POLICY MANUAL
AND
RULES AND REGULATIONS
FOR THE SAFE HANDLING
OF
RADIOACTIVE MATERIALS

NYVAMC

DECEMBER, 1984

POLICY MANUAL

AND

RULES AND REGULATIONS FOR THE SAFE HANDLING OF RADIOACTIVE MATERIALS

NEW YORK VETERANS ADMINISTATION MEDICAL CENTER
FIRST AVENUE AT EAST 24th STREET
NEW YORK, NEW YORK

DECEMBER, 1984

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1.0 MEDICAL ISOTOPES COMMITTEE

1.1 Authority

The Medical Isotope Committee is empowered by the Hospital Director's office to promote the best practice in safe handling and use of radioactive sources at the New York Veterans Administration Hospital.

1.2 Responsibility

The Committee is responsible for:

Ensuring that all individuals who work with or in the vicinity of radioactive material have sufficient training and experience to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.

Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with NRC regulations and the conditions of the license.

1.3 Duties

The Committee shall:

1.3.1 Be familiar with all pertinent NRC regulations, the terms of the license, and information submitted in support of the request for the license and its amendments.

1.3.2 Review the training and experience of any individual who uses radioactive material (including physicians, technologists, physicists, and pharmacists) and determine that the qualifications are sufficient to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.

1.3.3 Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g., nursing, security and housekeeping personnel) are properly instructed as required by Section 19.12, of 10 CFR Part 19.

1.3.4 Review and approve all requests for use of radioactive material within the institution. The review process will include review of application forms and where indicated, site visits to document the adequacy of facilities and equipment, operating, handling, and emergency procedures, and the experience and training of the proposed users.

1.3.5 Prescribe special conditions that will be required during a proposed use of radioactive material such as requirements for bioassays, physical examinations of users and special monitoring procedures.

1.3.6 Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NRC regulations and the conditions of the license. The review shall include an examination of all records, results of NRC inspection, written safety procedures and management control system, and reports from the radiation safety officer to include procedures for maintaining inventories, possession limits, procurement and transfer of radioactive material.

1.3.7 Recommend remedial action to correct any deficiencies identified in the radiation safety program.

1.3.8 Maintain written records of all committee meetings, actions, recommendations, and decisions.

1.3.9 Ensure that the byproduct material license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures, and personnel.

1.4 Meeting Frequency

The Medical Isotopes Committee shall meet as often as necessary to conduct its business, but not less than once in each calendar quarter.

1.5 List of Members

Name:	Marcus A. Rothschild, M.D.
Title:	Chief, Nuclear Medicine Service
Board Certification:	Internal Medicine; 1957
Major Isotopes & Amounts Used:	^{131}I (100 mCi), ^{14}C (500 mCi), ^{35}S (100 mCi), ^{99m}Tc (500 mCi), ^{3}H (5 mCi), ^{32}P (100 mCi), ^{24}Na (50 mCi), ^{42}K (10 mCi)
Work with Radioisotopes:	Radioisotopes used since 1953

Name:	Murray Oratz, Ph.D.
Title:	Assistant Chief, Nuclear Medicine Service
Major Isotopes & Amounts Used:	^{131}I (100 mCi), ^{14}C (500 mCi), ^{35}S (100 mCi), ^{99m}Tc (500 mCi), ^{3}H (5 mCi), ^{32}P (100mCi), ^{24}Na (50 mCi), ^{42}K (10 mCi)
Work with Radioisotopes:	Radioisotopes used since 1952

Name: Sidney S. Schreiber, M.D.
Title: Attending Internist, Nuclear Medicine Service
Board Certification: Internal Medicine: 1958
Major Isotopes & Amounts Used: ^{131}I (100 mCi), ^{123}I (100 mCi), ^{14}C (100 mCi), ^{99m}TC (500 mCi), ^{32}P (100 mCi), ^{42}K (100 mCi), ^{24}Na (50 mCi)

Work with Radioisotopes: Radioisotopes used since 1958

Name: Vincent J. Fisher, M.D.
Title: Associate Chief of Staff for Research
Board Certification: Internal Medicine: 1964
Major Isotopes & Amounts Used: ^{201}Tl (1.5 mCi), ^{99m}Tc (up to 20 mCi)

Work with Radioisotopes: Radioisotopes used since 1974

Name: John H. Ayvazian, M.D.
Title: Chief of Staff, VA Medical Center
Board Certification: Internal Medicine: 1961
Major Isotopes & Amounts Used: ^{3}H (5 mCi), ^{14}C (5 mCi)
Courses taken: AEC Course: 1965
NYU Radiology Dept. Course: 1963

Work with Radioisotopes: Radioisotopes used since 1966

Name: Norman S. Cooper, M.D.
Title: Chief, Laboratory Service, VA Medical Center
Board Certification: American Board of Pathology: 1952
Major Isotopes & Amounts Used: ^{3}H (mCi), ^{14}C (1 mCi)
Courses taken: Basic AEC Course, Oak Ridge National Laboratory: 1947 - 1948

Work with Radioisotopes: Radioisotopes used since 1947

Name: Richard D. Kittredge, M.D.
Title: Chief, Radiology Service, VA Medical Center
Board Certification: Radiology: 1958

Name: Marie P. Basti
Title: Chief, Nursing Service

Name: Steven Rudolph, Ph.D.
Title: Radiation Safety Officer

2.0 RADIATION SAFETY OFFICER

Steven Rudolph, Ph.D.

2.1 Authority of the Radiation Safety Officer

The Radiation Safety Officer, RSO, derives authority from the Administration through the Medical Isotope Committee. The RSO is the authorized representative of the Medical Isotope Committee regarding measures to implement radiation protection and control within the hospital.

2.2 Duties of the Radiation Safety Officer

The duties of the RSO regarding radioisotopes are:

2.2.1 General surveillance over all activities involving radioactive material, including routine monitoring and special surveys of all areas in which radioactive material is used.

2.2.2 Determining compliance with rules and regulations, license conditions, and the conditions of project approval specified by the radiation safety committee.

2.2.3 Furnishing consulting services on all aspects of radiation protection to personnel at all levels of responsibility.

2.2.4 Distributing and processing personnel monitoring equipment: determining the need for and evaluation of bioassays; keeping personnel exposure and bioassay records; and notifying individuals and their supervisors of exposures approaching maximum permissible amounts and recommending appropriate remedial action.

2.2.5 Conducting training programs and otherwise instructing personnel in the proper procedures for the use of radioactive material prior to use, at periodic intervals (refresher training) and as required by changes in procedures, equipment, regulations, etc.

2.2.6 Supervising and coordinating the radioactive waste disposal program, including keeping waste storage and disposal records and monitoring effluents.

2.2.7 Storing all radioactive materials not in current use, including wastes.

2.2.8 Performing leak tests on all sealed sources.

2.2.9 Maintaining an inventory of all radioisotopes at the institution and limiting the quantity of radionuclides at the institution to the amounts authorized by the license.

2.2.10 The authority to terminate immediately a project that is found to be a threat to health or property.

2.2.11 Maintining other records not specifically designated above, e.g., receipt, transfer, and survey records as required by §30.51 of 10 CER Part 30.

3.0 LICENSING AND REGISTRATION REGULATIONS

3.1 GOVERNMENT REGULATIONS

Radioactive material may be used only under specific license issued by the U.S. Nuclear Regulatory Commission. Such a license has been issued to the N.Y. Veterans Administration Hospital under the custodianship of the Medical Isotope Committee. The regulations covering the procurement of licenses are published in Parts 30, 33 and 35 of the Code of Federal Regulations. Copies of these regulations may be obtained from the Radiation Safety Officer.

All licenses of the U.S. Nuclear Regulatory Commission are required to conform with standards for protection against radiation hazards. These standards are published in Part 20 of the Code of Federal Regulations. Copies of these standards may be obtained from the Radiation Safety Officer.

3.2 HOSPITAL REGULATIONS

No person may use within or bring into the hospital any radioisotopes in any amounts without authorization from the Medical Isotopes Committee. The authorization will normally be embodied in an amendment to the "Radioactive Material License" held by the hospital following application by the Medical Isotopes Committee to the Nuclear Regulatory Commission.

