PROCEDURES FOR
ADMISSION AND MANAGEMENT OF
RADIOACTIVELY CONTAMINATED PATIENTS
AT
BERNALILLO COUNTY MEDICAL CENTER
AND
CANCER RESEARCH AND TREATMENT CENTER
THE UNIVERSITY OF NEW MEXICO
ALBUQUERQUE, NEW MEXICO

AUGUST 1979

REVIEWED DECEMBER 1981

DECONTAMINATION AND TREATMENT

OF

THE RADIOACTIVELY CONTAMINATED PATIENT

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ATTACHMENTS

SECTION 1

INTRODUCTION AND GENERAL GUIDELINES

FOR

ADMISSION AND MANAGEMENT OF RADIOACTIVELY CONTAMINATED PATIENTS

1.0 BACKGROUND

In 1979, the Bernalillo County Medical Center and the Cancer Research and Treatment Center of The University of New Mexico established a formal protocol for the admission and management of radiation casualties and designated a controlled area within the Cancer Research and Treatment Center (CRTC) for the reception, decontamination and emergency treatment of such patients. This action was taken in recognition of the expanding use of nuclear materials in industry, medicine and research in the New Mexico area. Though the incidence of serious radiation accidents was expected to remain low, it was believed that prudent planning for a centralized Radiation Medicine Center would preclude the uneconomical proliferation of costly facilities in smaller hospitals throughout the area. The University of New Mexico has already established a Radiation Control Committee to establish policy and procedures for the admission and management of radiation casualties. This document expresses these policies and specifies the required procedures.

1.1 Purpose

This manual is designed to give both general and specific instructions for the provision of effective care to victims of accidents involving radiation, for protection of patient and hospital staff from injury by radioisotopes, and for prevention of contamination of other hospital areas by the radioactive patient.

1.2.0 COMPOSITION AND RESPONSIBILITIES OF THE RADIATION EMERGENCY COORDINATING COMMITTEE

1.2.1 Composition

1.2.1.1 Chairman: R.D. Moseley, Jr., M.D.

1.2.1.2 Members: as elected or appointed

1.2.2 Responsibilities: See University of New Mexico Policy Manual.

1.2.2.1 Policy and Procedures - Written statements of policy and procedures for the admission and management of radiation casualties at Bernalillo County Medical Center (BCMC) and the CRTC shall be prepared, distributed to involved individuals, tested periodically and reviewed annually.

1.2.2.2 Meetings -

The Committee will meet at the call of the Chairman. The Committee will consider such matters as affect the institution's preparedness to admit and treat radiation casualties, including availability of trained specialists, status of supplies and equipment and status of training.

1.2.2.3 Availability and Response -

The Committee shall assure that a trained staff is available at all times to respond to authorized requests for consultation relating to, or for treatment of, radiation casualties.

1.3.0 Consultation or Treatment

1.3.1 General

Requirements for consultation or treatment of radiation casualties may arise from cases presented by staff members of BCMC-CRTC, non-staff physicians, unannounced arrival of radiation casualties (emergency cases), inquiries or requests for assistance from non-medical persons, and industries and institutions who may in the future have formal agreements for radiation support. It is expected that if cases are presented from the last category, the industry or institution will furnish the hospital with a current list of its affiliated plants and health physics personnel.

1.3.2. Cases Presented by Staff Members of BCMC-CRTC or Non-Staff Physicians

Staff members or physicians from the community having patients involved in radiation accidents will be referred to the Chairman, Radiation Control Committee (RCC). The Chairman, in consultation with RCC, will advise the physician in accordance with the procedures of this document.

1.3.3 Unannounced Arrival of Radiation Casualties at the Emergency Room

Personnel on duty at the Emergency Room shall act in accordance with the instructions contained in a memorandum is included in this document (Section2). A copy is also on file in the Emergency Room.

1.3.4 Inquiries or Requests for Assistance from Non-Medical Persons

Such inquiries or requests shall be directed to the Chairman or the Radiation Protection Officer by either the telephone operator or the staff member receiving the inquiry or request. The telephone operators are in possession of the memorandum, entitled, "Procedures for Radiation Injury", that contains explicit instructions concerning this matter. A copy of these instructions is included in this document (Section 2).

1.3.5 Referrals from Associated Industries and Institutions

By prior agreement with BCMC-CRTC, employees of certain industrial firms and institutions may be transferred from "local supporting hospitals" to BCMC-CRTC

or treatment of radiation injuries. It is anticipated that such transfers will result from deliberations between the local hospital staff, the firm or institution director, and the BCMC-CRTC staff.

It is also anticipated that any patient transferred from a local hospital will have been decontaminated, as much as possible. Accordingly, patients in this category, although victims of radiation accidents, may not require admission through the Radiation Emergency Area of CRTC.

1.4.0 HOSPITAL ADMISSIONS (see also Section 4)

Every reasonable effort will be made to admit patients who present a radiation or contamination hazard through the Radiation Emergency Area (REA) (Room 1303) in the CRTC. Since the REA can be set up and staffed for admission of radiation casualties at short notice, advance notification of requirements for these facilities should be made. As used in this document, a radiation or contamination hazard will be assumed to exist if the radiation level emanating from a radiation casualty or his apparel is detectable (i.e., twice background) with a portable beta-gamma G.M. survey meter.

1.4.1 Preparation of Radiosurgery Decontamination Suite

Upon notification of intent to admit a radiation casualty, BCMC shall assume the responsibility of supervising the preparation of the Radiosurgery Decontamination Suite in the operating room (1303) of the CRTC. This

preparation will be accomplished in accord with the procedure presented in Section 5.

1.5.0 RADIATION PROTECTION AND MONITORING OF ATTENDENTS

Section 6 of this document presents specific operational procedures for personnel working in and supporting activities in the Decontamination Suite.

1.6.0 TELEPHONE DIRECTORY OF ESSENTIAL PERSONNEL

A directory of essential personnel is included in this document as Section 3. It shall be the responsibility of the RCC secretary that this directory be kept current.

1.7.0 AUDIT OF REA SUPPLIES AND EQUIPMENT

The UNM Radiation Safety Officer shall conduct an audit of the supplies and equipment maintained for use in the REA. The audit shall be conducted semi-annually and following any actual use. Records of the findings of these audits shall be maintained. Findings that adversely affect the state-of-readiness of this procedure shall be corrected immediately. Significant deficiencies that cannot be corrected immediately shall be brought to the immediate attention of the Chairman, RCC. An inventory of supplies maintained for use in the REA is shown in Section 7 of this manual.

1.8.0 PUBLIC RELATIONS

Radiation accidents are a rare and noteworthy event. Consequently, they will draw considerable public attention. To avoid unnecessary alarm,misinterpretation and misunder-

standing, it is imperative that correct and concise information be given. All requests for information concerning the patient and the accident should be directed to BCMC, Public Relations Office, who will contact the following:

(1) Chairman, RCC

(2) Primary Care Physician

(3) Director, BCMC

(4) Medical Director of Company involved

The information on the radiation accident should be channeled by the Chairman, RCC, through the BCMC Public Relations Office as the central source for news dissemination to the media.

1.9.0 AMENDMENTS AND REVISIONS

The secretary, RCC, will submit recommendations for amendments and/or revision of this document to RCC in the course of evaluations made during implementation of its provisions, or as a result of his review of the document. The secretary shall conduct an annual review of the document and report his/her findings to RCC during its first meeting of each calendar year. The secretary shall issue copies of approved amendments and revisions to individuals or departments identified in paragraph 1.10.0.

