



TITLE: CODE ORANGE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

Purpose: To outline staff responsibilities required to effectively:

1. Protect themselves from radiation exposure
2. Stabilize the patient
3. Decontaminate contaminated patients
4. Prevent contamination of the hospital, hospital personnel and inpatients

Definitions:

1. **Ionizing Radiation:** A physical agent that can injure living tissue by the transfer of energy to constituents of the cell, disrupting normal biochemical processes.
 - a. **Alpha Particles:** Larger radioactive particles unable to penetrate skin. Enters body through inhalation (radon), ingestion or open wounds.
 - b. **Beta Particles:** Small particles able to travel several meters and penetrate tissues. May cause burns and necrosis of tissue.
 - c. **Gamma Rays:** Very energetic form of electromagnetic radiation. Is able to travel many meters in the air and easily penetrates human tissue.
 - d. **Neutrons:** Large radioactive particles that can easily penetrate tissue.
2. **Background Radiation:** Small amounts of natural ionizing radiation in the environment (sun, minerals, radon gas).
3. **Rad:** Expression of the amount of energy transferred to matter from an ionizing radiation source.
4. **Rem:** Expression of the biological effect of radiation. 1 rad of gamma radiation produces one rem of biological effect. 5000 mrem is the maximum annual whole body exposure permitted by the Nuclear Regulatory Commission (NRC).
5. **Dosimeter:** Instrument that measures dose of radiation received.
6. **Geiger Counter:** Instrument that measures gamma and beta radiation.
7. **Alphameter:** Instrument that measures alpha radiation.
8. **Gray (Gy):** SI unit of absorbed dose. 1Gy = 100 rads (SI) the international system unit (SI Unit)



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

Supportive Data: A. General Considerations

- Harmful radiation exposure and injury may be caused by:
 - Breaching of a medical sealed source
 - Nuclear weapons
 - Nuclear reactor accident
 - Explosive agent with dispersal device
- It is highly unlikely that radiological contamination poses a significant risk to care providers.
- PPE will not protect first responders or hospital personnel from external gamma and neutron exposure.
- PPE will protect first responders and medical personnel from external alpha particles and all but the most energetic beta particles.
- Use the principles of time, distance, and shielding to reduce your radiation exposure.
- Attention to life and limb-threatening injury should always take priority over decontamination.
- The severity and speed of onset of acute radiation effects depends on the dose; the higher the dose, the sooner the effects appear and the more severe they are.
- Dehydration and radiation burns may require emergent therapy. Other effects such as hematopoietic suppression, GI bleeding, cerebral edema from vascular injury (uniformly fatal) develop over days to weeks. Patients requiring surgery should be scheduled within 48 hrs. of exposure.

B. Symptomatology

Symptomatology Table:

Radiation Exposure	Clinical Injuries/Time to Onset	Medical Problem
≤ 0.35 Gy (35 rad)	Nausea, weakness, and appetite loss within 6° symptoms subside within 12°	Anxiety
0.7 – 1.25 Gy (70-125 rad)	Nausea, vomiting in 5-30%, onset 3-5°, end 24°	Potential delayed traumatic and wound healing minimal clinical effect, death not expected except for opportunistic infection
1.25-3 Gy (125-300 rad)	Mild-moderate nausea and vomiting in 20-70%, onset 2-3°, end 2 days	Significant medical care at 3-5wk for 10-50%, infection, bleeding, fever, wounds/burns geometrically increase morbidity and mortality
~3Gy (300 rad)	50% death untreated in 60 days; children more susceptible	
3-5 Gy (300-500 rad)	Signs and symptoms of lower doses will persist and increase in severity	Diarrhea, anorexia, fluid loss ulceration, dramatic increased probability of death
>5 Gy (500 rad)	Mortality 100% 2-3 wk with no treatment; with treatment and no complications there is a potential to survive 10 Gy (1000 rad)	



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

C. Notification:

1. Notify the Department of Health

Proper notification of the Tennessee Department of Health, Division of Occupational Health and Radiation Control is essential if qualified radiation physicists are to arrive at the hospital in the shortest possible time.

