A MANUAL OF GUIDELINES FOR SAFE HANDLING OF RADIOACTIVE MATERIALS AND PROTECTION FROM DIAGNOSTIC X-RAYS

VETERANS ADMINISTRATION MEDICAL CENTER
WEST HAVEN, CONNECTICUT

1984

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IN CASE OF EMERGENCIES CONCERNING RADIATION ACCIDENTS

OR RADIOACTIVE MATERIAL SPILLS AND CONTAMINATION, TELEPHONE:

RADIATION SAFETY OFFICER

DAY EXTENSIONS - 661 or 723

PAGER NUMBER - 246

DURING WEEKENDS AND HOLIDAYS, OR AFTER WORKING HOURS, PLEASE CALL:

THE RADIATION SAFETY OFFICER (RSO)

(NUMBERS AVAILABLE FROM MEDICAL CENTER OPERATOR

OR SECURITY OFFICE - EXT 218)

1. INTRODUCTION

1.1 Purpose. The West Haven Veterans Administration Medical Center (WHVAMC) is authorized to use radioactive materials under licenses issued by the United States Nuclear Regulatory Commission (NRC). This manual is prepared by the Medical Isotope and Radiation Safety Committee at the WHVAMC to provide guidance for the safe handling of radioactive materials and x-rays.

The Medical Isotope and Radiation Safety Committee's aim is to promote the best practice in the safe handling and use of ALL radioactive materials within the area of the Medical Center's jurisdiction. Its services are available to all users of radioactive compounds and shall complement the radiation safety practices already existing within the Medical Center. All regulations concerning radioactive compounds shall be implemented by the action of the Medical Isotope and Radiation Safety Committee in association with the individual users, Service Chiefs, Chief of Staff and Medical Center Director. The Radiation Safety Officer (RSO) derives authority from and is responsible to the Medical Isotope and Radiation Safety Committee reqarding measures to implement radiation protection and control with the Medical Center.

Each person using radioactive materials has an obligation to prevent the spread of contamination from the sources for which he is responsible. Furthermore, it is the responsibility of each worker to undertake no task until he knows that adequate safety provisions are in effect. Thus an acknowledgment of the contents of this manual is mandated for each user of radioactive material at the WHVAMC by completion of a copy of an ACKNOWLEDGMENT form

Management has an obligation to ensure safety, to include radiological safety, for all employees. Management's responsibility is to retain only employees who will practice safety for themselves and their co-workers. See ALARA Report (Appendix #1)

1.2 Scope. As a guide this manual does not contain sufficient detail to cover all situations concerned with the safe use of radioactive materials; thus, supplemental material will be issued at appropriate times. For further information personnel working with radionuclides may consult the references included in this manual. the Chairman of the Medical Isotope and Radiation Safety Committee or the RSO. NRC publications are available from the RSO and National Council of Radiation Protection (NCRP) publications are available in the Medical Center Library.

1.3 Definitions.

1.3.1 Authorized User: (Principal Investigator) An individual specifically named as an authorized user and a person specifically designated by the Medical Center's Medical Isotope and Radiation Safety Committee under the provisions of the License.

1.3.2 Controlled or Restricted Area: Any Medical Center area the access to which is controlled for the purpose of protecting individuals from exposure to radiation and radioactive materials. Controlled or restricted area shall not include any areas used as residential quarters, although a separate room or rooms in a residential

building may be set apart as a restricted area. Both Federal and State regulations define restricted areas containing radiation which require special control measures as follows:

a. Radiation Area - Any area accessible to individuals in which there exists ionizing radiation at such levels that a major portion of the body of such individuals could receive a dose equivalent greater than 5 mrem in any 1 hour or 100 mrem in any 5 consecutive days.

b. High Radiation Area - Any area accessible to individuals in which there exists ionizing radiation at such levels that a major portion of the body could receive in any 1 hour a dose equivalent greater than 100 mrem.

The authorized user shall be responsible for work with radioactive compounds in his own restricted area and also shall be responsible for controlling access to the area.

1.3.3 Curie: That quantity of radioactive material which disintegrates at the rate of 3.7×10^{10} atoms per second, and is the unit by which radioactivity is measured. One millicurie (mCi) equals 0.001 curie; one microcurie (uCi) equals 0.000001 curie.

1.3.4 Dose: That quantity of radiation absorbed, per unit of mass, by any body tissue. Reference to a dose during a specific period of time means the total quantity of radiation so absorbed during such period.

1.3.5 Medical Center: West Haven Veterans Administration Medical Center.

1.3.6 Individual: Any human being.

1.3.7 License: An NRC Broad License issued to the Medical Center under the NRC regulations.

1.3.8 License: The West Haven VA Medical Center.

1.3.9 Occupational Dose: Any dose received by an individual in the course of employment where duties involve the possible exposure to radiation. It shall not include any dose received by any individual in the course of exposure to radiation for the purpose of medical diagnosis or therapy.

1.3.10 Rad: A measure of the dose in terms of the energy absorbed, per unit of mass, by any body tissue. One rad is the dose corresponding to such absorption of 100 ergs per gram of such tissue. One millirad (mrad) equals 0.001 rad.

1.3.11 Radiation: Any or all of the following: alpha, beta, gamma or x-rays and neutrons, high speed electrons and protons and other atomic particles.

1.3.12 Radioactive Materials: Any material which emits any or all of the particles or rays listed for Radiation above, whether licensed by the NRC or not.