3.3 RESPONSIBILITY OF APPROVED USERS

Those persons who are approved to use radioisotopes are responsible for the safe use of radiation sources by individuals under their control.

These persons are responsible for:

1. Compliance with the hospital's "Rules and Regulations for the Safe Handling of Radioactive Materials" (Sections 7.1-7.14 of this manual) and the U.S. Nuclear Regulatory Commission's Regulations.

2. Instruction of employees under their control in the use of safety devices and procedures.

3. Adequate planning of an experiment, or procedure, to assure that adequate safety precautions are taken.

4. Communication of pertinent information regarding employees to the RSO with respect to changes in operational procedures, new techniques, to increased personal exposures of contamination levels in the laboratory or the environs.

5. Direction of personnel under their control to comply with all recommendations to wear radiation badges, to survey their hands

3.3 RESPONSIBILITY OF APPROVED USERS (Continued)

and clothing, to submit to physical examinations (including CBC) prior to the initial handling of radioactive materials, in the event of extended leave or resignation from the hospital, and at other times as indicated, to submit urine specimens, breath samples or other bio-assay samples.

6. Limitation of use of radioisotopes under his permit to those over whom he has supervision.

7. Maintenance of required current records of receipt, use, storage and disposal of radioisotopes.

8. Preparing an annual inventory of radioactive materials on hand, and at other times when requested by the RSO.

3.4 RESPONSIBILITY OF THE INDIVIDUAL USER OF RADIOISOTOPES

Each person who has any contact with sources of ionizing radiation has a responsibility to:

1. Keep his exposure to radiation at the lowest possible value and specifically below the maximum permissible exposure as stated in Section 7.2.

2. Wear the recommended radiation monitors for personnel.

3. Survey his hands, shoes, body and clothing for radioactivity and remove all loose contamination before leaving the laboratory particularly after the use of radioactivity at levels above those stipulated in Section 7.6.

4. Use all recommended protective measures such as protective clothing, respiratory protection, remote pipetting devices, ventilated and shilded glove boxes and hoods.

5. Not smoke, eat or drink in radioisotope laboratories.

6. Maintain clean working habits.

7. Check working area for contamination periodically or after each radioisotope procedure in conformity with Section 7.6.

8. Maintain good housekeeping practices in the laboratories.

9. Label radiation equipment and segregate radiation waste and equipment to avoid cross examination.

10. Report immediately to the RSO the details of a spill or other accident involving radioactivity.

11. Conduct decontamination procedures as set forth in the "Emergency Plans for Radioactive Materials" posted in each laboratory area.

4.0 APPLICATION FOR AUTHORIZATION TO USE RADIOISOTOPES

4.1 APPLICATION FOR NON-HUMAN USE

An intending user of radioactive materials must demonstrate to the Committee adequate training in, and facilities for, the safe use of these materials. For non-human use (biological, chemical or physical) in quantities greater than license exempt quantities training must meet the criteria specified in Section 33.15 (b) of 10 CFR Part 33 (3/24/78)

1. The applicant shall obtain a V.A. Hospital application for use of radioactive materials from the Secretary in the Nuclear Medicine Service, 18 South.

2. The applicant shall return the completed form to the Nuclear Medicine Service for transmittal to the Medical Isotopes Committee.

3. The applicant shall be notified of approval or other action taken by the Committee.

4.2 APPLICATION FOR HUMAN USE

The general requirements for a permit to administer radioactive materials to humans are more restrictive than the requirements for a non-human use permit. The pre-requisites are:

a. The user must be a physician licensed to dispense drugs in the practice of medicine.

b. The physician must have basic radioisotope training and, for certain common procedures, must have participated actively in the use of radioisotopes in accordance with the criteria specified in Appendix A of the Nuclear Regulatory Commission's draft Medical Licensing Guide, NU REG-0338, Revision 1.

The following procedure has been adopted in the issuance of permits for human use:

1. The applicant shall obtain from the Secretary in the Nuclear Medicine Service three copies of U.S. Nuclear Regulatory Commission Application Form #313M. Applicants for non-routine human use shall also obtain an outline of the research protocol which must accompany the application. (FDA Form FD 1571).

2. The applicant shall send to the Nuclear Medicine Service two copies of each of the completed forms for transmittal to the Medical Isotopes Committee.

3. The applicant shall be notified of approval or other action taken by the Committee. Applications for uses not already authorized under the V.A. Hospital license shall be transmitted to the Nuclear Regulatory Commission for approval and the applicant notified upon receipt of license amendment or other NRC action

4.3 SPECIAL REQUIREMENTS OR RECOMMENDATIONS OF THE COMMITTEE

1. If deemed appropriate special requirements or recommendations regarding surveys, bio-assays, waste disposal, storage of material, protective devices, etc., may be made by the Committee.

4.4 DISTRIBUTION OF CODES, PROCEDURES AND PERTINENT LITERATURE

1. The Radiation Safety Officer shall furnish to each approved applicant copies of the following:

a. A copy of these regulations.

b. Form NRC-3 "Notice to Employees."

c. Handling procedures.

d. Emergency procedures.

e. Pertinent handbooks and literature.

The "Notice to Employees" and handling and emergency procedures are to be conspicuously posted in the restricted area(s) when radioactive materials are on hand.

5.0 PROCEDURE FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

All requests for radioactive materials must be processed by the Nuclear Medicine Service, 18 South. The following procedures have been established.

5.1 REQUISITIONS

The appropriate request form is to be completed and must show the following information:

1. Suggested supplier.
2. Amount and chemical form of radioisotope(s).
3. Catalogue number.
4. Data needed.
5. Account or Grant number to be charged.

5.2 ORDER PLACEMENT

The requisition form is to be submitted to the Nuclear Medicine Service, 18 South, where it will be processed.

5.3 PURCHASE APPROVAL AND BILLING

The Nuclear Medicine Service will verify the order against the current hospital license to ensure that the requested materials and quantities are authorized and that possession limits are not exceeded and will forward it to the purchasing office. The purchasing office will honor only request forms which have been approved by the Nuclear Medicine Service and will directly charge the department or grant.

5.4 DELIVERY OF MATERIAL

1. During normal working hours carriers will be instructed to deliver radioactive packages directly to the Nuclear Medicine Service.

2. During off-duty hours security personnel will accept delivery of radioactive packages in accordance with the procedures outlined in Administrator's memorandum (see copy on page 13).

RADIOACTIVE SHIPMENT RECEIPT REPORT

1. P.O.# _____ SURVEY DATE _____ TIME _____

   SURVEYOR _____

2. CONDITION OF PACKAGE:

   _____ O.K. _____ PUNCTURED _____ STATUS _____ WET

   _____ CRUSHED _____ OTHER _____

3. RADIATION UNITS OF LABEL: _____ UNITS (mR/hr)

4. MEASURED RADIATION LEVELS: a. Package surface _____ mR/hr

   b. 3' from surface _____ mR/hr

5. DO PACKING SLIP AND VIAL CONTENTS AGREE?

   a. Radionuclide _____ yes _____ no difference _____

   b. Amount _____ yes _____ no difference _____

   c. Chem Form _____ yes _____ no difference _____

6. WIPE RESULTS FROM: a. Outer _____ CPM = _____ DPM

   eff = ( )

   b. Final source container _____ CPM = _____ DPM

   eff = ( )

7. SURVEY RESULTS OF PACKING MATERIAL AND CARTONS _____ mR/hr, CPM

8. DISPOSITION OF PACKAGE AFTER INSPECTION _____

9. IF NRC/CARRIER NOTIFICATION REQUIRED, GIVE TIME, DATE AND PERSONS NOTIFIED.

Veterans Administration

Memorandum

Date December, 1984

From Administrator

To Security Personnel

Sub: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. Any packages containing radioactive material that arrive between 4:30 p.m. and 7:00 a.m. or on Sundays shall be signed for by the Security guard on duty and taken immediately to the Nuclear Medicine Service. Unlock the door, place the package on top of the counter in Room 18073 South if it requires refrigeration or in 18101 Center if it does not, and relock the door.

2. If the package is wet or appears to be damaged, immediately contact the Medical Center Radiation Safety Officer. Ask the carrier to remain at the Medical Center until it can be determined that neither he nor the delivery vehicle is contaminated.