Tennessee Department of Health
Radiological Field Team
Weekdays: 594-5518
Nights, Holidays, Weekends:
TEMA 1-800-262-3300

2. Notify REACTS at Methodist Medical Center. They may be able to assist with services not provided by TDOH.

Disaster Network: 576-3131
After hours, weekends, and holidays: 576-1005 (DOE Office will notify on-call person)

Level of Responsibility:

Triage and Decontamination Team: Emergency Department physician and RN, [RT sets up the tent, 1 ERT and 4 PCA's to assist]

Equipment:

Items for Decontamination Cart:

A. PREPARATION:

- Trash cans & plastic bags
- Plastic wrap
- Paper or plastic sheets for covering floor
- Radiation signs x5 (located in Nuclear Medicine)
- Rope to cordon off area
- Masking tape

B. PPE ITEMS

- Waterproof scrub suit (PPE)
- Rubber gloves
- Hair covers - waterproof
- Waterproof boots
- Water-tight goggles/full face shields*
- Hair clips
- Dosimeters (located in Nuclear Medicine)

C. TRIAGE

- 3 - Geiger counters with alphameters attached (located in Nuclear Medicine)

- Potassium iodide pills - (Pharmacy)
- Waterproof armbands
- Blankets
- Battery operated emergency light
- Waterproof triage tags

D. TREATMENT AREAS

- NG tubes (various sizes)
- Povidone Iodine
- Medical tape
- Scissors
- 4 x 4s
- Sterile transparent dressings
- Kling
- Disposable Sheets - waterproof

E. DECONTAMINATION TENT(S)

- Sealable plastic bags (large and small) to accommodate belongings
- Tags labeled RADIOACTIVE MATERIAL for sealing plastic bags
- Labels for bags
- Shampoo
- Patient Gowns

- Towels
- Blankets
- Portable heat source
- Cotton swabs
- Laminated decon instructions in English and Spanish
- 60 cc syringes
- Drapes
- Irrigating solutions (NS)
- Non allergenic soap
- Bulb syringes
- Dial soap bars
- Sponges
- Water Containment Collection System
- Citric acid
- Hoses with hot and cold water
- Modesty screens
- Megaphones
- Scissors
- Stretchers
- Walkie-talkies
- Specimen collection cups
- Plastic pallets to prevent slippage



TITLE: CODE ORANGE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

TABLE OF CONTENTS

I. Preparation4

II. area contamination control.....5

III. Triage / Decontamination Team.....6

IV. Collection of Belongings9

V. Staff Decontamination.....10

VI. area clean up10

Flowchart for Radiation Disaster13

ESSENTIAL STEPS / KEY POINTS & PRECAUTIONS

I. PREPARATION

- A. Incident Command Center will activate hospital emergency plan as necessary and WaveWare all respiratory therapists for tent set-up if indicated, [see Section I.D.1, "The decontamination tent"](#).
- B. Obtain radiation survey meters and personal dosimeters for staff (located in Nuclear Medicine).
- C. Contact in-house radiation professionals in Nuclear Medicine.
- D. Establish triage and decontamination areas with warm and cold zones.
 - 1. The decontamination tent only needs to be setup in the following instances:
 - a. If the event is undetermined as to a radiological or chemical (i.e. dealing with unknown circumstances).
 - b. It is anticipated there will be massive numbers of patients to decontaminate.
 - 2. An Emergency Department physician and an RN should be in triage to triage victims.
- E. When advised, distribute Potassium Iodide in sufficient quantities for staff and patient use as thyroid uptake prophylaxis.
[\(See attached dosage chart\)](#)
- F. Place a Decontamination Team member or ER staff member at the ambulatory entrance to scan individuals for possible radiation. If radiation is detected, transfer patient to decontamination area.
 - a. Place guard at ambulatory entrance door to maintain security of the area.



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

- G. All non-contaminated patients and non-critical decontaminated patients will enter the Emergency Department through ambulatory entrance or clinic entrance following triage. [See Flow Chart](#)
- H. All non-contaminated critical patients will be taken through Clinic entrance to PICU.
- I. Contaminated, critically ill patients will enter through the Clinch Avenue entrance following triage.
 - 1. The area should be roped off, with "DO NOT ENTER - RADIATION" signs posted. ED staff or Security is responsible for roping off area.
- J. Obtain necessary equipment from the Emergency Department disaster closet.
- K. Close all doors to rooms in entrance hallway in order to decrease spread of contaminated material.
 - 1. Close doors to Consultation Room, Housekeeping Room, closets.