1.3.13 Rem: A special unit of dose equivalent. (Dose in Rem=Dose in Rad multiplied by a quality factor). A measure of the dose in terms of its estimated biological effect relative to a dose of one Roentgen (R) of x-rays. One millirem (mRem) equals 0.0001 Rem. The relation of the Rem to other dose units depends upon the biological effect under consideration, and the conditions of irradiation. Any of the following, for protection purposes, can be considered to be equivalent to a dose of one Rem:

one R (Roentgen) due to X-or gamma radiation;
one Rad due to X-, gamma or beta radiation;
0.1 Rad due to neutrons or high energy protons;
0.05 Rad due to particles heavier than protons with sufficient energy to reach the lens of the eye.

1.3.14 Roentgen: Unit of exposure of X-or gamma radiation such that the associated corpuscular emission per one electrostatic unit of quantity of electricity of either sign. A numerically identical definition is 1 R = 2.58×10^{-4} C/kg, where C = coulombs. One milliroentgen (mR) equals 0.001 Roentgen.

1.3.15 Survey: An evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions.

1.3.16 Uncontrolled or Unrestricted Area: Any Medical Center area the access to which is not controlled or restricted for the purpose of protecting individuals from exposure to radiation and radioactive materials, any area used as residential quarters. Such an area does not require control measures:

a. If an individual continually present in the area cannot receive more than two mRem in one hour of 100 mRem in any 7 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.

REFERENCES

1. Radiation Protection for Medical and Allied Health Personnal, NCRP 48, 1976.

2. Dental X-Ray Protection NCRP-35, 1971.

3. NRC Regulation 10 CFR, Part 20 - Safe Use of Radioactive Materials.

2. PERSONNEL

2.1 Physical Examinations. A thorough medical examination shall be made at the time of employment of each individual who is to be potentially exposed to radiation. The personnel Health Physician will give particular attention to the pre-employment occupational factors or unusual radiation exposures in the physical examinations of employees. Results of all examinations shall be filed in the employee's personal file.

Complete physical examinations of employees exposed to radiation will be performed when requested by the respective Service Chief, Chairman, Medical Isotope and Radiation Safety Committee or the Personnel Health Physician.

3. MAXIMUM PERMISSIBLE OCCUPATIONAL DOSE.

3.1 TYPE OF EXPOSURE	LIMIT
WHOLE BODY	1250 Millirems Per Quarter
WHOLE BODY	5000 Millirems Per Year
WHOLE BODY	5000 Millirem (Age-18) Lifetime
SKIN	7500 Millirems Per Quarter
PREGNANT WOMEN (with respect to fetus)	500 Millirems in Gestation Period
HANDS, FOREARMS, FEET AND ANKLES	18750 Millirems Per Quarter 75000 Millirems Per Year

U.S. Nuclear Regulatory Commission Regulations. Title 10, Part 20 CFR

3.2 Minors. With some exceptions, occupationally exposed individuals in the United States are limited (by law) to a minimum age of 18 years (1). Thus, the Chairman, Radiation Safety and Medical Isotope Committee or his duly authorized representative shall be consulted prior to permitting persons under 18 years of age (excluding patients) access to controlled areas.

3.3 Fertile Women. During the entire gestation period, maximum permissible dose equivalent to the fetus from occupational exposure of the expectant mother should not exceed 0.5 Rem (1). Once a pregnancy is known the Chairman, Medical Isotope and Radiation Safety Committee or his duly authorized representative shall be consulted in order to review work continuance.

3.4 ALARA - It is the WHVAMC policy to keep exposures to levels as low as reasonably achieveable. The Medical Isotopes and Radiation Safety Committee has adopted a program to help accomplish the intent of this policy and the ALARA program is outlined in Appendix #1.

REFERENCE

1. NCRP REPORT NO. 39, BASIC RADIATION PROTECTION CRITERIA, Recommendations of the National Council on Radiation Protection and Measurements, Issued January 15, 1971.

4. PROCUREMENT OF A PERMIT TO USE RADIOACTIVE MATERIALS

4.1 Procedure. An intending user of radioactive materials shall submit a protocol according to the procedures established by the Medical Isotope and Radiation Safety Committee. Applications per the forms in Appendix #2 shall be completed by the applicant.

4.2 Responsibility of Approved Users. Those persons who are permitted by the Radiation Safety and Protection Committee to use radionuclides are responsible for the safe use of radiation sources by individuals under their control. These persons are responsible for:

a. Compliance with the rules contained in the WHVAMC's Guidelines For Safe Handling of Radioactive Materials and Protection From Diagnostic X-Rays;

b. Instruction of employees under their control in the use of safety devices and procedure and to assure each employee has attended a Radiation Safety Seminar;

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

d. Communication of pertinent information regarding employees to the RSO with respect to changes in operational procedures, new techniques, alterations in the physical plant or new operations which might lead to increased exposures to individuals or contamination levels in the laboratory or the environs;

e. Direction of personnel under their control to comply with all recommendations to wear film badges, to survey their hands and clothing, to submit urine specimens, etc. which are designed to control and to reduce their total exposure;

f. Limitation of use of radionuclides under his permit to those whom he supervises;

g. Maintenance of required current records of receipt, use, storage and disposal of radionuclides;

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

4.3 Responsibility of the Individual User. Each person at the WHVAMC who has any contact with sources of ionizing radiation has a responsibility to:

a. Keep his exposure to radiation at the lowest possible value and specifically below the maximum possible exposure as stated in Section 3;

b. Wear the recommended radiation detectors for personnel, such as film badges and pocket ionization chambers;

c. Survey his hands, shoes, body and clothing for radioactivity and remove all loose contamination before leaving the laboratory.

