li> <li>▪ Facility clean up and readiness for return to normal operations</li> </ul>

## WATER CONTAINMENT IN MASS DECONTAMINATION OPERATIONS

TIER	DESCRIPTION	RECOMMENDATIONS
<b>Mass Decontamination Operations</b>	<p>Mass decontamination is defined as an incident that involves increased numbers of victims exceeding the planned capability of the facility to decontaminate those victims. Attempts must be made to contain waste water.</p> <p>Life safety of victims, current patients and personnel is the primary mission. Protection of the environment is a secondary consideration. Local fire and/or hazmat resources may not be able to respond to the facility to assist in the decontamination efforts. The facility must anticipate decontamination requirements that exceed the planned capacity.</p> <p>Large quantities of water are required to safely and completely decontaminate victims, resulting in large quantities of waste water with dilute contaminants.</p> <p>The facility must work closely with the POTW or MS4 to plan for decontamination that exceeds the planned facility capabilities and investigate the options for containment of mass quantities of waste water and runoff during the process.</p> <p>In consultation with local authorities, berm the decontamination area and dike the waste water runoff to the extent possible as follows:</p> <ul style="list-style-type: none"> <li>▪ Containment</li> <li>▪ Diverting to sanitary sewer</li> <li>▪ Diverting to storm drains</li> <li>▪ Diverting to ground leaching.</li> </ul> <p>Notification of proper regulatory authorities when waste water cannot be contained should be in accordance with the CA Health and Safety Code, Chapter 6.95, Section 25500</p>	<p>Due to the location of the decontamination area and the large quantities of runoff produced, the sanitary sewer may not be an option for routing the runoff of waste water. Use of the storm drain or ground leaching may be necessary in an emergency.</p> <p>Considerations to address in hospital policy and procedure include:</p> <ul style="list-style-type: none"> <li>▪ Involve the proper regulatory authorities (POTW/MS4) and first responders providing decontamination services in planning for mass decontamination and waste water issues. Make reasonable efforts to contain the excess waste water including the use of berms and dikes.</li> <li>▪ Ensure large quantities of water are available for decontamination in order to dilute the agent as much as possible.</li> <li>▪ Direct excess waste water to the sanitary sewer and immediately notify the POTW and/or MS4.</li> <li>▪ Should the sanitary sewer not be available, immediately notify the proper regulatory authorities (MS4, POTW, etc.)</li> <li>▪ Investigate procedures for containment and disposal of the contained waste water: <ul style="list-style-type: none"> <li>✓ Contracts with waste pumping and disposal companies</li> </ul> </li> <li>▪ Agreements with the POTW/MS4 to allow waste water to flow into sanitary sewer</li> <li>▪ Identification of the agent <ul style="list-style-type: none"> <li>✓ Field / Fire / Hazmat reports</li> <li>✓ Laboratory testing of excess waste water</li> </ul> </li> <li>▪ Establish procedures for facility clean up and readiness for return to normal operations.</li> </ul>

## VI. Evidence Collection – Recommended Procedure

The following recommended procedures serve as a foundation for hospitals and first responders in order to collect and maintain the chain of evidence. In the event of a suspected or actual criminal event including CBRNE events, a variety of responders, ranging from health care providers to law enforcement and federal authorities, will play a role in the coordinated response. The identification of victims as well as the collection of evidence will be a critical step in these efforts.

- The health care provider's first duty is to the patient; however interoperability with other response agencies is strongly encouraged.
- The performance of evidence collection while providing required patient decontamination, triage and treatment should be reasonable for the situation.
- Information gathered from the victims and first responders may aid in the epidemiological investigation and ongoing surveillance.

It is imperative that individual healthcare providers work with the local law enforcement agencies and prosecutors in the development and customization of these policies.

### Collection of Belongings - Valuables

- Ambulatory and non-ambulatory patients who are able to undress without assistance will be directed to place their valuables (wallets, jewelry, cell phones, etc.) in a clear, pre-labeled, plastic re-sealable bag.
- Direct the person to place a form of picture identification in the bag so that it is visible from the outside.
- Assistive devices such as glasses, canes, hearing aids, etc. and car/house keys should be kept by the patient and decontaminated along with him/her.