1.10.0 DISTRIBUTION

Copies of this document and all subsequently published amendments and revisions shall be distributed by the

secretary as shown below:

Radiology (6 copies)

Internal Medicine (Hematology)

Surgery

CRTC Nursing Service (2 copies)

BCMC Nursing Service (3 copies)

Director's Office, BCMC

Director's Office, CRTC

RCC Members (1 copy each)

Diagnostic Imaging, CRTC

Emergency Room

Radiation Safety Office, UNM (3 copies)

Telephone Switchboard Office

Public Relations Office

SECTION 2

ADMISSION, CARE AND TREATMENT OF RADIATION ACCIDENT PATIENTS

2.0 GENERAL

This memorandum is composed of two parts. Part 1 provides administrative guidance on the admission of radiation accident patients. Part 2 provides guidance on emergency treatment of such patients. Radiation safety for BCMC-CRTC personnel is a responsibility of the Radiation Protection Officer.

PART 1

2.1.0 Admission

Guidance is provided for the unannounced arrival of accident patients under two circumstances: (A) Emergency Room personnel become aware of the patient's status as a "radiation accident patient" before the patient has been removed from the ambulance; and (B) the patient has been brought into the Emergency Room before his status as a "radiation accident patient" has been determined.

(A) Patient Still in Ambulance

If minimum medical attention is required, treat patient in the ambulance as adequately as possible, while radiation area is being set up. Call the Nuclear Medicine staff on call to assess the level of radiation contamination. Instruct driver, attendants and Emergency Room personnel who have been in contact with the patient to stay in the vicinity of the ambulance (but not inside the ambulance).

Have security clear an area of about 8 feet around ambulance and keep unnecessary personnel and vehicles away.

Attend to patient's emergency medical condition as required. Use surgical gloves and mask. If immediate life saving measures are not necessary, observe patient from a distance until the radiation level is ascertained. All equipment and supplies used to attend the patient MUST stay in the vicinity of the ambulance. DO NOT carry anything back to the Emergency Room.

If medical condition of patient is such that he must be removed from ambulance:

- Admit patient to the Radiosurgery Decontamination Suite (1303) of CRTC. Keys are in the possession of the head nurse of the Emergency Room and the UNM Security Office.
- Evacuate the operating room of CRTC (1303) before bringing patient in.
- Instruct driver to stay with ambulance until a radiation survey has been made.
- Bring necessary equipment and supplies to treat patient from Emergency Room to the CRTC operating room. ALL equipment, supplies and personnel entering operating room MUST stay there until arrival of radiation monitoring personnel. Establish a guard at the door. Pass Emergency Room supplies and equipment into area but DO NOT allow

personnel and equipment to come out.

- Personnel attending patient in area should stand next to patient only as long as necessary to perform lifesaving measures. At all other times, stand about 5-8 feet back and observe patient.

(B) Radiation Status Discovered After Admission (i.e., on obtaining patient's history)

Immediately secure and label the entire area through which the patient has passed and in which he is located. Keep all personnel and equipment in the area. DO NOT allow anyone or anything to leave. Establish a control point through which necessary personnel and equipment pass into restricted area.

Attend to patient's emergency medical condition as required. Use surgical gloves, mask and gown when treating patient. If immediate measures are not necessary observe the patient from a distance of 5-8 feet.

If possible, ascertain the means by which the patient was transported to the BCMC-CRTC and inform the Radiation Safety Officer.

Reviewed: December 1980

PART 2

2.2.0 Emergency Treatment of Radiation Accidents

2.2.1 General

Emergency treatment of radiation accident may have to be given before contact with or arrival of specialists having expertise in evaluation and management of these accidents. In this case, the management of the patient should take place in the following order:

- Resuscitation and Stabilization - Including basic life support and CPR as necessary.
- Initial Decontamination (if not previously done).
- Evaluation of Radiation Status.
- Initial treatment of Radiation Injury.

2.2.2 Resuscitation and Stabilization

Since radiation injury is not immediately life-threatening, primary attention should always be directed to traumatic life-threatening injuries -- maintenance of airway and breathing, arrest bleeding, treatment of shock, etc.

Decontamination

Concomitantly with the procedure above, or as soon as possible, the patient should be decontaminated. In the initial decontamination:

- Survey with a G-M tube and note levels of contamination on the radiation status sheets at the end of Section 8.

- Remove all clothing.
- Remove obvious dirt and debris - bathe if necessary, while protecting wounds.
- Flush wounds with copious amounts of sterile water and/or saline.
- Flush orifices with water or saline. Do not allow patient to swallow.

2.2.3 Evaluation of Radiation Exposure Status

History:

- When did accident occur?
- Source of accident?
- Type of radioactive isotopes involved?
- How long was patient in accident environment?

Dose Evaluation:

This will require the assistance of persons knowledgeable in radiation. This assistance can be by someone on location or by telephone. In any case, gather as much of the following information as possible:

- Level of radiation in accident environment.
- Surface and air contamination in accident environment.
- Level of radiation on patient's or other's dosimeters.
- Level of residual contamination (Beta, Gamma) on patient using open window G-M tube (mark areas on anatomical diagrams)
- Calculation of dose to the patient and to attendants

Clinical Picture:

A good estimation of the severity of the patient's radiation exposure can be obtained by observing the following clinical symptoms and signs:

- Nausea and vomiting: >100 rem (whole body)
  Beginning within 2 hours: >400 rem (WB)
  Beginning within 4 hours: <200 rem (WB)
- Skin - Erythema: >300 rem
- Diarrhea: >400 rem to abdomen
- CNS symptoms (only reliable in the absence of cerebral trauma): >1000 rem
- Lymphocyte count within 48 hours:
  >1200/mm^3 : good prognosis
  300/1200mm^3 : guarded prognosis
  <300/mm^3 : poor prognosis

2.2.4 Initial Treatment of Radiation Injury

- Detailed Decontamination - It is particularly important at this stage to remove high level contamination caused by penetrating missiles or splinters and wounds.
- Overexposure - Since overexposure to radiat
  results in a slowly unfolding course o
  of time, there is little in the wa
  treatment in the initial stage
  Treatment is symptomatic a
  patient confortable and a
  may require an emetics, flu
  analgesics.

- Internal Contamination - Except in a few specific instances, there is also little to offer in the way of specific treatment in the initial stages. Generally, specific treatment to eliminate any absorbed radioactivity requires rather detailed and complex analysis, including whole body counting, and measurements performed on serum, red cells, urine, feces and expired gas. If it has been determined that an appreciable amount of radioactivity has been ingested (which is seldom the case) a stomach lavage, emetics ($ZnSO_4$) or cathartics (10% $MgSO_4$) may be indicated.

- Suggested permissible levels of attendant exposure in the course of treating a patient are:

  to 5 rem - routine treatment and decontamination
  to 25 rem - emergency treatment and decontamination
  to 100 rem - life-saving treatment and decontamination

To estimate attendant exposure, pass the probe of the dose rate meter 6" above the patient. If the reading is 5R/hour, and estimate of attendant exposure would be 5R if treatment without a shield should take one hour. With a shield, the dose will be reduced by 80%.

Experience shows it is extremely unlikely that an accident would be so severe that an attendant would receive an exposure of over 5R. In high radiation fields, personnel should be rotated

in order to minimize the exposure to any single individual. It is also suggested that anticipated exposures over 5R should be on a voluntary basis.

If it has been determined that the patient absorbed considerable amount of:

Tritium (3_H) - force fluids

Iodine (^{131}I) - give Lugol's Solution (8 drops in glass of water = 100mg)

- inject 250mg of potassium perchlorate intraven ously

2.3.0 Principles of Radiation Protection

Certain precautions to minimize exposure to attendants are necessary when dealing with a patient who has external contamination, specifically:

- Always wear surgical scrub suits, masks, caps, and gloves.
- Use the shielding if available in unknown or high levels of patient contamination (greater than 5R/hour gamma radiation at one foot) when treating the patient.
- As few attendants as necessary should be in the same room with patient.
- Only in the performance of emergency treatment and initial decontamination should attendants be next to patients. At all other times, e.g., while evaluating the situation, attendants

should stand at least 5-8 feet from the patient and observe from a distance..