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

e. Avoid smoking, eating, drinking or food preparation in laboratories where radioactive compounds are used;

f. Maintain clean working habits;

g. Check working areas for contamination periodically or after each procedure in which radioactive compounds are used in conformity with Section 8;

h. Maintain good housekeeping practices in the laboratories;

i. Label and segregate radiation waste and equipment to avoid cross contamination;

j. Report immediately to the RSO the details of a spill or other accidents involving radioactivity;

k. Conduct decontamination procedures;

l. Deliver radioactive waste to radioactive waste area, room DB-10, refer to Section 10 for further details.

5. PROCUREMENT OF RADIOACTIVE MATERIALS

5.1 Purchase. No orders for radioactive materials to be purchased through the Medical Center using the Medical Center License as authority shall be procured until the Medical Center Form 07-2237 is signed by the Chairman, Medical Isotope and Radiation Safety Committee or his duly assigned representative. All requests must contain the appropriate NRC License Number. A file copy of the 2237 will be supplied to the Nuclear Medicine Service.

The business office at Yale University has been informed that no orders for radioactive materials using grant funds should be procured on the WHVAMC License unless approved by the Chairman, Medical Isotope and Radiation Safety Committee or his designate.

The above regulations shall apply to the procurement of any radioactive material (Regardless of source) to be used at the WHVAMC.

5.2 Incoming Shipments. The Purchasing and Receiving Departments shall adopt internal procedures to insure that all incoming shipments are immediately delivered unopened to the user.

5.2.1 In the event that incoming shipments appear to have been damaged in transit the following procedure should be strictly followed:

a. Notify the Radiation Safety Officer immediately.

b. If possible have vehicle and driver remain for a survey of possible contamination.

c. Refer to Hospital Memorandum No. 115-3 for details.

d. Isolate the damaged package from further handling.

e. Keep all personnel away from the immediate vicinity of the package.

f. Under no circumstances is anyone to attempt to open the shipment until Radiation Safety Officer is present.

Numerous kinds of commercial equipment now contain radioactive materials in such small quantities that labeling or special packaging is not required by governmental shipping regulations. However, radiation and leakage from these items may also cause technical interferences with the sensitive radiation measurments made in many hospital programs. When these commercial items are received or discovered, they should be labeled to denote the presence and, if known, the amount and kind of radioactive material. Radiation Safety Officer should be notified, in writing, as to the radionuclide amount (in microcuries), and location of any such radioactive sources.

5.2.2 Upon receipt by the user, the following procedure should be followed:

a. Take all radioactive packages to the area designated for processing or storage.

b. Disposable gloves should be worn while processing the packages and remote handling devices should be used when possible.

c. Measure the exposure rate at the package surface with a suitable survey meter. Record exposure rate (mR/hr). If the exposure rate exceeds 200 mR/hr DO NOT OPEN - NOTIFY the Radiation Safety Officer.

d. Open outer package and remove packing slip. Open inner package and verify that the contents agree in name and activity with the packing slip as well as with the appropriate form 07-2237.

e. Check for possible breakage of seals or containers, loss of liquid, or change in color of liquid absorbing material.

f. If the shipment appears intact, remove the radioactive material from the outer package and place behind lead shielding.

g. Monitor the shipping package inside and out for radioactive contamination with a suitable survey meter. Document any pertinent findings.

h. Record the date the shipment was received, radionuclide, chemical form, quantity, supplier, and the name of the person for whom the shipment was ordered.

i. Volatile radioactive compounds should be processed under a hood. Immediately notify the Radiation Safety Officer of damage or breakage in the shipping container or of any discrepancies. Contaminated articles should be discarded in the "hot" waste containers.

The respective user(s) of the radioactive material(s) should ALWAYS wear disposable gloves when handling the radioactive container (including any shielding material) since quite often they are contaminated. The respective user(s) shall be responsible for maintaining accurate and complete written records of each receipt, transfer or disposal of radioactive materials.

5.3 Outgoing Shipments. All shipments or transfers must be approved by Radiation Safety Officer before shipment or transfer. See Appendix #4.

6. STORAGE, SIGNS AND TRANSPORTATION OF RADIOACTIVE MATERIALS ON MEDICAL CENTER PREMISES

6.1 Storage and Records. All radioactive material shall be secured against unauthorized removal from the place(s) of storage. Further,

a. Radionuclides requiring a "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.

b. The radionuclides 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.

c. Containers must be properly labeled and area signs posted where necessary.

d. 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.

Pursuant to NRC regulations accurate and complete records of each receipt, use or transfer, and disposal of radioactive materials shall be maintained. The record keeping is the responsibility of the user.

6.2 Posting and Labeling. Signs are required by regulations to denote areas on containers with levels of radiation or radioactivity as specified below.

6.2.1 "CAUTION RADIATION AREA" - in areas accessible to personnel in which a major portion of the body could receive in any one hour a dose of 5 mrem or in any five consecutive days a dose in excess of 100 mrem.

A sign is NOT required:

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

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

6.2.2 "CAUTION RADIOACTIVE MATERIAL" - in areas in which radioactive material is used or stored in amounts exceeding those in Appendix #5, Column I (taken from Appendix C 10 CFR 20), on containers in which radioactive material is transported, stored or used in amounts exceeding those in Appendix #5, Column II (taken from Appendix C 10 CFR 20).