RADIATION SAFETY OFFICER: Marcus A. Rothschild, M.D.

OFFICE PHONE: 686-7500, Extension 405, 663

HOME PHONE: _____

6.0 PROCEDURES FOR OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. Visually inspect package for any sign of damage (e.g., wetness, crushed). If damage is noted stop procedure and notify Radiation Safety Officer.

2. Measure exposure rate at 3 feet from package surface --record. If >10 mR/hr--stop procedure and notify Radiation Safety Officer.

3. Measure surface exposure rate and record. If >200 mR/hr --stop procedure and notify Radiation Safety Officer.

4. Put on gloves.

5. Open the outer package (following manufacturer's directions, if supplied) and remove packing slip. Open inner package to verify contents (compare requisition, packing slips, and label on bottle), check integrity of final source container (inspect for breakage of seals or vials, loss of liquid, discoloration of packing material). Check also that shipment does not exceed possession limits.

6. Wipe external surface of final source container with moistened cotton swab or filter paper held with forceps, assay and record.

7. Monitor the packing material and packages for contamination before discarding:

   a. If contaminated, treat as radioactive waste.

   b. If not, obliterate radiation labels before discarding in regular trash.

8. Store materials, particularly gamma emitters, behind suitable shielding as soon as possible.

7.0 RADIATION PROTECTION PROCEDURES

7.1 CLASSIFICATION OF AREAS

Under the Code of Federal Regulations, Part 20 (20.105) area is unrestricted and does not require control measures:

a. If an individual continually present in the area cannot receive more than two mrem in any one hour or 100 mrem in any seven consecutive days to any portion of the body; or

b. If, when allowance is made for expected occupancy and time variations in dose-rate, no individual is likely to receive more than 500 mrem in a calendar year.

7.1.2 RESTRICTED AREAS

All areas within the hospital in which dose levels do not conform to the standard for unrestricted areas shall be restricted and under the control of the Radiation Safety Officer for radiation safety purposes. A sign carrying the words, "Caution Radioactive Materials" and, if appropriate, "Caution Radiation Area" Part 20 (20.203), shall be prominently displayed at the entrance to each restricted area, and the person responsible for work with radioisotopes in that area shall be responsible for controlling access to the area.

7.2 MAXIMUM PERMISSIBLE DOSE LEVELS

7.2.1 In restricted areas, control must be such that no individual over 18 years of age (excluding patients) will receive in any one calendar quarter, a dose in excess of the following limits, except as specified in 7.2.2.

Whole body, head and trunk active blood-forming organs lens of eyes or gonads	1.25 rem
Hands, forearms, feet, ankles	18.75 rem
Skin of the whole body, thyroid	7.5 rem

7.2.2 Doses to the whole body in excess of the above limits are permitted providing that during any calendar quarter the dose does not exceed 3 rem and that the cumulative dose does not exceed 5 (N-18) where N=age in years.

7.2.3 The maximum whole body exposure of individuals under age of 18 must be limited to 0.5 rem per calendar year.

7.2.4 All areas in the vicinity of the hospital which may be irradiated by sources under the control of the hospital shall meet the standards in 7.1.1.

7.2.5 CONTAMINATION LEVELS

Radioactive contamination levels of air and water in restricted areas must be controlled such that the levels in uc/ml specified in Part 20, Appendix B, Table I are not exceeded. In unrestricted areas, contamination levels of air and water shall not exceed those specified in Part 20, Appendix B, Table II. Removable surface contamination levels for beta or for beta-gamma emitters shall be controlled such that a level of 100 dpm per 100 cm^2 is not exceeded. Fixed surface contamination with beta or beta-gamma emitters shall be controlled such that a radiation level of 0.1 mR/hr (measured close to the surface with a suitable detector) is not exceeded.

7.3 PERSONNEL MONITORING

Arrangements for radiation badge monitoring are made through the Nuclear Medicine Service. The badges are distributed and collected on a monthly basis by the Nuclear Medicine Service. A guide concerning the advisability of wearing radiation badges can be found in Appendix 4. Each individual assigned a radiation badge is responsible for complying with the instruction regarding its use contained in Appendix 4. Exposure records are centrally maintained by the Nuclear Medicine Service.

7.4 BIOASSAYS

Where the Radiator Safety Officer considers that significant fractions of the maximum permissible body burden of a given nuclide may be accumulated, bio-assay procedures such as thyroid counts, urinalysis or CO_2 breath analysis shall be instituted. Under certain circumstances bio-assays may be required when quantities in unsealed form as low as 1 millicurie of H-3 or 10 microcuries of I-125 or I-131 are handled. Bio-assay procedures and their implementation will be in accordance with the appropriate Nuclear Regulatory Commission bio-assay guidelines.

7.5 POSTING OF AREAS AND OTHER REQUIRED LABELS

Signs are required by Part 20 (20.203) to denote areas or containers with levels of radiation or radioactivity specified in the following sections. Signs may be ordered through the Nuclear Medicine Service.

7.5.1 "CAUTION RADIATION AREA"

In areas accessible to personnel in which a major portion of the body could receive in any one hour a dose in excess of 5 mrem or in any five consecutive days a dose in excess of 100 mrem.

7.5.1 "CAUTION RADIATION AREA" (continued)

A sign is NOT required:

a. In a room containing a sealed source if the radiation level 12 inches from the surface of the source container or housing does not exceed 5 mrem/hour.

b. In room or wards with patients containing radioactive materials, or containing radioactive materials for less than eight hours, provided that there are personnel in attendance to prevent exposure of individuals in excess of the levels of 7.2.

7.5.2 "CAUTION RADIOACTIVE MATERIAL"

In areas in which radioactive material is used or stored in amounts exceeding ten times those in Appendix 1, Column 1, and containers in which radioactive material is transported, stored or used in amounts exceeding those in Appendix 1, Column 1.

When containers are used for storage, the labels shall state the quantities and kinds of radioactive materials and the date of measurement.

A label is NOT required if the concentration of the material in the container does not exceed the maximum permissible concentration for occupationally exposed individuals (Part 20, Appendix B, Table I); or for laboratory containers, such as beakers, flasks and test tubes, used transiently in laboratory procedures, when the user is present.

7.5.3 Other signs are required for HIGH RADIATION AREAS (dose-rate greater than 100 mrem in an hour) with the above exceptions, and in AIRBORNE RADIOACTIVITY AREAS. The Radiation Safety Officer must be consulted regarding control measures in these areas.

7.6 SURVEYS

1. It is the authorized users' responsibility to provide for appropriate surveys of work with radioactive materials. Recommendations for special survey techniques may be made by the Medical Isotope Committee upon issuance of approval.

2. All elution, preparation and injection areas will be surveyed daily and decontaminated if necessary.

3. The survey will consist of measurement of contamination with a G-M survey meter or a series of wipe tests. The method for performing wipe tests will be sufficiently sensitive to detect 100 dpm.

4. Laboratory areas where radioactive materials are used will be surveyed at least once per calendar month.

7.7 SEALED SOURCE LEAK TESTS (continued)

7.7 Any leak test result of 0.005 microcuries or greater s ll be reported to the Radiation Safety Officer for source repair or disposal.

7.8 LABORATORY RULES FOR THE USE OF RADIOACTIVE MATERIALS

1. Before any work is undertaken with quantities of radioisotopes which may produce a significant external or internal exposure, attention shall be given by the user to precautionary measures including the use of shielding hoods, remote handling equipment and air monitoring. The Radiation Safety Officer shall be consulted for recommendations on initial or unusual operations.

2. Work which may result in contamination of work areas shall be done over stainless steel trays or trays lined with heavy absorbent paper.

3. Personnel working in areas containing radioactive materials shall wash their hands thoroughly, using plenty of soap, before eating, smoking or leaving work. Those working with unsealed sources should monitor hands and shoes upon completing operations.

4. Eating, storing, or preparation of food is forbidden in a laboratory or rooms where work with unsealed radioactive sources is taking place or where contamination may exist.

5. Smoking is not permitted in areas where work with unsealed radioactive sources is in progress or where contamination may exist. Under no circumstances should cigarettes, cigars or pipes be laid on tables or benches where radioactive work has been or is in progress.