- Rope off and control the area in which the patient is being treated.

ALL persons, equipment and supplies that enter this area MUST stay there until Radiation Emergency Teams arrive to assist in the monitoring and decontamination of people and equipment.

2.4.0 Initial Bioassay Samples

When a patient has suffered internal contamination, or when it is suspected, each of the following bioassay samples should be obtained as soon as possible and labelled with name, date, time and type of specimen. Avoid cross-contamination of samples from external sources of contamination.

2.4.1 PBBH Laboratory

Blood:

- 10cc for bioassay of radioactive isotopes (1 red top, 2 lavender top tubes)
- 5cc (Heparinized) for chromosomes (keep samples chilled in a glass of ice) (1 green top tube)
- 10cc for hemogram - complete CBC with differential (1 lavender top tube)
- Chemistries - SMAC (1 red top tube)

2.4.2 Other Laboratory Analysis

Using the kit provided, samples of the following will be sent to other laboratories (Los Alamos, etc.)

- Urine - first urine - instruct patient initially to

void when he is medically able. Save this and every subsequent voiding.

- All urine - Label with time, date, and patient name. DO NOT discard any urine.

- Feces - first 4 days - Every sample should be collected and refrigerated after being marked with name, date, and time of collection.
- Sputum
- Vomitus
- Tissue (note location)
- Irrigation fluids
- Filter paper or cotton smears of orifices, wounds, skin areas (note location)

All samples with the exception of routine hematology and blood chemistry will be picked up by Radiology

(See Page 2.1.2

ADMISSION PROCEDURES FOR

RADIATION INJURY

1. Treat traumatic injury (resuscitate and stabilize)

2. Ascertain whether the patient is contaminated:

   a) Call the hospital radiation safety office - UNM ext. or BCMC ext. in Nuclear Medicine and state the situation, asking for assistance.

   b) If the radiation safety officer is not available, call the Radiology Staff on call. Utilize the count rate meter in the health physics emergency locker, located in the CRTC operating room entrance area.

      Follow the procedure below:

      Turn meter to "batt" position; the indicator should move to the "batt" position on the scale. If it does proceed to the next step (if not, plug it into a 110v outlet) move the dial to the XI position. Wait until the meter has time to react, then utilize the probe attached. Pass it over the patient, assuring that you do not touch body. If you get a marked increase in the number of clicks, you must assume the patient is contaminated.

   c) If in doubt...admit patient to the radiosurgery decontamination suite in the CRTC.

3. If contaminated, decontaminate in the radiosurgery decontamination suite of the CRTC.

4. Call for assistance:

Day: Nuclear Medicine

Night: Nuclear Medicine Page

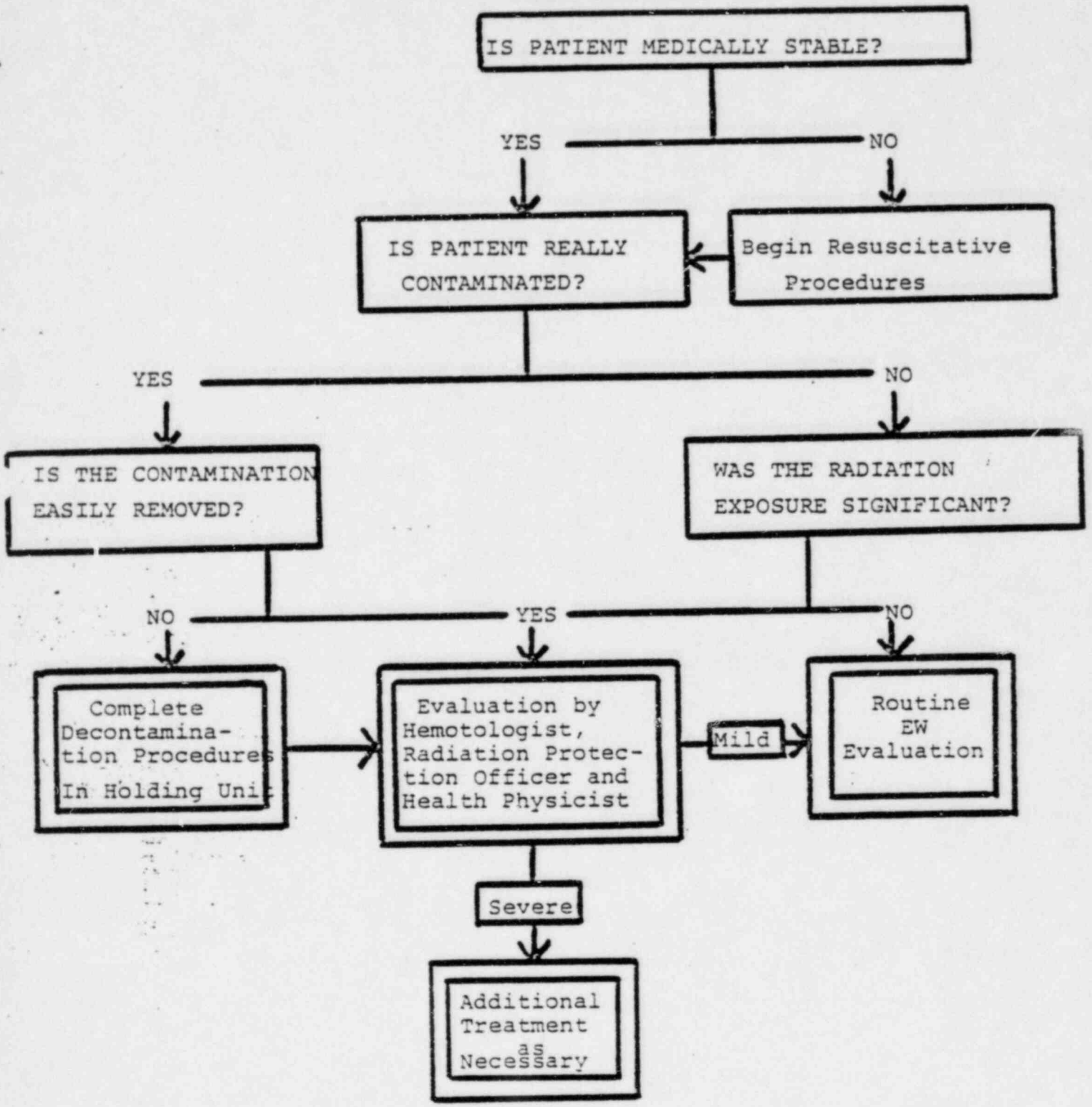
Radiation Safety Office: Day:

BCMC Security Office:

UNM Security Office:

BCMC Emergency Room:

FLOW CHART FOR RADIATION INJURIES



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SECTION 3

TELEPHONE NUMBERS OF ESSENTIAL PERSONNEL

	OFFICE	HOME
1. UNM and CRTC Administration		
(area code		
BCMC Director, Dr. Pitcher		
CRTC Director, Dr. Tomasi		
2. Radiology Department		
Dr. Moseley		
Dr. Christie		
Dr. Mettler		
Dr. Kelsey		
3. Nursing Service		
a) Supervisor		
b) Emergency Room Charge Nurse		
4. Radiation Emergency On-Call Roster - BCMC		
(In Order of Listing Until Response is Obtained)		
a) Radiology Staff on call - BCMC page		
b) On call Nuclear Medicine - BCMC page		
c) Radiation Protection Officer		
Mr. William Tabor		
5. Security Department, BCMC		

UNM

(continued)

6. Department of Surgery

Emergency Room Resident on call

7. Department of Medicine (Hematology)

Hematologist on call BCMC Operator

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SECTION 4

ADMISSION OF RADIATION ACCIDENT PATIENTS

STAGES IN RADIATION CASUALTY MANAGEMENT

1. Area Preparation
2. Report of Accident
3. Medical Stability Defined
4. General Decontamination
5. Initial Cleanup
6. Wound Decontamination
7. Detailed Cleanup
8. Patient Transfer
9. Exit of Patient
10. Area and Personnel Cleanup

SECTION 4

OPERATIONAL PHASES OF RADIATION ACCIDENT CASUALTY CARE

4.1 Unannounced Admissions

The procedure to be followed in the event that a victim of a radiation accident arrives unannounced at the Emergency Ward is presented in Section 2.