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 minimum permissible concentration for occupationally-exposed individuals (10 CFR 2 Appendix B, Table 1, Column 2), or for laboratory containers, such as beakers, flasks and test tubes, used transiently in laboratory procedures, when the user is present.

6.2.3 Other signs are required in HIGH RADIATION AREAS and in AIRBORNE RADIOACTIVITY AREAS. The RSO must be consulted regarding control measures in these areas.

6.3 Transportation on Medical Center Premises. The following guides shall be followed when transporting radioactive materials on Medical Center premises.

a. Radionuclides requiring a "Radioactive Materials" label must be enclosed in non-shattering carrying cases or containers, preferably metallic, before being transported through corridors or between buildings.

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

c. 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 the one meter does not exceed 10 mrem per hour.
(This rule follows the D.O.T. shipping regulations.)

7. HANDLING OF RADIOACTIVE MATERIALS

7.1 Guidelines. Minimum guidelines for the safe handling and/or use of radioactive materials are given below.

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

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

c. 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.

d. 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.

e. 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.

f. Pipetting by mouth is not permitted.

g. 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.

Gloves should be cleaned, if practicable before removal or disposal. They should be handled and stored to prevent contamination of the inside surface.

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

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 count-rates on a thin end-window Geiger-Muller survey meter of less than 200 cpm may be released to the Medical Center laundry. Clothing showing higher count-rates shall either be stored until the count-rate is less than 200 cpm, laundered by an approved decontamination laundry or disposed of through a commercial disposal company, at the discretion of the Radiation Safety Officer.

7.2 Design of New Facilities and Procedures. The design of all facilities involving the use, handling or storage of radioactive materials shall be reviewed by the Medical Isotope and Radiation Safety Committee to assure maintenance of adequate environmental protection. New proposed procedures and techniques will likewise be reviewed.

References:

NCRP Report No. 39. BASIC RADIATION PROTECTION CRITERIA.

NRC RULES AND REGULATIONS.

8. SURVEYS

8.1 Type and Frequency. All laboratories where radionuclides are used or stored shall be surveyed on a routine basis. Routine surveys consist of a measurement of contamination levels on bench tops and any other work surface (to include swipes), the radiation levels of temporarily-stored radioactive materials in such a laboratory, and whenever necessary measurement of concentrations of radioactivity in the air, either inside the laboratory or in hoods, and/or effluent from hoods in the vicinity of the laboratory building(s). Survey frequency will depend on many factors to include quantity and/or quality of radioactive material being used, areas of use, type of use, and results.

The Radiation Safety Officer shall assist in the initial survey to be performed before any work with radioactive materials is begun; subsequent surveys shall be performed by the user according to type and frequency as recommended by the RSO. Regardless of frequency, a final survey shall be performed when vacating premises.

8.2 Instruments. Principal Investigators may supply his own survey meters or surveying instruments are available in Nuclear Medicine Service. These instruments must be known to be capable of detecting the radiation in question. If there is any doubt concerning the selection of an instrument for a particular survey consult the RSO.

All survey instruments should be calibrated at least once a year and shall be checked with a performance check source prior to use. In addition to routine calibrations, any instrument shall be calibrated as soon as practicable after any of the following occurrences:

a. Any rough or unusual handling of the instrument, i.e., dropping, etc.

b. Any major maintenance.

8.3 Results. Results of such surveys are to be recorded on a floor plan in their exact locations, and such reports are to be made out in duplicate with one copy being retained by the user and one copy being forwarded to the RSO.

8.4 Contamination Levels. Small amounts of contamination will be unavoidable at times, but the degree of such contamination should be kept as low as possible. Loose contamination on exposed surfaces such as bench tops and floors shall be removed as soon as possible consistent with the limits specified in Appendix #6.

In all cases controls for contaminated surfaces, areas, or equipment shall be instituted where necessary to prevent the occurrence of a health hazard or the spread of contamination.

9. PERSONNEL MONITORING

9.1 Requirements. Personnel monitoring devices are required by regulation and records must be maintained, if an individual receives or is likely to receive a dose in any calendar quarter in excess of 25 percent of the values in Section 3.1 (5 percent for individuals under 18). In general, personnel monitoring shall be required for all Medical Center personnel working with radioactive materials. Exceptions may be made for personnel employed in laboratories using the following radionuclides exclusively: H^3, C^{14}, S^{35}, Ca^{45}, Ni^{63}, Rb^{87}.

Pregnant women shall be monitored with a suitable device, and their exposure shall be kept below the 0.5 rem (500 millirem) exposure guide for the 9 month gestation period.

9.2 Devices. Such monitoring will normally take the form of film badges.

Where the nature of the radiation or the unusual level of the possible exposure dictates their choice, personnel dosimeters of the ionization or thermoluminescent type, in addition to the film badge, may be required. All information derived from these devices must be recorded and maintained.

9.3 Radiation Exposure. Investigation levels have been established in order to monitor individual occupational exposure. See Appendix #1.

9.4 Film Badge Program. The Radiation Safety Officer, at the request of the Chief of each using service, will issue numbered monitor film badges to all personnel whose employment involves regular or irregular exposure to any source of radiation hazard. (The same serial number will be assigned to one ndividual as long as he is employed at this Medical Center in areas of radiation hazard). In the event the employee leaves our employ or is reassigned from his position, the numbered film badge will be turned in to his department head or his designate and held until the routine collection time for exposure examination.