6. Pipetting by mouth is forbidden.

7. Impervious gloves shall be worn whenever hand contamination is likely, and should be seriously considered whenever quantities requiring a radioactive materials area sign are being handled.

8. Laboratory coats shall be worn by all individuals handling radioactivity. In cases where millicurie amounts of activity are being handled and there is likelihood of spillage and personal contamination, the laboratory coat should be removed before leaving the isotope laboratory and kept in the laboratory.

9. Where contamination is noted during a laboratory survey, or there has been a spill of radioactive material which may have produced contamination of a person or clothing, both the person and the clothing shall be monitored. Personal contamination should be removed as soon as possible. Clothing which shows contamination producing surface levels less than the levels indicated in Section 7.2.5 may be released to the institutional laundry. Clothing showing higher count rates shall either be stored until the count rate is less than the levels indicated in Section 7.2.5, laundered by an approved decontamination laundry or disposed of through a commercial disposal company, at the discretion of the Radiation Safety Officer.

7.8 LABORATORY RULES FOR THE USE OF RADIOACTIVE MATERIALS (continued)

10. Suitable lead barriers, containers, and syringe shields should be used for preparation of patient doses and administration to patients except in circumstances, such as pediatric cases, where the use of syringe shields might compromise the patient's well-being.

11. Assay each patient dose in the dose calibrator prior to administration. Do not use any doses that differ from the prescribed dose by more than 10%.

12. Wear personnel monitoring devices at all times while in areas where radioactive materials are used or stored. These should be worn at chest or waist level.

13. Wear TLD finger badges during elution of generator and preparation, assay, and injection of radiopharmaceuticals.

14. Dispose of radioactive waste only in specially designated receptacles.

15. Survey generator, kit preparation, and injection areas for contamination after each procedure or at the end of the day. Decontaminate if necessary.

16. Confine radioactive solutions in covered containers plainly identified and labelled with name of compound, radionuclide, date, activity, and radiation level if applicable.

7.8 LABORATORY RULES FOR THE USE OF RADIOACTIVE MATERIALS (continued)

17. Always transport radioactive material in shielded containers.

18. Forceps, tongs or other suitable remote handling devices should be used in handling significant quantities of hard beta and/or gamma emitting materials.

7.9 STORAGE

1. Radioisotopes requiring "Radioactive Materials" label must be stored in areas under the control of the user, which may be locked or otherwise secured against unauthorized removal of the material.

2. The radioisotopes shall be stored in a container, shielded if necessary, such that the radiation at a distance of one foot from the container does not exceed 100 mrem/hour, i.e., the area may be classified as no more than a Radiation Area.

3. Containers must be properly labelled and area signs posted where necessary.

4. Suitable precautions shall be taken so that the probability of an explosion in the storage area which would cause the dispersion of the radioactivity is very small.

7.10 TRANSPORTATION ON HOSPITAL PREMISES

1. Radioisotopes requiring a "Radioactive Materials" label must be enclosed in a non-shatterable carrying case or container, preferably metallic, before being transported through corridors or between buildings.

2. Containers for the transportation of beta sources requiring a "Radioactive Materials" label must provide shielding thicker than the maximum range of the beta rays.

3. Gamma-ray emitters shall be transported in closed containers, shielded if necessary, such that the dose-rate at the surface does not exceed 200 mrem per hour, and the dose-rate at one meter does not exceed 10 mrem per hour. (This rule follows the Department of Transportation shipping regulations.)

7.11 RADIOACTIVE WASTE DISPOSAL

7.11.1 STORAGE OF WASTES

a. Special 5-gallon pails suitably identified with the radioisotopes warning sign shall be supplied through arrangement with the Nuclear Medicine Service to each laboratory in which isotopes are used. Larger containers (30 gallon or 55 gallon capacity) may be obtained through special arrangement with the Radiation Safety Office, where required.

7.11.1 STORAGE OF WASTES (continued)

b. Radioactive wastes must be stored only in restricted areas where they can be secured against unauthorized removal.

c. Waste that contains short-lived radioactive material should be stored temporarily in a marked area to permit substantial decay before ultimate disposal.

d. Liquid waste should be stored in unbreakable inner containers, preferably in polyethylene bottles. All liquid waste pails shall in addition have polyethylene inserts with sufficient absorbent material to absorb the liquid contents in the event of leakage from an inner container. There must be no possibility of a chemical reaction during storage that might cause an explosion or cause the release of radioactive gases or vapors. Liquids shall be neutralized before deposition in a waste container.

7.11.2 LIQUID AND GASEOUS WASTES

An approval for the use of isotopes may contain limitations on disposal of liquid wastes by sink and of gaseous wastes through hoods. Such limitations will be designed to ensure conformity with Nuclear Regulatory Commission regulations.

Any laboratory, however, may dispose of radioactive waste into a designated sink if the following conditions are met:

a. A record is kept giving the date and upper estimate of the amount of activity discharged for the day.

b. The material is readily soluble or dispersible in water.

c. The concentration of material with a half life greater than 90 days, (C^{14}, H^3, etc.) discharged into the sink does not exceed the limits in Part 20, Appendix B, Table II, Column 2. Material exceeding these limits is to be placed in the special radioactive pail.

d. The total quantity of any one material discharged per day into the sink does not exceed the minimum amount requiring a radioactive materials label. (Appendix 1, Column I of these regulations.)

e. The Radiation Safety Officer must be consulted for daily disposal of larger quantities than the minimum amount requiring a radioactive materials label or for any other special problems.

f. The foregoing restrictions do not apply to excreta from individuals undergoing medical diagnosis or therapy with radioactive materials.

7.11.3 SOLID WASTE

All solid waste material including wipes, paper towels, broken glassware, etc., which may be contaminated must be placed in the special radioactive waste pails. Non-radioactive waste should not be placed in these containers since special handling costs are involved.

7.11.4 WASTE COLLECTION

Arrangements for regularly scheduled radioactive waste collections (weekly, bi-weekly, monthly, etc., depending on needs) are made through the Nuclear Medicine Service. Those users not requiring routine collections must notify the Nuclear Medicine Service at least five working days in advance of having a full container to be included in the next regular collection. Each department is billed according to the type and number of containers removed.

7.11.5 WASTE DISPOSAL RECORDS

Records shall be kept by the user of all radioisotopes disposed of via any of the above methods. If disposition is made by administration to humans or animals, or by transfer to an authorized recipient, the laboratory use records must show these amounts. In order to maintain releases to the outside via sink or hood within institutional limits such disposals shall be recorded on Form WD-1 and a copy sent to the Nuclear Medicine Service at the end of each month.

7.12 PERSONNEL TRAINING PROGRAM

All persons who work in or frequent a restricted area shall receive instruction to include the following:

1. Areas where radioactive material is used or stored.

2. Potential hazards associated with radioactive material.

3. Radiological safety procedures appropriate to their respective duties.

4. Pertinent NRC regulations.

5. The rules and regulations of the license.

6. The pertinent terms of the license.

7. Their obligation to report unsafe conditions.

8. Appropriate response to emergencies or unsafe conditions.

9. Their right to be informed of their radiation exposure and bio-assay results.

7.12 PERSONNEL TRAINING PROGRAM (continued)

Personnel will be properly instructed in the following situations:

1. Before assuming duties in a restricted area. The extent of instruction will be determined by previous radiation safety training and the scope of the program.

2. Wherever there is significant change in duties, regulations, terms of the license, or scope of the program.

Instruction will be given by the Radiation Safety Officer (RSO), Deputy Radiation Safety Officer, or when appropriate, by the authorized user.

In addition to the above, a three-hour radiation safety lecture will be given no less than once a year by the Radiation Safety Officer or Deputy Radiation Safety Officer. All persons working in or frequenting a restricted area will be required to attend.

Competency determinations of persons working in or frequenting a restricted area will be made through observation, written or oral testing, as appropriate.

Records of all training, testing and competency determination will be maintained.

7.13 DESIGN OF NEW FACILITIES

The design of all facilities involving the use, handling or storage of radioactive materials shall be reviewed by the Radiation Safety Officer to assure the maintenance of adequate environmental protection.