4.2 Announced Arrival of Radiation Casualties

The Chief of the Radiation Emergency Team (Team Chief) is responsible for the general guidance as to the proper management of the accident cases, including transportation of these cases to BCMC-CRTC.

Further action involving BCMC-CRTC will take place in five phases: the alert phase, the notification phase, the arrival phase, the clean-up phase, and definitive care phase.

4.2.1. The Alert Phase

- As soon as possible, the Team Chief will alert the PBBH Emergency Ward Head Nurse of the possible referral of (a) patient(s), indicating the most probable arrival time and the nature and extent of the patient's injuries and condition.

- The Team Chief will then alert the BCMC switchboard personnel, who will in turn alert other involved members of BCMC-CRTC.

Responsibilities of Alerted Personnel

- Surgery: assure availability of an anesthesiologist and other surgeons.
- Administration: alert UNM and BCMC Security.
- Nursing: stand by ready to set up the Holding Unit. Assure availability of nursing personnel. Assure earmarked equipment is ready and available. In the event that the Alert is cancelled, notify personnel identified on the Notification Personnel List.

4.2.2 Notification Phase

- As soon as it has been decided that (a) patient(s) will be referred to BCMC-CRTC for observation or treatment, notification will be given by the Team Chief to the Emergency Ward Head Nurse.
- This notification shall contain the following information:

  Number and names of patients
  Estimated time of arrival
  Condition of patient(s)
  Description of injuries
  Degree and type of contamination
  Special needs for equipment and/or personnel

Responsibilities of Notified Personnel

Emergency Ward Personnel

- Supervise and assist in the setting up of the Radiosurgery Decontamination Suite in the CRTC, to include transfer of patients.
- Brief assembled staff on safety procedures to be followed in the operational management of the patient.

- Assure that required equipment is ready for use.

Administration

- Assure that Security Department is instructed to perform the following duties:
  - Clear vehicle access to the CRTC.
  - Post guards at Emergency Entrance and CRTC-BCMC corridor.
  - Clear access route to CRTC Room 1303 of unauthorized personnel.
  - Alert Public Relations, Housekeeping, and such other departments as may become involved.

Radiation Safety Office/Nuclear Medicine

- Check all dosimeters and monitoring equipment.
- Prepare for contaminated sample collections.

4.2.3. Arrival Phase

BCMC and UNM Security will proceed as follows:

- Direct ambulance to BCMC-CRTC common corridor entrance.
- Secure area around ambulance.
- Hold ambulance until cleared by the Radiation Safety Officer.

The emergency room physician in charge, the Radiation Protection Officer, Radiology staff on call, will meet the ambulance at the CRTC. The Radiation Safety Officer or Radiologist will evaluate the radiation and contamination status of the patient, ambulance personnel and the ambulance. They will consult with the Radiation Protection Officer to advise on radiation safety precautions to be

followed. The emergency ward physician will ascertain the medical status of the patient.

- The patient will then be brought into the CRTC, Room 1303.
- Ambulance attendants and litter bearers will meet beside the ambulance where the radiologist and/or health physicist will monitor them and instruct them regarding their personal decontamination. When they have completed decontamination, they will be rechecked by monitoring and permitted to leave the CRTC.
- Only persons and equipment necessary for patient care and treatment will be permitted in the Radiation Emergency Area (REA).
- After the arrival of the contaminated patient, all persons or items leaving the CRTC will be monitored for radioactive contamination at the central point. Persons or items found to be contaminated will be decontaminated before leaving the CRTC.
- Should there be a number of patients, the customary mass casualty triage system will be used.

4.2.4 Clean-up Phase

- After the patient has been moved from the CRTC Radiation Emergency Area to the main hospital, attending personnel will proceed with removal of protective apparel, personnel monitoring and decontamination in accordance with procedures given in Section 6.
- Radiation Safety Office will provide decontamination instructions and will monitor attending personnel.
- Radiation Safety Office will decontaminate equipment

and all facilities and will collect and dispose of non-salvageable items.

- As soon as convenient following clean-up activities, all personnel who were involved in the care or treatment of the patient will attend a post-accident conference convened by the Chairman of the RCC or the Radiation Protection Officer. The conference will cover such subjects as follows:

  Medical review of the event.
  Operational review of the event.
  Exposures for bioassay of attendant personnel.
  Requirement for bioassay of attendant personnel.
  Recommendation for future handling of radiation casualties.

- Following the post-accident conference, Radiation Safety will submit a complete report of events to RCC, to concerned regulatory authorities, and to the Medical Director or Consultant of the company responsible for the accident.