The "Film Badge Radiation Exposure Reports" furnished by the Contractor who performs the radiation exposure examinations, will be sent to the Radiation Safety Officer. He will retain one copy and forward one copy of exposure reports to the appropriate department head or his designate.

9.5 In Vivo and Bio-Assays. In certain instances it is impossible to accurately determine the dose received from exposure to radioactive materials by any means other than in vivo counting or bio-assays. In these cases personnel will be required to be available for in vivo measurements or to submit specimens as may be necessary to fully evaluate exposures.

10. WASTE DISPOSAL PROCEDURES

10.1 General. Waste disposal at the Medical Center must follow the United States Nuclear Regulatory Commission Rules and Regulations as stipulated in Title 10, Part 20 "Standards for Protection Against Radiation." The Medical Center's Medical Isotope and Radiation Safety Committee has further stipulated that disposal by burial will not be allowed. Thus, three alternatives remain; namely, disposal by release into the sanitary sewerage system, or storage until decay has rendered the material free of radioactivity, or regular pickup by private vendor.

10.2 Specific. Appendix #8 details the RADIOACTIVE WASTE DISPOSAL PROCEDURES at the Medical Center. The maximum allowed to sanitary sewer is a total of 5 curies ^{3}H, 1. curie ^{14}C, and 1. curie of all other isotopes per year for the entire institution, above and beyond that which passes through patients.

10.3 Patient Excreta. The foregoing do not apply to excreta from individuals undergoing medical diagnosis or therapy with radioactive materials. Human waste with radioactive material may be flushed away in the usual manner.

11. ANIMALS CONTAINING RADIOACTIVE MATERIALS

11.1 General. The administration of radionuclides to lower animals requires some additional considerations with respect to the SAFE HANDLING OF RADIOACTIVE MATERIALS. Foremost among these considerations are adequate instructions to those persons handling the animals and their waste products. All of the usual requirements of radiation area posting and radioactive material labeling shall apply to *in vivo* animal experiments.

11.2 Specific. The principal investigator shall be responsible for the implementation of the following regulations.

a. Injections of radioactive materials in animals shall be carried out in stainless steel trays having absorbent materials in the bottom. Disposable gloves shall be worn by the workers for all levels of radioactivity requiring a radioactive materials sign.

b. Animals containing radioactive materials must be kept in cages apart from other animals.

c. The cages used to house the animals receiving radioactive materials should either be of the disposable type or constructed in such a manner as to be readily decontaminated.

d. All cages having animals containing radioactive material shall be clearly labeled as follows:

(1) Name of radionuclide
(2) Amount of radioactive material administered per animal
(3) Date of administration
(4) Principal Investigator's name
(5) Proper labeling of cage (e.g. "Caution Radioactive Material" tape must be Affixed to the cage)

e. All animal excreta which may contain radioactivity shall be collected and disposed of, if necessary, after storage. Whenever feasible, radioactive decay shall be used to dissipate the activity to the fullest extent prior to disposal. There are no restrictions for disposal through the sewage system if the excreta is in a suitable form, i.e., not mixed with sawdust or wood shavings and it is soluble or readily dispersible in water and below the quantities specified in Section 10.2 - Appendix #8.

If the excreta show no significant activity above background when monitored appropriate to the radionculide involved (survey meter and/or wipes), they may be discarded as normal trash in a suitable container.

In all other cases, the excreta shall be labeled with the name of the radionuclide and the estimated amount of activity and disposed of in accordance with Section 10.2 - Appendix #8, Solid Wastes.

f. The carcasses or dissected parts of radioactive animals shall be wrapped in absorbent material and placed in a watertight container so as to prevent dripping during transportation and/or storage. Disposal shall be in accordance with Section 10.2 - Appendix #8, Laboratory Animals.

g. Adequate ventilation and air cleaning must be provided in instances where animals are stored after administration of radioactive materials that may be volatilized and dispersed in a room.

h. Instructions to animal handlers shall consist of, at least the following considerations:

(1) Each person in charge of an experiment involving the use of radioactive materials in animals will be responsible to see that animal handlers who are caring for such animals have been made aware of the methods and procedure to be used to maintain radiological safety.

(2) Each person who is to care for animals receiving radioactive materials shall receive a copy of the RADIATION SAFETY MANUAL.

(3) Animal Handlers shall be oriented in the following specific respects before they are allowed to care for animals containing radioactive materials.

a. Their responsibilities for radiological safety and the methods to be employed to carry out this responsibility.

b. The methods to be employed for contamination control.

c. Their role in maintaining radionuclide accountability.

d. Action to be taken in the event of an accident.

e. The proper use of personnel monitoring and protective clothing as may be appropriate for the experiment.

f. Their role in maintaining contamianton control boundaries.

12. HUMAN USE OF RADIOACTIVE MATERIALS

12.1 General. The Medical Isotope and Radiation Safety Committee shall review all proposals for the use of radioactive materials in patients for experimental and diagnostic purposes. Therapeutic purposes shall be governed by the Radio-Therapeutic physician in accordance with NRC License #06-00092-05. The regulations of the Committee shall govern the permitted use. Nuclear Medicine Service shall be responsible for maintaining records of ALL diagnostic and experimental radioactive materials for human use. Radiation therapy service shall be responsible for maintaining records of all their radioactive materials for human use.

12.2 Specific - Experimental and Diagnostic. The experimental and diagnostic human use of radioactive materials shall be goverened by the conditions of the applicable U.S. NRC By-product Materials License issued to the Medical Center and the specific regulations of the Medical Isotope and Radiation Safety Committee. The experimental and diagnostic (tracer) doses shall be kept to the lowest practicable level and utmost consideration shall be given to young adults, and fertile and pregnant women.