7.14 VACATING FACILITIES

The Radiation Safety Officer shall be informed whenever a facility used for radioisotope work or storage is to be vacated so that appropriate measures, e.g., a final contamination survey, may be taken before the facility is released to a new occupant.

RADIATION SAFETY INSTRUCTIONS FOR ANIMAL CARETAKERS

8.0 The tracer amounts normally used in animal experiments are unlikely to present a significant radiation hazard to animal caretakers. However, care should be taken to avoid contamination of the body, either externally or by ingestion or inhalation.

1. Rubber gloves, aprons, and boots shall be worn whenever contamination is likely, e.g., handling radioative animals or cleaning cages.

2. Smoking, eating, or storage or preparation of food is forbidden in the area where animals containing radioactive material are kept.

3. Personnel working in areas containing radioactive animals sha'l wash their hands thoroughly before leaving the work area.

4. In experiments where radioactive gasses may be generated animals will normally be housed in a fume hood or other appropriately ventilated enclosure until acceptable levels have been achieved. Special handling instructions will be posed on the cages.

5. Additional special instructions, e.g., for washing cages, and/or special monitoring or protective devices will be provided by the Radiation Safety Officer, when indicated.

9.0 NURSING CARE OF PATIENTS RECEIVING RADIOACTIVE MATERIALS

HAZARDS OF RADIOACTIVE ISOTOPES

Hazards may arise from three sources:

1. Contamination of the skin with radioactive materials.

2. Inhalation or ingestion of radioactive materials in the body.

3. Irradiation of the body from outside by radiation emitted from these materials.

No precautions are usually needed for those patients who have received tracer doses of radioactive materials for diagnostic tests.

In general, precautions should be taken when doses of radioactivity above 1 mc. (millicurie) are used.

The hazards increase with increased level of the dose.

Information about special hazards should be obtained from the Radiation Safety Officer or physician responsible for the administration of the radioactive material.

GENERAL PRINCIPLES OF PROTECTION

1. Skin contamination, ingestion, or inhalation is prevented in part by practicing good housekeeping, hand washing, and clean work habits.

   a. Radioactive materials should not be allowed to come into contact with the skin.

   b. Where radioactivity is present, personnel should not be allowed to eat or smoke.

   c. Monitoring, i.e., checking equipment or work areas for radioactivity with a Geiger counter, is necessary when contamination is suspected. (Call the Nuclear Medicine Service.)

2. External irradiation of the body may be reduced to permissible limits by:

   a. Spending the minimum of time close to patients with therapeutic doses of radioactivity.

   b. Taking precautions in handling contaminated equipment.

9.0 NURSING CARE OF PATIENTS (continued)

GENERAL PRECAUTIONS

1. The length of time personnel should remain at any particular distance from the patient shall be determined by the Radiation Safety Officer or the physician responsible for the administration of the radioactive material.

2. Wash hands after contact with patients. Give particular attention to fingernails. Avoid working with open cuts.

3. The Radiation Safety Officer shall be informed if articles are likely to be contaminated. If the Radiation Safety Officer (or his deputy) is not immediately available, the articles shall be stored in a plastic bag and sent to the Nuclear Medicine Service, 18S.

4. It is not necessary to limit visitors in general. In circumstances where very large doses are used and there may be possible contamination, limitations shall be specified by the Radiation Safety Officer or the physician responsible for administration of the radioactive material.

9.1 PATIENTS RECEIVING TRACER DOSES INTERNALLY FOR DIAGNOSTIC STUDIES

GENERAL PRINCIPLES

1. There is no danger in carrying out routine nursing care.

2. Patients are allowed visitors in accordance with the usual hospital rules.

3. Precautions may be necessary if urine or stools are to be saved for isotope studies. Special orders will be written as indicated.

4. If the patient should vomit within the first few hours of oral ingestion of radioisotopes, call the Radiation Safety Officer or the physician responsible for administration of the radioisotopes. (See below for special instructions concerning vomitus.)

5. No special precautions are needed for dishes, instruments or utensils.

SPECIAL INSTRUCTIONS

1. If there are any special instructions for a particular case, they will be noted on the patient's order sheet.

2. When cleaning up vomitus or handling contaminated articles, the nurse or aide should wear disposable gloves. The Radiation

Safety Officer should be called for disposal of contaminated paper towels or other articles. These articles should be set aside in plastic bags to await his arrival and should not be disposed of by routine methods.

9.2 PATIENTS RECEIVING THERAPEUTIC DOSES OF RADIOACTIVE IODINE, GOLD OR PHOSPHORUS

1. Patients treated with Gold-198 or Iodine-131 will be placed in a private room with a toilet.

2. The patient's room will be properly posted in accordance with Section 20.203, 10 CRF Part 20.

3. Surveys of the patient's room and surrounding areas will be conducted as soon as practicable after administration of the treatment dose. Exposure rates will be measured at the patient's bedside, three feet away, and the entrance to the room. The Radiation Safety Officer or his designate will then determine how long a person may remain at these positions and will post these times in the patient's chart and on his door. The results of daily surveys will be used to recalculate permitted times which will be posted on the patient's chart and on his door. A final survey of the patient's room will be required prior to its return to normal use.

4. The form,Nursing Instructions for Patients Treated with Phosphorous-32, Gold-198, or Iodine-131, will be completed immediately after administration of the treatment dose (see Appendix 7). A copy will be posted in the patient's chart.

5. Radiation levels in unrestricted areas will be maintained less than the limits specified in Section 20.105(b), 10 CFR Part 20.

9.3 PATIENTS RECEIVING RADIOACTIVE IODINE

1. Radioactive iodine is administered orally. That portion of the dose which is not retained by the thyroid is almost entirely excreted in urine.

2. Patients who have received small therapeutic doses for thyrotoxicosis or for heart disease require only routine precautions (see pertinent sections of these instructions)

3. Except under unusual conditions (see below), routine nursing care may be employed, and patients may be allowed visitors in accordance with usual hospital regulations.

DETAILED INSTRUCTIONS FOR GENERAL NURSING CARE

1. NO PRECAUTIONS WHATSOEVER are needed for patients who have received doeses of radioactive iodine for diagnostic purposes, except

when vomiting occurs within the first hour of administration. (See special instructions in previous section.)

2. Patients who have received small therapeutic doses for thyrotoxicosis or for heart disease do not need to be isolated from the nursing staff, visitors or other patients.

3. Patients who have received very large doses (30 Millicuries or more) of radioactive iodine for treatment of cancer will have special precautions posted and special instructions given at the time of treatment. The following rules generally apply in these cases:

a. The patient should be placed in a private room with a toilet.

b. Visitors should be limited to no more than one hour per day per visitor, unless approval for longer visits has been obtained from the Radiation Safety Officer or the physician responsible for the administration of the radioisotope.

c. Nursing personnel should attend the patient for routine purposes, but if special nursing care is required, the problem of nursing exposure will be worked out by the Radiation Safety Officer (or his deputy).

d. Pregnant nurses or visitors should not be permitted to enter the room.

EXCRETIONS

Use disposable gloves whenever handling excretion of a patient or contaminated materials.

1. Urine

a. If the urine is to be assayed, it should be collected directly via funnel into the bottle provided at the bedside and held for the Nuclear Medicine Service.

b. A balloon catheter may be inserted in the bladder before treatment.

c. In cases where urine is not to be retained, the patient should be encouraged to make direct use of the toilet in the room taking care to flush thoroughly.

d. Any spillage should be immediately and thoroughly wiped with paper towels which should be placed in a plastic bag and sent to the Nuclear Medicine Service, 185.

2. Stools

Usually there is very little radioactivity in stools. They may be disposed of in the usual way, unless retention is requested.

3. Sputum and Vomitus

a. Should the patient vomit during the first 48 hours after therapy, the vomitus (and sputum) should be collected in waterproofed cardboard container and placed in a plastic bag. It should be sent to the Nuclear Medicine Service for assay. It should be labelled with the name of the patient, date and time of vomiting.

b. If the vomitus is spilled it should be wiped up with towels by a nurse wearing disposable gloves. All linens soiled by vomitus and contaminated disposable gloves should be deposited in a plastic bag.

4. Soiled Tissues and Sponges

Place soiled tissues and sponges in a paper bag attached to patient's bed. This should then be transferred to a plastic bag and sent to the Nuclear Medicine Service for monitoring.