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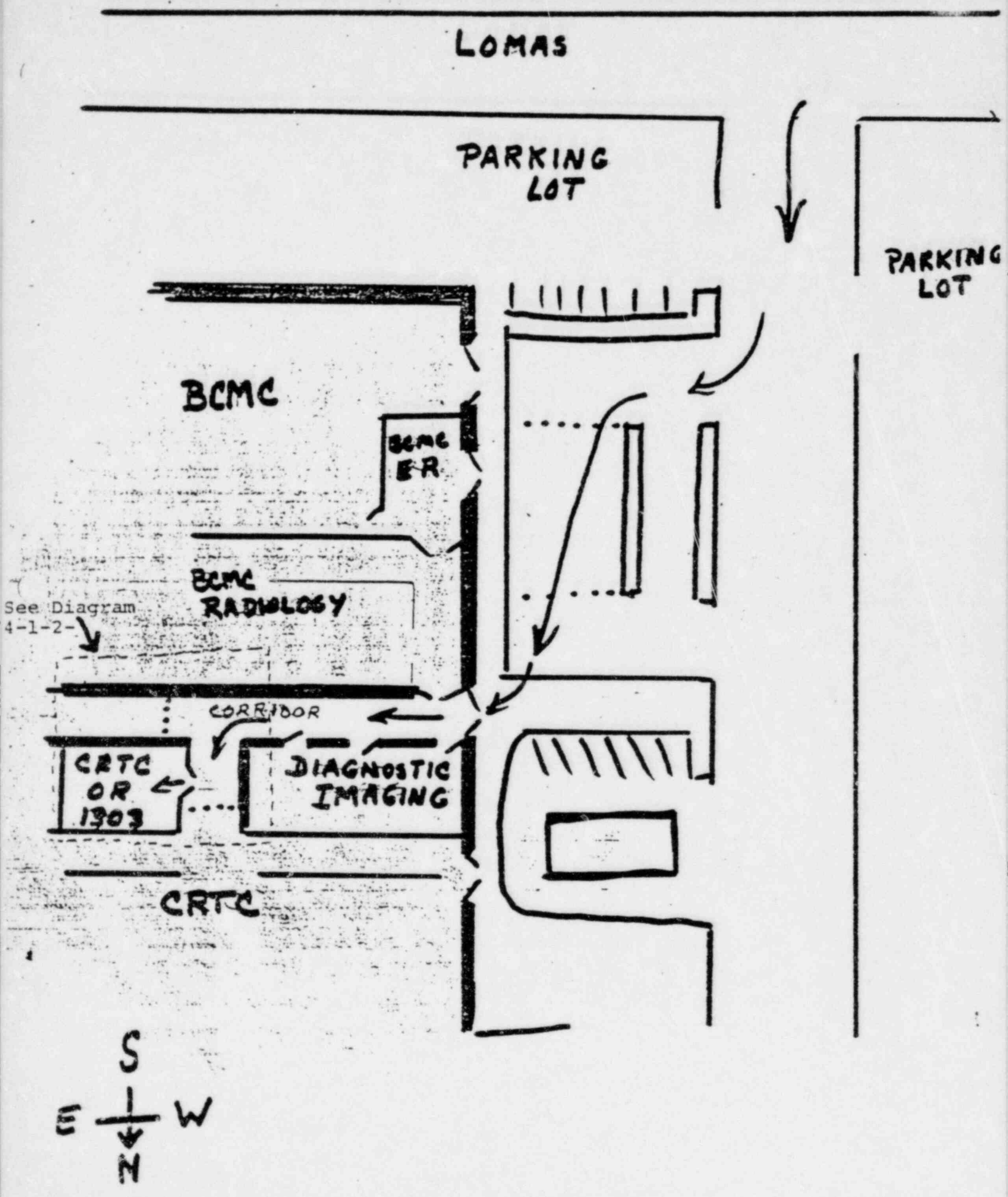
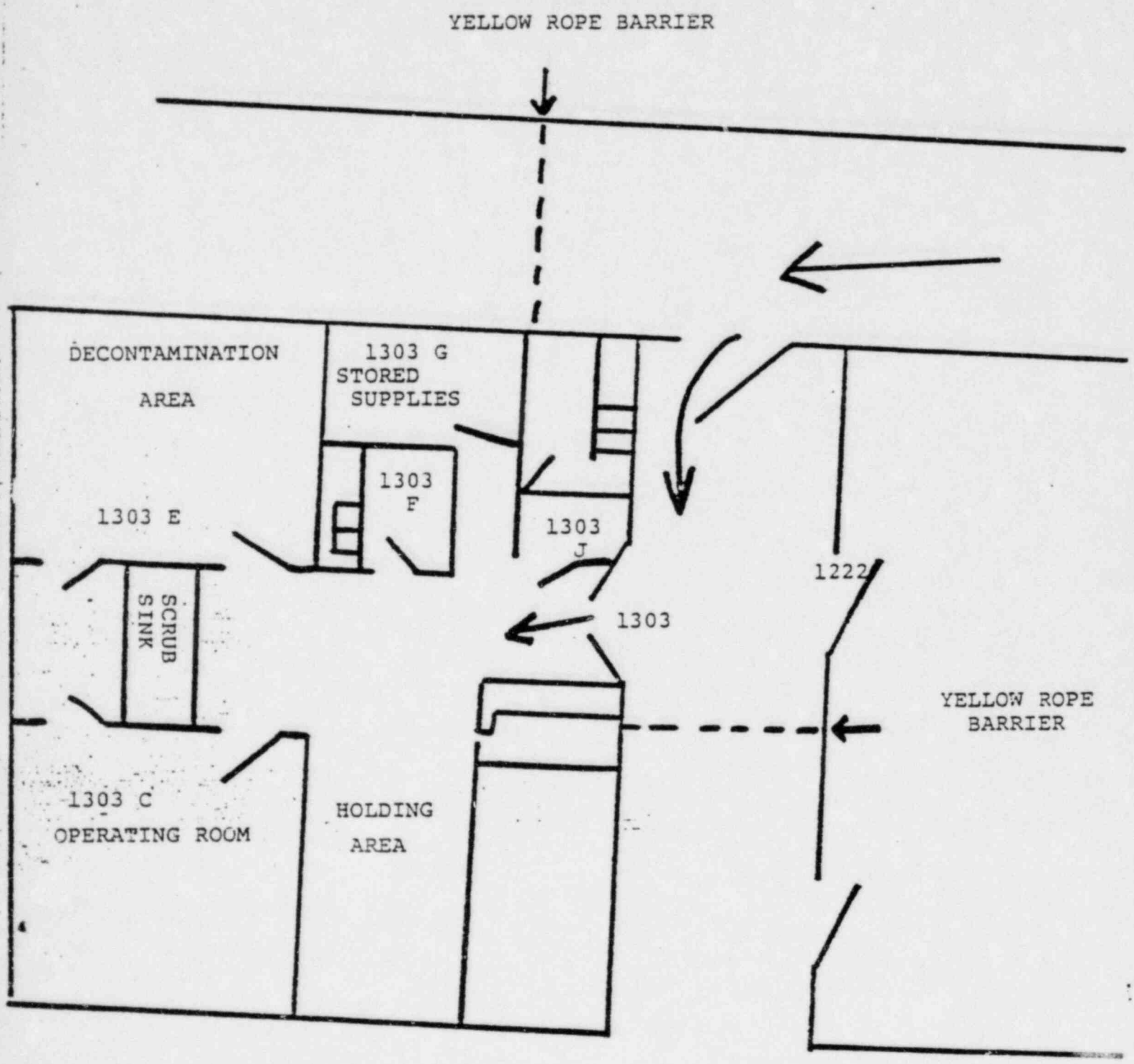

LOMAS
PARKING LOT
PARKING LOT
BCMC
BCMC ER
BCMC RADIOLOGY
See Diagram 4-1-2-
CORRIDOR
CRTC OR 1303
DIAGNOSTIC IMAGING
CRTC
S
E
W
N



Reviewed: December 1981

DIAGRAM 4-2

SECTION 5

PREPARATION OF THE RADIATION EMERGENCY AREA

5.1 Purpose

To outline procedures for preparing to receive a radiation casualty into the CRTC Operating Room of the University of New Mexico.

5.2 Definitions

5.2.1 Radiosurgery Decontamination Suite - Room 1303

The area by the scrub sinks (see Diagram 4.2) will be used for decontamination and initial treatment of patients exposed to accidents involving radioisotopes.

5.2.2 Radiation Emergency Area

This designation is given to the Radiosurgery Decontamination Suite, the adjacent floor passage areas and storage shelves (the Buffer Zone), and the utility rooms. During reception and care of a radiation casualty, the Radiation Emergency Area is identified by radiation tape and is off limits to personnel without dosimeters.

5.3 Procedures

5.3.1 A verbal communication, from either the contamination site or the Radiation Protection Officer, will be received by the Emergency Ward Charge Nurse stating that the hospital will be receiving a radiation casualty, with information stating the condition of the patient, estimated time of arrival and nature of exposure.

5.3.2 The charge nurse who received the communication in the Emergency Ward will complete appropriate notifications (see Section 3, Telephone numbers of essential personnel). At this time, hospital security will be directed to cordon off the parking lot receiving site and to control patient, employee and spectator traffic.

5.3.3 The disaster supply closet will be opened by Radiology and appropriate supplies transferred to the Decontamination Suite (see Section 7, Supply Inventory).

5.3.4 A regulation stretcher positioned lengthwise in the decontamination suite to accommodate the decontamination tub. A large round plastic radioisotope disposal barrel will be positioned just underneath the tub drain.

5.3.5 The hose showerhead will be attached and tested by the charge nurse to ensure its functional status.

5.3.6 The Buffer Zone, the area immediately outside the Decontamination Suite will be identified with special radiation tape provided for this purpose. A nuclear medicine technologist or a physicist will be positioned outside the Buffer Zone to assist active participants of the Decontamination and/or treatment procedures with appropriate coverings and equipment (ring dosimeters, caps, masks, double sterile gowns, and gloves, foot coverings and plastic aprons), with monitoring and packaging of samples and waste, with communications, record keeping and the logistic support.