12.3 Specific - Therapeutic. In addition to Section 12.2 patients containing therapeutic quantities of radioactive materials shall remain hospitalized until the residual radioactivity is 30 mCi or less. Radiation surveys of the patient's room, special nurse (attendant) or visitor instructions, necessary personnel monitoring, etc., shall be implemented by the RSO with reference to the Recommendations of the National Council on Radiation Protection and Measurements, NCRP REPORT NO. 37, "Precautions in the Management of Patients Who Have Received Therapeutic Amounts of Radionuclides," (Issued October 1, 1970).

A "Radiation Safety Check List for Discharged Patients Containing Radionuclides" (Appendix #9) shall be completed by the RSO and should be made a part of the patient's record.

"Instructions for Family of Released Patients" containing radioactive material (Appendix #10) shall be completed by the RSO and should be made part of the patient's record.

12.4 Cadavers and Emergency Surgery. It must be impressed upon a responsible family member that if the patient containing radioactivity dies at home or in another hospital, has emergency in another hospital, or has an emergency illness at home, the RSO at the Medical Center shall be informed immediately. Appendix #10 form provides a statement to this effect.

Section 5 of NCRP REPORT NO. 37 provides detailed information covering many contingencies for patients containing radioactive materials who die or need emergency surgery while in the Medical Center. Pertinent parts of Section 5 of NCRP REPORT NO. 37 shall guide the RSO with respect to such contigencies (and will also be applied to the patient containing radioactive material who dies or has an emergency illness at home). A "Radioactive Report Accompanying the Body" (Appendix #11) shall be provided to the funeral director by the RSO.

13. GUIDELINES FOR NURSING CARE OF PATIENTS CONTAINING RADIOACTIVE SOURCES FOR THERAPY

13.1 Care of Patients Containing Sealed Radioactive Sources* for Therapy

a. Patients containing sealed radioactive sources are very unlikely to produce external contamination of linen and personnel.

b. Many sources used for diagnostic purposes do not require the extensive precautions listed in these guidelines.

c. Protection of nursing personnel can be attained by using the factors of time, distance, and shielding.

1. Time: This is the most important factor to reduce radiation exposure. Limit the time in the vicinity of the patient to the essenial duties required for adequate nursing care. Do not linger needlessly near the patient.

2. Distance: Use distance whenever possible for additional protection. Standing near the patient's head or at the foot of the bed (For abdominal implants) can produce lower exposures than standing at the side of the bed.

3. Shielding: This is the most difficult protection device to offer the nurse. Lead screen may be used beside the patient's bed for additional protection. A lead screen is available from Radiation Therapy Department.

13.2 Preliminary Precautions

a. A single room is necessary for any patient undergoing radiation therapy with isotopes.

b. A "Limit Visitors" sign is to be placed on the door.

c. A "Caution - Radioactive Material" sign is to be placed on the door.

d. The patient will wear a wristband indicating that he or she is undergoing treatment with radioactive material.

e. The following information will be noted on a form to be supplied by the Radiation Safety Officer (RSO) or the Radiation Therapy Physician.

1. Date and time inserted.
2. Area inserted.
3. Radioisotope being used.
4. Type of source (needles, seeds, liquid, etc.)
5. Number of source.
6. Strength of such source
7. Date and time to be removed.

A copy of this form will be kept:

1. In the patient's chart
2. In the Kardex*
3. By the Radiation Safety Officer (RSO).

f. A lead storage cart will be placed in the patient's room for the removal of sources.

g. Movable lead screens may be available for additional protection if deemed necessary by the RSO. (Available from Radiation Therapy Department).

h. If possible, the patient should be positioned in the room so that personnel can approach the head of the patient. Most nursing procedures require the nurse to approach the head of the bed, and positioning the patient in the above manner eliminates the need to pass the radioactive source twice. For oral cavity implants, the nurse should approach the foot of the bed.

13.3 Guidelines for Nursing Care

The following guidelines are recommended, based on the time, distance and shielding factors previously discussed and are consistent with adequate nursing care:

a. Bed Changing and Making. Bed linen will not be changed during intersititial therapy unless it becomes soiled. Change the bed before the implantation of the source and immediately after the source is removed. If the patient is allowed out of bed, have him sit on the opposite side of the room if it is necessary to change the bed.

b. Baths. No bed baths will be given during interstitial therapy. Wash the patient before the implantation of the source and immediately after its removal. If the patient is allowed to move and able to move, he should be permitted to wash himself.

c. Back Rubs. No back rubs will be given unless the patient is uncomfortable and back rubs are ordered specifically by the physician.

d. Vital Signs and Medications. Vital signs will be taken and medications given as ordered by the physician.