5. Incontinence

If there has been a large spill of urine or vomitus, notify the Radiation Safety Officer or physician responsible for administration of the radioisotope. Do not handle the damp bed clothes without disposable gloves. Remember distance, heavy metal shielding, and short exposure times are the best methods of protection.

EQUIPMENT

1. A plastic lined laundry bag should be used to collect linen, disposable gloves, instruments, etc., where there is possible contamination by Iodine-131 and sent to the Nuclear Medicine Service for monitoring.

2. Thoroughly wash with soap and running water, items such as bed pans, urinals, and basins. Use items for same patient until treatment is complete. Have this equipment, when used by therapy patients, monitored by the Radiation Safety Officer before it is used for other patients.

BATH

Unless specifically ordered by the doctor, the bath should be postponed for the first 48 hours.

EMERGENCY SITUATIONS

If there are any questions of contamination, techniques for handling contamination, or personnel exposure, the Radiation Safety Officer should be contacted.

9.4 PATIENTS RECEIVING RADIOACTIVE GOLD (OR CHROMIC PHOSPHATE)

GENERAL PRINCIPLES

1. Every patient must have a yellow RADIATION tag on his wrist when he returns to the floor after receiving radioactive gold. This tag may ONLY be removed by the physician in charge or the Radiation Safety Officer. Special instructions for this patient's care will be written on the order sheet as indicated.

2. The physician inserts radioactive liquid through a trochar into the pleural or peritoneal space, and the puncture wound is sutured. Therefore, contamination is not a problem--unless there is drainage from the puncture wound.

3. The patient's bed must be isolated from other patients as described on the following page.

4. Nurses should spend only the necessary time near a patient for appropriate nursing care. If indicated, radiation badges will be issued by the Radiation Safety Office (see following page).

5. Visitors must be restricted in accordance with the rules below.

6. No special precautions are needed for vomitus, sputum, urine, stools, or dishes.

SPECIAL INSTRUCTIONS

1. Patients with Radioactive Gold

a. The patient should be placed in a private room. The bed must be arranged so that there is at least six feet distance to occupied beds in neighboring rooms. This does not apply to the use of radioactive chromic phosphate.

2. Nursing Care

a. Surgical dressings and bandages may be changed only as directed by the physician in charge. If there is no drainage from the puncture wound, dressings may be handled in the usual manner after the first two or three days. Surgical dressings used over the puncture wound during the first few days may not

be discarded until directed by the physician in charge or the Radiation Safety Office (see "Emergency Situations" below).

b. Bed baths given by the nurse should be omitted for the first 48 hours, unless specially ordered. This does not apply to the use of radioactive chromic phosphate.

c. Bedding may be changed as usual unless there has been drainage from the puncture wound, in which case the physician in charge or the Radiation Safety Officer should be notified and will direct the disposal of the soiled bedding (see "Emergency Situations" below).

d. If radiation badges are distributed, each badge shall be worn only by the nurse to whom it is issued and shall not be exchanged between nurses. Badges shall be returned to the Radiation Safety Office as directed for processing.

e. Pregnant nurses should not be assigned to the care of radio gold patients.

3. Visitors

a. A visitor may stay at the bedside for no more than one hour per day and is not allowed to sit on the bed. Visitors staying for more than one hour per day must stay at least four feet from the edge of the bed. These rules do not apply to the use of radioactive chromic phosphate.

4. Emergency Situations

a. If there is any question of contamination of bedding, furniture, instruments, clothing, floor, utensils, etc., immediately call the physician in charge or the Radiation Safety Officer, who will monitor the area for radiation hazards and determine what protection or disposal methods are indicated.

b. If the surgical dressing becomes damp or bloody because of drainage or leakage from the puncture wound, DO NOT TOUCH THE DRESSING but call the physician in charge. Keep all wet dressings (together with all instruments or utensils used) in a plastic bag on the patient's bed or table and DO NOT DISCARD until so directed by the physician in charge or the Radiation Safety Officer.

9.5 PATIENTS RECEIVING RADIOACTIVE PHOSPHORUS

GENERAL PRINCIPLES

1. If the P-32 (radioactive phosphorus) is given intravenously,

there is no radiation hazard near the patient and no special precautions are necessary.

2. Nurses may spend whatever time necessary near a patient for appropriate nursing care.

3. Patients are allowed visitors in accordance with the usual hospital rules.

4. No special precautions are needed for sputum, stools, dishes, instruments, or bedding.

EMERGENCY SITUATIONS

1. In case of loose dressings or any problem or question not answered above, CALL THE PHYSICIAN IN CHARGE or the RADIATION SAFETY OFFICER.

9.6 PATIENTS IN OPERATING ROOMS OR RECOVERY ROOMS

OPERATING ROOM

1. The Radiation Safety Officer or the physician in charge of the case will indicate if any special precautions, e.g., the use of disposable gloves or other contamination control procedures, are required.

RECOVERY ROOM

1. Personnel should spend only that time at the bedside necessary for appropriate nursing care; otherwise, no special precautions are needed in a routine post-operative case.

2. In nonroutine cases requiring recovery room time greater than one hour, the Radiation Safety Officer or the physician in charge will issue special instructions depending upon the amount of radioactive material used. If indicated, radiation badges will be issued by the Radiation Safety Office.

10.0 NON-ROUTINE HUMAN USE OF RADIOACTIVE MATERIALS

10.1 GUIDELINES FOR EVALUATION OF PROPOSALS

In evaluation of proposals for the non-routine human use of radioisotopes, the Medical Isotopes Committee will be guided by the following:

1. The benefit expected to be derived from the procedure.

2. The total absorbed radiation dose to the patient.

3. Any previous work on the subject.

4. The radioisotope training and experience of the applicant.

5. The instrumentation available for the study.

10.2 RADIATION ABSORBED DOSE

Adult humans who are ill and who are expected to receive benefit from a diagnostic procedure involving the administration of radioactive materials shall not ordinarily receive amounts so that the total absorbed dose exceeds 10 rem in any twelve-month period. Children in this category (all patients below 15 years of age) shall not receive more than a total absorbed dose of 1.0 rem. Dosage calculations shall be made for the organ of maximum dose.

When volunteers who are not ill are given tracer doses, the amounts must be limited such that the total absorbed dose does not exceed 2.5 rem for adults or 0.25 rem for children in any twelve-month period. Whenever possible volunteer subjects should be at least 30 years of age. Signed consent should be obtained.

It is recognized that some procedures require doses larger than the limits set forth above. In cases where the expected benefits are considered to justify such larger doses, permission may be granted by the Committee.

10.3 AVAILABLE LITERATURE

Where the physiology, metabolic processes, etc., are not well known, the applicant should reference the results of animal studies and any other literature that may be available in support of his estimates of relative organ concentrations and biological half life.

10.4 INSTRUMENTATION

The Committee will consider the sensitivity of the instrumentation available to the applicant in determining whether or not the radiation dose is being kept to the lowest practicable level. The Radiation Safety Officer is available for consultation on instrumentation matters.

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11.0 SAFE HANDLING OF CADAVERS CONTAINING RADIOACTIVE ISOTOPES

11.1 PROCEDURE AFTER DEATH OF PATIENT

11.1.1 If a patient containing less than 5 mc of radioactive material dies in the hospital, no special precautions are necessary.

11.1.2 If a patient dies in the hospital and contains more than 5 mc, the doctor signing the death certificate should inform the pathologist and the Radiation Safety Officer of this fact. The Funeral Director's form should be completed (Appendix 3).

If there is an autopsy and the body contains more than 30 mc, the doctor signing the death certificate should notify the Radiation Safety Officer who will prepare a statement for the Funeral Director.

11.2 CONDUCT OF AUTOPSY

1. When a cadaver suspected to contain more than 5 mc of radioactive material is to be autopsied, the Radiation Safety Officer should be notified.

2. The amount of activity remaining in the body should be estimated by reference to the time elapsed since the administration of the isotope and its biological fate.

3. If the remaining amount is less than 5 mc, no special precautions are necessary other than the usual wearing of gloves, except in cases of I-131 therapy, where the handling of the thyroid gland which contains most of the activity should be minimized.