5.4 Radiation Casualty Treatment Team

Personnel required during a radiation decontamination are as follows (see Figure 5.4):

(1) Surgeon and Nurse A to treat and clean the patient directly within the Decontamination Suite.

(2) Nuclear Medicine Technologist or physicist A to measure radiation levels during decontamination of the patient.

(3) The Radiation Protection Officer or physicist to oversee the progress of decontamination, interpret radiation level measurements and to handle patient blood, fluid, and exudate samples.

(4) Two Nurses, B and C, gowned and positioned within the Buffer Zone, to assist the surgeon and Nurse A, as needed.

5.5 Cleanup Procedures

When the decontamination patient has been transferred from the Radiation Emergency Area, cleanup procedures will be supervised by the Radiation Protection Officer. Housekeeping with the assistance of nuclear medicine technologists, will safely package all radioactive waste and wash materials in fiber barrels lined with polyethylene. A through washdown of the area will ensue, and normal useage will be resumed when approved by the Radiation Protection Officer.

SECTION 6

USE OF PROTECTIVE CLOTHING AND DOSIMETERS

6.1 To prevent personnel from becoming contaminated with radioactive material, protective clothing will be issued in the CRTC operating room (Rm. 1303).

6.2 Standard protective clothing is available:

Standard protective clothing. Essentially consisting of the same items normally used by surgeons in the operating room, i.e., a scrub suit, surgical gown, latex gloves, and a surgical mask and cap, augmented by shoe covers and a vinyl apron; to be worn by males and females.

6.3 Conditions requiring protective clothing

(1) All work past the Buffer Zone boundary requires protective clothing, independent of the degree of contamination present on the patient or his clothing. Standard protective clothing will suffice in all cases where gross decontamination has been performed (i.e., where very little "loose" contamination is present) or where the contamination is confined to a relatively small area.

(2) For complete protection, taping of full protective clothing around the hood, and at the wrists and ankles may be required. For this purpose, 3-inch wide gray tape is available.

6.4 Removing contaminated protective clothing

(1) Upon completion of their activities in the contamination and treatment room, personnel will proceed to the rope between the contaminated area and the Buffer Zone (see Diagram 4.1), take off the outer layer of the protective clothing and deposit garments in a plastic laundry bag, in the following order:

a) remove tape and hood, if any;

b) remove apron and gown, or coveralls, turning them inside out;

c) remove shoe covers, one at a time, stepping out of the contaminated area - over the rope - with the uncovered shoe;

d) remove gloves, mask, and cap.

(2) After removal of the outer layer, personnel proceed to the Control Point (without crossing the rope between the Buffer Zone and the uncontrolled hospital area) to have their dosimeters removed and to be monitored for any contamination.

6.5 Clearance procedures

(1) In case no contamination is found, personnel may proceed to the change area and put on their normal clothing. After a final check at the Control Point, they will be cleared to enter the uncontrolled hospital area.

(2) In case persons are found to be contaminated, they will take a shower, be monitored again, and, if free from contamination, be supplied with disposable garments; then proceed as described above. The Radiation Protection Officer should be consulted if there is difficulty with decontamination.

6.6 Use of dosimeters

(1) Dosimeters will be supplied at the Control Point to all personnel entering the Radiation Emergency Area.

(2) Dosimeters are of three types (see pictures at the end of this section):

a) Direct reading dosimeters ("pen-dosimeters"), which are supplied to all personnel;

b) Badge dosimeters (TLD type), also supplied to all personnel;

c) Ring dosimeters (TLD's), which are only supplied to surgeons (and their assistants, if any) in case they

have to remove highly radioactive foreign bodies.

(3) Dosimeters are to be worn:

a) Above the sternum, clipped to the scrub suit (pen and badge dosimeters) i.e., under the outer layer of the protective clothing.

b) On the ring finger of the right and left hand under the glove (ring dosimeters).

(4) Upon leaving the Radiation Emergency Area, the wearer should surrender his dosimeters to the Nuclear Medicine Technologist, who will record the reading of the pen dosimeter and retain the TLD dosimeters for later processing.

(5) The Radiation Protection Officer must assure that the records clearly show the serial number of each dosimeter worn by each individual who occupied the Radiation Emergency Area and duration of time each individual spent in the REA.

SECTION 7

SUPPLY INVENTORY

7.1 Supply Inventory

Gamma Dose Rate Survey Instrument Digi-Master 0.1 mR/H to 100 R/H or PIC 6A	1
Beta-Gamma Monitor, R.M. 14 with H.P. 240 Probe	1
Self-Reading Pocket Dosimeters, 0-1 R	10
Thermoluminescent Dosimeters, Pocket Type	10
Thermoluminescent Dosimeters, Ring Type	20
Charger for Self-Reading Dosimeters	1
Decontamination Table-Top with Stretcher, Side Panels, Hose, 2 each 5 gallon Containers	1
Lead Container, high activity samples	1
Kit, decontamination and sample taking (see Attachment for inventory)	1
Hose, low pressure, with shower head and valve	1
Plastic sheets, 4-5 mils	1
Herculite, 50 inch width	1 roll
Masking tape, 2 inch	4
Set, radiation warning signs, tape and rope	1
Batteries, for instruments	4
Head Covers	12
Coveralls, disposable	12
Shoecovers	12 pairs
Poly Bags (large)	20
Poly Bags (small)	20
Absorbent Paper, 3" x 12"	1 roll

Signs "Caution Radiation Area"	4
Signs "Caution Radioactive Material"	4
Stickers, "Contaminated Material"	10
Barrier Tape	1 roll
Plastic can, 30 gallon, lined with dual polyethylene bags	2

7.2 Decontamination Kit

1. Skin Decontamination

(a) Utensils:

Absorbent balls, extra large	box(1)
Sponge - Holding forceps	1
Plastic beaker, large	2
(to discard used sponges)	
Pre-op sponges	6
(for large area decontamination)	
surgical hand brushes	
Wash bottle	1
(to hold water for decontamination)	

(b) Decontaminants:

Ivory Soap	2
(for first decon effort, [illegible])	
Radine Wash	2
(for second decon effort)	
Clorox, bottle	1

2. Wound Cleaning

a. Utensils:

Sterile gauze pads, 4x4-inch, in box	box(1)
Surgical gloves, assorted sizes sterile, pair	5
Solution bowl, plastic	1
Plungerless syringes, 50cc, sterile	1
Cotton tipped applicators	pkg(1)

(b) Cleansing agents:

Saline solutions, normal sterile, bottle	1
Hydrogen Peroxide, 3% solution bottle	1

3. Miscellaneous Materials

Nivea cream, jar (apply on dry skin after complete decon)	1
Prep Kit (for clipping and shaving)	1
Nail clippers, pair	1
Scissors, heavy duty, HARE, paramedic	1
Medical and Radiation Status Card	5
Plastic bags, assortment (to hold decon materials after use)	
Tags, with wire	10

(to indicate contents of container and bags)

Tissue paper, box	1
Notebook	
Pencils	

7.3 Sample Taking Kit

1. Blood Sampling	
Vacutainers, heparinized, 10 ml, sterile	6
Vacutainers, uncoated, 10 ml, sterile	6
Vacutainers, oxalated, 10 ml, sterile	6
Vacutainers, EDTA 10 ml, sterile	6
Needle-holder combination, sterile	12
Alcohol wipes, sterile, pre-packaged	12
2. Wound Fluid, Nose Swabs	
Cotton tipped applicato s, in test tube, sterile	
Envelopes, (for storage of nose swabs)	
Tissue paper, box (for nose blows)	box(1)
3. Small Specimens	
(hair, nails, tissue samples, sputum)	
Bottles, wide mouth, 100 ml	5
4. Excreta, Irrigation Fluids, Vomitus	
Jar, plastic for feces samples	2
Urine specitainers, 250c	5
Bottles, wide mouth, 500 ml, for collection of irrigation fluids	2
5. Skin Smears	

	NUCON smear pads, with envelopes	50
6.	Miscellaneous Items	
	Plastic bags, assorted sized	10
	Tags, with wire	20
	Labels, self-sticking	20
	Medical & Radiation Status Card	5
	Notebook	
	Pencils	

Reviewed: December 1981

SECTION 8

PROCEDURES FOR PATIENT DECONTAMINATION AND SAMPLE TAKING

8.0 General

These procedures cover the use of the Decontamination and Sample Taking Kits. The kits provide all the necessary items for the decontamination of a radioactively contaminated patient and the collection of specimens of this contamination.