*Discard after source is removed.

e. Feeding. Patients should feed themselves whenever they are able. Use routine procedure for the disposal of dishes. Carry out tube feedings as quickly and efficiently as possible.

f. Emergency Care of a Patient. (Nausea, vomiting, etc.) This should be carried out quickly and without fear of being exposed to radiation, and by rotation of the nursing staff.

g. During nursing care, the nurse must check all materials used by the patient (linens, bedpans, emesis basin, etc.) for radioactive sources which may have accidentally fallen out of place.

h. If possible, the nurse will inspect the source to make certain that the source appears to be in its proper position.

i. Explain to the patient that nursing care may be limited during the treatment; reassure the patient that you are present and will check his needs frequently.

j. Limit visitors to 6 feet from the patient and for one-half hour per day. No pregnant women or children will be allowed to visit.

k. Housekeeping personnel should not be allowed in the room while the source is present. The room should be cleaned before insertion of the source and as soon as possible after the source is removed and the room monitored.

l. The patient must stay in bed unless orders are written to the contrary.

m. Pregnant nurses should not be assigned to patients containing radioactive sources.

n. Surgical dressings used to cover the area of source insertion may be changed only by the physician or radiologist, and may not be discarded unless checked by the Radiation Safety Officer.

o. Special orders will be written on oral hygiene for patients with radioactive implants in the oral cavity.

13.4 Procedures to follow if a radioactive source becomes dislodged:

a. If a radioactive source becomes dislodged or displaced, immediately notify the physician and the Radiation Safety Officer.

b. Never pick up a radioactive source with your hands. Forceps will be provided for this purpose; they will be put on the lead storage cart. Forceps should preferably be 12 inches long.

c. Source will be placed into the lead storage cart.

13.5 Other precautions:

a. When necessary to transport patients, use an empty elevator, and push stretcher from opposite end of implanted site.

b. The patient's room will be monitored after all sources have been removed. Everything used by the the patient (except dishes) must be saved.

c. If a patient containing radioactive materials expires, notify the RSO in additon to other personnel.

d. Pocket dosimeters and/or film badges will be issued when needed to check an individuals exposure.

Nursing Care of Patients Containing Unsealed Radioactive Sources for Therapy

1. The precautions listed in "Guidelines for Nursing Care of Patients Containing Sealed Radioactive Sources for Therapy" will also apply to this procedure.

   Note: For diagnostic isotopes, precautions 2 through 8 will be observed for 6 hours after the use of I-131 for thyroid uptake, thyroid scan, urinary excretion, fatty acid absorption.

2. Disposable dishes will be used for patients undergoing radiation therapy with unsealed radioactive sources.

3. Nurses will wear disposable rubber or plastic gloves when handling any excreta from the patient.

4. Gowns will be worn to protect clothing from possible contamination when working in the patient's room.

5. Plastic laundry hampers lined with a plastic bag will be used to store soiled linen. This must be checked for contamination before removal from the patient's room.

6. Waste baskets will be lined with a plastic bag. This must be checked for contamination before removal from the patient's room.

7. Patient's excreta can be thrown into the toilet or hopper; the toilet or hopper must be flushed three times.

8. Any spill or radioactive material (urine, feces, etc.) must be reported immediately to the RSO. Do not clean the area yourself unless no one can be contacted. Refer to "Procedure To Be Followed in The Event of Spillage of Radioactive Material"; also, "Special Instructions for Radioisotopes".

9. Everything used by the patient must be saved and the room monitored for contamination following the discharge of the patient.

13.6 Specific instructions for Radioisotopes P-32, I-131, Au-198

1. P-32 Radioactive Phosphorus (1-10 mc)

The hazard associated with radioactive phosphorus results from exsanguination, within one week of administration. If bleeding occurs from any orifice or area, all blood contaminated equipment or materials (including personnel's uniforms) must be handled with rubber gloves and the RSO called to dispose of this material or equipment. DO NOT DISPOSE OF THIS EQUIPMENT YOURSELF. If the radioactive blood gets on the nurse's skin, the nurse must call the RSO for monitoring and decontamination. Meanwhile, she may scrub the skin area with a brush, soap and water.

2. I-131 (Radioactive Iodine) (4-100 mc)

Radioactive iodine is likely to be present in vomitus up to six hours following ingestion. The radioactive iodine is excreted in the urine and constitutes a hazard for about 48 hours. Bedpans should be handled with rubber gloves; the urine can be emptied into the toilet unless the nurse is requested to do otherwise. The bedpan should be kept in the patient's unit for this 48 hour period and must be checked by the RSO for monitoring prior to its use on the ward for any other patient. If the urine is to be collected, the collection jar must remain in the room and RSO called to dispose of the collection. If urine is spilled in any area, DO NOT ATTEMPT TO CLEAN THE AREA, BUT CALL THE RSO. If it is impossible to contact the personnel of the Nuclear Medicine Service, the nurse, wearing rubber or plastic gloves, can wipe up the urine and, after washing the area with soap and water, save the materials
used in the patient's unit until the Nuclear Medicine personnel can be notified. The cleaned area must be avoided until it has been monitored by the Nuclear Medicine personnel. If urine is spilled on the skin, wash the area for five minutes with a brush and soap and water and report to the RSO for monitoring. Any equipment or material contaminated with urine in this 48 hour period must be kept in the patient's unit and handled by the Nuclear Medicine laboratory personnel.

3. Au-198 (Radioactive Colloidal Gold) (50-100 mc)

Because the radioactive gold is in a colloidal state, normally, it will not be excreted. If a beet red color is noted on the dressing over the instillation site, do not handle this material; notify the RSO immediately. If dressing must be handled in an emergency, wear rubber gloves and use a Kelly clamp to pick up the dressings.