4. Where the residual activity exceeds 5 mc, the following procedures should be followed:

a. Survey the body before it is opened to establish maximum working times if necessary.

b. Drain carefully all body fluids and save for assay. In cases of I-131 therapy, the blood and particularly the urine will be radioactive.

c. After the body is opened, a second survey should be made to estimate levels of beta ray dose, particularly in the pleural or peritoneal cavity following treatment with Gold-198.

d. Where intense beta ray fields exist (e.g., from Gold-198) the use of double gloves will significantly reduce the hand dose. The working time inside the body will usually be limited by the acceptable exposure of the hands of the pathologist. The use of goggles or glasses is also recommended.

11.2 CONDUCT OF AUTOPSY (continued)

e. In cases of I-131, the thyroid gland will produce a gamma-ray dose of about 0.5 R/min near its surface for each 10 mc in it, and consequently should not be touched by hand directly. Its removal, depending on the activity level, should be accomplished using long instruments.

5. Highly radioactive fluids should be stored behind a shield before disposal via the sewage system (see Section 7.11.2). Highly radioactive specimens should also be stored and handled as infrequently as possible until levels of a few millicuries are reached.

6. All instruments and clothing involved in the autopsy should be monitored after the procedure and stored or decontaminated before return to general use or dispatch to the laundry. The autopsy room should also be surveyed and decontaminated if necessary.

11.3 PRECAUTIONS REGARDING EMBALMING

1. A radioactivity form should be filled out if the residual activity exceeds 5 mc. (Appendix 4).

2. A body containing less than 30 mc may be released directly to the Funeral Director for embalming without the advice of the Radiation Safety Officer, and the form should indicate that no precautions are necessary for standard embalming procedures.

3. The Radiation Safety Officer should recommend precautions, if necessary, on the form accompanying a body containing more than 30 mc. Such precautions might include the wearing of rubber gloves by the embalmer, and the removal of body fluids into a closed system avoiding spillage.

12.0 EMERGENCY PROCEDURES

12.1 SEALED SOURCE RUPTURE

If a disruption of a sealed source occurs, or if potentially hazardous quantities of radioactive dusts, mists, fumes, organic vapors or gases are introduced into the air, the following emergency measures should be taken immediately:

1. No immediate attempt should be made to clean up the spill.

2. All windows should be closed, fans and air conditioners should be shut off, and everyone should leave the room.

3. All doors should be closed and locked.

4. If powdered or gaseous sources are involved, the door and all other openings leading into the room should be sealed with wide masking tape or adhesive tape and heavy wrapping paper.

5. The spread of radioactive contamination can be diminished by restricting the movements of potentially contaminated persons to a local zone just outside the spill area until the extent of shoe and clothing contamination is ascertained.

6. Every person who might have been contaminated should be monitored for radioactivity, and, if contaminated, should remove his clothes and be decontaminated. If no means are available for monitoring, it should be assumed that the person is contaminated.

7. The Radiation Safety Officer should be immediately called and his advice followed.

12.2 UNSEALED SOURCES

All spills of loose radioactive material must be cleaned up promptly. The responsibility for cleaning or for calling for experienced help rests on the individuals working in the area involved and responsible for the spill.

A major spill is defined as an uncontrolled and inadvertent release of radioactive material which exceeds 100 times the amount specified in Appendix 1, Column 1.

Under no circumstances should any untrained person attempt to examine or clean up a major spill of radioactive material. (The cleaning-up technique should be planned with the same care as is used in quantitative chemical analyses or in bacteriological handling of virulent organisms). Fans or ventilating apparatus should not be turned on in

an attempt to blow the isotope or its decay products away. Such a maneuver will only disseminate the radioactive material throughout the area. If the isotope is blown out of a building, air currents may carry the finely divided material into nearby windows or air intake ducts. Proper precautions taken immediately will protect human life and reduce financial losses.

The Radiation Safety Officer shall be notified immediately of all accidents involving possible body contamination or ingestion of radioactivity by personnel, overexposure to radiation, contamination of equipment, spread of contamination or difficulty in cleaning up a contaminated area. The Radiation Safety Officer must be notified immediately in the event of loss of radioisotopes.

The following procedures will be followed:

1. Minor Spills

   a. Notify all persons in the room at once.

   b. Permit only the minimum number of persons in the area necessary to deal with the spill.

   c. Confine the spill immediately.

   d. Don protective gloves.

   e. If a liquid, drop absorbent paper on the spill.

   f. If dry material, dampen thoroughly taking care not to spread the contamination. (Water may generally be used except where chemical reaction with the water would generate an air contaiminant. Oil would then be used.)

   g. Notify the Radiation Safety Officer as soon as possible.

   h. Decontaminate using a monitor to check the progress of the work.

   i. Monitor all persons involved in the spill and the cleaning.

   j. Permit no person to resume work in the area until a survey is made and approval of the Radiation Safety Officer is secured.

2. Major Spills

   a. Notify all persons not involved in the spill to vacate the room at once.

   b. If hands are protected from contamination (i.e., gloves) right the container if the material is liquid.

12.0 EMERGENCY PROCEDURES (continued)

c. If the spill is on clothing, discard outer clothing at once.

d. If the spill is on the skin, flush thoroughly.

e. Shield the spill if possible without spreading contamination or significantly increasing exposure.

f. Switch off fans.

g. Vacate the room.

h. Notify the Radiation Safety Officer as soon as possible.

i. Take immediate steps to decontaminate involved personnel.

Radiation Safety Officer: MARCUS A. ROTHSCHILD, M.D.
Chief, Nuclear Medicine Service

Telephone Numbers: 212-686-7500 Ext. 663/405/751 (Office)
212-683-4851 (Home)

MURRAY ORATZ, Ph.D.
Assistant Chief, Nuclear Medicine Service

Telephone Numbers: 212-686-7500 Ext. 663/405/751 (Office)
516-223-5476 (Home)

Deputy Radiation Safety Officer Steven Rudolph, M.D.

Telephone Numbers: 212-686-7500 Ext. 663/405/751 (Office)
201-836-5173 (Home)

APPENDIX 1

SMALL QUANTITIES OF SOME RADIOACTIVE MATERIALS

Radionuclide		Column I Unsealed Sources µc	Column II Sealed Sources µc	Radionuclide		Column I Unsealed Sources µc	Column II Sealed Sources µc
Antimony	124	1	10	Manganese	52	1	10
Arsenic	73	1	10		54	1	10
	74	1	10		56	50	50
	76	10	10	Molybdenum	99	10	10
	77	10	10	Nickel	59	1	10
Barium-Lanthanum	140	1	10		63	1	10
Beryllium	7	50	50	Niobium	95	10	10
Bromine	82	1	10	Palladium-Rhodium	103	50	50
Cadmium-Silver	109	10	10	Palladium Silver	109	1	10
Calcium	45	10	10	Phosphorus	32	10	10
Carbon	14	50	50	Platinum	191	1	10
Cerium-Praseodymium	144	1	10		193	1	10
				Polonium	210	0.1	1
Cesium-Barium	137	1	10	Potassium	42	10	10
Chlorine	36	1	10	Praseodymium	143	10	10
Chromium	51	50	50	Prometheum	147	10	10
				Radium	226	0.1	1
Cobalt	58	1	10	Rhenium	183	1	10
	60	1	10		186	10	10
Copper	64	50	50	Rhodium	105	10	10
Europium	154	1	10	Rubidium	86	10	10
Fluorine	18	50	50	Ruthenium	103	1	10
Gallium	72	10	10	Ruthenium-Rhodium	106	1	10
Germanium	71	50	50				
Gold	196	1	10	Samarium	153	10	10
	198	10	10	Scandium	46	1	10
	199	10	10		47	1	10
Holmium	166	1	10		48	1	10
Hydrogen	3	250	250	Silver	105	1	10
Indium	114	1	10		110	1	10
Iodine	125	1	10		111	10	10
	131	10	10	Sodium	22	10	10
	132	1	10		24	10	10
Iridium	190	1	10	Strontium	89	1	10
	192	10	10	Strontium-Yttrium	90	0.1	1
Iron	55	50	50				
	59	1	10	Sulfur	35	50	50
Krypton	85	1	10	Tantalum	182	10	10
Lanthanum	140	10	10	Technetium	96	1	10
Lead	203	1	10		99	1	10
	210	0.1	1	Tellurium	127	10	10
Lutecium	177	1	10		129	1	10