II. AREA CONTAMINATION CONTROL

- A. Establish an area where contamination is allowed.
- B. Minimize contamination of controlled area:
 - 1. Cover floor - equipment
 - a. Cover all floors with paper or plastic sheets, wall to wall, from ambulance entrance to and including decontamination rooms depending on number of expected victims.
 - b. Tape all seams of sheets with masking tape.
 - In Code Able II, the entire ED may be used as victim treatment area and decontamination. The entire ED will be decontaminated following the event.*
 - c. Cover all light switches, cabinets, drawers, etc., that will not be used with paper to minimize contamination.
 - d. Cover with plastic wrap any equipment that will come into contact with contaminated patients.

This includes stretchers, geiger counters and wheelchairs, etc.
 - e. Place 2-3 disposable waterproof sheets if available on exam tables.
 - f. If the entire ER is used, critically ill non-contaminated patients will go directly to PICU for stabilization.
- 2. Provide waste containers.
- 3. Prevent contamination from getting out of this area:
 - a. Restrict entry and exit
 - b. Monitor (scan) all personnel exiting the contaminated area ([See Attachment #1](#))
 - Scan (monitor) all equipment exiting the contaminated area
 - Pay special attention to the wheels of stretchers
 - c. Control ventilation



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

4. Emergency Room Personnel Contamination Control:

a. Protective clothing. All personnel in the Emergency Room will wear protective clothing while caring for the contaminated patient. Protective clothing include:

- Scrub suits with cover gown
- Gloves, plastic/rubber – 2 pairs
- Head covers, caps
- Shoe covers
- Mask (surgeons mask) N-95 if available

III. TRIAGE / DECONTAMINATION TEAM

A. After the Triage / Decontamination Team is activated, meet in Emergency Department.

B. Set up decontamination tent and gather supplies if necessary. [See Preparation section](#)

RT personnel will set-up decontamination tent.

C. Each decontamination team member must obtain a dosimeter. Dosimeter should be read every 30 minutes. At a level of 500 mR/hr, staff must leave the area following their own decontamination. Readings will be recorded each time a decontamination team member is replaced and dosimeter is handed to oncoming team member. Once a team member has reached 500 mR, they will not be allowed back into the contaminated area until released by the Radiation Safety Officer or designee.

D. Don PPE (Personal Protective Equipment).

1. Change into scrub suit if not already in scrubs.
2. Attach dosimeter to scrub suit at the neckline and close to the thyroid gland.
3. Don suit, shoe covers (if tent is set up), full-face shield, and 2 pairs of rubber gloves.
4. First pair of gloves is secured by taping them to sleeves of suit.
5. Second pair of gloves are worn over top of first pair of gloves and changed as needed. A third pair of gloves is optional.

Gloves are changed after touching a contaminated area prior to touching an uncontaminated object or area.

6. Ensure trouser legs are outside of boots.

E. The Decon Team leader will use Geiger Counter to obtain background radiation level in the triage area. [See Attachment #4](#)

F. ALL PATIENTS WILL BE DIRECTED TO THE TRIAGE / DECON AREA IN THE PHYSICIANS PARKING LOT ON CLINCH AVENUE.



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

1. AMBULATORY PATIENTS

a. Primary Triage (Minor or No apparent Injury or Illness)

- 1) Do not separate child from parent if at all possible.
- 2) Use Geiger counter to determine need for decontamination. Scan patient's entire body including the back. Any reading above background level requires the patient to be decontaminated.
 - a) The patients should stand with extremities extended slightly to avoid confusion of the radiation source.
 - b) The probe should be moved 1 inch above the body at a rate of 1 inch per second or less.
 - c) The entire body should be monitored, including the soles of the feet, armpits, groin, and hair.
- 3) If contamination is found, direct the patient (child and/or parent) to the decontamination area.

b. Decontamination Tent

- 1) Identify patient, if possible
 - a) Sign patient in. (Every effort should be made to ensure children are properly identified).
 - b) Tag children with name, parents name
- 2) Begin decontamination process
 - a) Have patient remove clothing as quickly as possible being careful not to contaminate their skin, eyes, or mouth during the removal of clothing.
 - b) Have patient place valuables (wallets, jewelry, cell phones, keys, etc) in a clear, pre-labeled plastic re-sealable bag.

c. Decontaminate patient (child and/or parent)

- Instruct patient to proceed to shower.
 - Have patient shower and shampoo with copious amounts of soap and water, starting at the head and moving to the feet.
 - 1) The pediatric patient will require assistance and emotional support during decontamination.
 - 2) A heat source should be available for the pediatric patient to help prevent hypothermia
 - 3) After patient has completed decontamination shower, have patient dry with clean towel and put on gown provided.
- a) **Re-scan patient** for radioactive material. If present, send patient back to shower again.
 - b) Instruct patient to proceed to designated treatment area by triage category when clear of radiation.

**TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION
PROCEDURE**

2. **NON-AMBULATORY PATIENTS (Stretcher Patients).** Patients with Life or Limb Threatening injuries will be decontaminated in the Emergency Department following stabilization and using procedure for stretcher patients.
- a. **Non-ambulatory Patients (Stretcher Patients).** Patients who are non-ambulatory without Life or Limb Threatening injuries will be surveyed for contamination.
 - b. If patients are not contaminated, transfer patient to the Emergency Department.
 - c. If patient is contaminated, record location of contamination and proceed with decontamination.
 - d. **Decontamination Tent (All other stretcher patients)**
 - 1) **Proceed with decontamination**
 - a) Four people are required per stretcher patient to complete decontamination procedure
 - b) Identify patient (if possible)
 - c) Remove all gross contamination from the patients clothing
 - d) Remove patient clothing.
 - Cut clothing** - around bandages and splints (if any)
 - Remove patient's shirt**
 - Cut from the wrist area of sleeve, up to the armpits and then to neck area
 - Roll chest sections to respective side with inner surface outward
 - Tuck clothing between arm and chest
 - Repeat procedure for other side of shirt.
 - Remove patient's trousers**
 - Cut from cuff along inseam to waist on left leg
 - On right leg cut from the cuff to just below zipper and then go sideways into first cut.
 - Allow trouser halves to drop to the stretcher with contamination away from patient.
 - Tuck trouser halves to sides of body and roll outer sides under between legs
 - Remove shoes**
 - Cut laces
 - Hold heels with one hand
 - Pull shoes/boots downward over the heels with the other hand
 - Pull towards you until removed.
 - Remove undergarments** - including diaper following the same procedure as for clothes. If patient is wearing a brassiere, it is cut between the cups. Both shoulder straps are cut where the attached to the cups and laid back off the shoulder.
 - 2) **Contaminated clothing is placed in a pre-labeled (patient's name, date of birth, medical record number, date and time) plastic bag and sealed.**



**TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION
PROCEDURE**

2. NON-AMBULATORY PATIENTS (Stretcher Patients - continued)

- 3) Survey patient for contamination and record.
- 4) **Eyes:** Remove contact lenses. Irrigate eyes with copious amounts of 0.9% Normal Saline at room temperature for at least 3 minutes; direct stream from nose to temple.
- 5) **Ears:** Rinse and irrigate with water for 3 minutes. Suction from ear canal frequently with bulb syringe.
- 6) **Nose and Mouth:** Turn the head to the side. Rinse with water and suction frequently. Do not allow water to enter the stomach.
- 7) Wash patient including hair with copious amounts of soap and water.
- 8) Irrigate open wounds after transfer to designated ER area. Flush with normal saline for 3 minutes. Monitor patient and repeat irrigation if necessary. Recheck and irrigate with 3% hydrogen peroxide if necessary. Cover wounds with sterile dressing. Surgical debridement may be necessary.
- 9) The pediatric patient will require assistance and emotional support during decontamination.
- 10) Heat sources should be available for the pediatric patient to help prevent hypothermia.
- 11) If patient is intubated, equipment is surveyed for contamination before leaving decontamination area.
- 12) After patient is washed, dress patient in a clean dry gown, provide blanket.
- 13) Rescan patient for radioactive material and wash again if positive. Make sure to scan all equipment, IV bags, drainage bags, etc.
- 14) Transfer to clean stretcher at designated clean area when clear of radioactive materials. Be sure a clean sheet is under patient.
- 15) Transfer to appropriate clinical area. Transfer patient by:
 - Making a clear path.
 - Bringing in a clean gurney.
 - Clean staff members will transfer patient.
 - Survey wheels of gurney at control line.
- 16) Transfer to appropriate clinical area.