The collection of specimens is a prerequisite for a thorough evaluation of the medical and radiation status of the patient. It should be performed in conjunction with patient decontamination. Section 7 provides a parts list for each of the two kits. There is also a parts list in each kit. Following use, the lists should be consulted for replenishment. The intended use of several of the items is indicated on the parts list.

This section contains a copy of "Patient Radiation and Medical Status Record Sheet". This form should be used to record essential data on the patient's medical and radiation status.

8.1 Patient Decontamination Procedures

8.1.1 Principles

a. The objectives of decontamination are:

(1) to prevent injury caused by the presence of radioactive substances on the body;

(2) to prevent the spread of contamination over and into the patient;

(3) to protect attending personnel from becoming contaminated themselves or (in extreme cases) from being exposed to a source of radiation.

b. Although decontamination should be started as soon as possible, primary attention should be given to the alleviation of life-threatening conditions created by traumatic injury.

c. Decontamination is essentially the physical removal of radioactive dirt from the skin, wounds, or body orifices. Most decontaminants contain detergents or other chemical agents to facilitate this removal. Therefore, most decontaminants are suitable for decontamination of the intact skin only, i.e., are not appropriate for wound cleansing or irrigation of body orifices.

d. Decontamination is performed:

(1) from the lowest level of contamination to the highest;

(2) starting with the simplest procedure (e.g., soap and water) to more complicated procedures;

(3) with due regard to contamination of wounds, body orifices, etc. (see below for specific guidelines).

e. Usually, the effect of decontamination is greatest in the earliest stages, i.e., most of the radioactive material is removed during the first decontamination effort. Continued decontamination may show diminishing effectiveness. At some point, a decision has to be made to either accept some residual contamination, or proceed with the use of more potent decontaminants (more specific guidelines below).

8.1.2 Measures to be Taken before Decontamination

a. Assuming that gross decontamination has been performed at the Nuclear Power Station, it can be expected that the residual contamination is minor, and/or that serious contamination is localized, e.g., around and in a wound. Before decontamination, the following steps should be taken:

(1) judge whether the patient's condition requires immediate intervention; if so, proceed, covering the contaminated area with a plastic drape or a towel;

(2) obtain a briefing from the Nuclear Power Station health physicist as to the contamination status of the patient and as to the specific measures to be taken by attending

personnel with regard to their protection. Confirm this in consultation with the Radiation Protection Officer.

(3) monitor the patient with the radiation survey instrument by scanning the entire body (holding the probe about 2 inches from the skin) and record the findings on the PATIENT STATUS RECORD SHEET; decide in which order skin decontamination shall be performed;

(4) inspect wounds, inquire about their decontamination at the site of accident, and decide whether further wound decontamination or treatment can safely be postponed until completion of skin decontamination;

(5) make a decision as to whether certain samples should be taken (see paragraph 8.2 for further details).

b. In case no decontamination has been performed (most likely because of an urgent need for emergency surgical treatment):

(1) perform a gross decontamination by removing all clothing and obvious dirt and debris; if immediate intervention is necessary, cover the contaminated area with a plastic drape and proceed;

(2) at the same time, obtain a briefing from any accompanying personnel as to the measures to be taken by attending personnel with regard to their

protection;

after the emergency treatment, proceed with the applicable steps described under 8.1.2a(2) to (5) above.

8.1.3 Decontamination Techniques

a. General

Two general rules apply to the performance of decontamination:

(1) check the effectiveness of the technique applied by monitoring periodically;

(2) avoid the spread of radioactive materials from the area being decontaminated to areas of lesser contamination by covering the adjacent area.

Except when prohibitive degrees of contamination are present on/in any of the locations listed below, decontamination is performed in the following order:

(1) wounds and adjacent skin;

(2) body orifices and adjacent skin;

(3) other skin areas.

b. Decontamination of Wounds

(1) use aperture drape

isolate the contaminated area;

(2) take sample (see paragraph 8.2.1a);

(3) decontaminate skin adjacent to wound as described below;

(4) depending on surface and depth of wound, irrigate wound with sterile saline dab with gauze pads and sterile saline or use applicators to cleanse wound; collect all materials used, and place in labeled containers;

(5) remove obviously necrotic and devitalized tissue surgically; keep all tissue specimens removed (see paragraph 8.2);

(6) monitor wound; record result

(7) if contamination persists - consult with Radiological Protection Officer to determine further course of action;

(8) if wound clean - treat wound as indicated.

c. Decontamination of Body Orifices

(1) take samples of activity in nares, ear canals, and other orifices as indicated (see paragraph 8.2.1a);

(2) decontaminate area surrounding orifices as described below;

(3) gently clean orifice using wetted swabs

(4) if nose swab indicates significant radioactivity in

nasal cavity, irrigate

(5) collect all materials used, and label containers.

d. Decontamination of Skin

(1) take smear sample of area (see paragraph 8.2.1a);

(2) protect adjacent area by covering with plastic drape or towels;

(3) cleanse skin area:

- around wounds and orifices:

tepid water, using large absorbent balls.

cover entire contaminated surface with a good lather, repeatedly renewing cotton balls.

remove lather after 2-3 minutes by wiping repeatedly with wetted cotton balls; monitor; record result.

- other skin areas: wash thoroughly with Turco decon soap, and tepid water, using either cotton balls, , pre-op sponges, or hand brushes; cover area with a good lather; rinse off ater 2-3 minutes with running water; monitor; record result.

(4) if contamination persists: repeat step (3) once;

(5) if contamination still persists: try gentle application of clorox or hydrogen peroxide NOTE: (avoid any of these entering wound or body openings); repeat a few times using new cotton balls; remove decontaminants with water; monitor; record result

(6) after complete decontamination: dry skin and apply skin cream

(7) if residual contamination is present: consult with the Radiation Protection Officer to decide whether further efforts are indicated; if it is decided to accept residual contamination, dry the skin and apply collodion, mark area involved, record,

(8) collect all materials used and label containers:

NOTES:

- in case of serious contamination around a wound, rapid removal of the bulk of radioactivity can be obtained by shaving the adjacent skin;
- in case of serious contamination of hair, or undernails: clip

Procedures for Sample Taking

Principles

a. The objectives of collecting specimens from a radiation accident victim are:

(1) to evaluate the amount and composition of the radioactive contamination and in the body;

(2) to obtain data with regard to the patient's exposure to external and internal radiation.

(3) to supply information on the biological injury inflicted by the irradiation.

b. To meet these objectives, the following types of specimens are collected routinely:

(1) materials containing the external contaminant (swabs, smears, tissue samples, contaminated cleansing fluids, etc.);

(2) specimens containing internal contaminant (feces, stools, sputum, etc.); Collect <u>all</u> samples. Remember an initial negative result does not indicated no internal contamination (eg. material may not be in urine, etc. yet).