### Collection of Belongings - Clothing

- Ambulatory and non-ambulatory patients who are able to undress without assistance will be directed to place their clothing in a pre-labeled plastic bag.
- Place the labeled patient's valuables bag in the clothing bag.
- If the clothing is contaminated with an agent that may pose a risk of secondary contamination, the bag should be placed in a large clear, pre-labeled, plastic re-sealable bag.
- Label the bag with patient identification and event information.
  - ✓ Patient name
  - ✓ DOB
  - ✓ Medical record number
  - ✓ Date and time

- ✓ Valuables list (if known and time allows)
- ✓ Geographical site where contamination occurred. (This information is critical to the epidemiological surveillance of the event and causative agent. Information may include proximity to the release site, location at time of the event, etc.)

#### Other Considerations in Evidence Collection

- If **time and staffing allow**, a picture of the patient taken with an instant developing camera prior to clothing removal should be taken and attached to or inserted into the labeled bag. This will enhance identification of belongings with patients post event. The use of digital cameras is not recommended due to the ability to modify the pictures.
- A hospital security personnel, hospital police officer or city police officer should oversee the collection of clothing and valuables. Efforts should be made to store each bag separately (i.e., not touching each other) in order to maintain the chain of evidence.
- Release of patient belongings and valuables to law enforcement authorities should be according to local law enforcement and hospital policy.

#### Decontamination of Valuables and Belongings

- In the event that law enforcement determines that the patient valuables and belongings are not needed as evidence, the property should be released to the patient upon discharge in accordance with hospital policy.
- The designated decontamination leader will determine the need for decontamination of the clothing and valuables. If valuables and/or belongings are released to law enforcement, it will be their responsibility to decontaminate the articles.

## VII. Glossary / Acronyms

<b>AFRRI</b>	Armed Forces Radiobiology Research Institute
<b>ALAR A</b>	As Low as Reasonably Achievable (used in relation to contaminant level)
<b>APIC</b>	Association for Professionals in Infection Control and Epidemiology
<b>APR</b>	Air Purifying Respirator
<b>ASR</b>	Atmosphere Supplying Respirator
<b>Berm</b>	A long mound of material (dirt, clay, cement, sandbags) used to dam waste water for containment or diversion
<b>CBRNE</b>	Chemical, Biological, Radiological, Nuclear and Explosive
<b>CDC</b>	Centers for Disease Control and Prevention
<b>CPM</b>	Counts per Minute (as related to radiation monitor)
<b>Dike</b>	An embankment to contain water
<b>DOB</b>	Date of Birth
<b>ED</b>	Emergency Department
<b>EMS</b>	Emergency Medical Services
<b>EPA</b>	Environmental Protection Agency
<b>FBI</b>	Federal Bureau of Investigation
<b>GM</b>	Geiger-Muëller – a common type of radiation detection instrument
<b>Hazmat</b>	Hazardous Materials
<b>HAZWOPER</b>	Hazardous Waste Operations and Emergency Response
<b>HVA</b>	Hazard Vulnerability Assessment
<b>MREM</b>	Milli-REM – One ten-thousandth of a REM
<b>MS4</b>	Municipal Separate Storm Sewer System - the storm runoff system within a jurisdiction separate from the water treatment sewer system. The runoff may flow directly to waterways (rivers, ocean, and streams).
<b>NIOSH</b>	National Institute for Occupational Safety and Health
<b>NCRP</b>	National Council on Radiation Protection
<b>OSHA</b>	Occupational Health and Safety Administration
<b>PAPR</b>	Powered Air Purifying Respirator
<b>POTW</b>	Publicly Owned Treatment Works - a wastewater treatment facility that is owned by a state or municipality.
<b>PPE</b>	Personal Protective Equipment
<b>REAC/TS</b>	Radiation Emergency Assistance Center / Training Site
<b>REM</b>	Roentgen Equivalent in Man – a measurement of radiation
<b>SAR</b>	Supplied Air Respirator
<b>SCBA</b>	Self-Contained Breathing Apparatus
<b>TLD</b>	Thermoluminescent Dosimeter - a device used to measure radiation
<b>USCG</b>	United States Coast Guard
<b>USEPA</b>	United States Environmental Protection Agency