IV. COLLECTION OF BELONGINGS

- A. Decontamination Team personnel should oversee the collection of clothing and valuables. Ensuring chain of evidence is maintained
- B. Decontamination of Valuables and Belongings
 1. The designated decontamination leader will determine the need for decontamination of valuables.
 2. In the event that law enforcement determines that the patient valuables and/or belongings are needed as evidence, it becomes the responsibility of the agency taking possession of the articles to implement appropriate steps to decontaminate the articles.



**TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION
PROCEDURE**

3. 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.
- C. Release of patient belongings and valuables to law enforcement authorities should be according to local law enforcement and hospital policy.

V. STAFF DECONTAMINATION

- A. After all patients are decontaminated; the team may then leave the decontamination area.
 1. Team members must perform self-decontamination prior to leaving the decontamination area.
 2. All undressing is to be done inside decontamination area.
 3. Remove outer gloves first, turning them inside out as they are pulled off.
 4. Give dosimeter to Radiation Safety Officer or designee.
 5. Remove all tape at trouser cuffs and sleeves.
 6. Remove outer suit without touching the outside of the suit.
Turn suit inside out during removal. Deposit suit in properly labeled receptacle inside door.
 7. Remove head cover and mask.
 8. Remove one rubber boot. Place foot on clean area.
 9. Remove other rubber boot.
 10. Place boots in properly labeled receptacle.
 11. Remove inner gloves.
 12. Remove clothing and undergarments in same manner as ambulatory patient.
 13. Do total body radiological survey of each team member.

VI. AREA CLEAN UP

- A. All equipment and rooms contaminated with radioactivity will be cleaned under the direction of the State Radiation Health Department.
-

See Attachment 1: Emergency Care Of The Contaminated Patient

See Attachment 2: Radiological and Clinical Laboratory Assessments

See Attachment 3: Radiation Accident With Trauma Or Illness

See Attachment 4: Using a Typical Geiger-Mueller (GM) Counter

See Attachment 5: Procedures for Personnel Monitoring



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

References: *“External Disaster Plan”*, Children’s National Medical Center, May, 2002.
Hospital Emergency Management, Office for Domestic Preparedness, US Department of Justice, April, 2002.
Medical Management of Radiological Casualties Handbook, Military Medical Operations Office, 12/99.
Emergency Management Planning in Healthcare, Joint Commission Resources, 2002.
“Managing Radiation Emergencies”, updated 2/02 – www.orau.gov/reacts
“Radiation Accident Management Guidelines”, www.medconnectwork.com, 2002.
Basic Disaster Life Support. Provider Manual: AMN 2007. Version 2.6.
Radiation Emergency Assistance Center / Training Sites Oak Ridge, TN. Oak Ridge Institute for Science & Education “Handling Radiation Emergencies by Emergency Department Personnel” Reference Manual.

Approved: Acute Care Committee, 2/81
 Safety Committee
 Emergency Preparedness Steering Committee

Distribution: Generic

Attachment: Threshold thyroid radiation exposures and recommended doses of KI for different risk groups.

KI tablets should be issued to individuals exposed to radiation within 4 hours, and no more than 12 hours after the exposure.

(AAP News – Balk and Miller 20 (3): 99)

Category	Predicted thyroid Exposure *rad)	Potassium Iodide dose (mg)	# of 130 mg tablets	ml of 65 mg/ml oral solution
Adults over 40 years*	>500	130	1	2 ml
Adults >18 to 40 years	≥ 10	130	1	2 ml
Pregnant or lactating women	≥ 5	130	1	2 ml
Adolescent >12 to 18 years**	≥ 5	65	½	1 ml
Children >3 to 12 years	≥ 5	65	½	1 ml of 65 mg/ml oral solution
Children > 1 month to 3 years***	≥ 5	32	¼	0.5 ml of 65 mg/ml oral solution
Birth to 1 month	≥ 5	16	⅛	0.25 ml of 65 mg/ml oral solution



**TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION
PROCEDURE**

* For adults >40 years, KI is given at high exposure levels. Older adults are more likely to suffer side effects of potassium and less likely to profit from cancer preventive effects.