(3) in case of neutron irradiation: materials in which neutron induced radioactivity may be present (hair, nail clippings);

(4) hematological specimens (whole blood in heparinized, oxalated, and uncoated tubes; blood smears, leukocyte counts).

c. As the analysis of radioactive samples with regard to their

composition is only possible in samples with a relatively high radioactivity, care should be taken to collect and store these samples separately from the usually bulky samples with rather low radioactivity (such as cleansing fluids, drapes, towels, etc.).

d. A sample which is not identifiable as to its source (location, time taken) may be practically worthless: therefore, take care to properly collect, store, and mark all samples.

8.2.2 Sample Taking Techniques and Indications

a. External Contamination

Before decontamination, the following samples shall be obtained:

(1) skin smears: use smear pads; moisten with a few drops of water, smear a skin area of about 100 cm^2 (4 x 4 in.), if possible, by allowing sticky side of the smear to adhere to gloves, and rub the smear pad over the surface to be sampled; place smear on record paper, record location and time, and area smeared if other than 100 cm^2.

(2) wound samples: use either one of the following methods:

- large wounds with visible blood or wound fluid: obtain a few cc's using dropper , transfer to bottle and label:

- superficial wounds: rub gently with cotton swab; return to tube, label;

- wounds with visible dirt or debris: remove with applicator SWN1 or use tweezers, and transfer sample to samll glass vial, label.

b. Internal Contamination

in all cases where internal contamination is suspected: collect all urine and feces in containers supplied and record time of voiding.

c. External Exposure

In all cases where a whole body dose of more than 10 rads is known or suspected:

(1) obtain a blood smear for differential:

(2) obtain a leukocyte count;

(3) obtain 30 ml of blood in vacutainers (green, red, gray and lavender stoppers).

Record date and time these samples were taken.

PATIENT RADIATION AND MEDICAL STATUS RECORD SHEET (to accompany patient)

Name of patient: _____ Age: ___ y

Location, date, and time of incident: _____

Summary description of incident: _____

_____

TYPE OF EXPOSURE/INJURY

WOUNDS

yes/no

where? *indicate overleaf*

how serious? _____

_____

_____

general condition? ____

_____

_____

EXTERNAL EXPOSURE

yes/no

where? whole body

local _____

_____

how much? ____ rems

(likely/possible)

what? β | γ | neutr

SKIN CONTAMINATION

yes/no

where? *indicate overleaf*

how much? *indicate meter readings overleaf*

what?

mixed fission products?

other (describe): _____

_____

INTERNAL CONTAMINATION

yes/no

how? *wounds/ingestion/inhal*

how much? _____

_____

what?

mixed fission products?

other (describe): _____

_____

MEASURES TAKEN

time:

first aid:

medical:

wound decon:

how:

effect:

time:

symptoms? *nausea* +/-

vomiting +/-

skin erythema +/-

other? _____

symptomatic treatment?

_____

blood samples taken?

_____

badge taken? _____

NEUTRON IRRADIATION ONLY:

ring taken?

buttons, hair, nail clippings taken?

time:

decon:

technique:

effect:

(indicate decontaminated areas overleaf)

residual contamination at time of transfer?

(describe; mark on skin):

time:

nose blow:

sample kept?

decon of orifices:

where?

how?

decon fluids kept?

other samples taken:

urine?

feces?

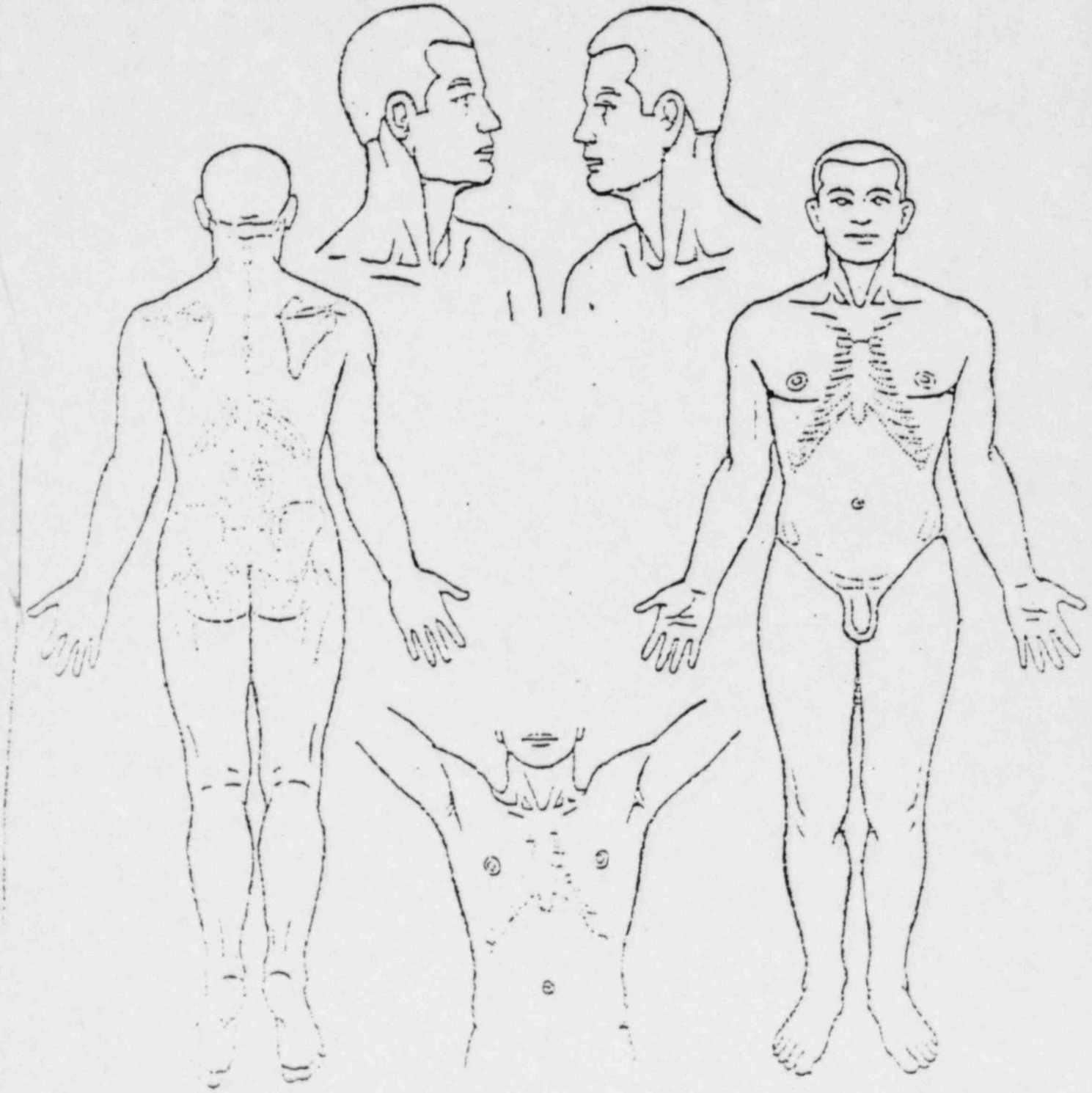
other?

Course/follow-up:

INDICATE CONTAMINATED AREAS AS TO LOCATION, DEGREE OF CONTAMINATION, DECON EFFORT

INDICATE LOCATION OF WOUNDS

(use additional sheets if necessary)



TYPE OF METER USED: _____
(Indicate model and number

DISTANCE SKIN-to-PROBE: _____ in.

Reviewed: December 1984