Radionuclide		Column I Unsealed Sources uc	Column II Sealed Sources uc
Thallium	200	1	10
	201	1	10
	202	1	10
	204	50	50
Thullium-Ytterbium	170	1	10
Tin	113	10	10
Tungsten	181	1	10
	185	10	10
Vanadium	48	1	10
Yttrium	90	1	10
Yttrium	91	1	10
Zinc	65	10	10
Zirconium-Niobium	95	1	10
Unidentified		0.1	1

APPENDIX 2

Permit Holder: _____

Building & Room: _____

- Receipt -

Isotope	Chemical Form	Batch #	Date Received	Amount in mCi	Packing contam. checks instrument	results-cpm

- Use & Disposal -

Use		Amount Remaining in mCi	Disposal		
Date	Amount in mCi		Date	Amount in mCi	Manner

- Receipt -

Isotope	Chemical Form	Batch #	Date Received	Amount in mCi	Packing contam. checks instrument	results-cpm

- Use & Disposal -

Use		Amount Remaining in mCi	Disposal		
Date	Amount in mCi		Date	Amount in mCi	Manner

APPENDIX 3

NEW YORK VETERANS ADMINISTRATION HOSPITAL

RADIOACTIVE WASTE DISPOSAL RECORD

Department _____ Rm. _____ Ext. _____

Authorized User _____ Signature _____

Isotope		#1	#2	#3	#4	#5	#6
Month	Day	Activity Released	Activity Released	Activity Released	Activity Released	Activity Released	Activity Released
Year	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
Activity per isotope		Total #1	Total #2	Total #3	Total #4	Total #5	Total #6

NOTES:
1. Label each column with isotope being disposed of.
2. Make all entries in microcuries released.
3. Indicate disposal method in column with each entry (H=hood - S=sink - P=radioactive waste pail)
4. A copy of this form must be sent to the Nuclear Medicine Service, 18S, at the end of each month in which an entry is made.

APPENDIX 4

N.Y. VETERANS ADMINISTRATION HOSPITAL

Report of Radioactivity to Funeral Directors

It is hereby certified that the body of

_____

has been examined this date with the following result:

(CHECK ONE)

( ) The body contains less than 30 mc of radioactive material and requires no special precautions if standard embalming procedures are employed.

( ) The body contains more than 30 mc of radioactive material, and the following precautions are recommended:

_____

_____

_____

_____

Signed _____

Title _____

Date _____

APPENDIX 5

GUIDE FOR THE USE OF RADIATION BADGES

The NRC regulations specify the wearing of personnel monitoring devices for individuals entering restricted areas who receive or are likely to receive more than 25% of the maximum permissible doses (Section 7.2). It is, however, recommended that radiation workers wear such devices when it is likely that 10% of these limits may be exceeded, i.e., when the maximum permissible dose for members of the general public may be exceeded.

DIAGNOSTIC STUDIES

A whole body dose of 40 mrem per month (10% of the limits) or a hand dose of 600 mrem per month is unlikely to be exceeded during the conventional daily use of 100 uc or less of a gamma emitter, or 1000 uc or less of a beta emitter in tracer or diagnostic studies with chemicals, animals or humans.

Where quantities of radioisotope greater than these levels are handled, or where the period of daily handling of such quantities comprise a large fraction of the day, it would be prudent to wear a radiation badge. The Radiation Safety Officer should be consulted.

LOW ENERGY BETA EMITTERS

The beta rays from soft beta emitters such as H^3, C-14 and S-35 have insufficient range to affect radiation badges as normally packaged. Therefore, bioassay procedures such as CO_2 breath analysis may be recommended or required by the Medical Isotopes Committee as an alternate means of monitoring personnel.

THERAPEUTIC USE

Therapeutic use of radioactive materials may lead to doses to individuals in their vicinity in excess of 40 mrem/month. Consequently, radiation badges must be worn by all individuals engaged in therapy. This rule applies also to personnel who are frequently close to (within a few feet of) patients undergoing therapy with gamma-emitting isotopes.

Radiation badges will be supplied to users of radioisotopes, personnel in operating rooms, recovery rooms, laboratories, wards, etc., on a trial basis whenever there is a possibility that exposure levels may exceed 40 mrem per month.

RESPONSIBILITIES OF RADIATION BADGE USERS

Each person assigned a radiation badge is responsible for:

1. Wearing the radiation badge at all times while in a restricted area.

2. Leaving the badge in a secure place in the laboratory (away from radiation sources) at the end of the working day.

3. Not transferring the badge to any other person unless specifically directed by the Radiation Safety Officer or his delegate.

4. Returning the badge to the Nuclear Medicine Service promptly upon receipt of the new badge at the beginning of each monthly (or other) monitoring period.

APPENDIX 6

NEW YORK VETERANS ADMINISTRATION HOSPITAL

RADIOACTIVE SHIPMENT RECEIPT REPORT

1. P.O. # _____ SURVEY DATE _____ TIME _____

   SURVEYOR _____

2. CONDITION OF PACKAGE:

   _____ O.K. _____ PUNCTURED _____ STATUS _____WET

   _____ CRUSHED _____ OTHER _____

3. RADIATION UNITS OF LABEL: _____ UNITS (mR/hr)

4. REMEASURED RADIATION LEVELS: a. Package surface _____ mR/hr

   b. 3 feet from surface _____ mR/hr

5. DO PACKING SLIP AND VIAL CONTENTS AGREE?

   a. Radionuclide _____ yes _____ no difference _____

   b. Amount _____ yes _____ no difference _____

   c. Chem Form _____ yes _____ no difference _____

6. WIPE RESULTS FROM: a. Outer _____ CPM = _____DPM

   eff = ( )

   b. Final source container _____CPM = _____DPM

   eff = ( )

7. SURVEY RESULTS OF PACKING MATERIAL AND CARTONS _____mR/hr, CPM

8. DISPOSITION OF PACKAGE AFTER INSPECTION _____

9. IF NRC/CARRIER NOTIFICATION REQUIRED, GIVE TIME, DATE, AND PERSONS NOTIFIED.

APPENDIX 7

NEW YORK VETERANS ADMINISTRATION HOSPITAL

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH

PHOSPHORUS-32, GOLD-198, or IODINE-131

Date: _____

Patient's Name: _____

Room No.: _____ Physician's Name: _____

Radioisotope Administered: _____

Date and Time of Administration: _____

Dose Received: _____ Method of Administration: _____

Exposure Rates in MR/hr

Date	3 feet from bed	10 feet from bed

(Comply with all Check Items)

_____ 1. Visiting time permitted: _____

_____ 2. Visitors must remain _____ from patient

_____ 3. Patient may not leave room

_____ 4. Visitors under 18 not permitted

_____ 5. Pregnant visitors not permitted

_____ 6. Radiation badges must be worn

_____ 7. Use and complete the following tags:

_____ door

_____ bed

_____ chart

_____ wrist

_____ 8. Gloves must be worn while attending patient

_____ 9. Patient must use disposable utensils

_____ 10. All items must remain in room until OK'd by Radiation Safety Officer

_____ 11. Smoking is <u>not</u> permitted

_____ 12. Do not release room to admitting until OK'd by Radiation Safety Officer

_____ 13. Other instructions

In case of an emergency contact:

RSO Name Marcus A. Rothschild, M.D.

212-686-7500 Ext. 663/405/751 (On Duty)
On/off duty Telephone No.

212-683-4851 (Off Duty)
On/Off duty Telephone No.

APPENDIX 8

VETERANS ADMINISTRATION MEDICAL CENTER
NEW YORK, NEW YORK

Medical Isotopes Committee

MARCUS A. ROTHSCHILD, M.D.	Chairman
MURRAY ORATZ, Ph.D.	Secretary
SIDNEY S. SCHREIBER, M.D.	Member
VINCENT J. FISHER, M.D.	Member
JOHN H. AYVAZIAN, M.D.	Member
NORMAN S. COOPER, M.D.	Member
RICHARD D. KITTREDGE, M.D.	Member
MARIE P. BASTI, R.N.	Member