** Adolescents approaching adult size (≥ 70 kg) should receive the adult dose (130 mg)

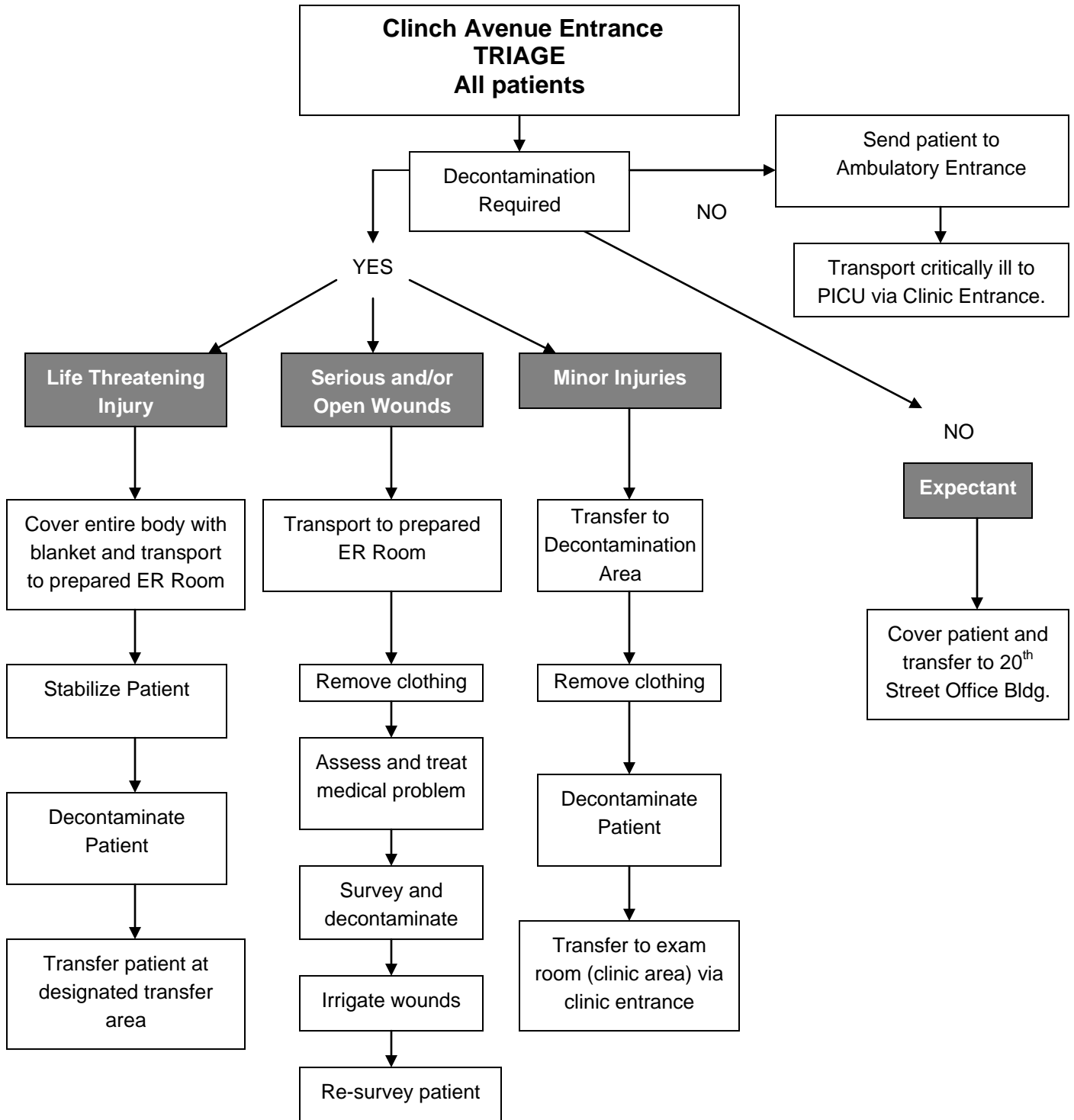
*** For infants, KI from tablets or as a fresh saturated KI solution may be diluted in milk, formula or water and given in an appropriate volume.

Source: www.fda.gov/cder/guidance/index.htm



TITLE: RADIATION DISASTER: TRIAGE & DECONTAMINATION PROCEDURE

Flowchart for Radiation Disaster



* See Radiation Accident with Trauma or Illness Attachment for more detail.