13.7 Procedure to be Followed in the Event of Spillage of Radioactive Material

If any radioactive material is spilled, the following steps must be taken:

1. Close off the area to avoid spread of contamination to and by unsuspecting persons.

2. Shut off the ventilation when possible.

3. CALL RSO - Ext. 723, 661 or Pager 246.

4. If you are unfamiliar with decontamination procedures, or if you do not know, or are not sure of the type of material and/or the quantity of material spilled, wait for the RSO. If no one can be contacted, proceed with the following:

a. Begin decontamination by using protective clothing such as plastic or rubber gloves, gown and rubber or plastic overshoes. Do not begin decontamination if atmospheric contamination is a possibiity (if radioactive gas has been released.

b. Confine the active solution to as small an area as possible with blotting paper or other suitable material.

c. Keep the area moist with water and absorb with blotting paper.

d. Repeat step 7 until the RSO arrives. If no one is available, repeat step 7 several times, limit traffic through the contaminated area and report the incident to the RSO as soon as possible.

e. Dispose of all contaminated material in a plastic lined box labeled "Radioactive Wastes".

f. Refer to Specific Instructions for Radioisotopes P-32, I-131 and Au-198.

14. NURSING CARE FOR PATIENTS AT VAMC, WEST HAVEN, RECEIVING INTERNAL DIAGNOSTIC DOSES

14.1 General Principles.

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

b. Patients are allowed visitors in accordance with the usual Medical Center rules.

c. Precautions may be necessary if urine or stools are spilled or are to be saved for clinical studies. Special orders will be written as indicated. Postpone routine urine collections if possible.

d. If the patient should vomit within the first few hours of oral ingestion of radioactive material, call the responsible physician and/or RSO. (See below for special instructions concerning vomitus.)

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

14.2 Special Instructions.

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

b. When cleaning up vomitus or handling contamined articles, the nurse or aide should wear rubber or plastic gloves. The RSO should be called for disposal of contaminated paper towels or other articles. These articles should be set aside to await his arrival and should not be disposed of by routine methods.

REFERENCE

1. Adapted from ENVIRONMENTAL ASPECTS OF THE HOSPITAL, VOLUME III - SAFETY FUNDAMENTALS, U.S. Department of Health, Education and Welfare, Public Health Service, Division of Hospital and Medical Facilities and Division of Environmental Engineering and Food Protection, Washington, D.C., 20201, (Public Health Service Publication No. 930-C-17, July 1967, p. 13).

15. NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC DOSES OF RADIOCTIVE IODINE (1)

15.1 General Principles.

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

b. Precautions which must be taken depend entirely upon the amount of radioactivity administered.

c. Except under unusual conditions (see below), routine nursing care may be employed, and patients may be allowed visitors in accordance with usual Medical Center regulations. The patient should be in a single room.

15.2 Precautions.

a. NO PRECAUTIONS WHATSOEVER are needed for patients who have received doses of radioactive iodine for diagnostic purposes or for therapy of thyrotoxicosis, except when vomiting occurs within the first hour of administration. (See special instructions in previous Section 14.2.)

b. Patients who have received very large doses (30 mCi or more) of radioactive iodine for the 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:

(1) The patient will be admitted to a private room with toilet. The same utensils will be used throughout the stay.

(2) Visitors (over 18 yrs of age) should be limited to no more than one hour per day per visitor, unless approval for longer visits has been obtained from the responsible physician and/or Radiation Safety Officer (RSO).

(3) 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 in collaboration with Nuclear Medicine Service. Specific orders shall be written in re: Time, Distance and Shielding.

(4) The nurses in attendance should secure and wear a film badge or other monitoring device. These may be obtained from the Radiation Safety Officer (Ext. 723) (Pager 246) and will be collected as directed. A film badge shall be worn only by the nurse to whom it is issued and should not be exchanged between nurses.

(5) A radioactive material tag indicating isotope, amount, and date will be placed on patients wrist.

15.3 Excretions. Use rubber or plastic gloves whenever handling excretion of a patient or contaminated materials.

a. Urine

(1) Urine should be collected only when requested directly via funnel into the bottle provided which is kept in a lead cart at the bedside. This urine will be disposed of by the RSO.

(2) A balloon catheter may be inserted in the bladder before treatment.

(3) In cases where urine is not to be retained, it may be disposed of in the usual way, taking care not to spill.

(4) Any spillage should be immediately and thoroughly wiped with paper towels while wearing gloves and all contaminated material should be placed in the marked radioactive disposal can. The RSO shall be notified.

(5) Encourage the patient to take care of his own collection if possible.

b. Stools

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

c. Sputum and Vomitus

(1) Should the patient vomit during the first 48 hours after therapy, the vomitus (and sputum) should be collected in a waterproofed cardboard container and saved within the lead cart. It should be labeled with the name of patient, date and time of vomiting. The RSO shall be notified.

(2) If the vomitus is spilled it should be wiped up with towels by a nurse wearing rubber or plastic gloves. All linens soiled by vomitus and contaminated gloves should be deposited in a plastic bag for monitoring by the RSO.

d. Soiled Tissues and Sponges

(1) Place soiled tissues and sponges in a paper bag attached to patient's bed. This should then be transferred to the disposal can for ultimate monitoring by the RSO.

e. Incontinance

(1) If there has been a large spill of urine or vomitus, immediately notify the doctor and/or RSO. Do not handle the damp bed clothes without rubber or plastic gloves. Remember distance, heavy metal shielding, and short exposure times are the best methods of protection.

15.4 Equipment

a. A metal can with plastic bag inside should be provided by the RSO to collect linen where there is possible contamination by Iodine-I31. The disposal of possible contaminated linen should be determined by the RSO.

b. A disposal can suitably marked should be placed in each room with I-131 therapy cases to collect active waste. This will be emptied periodically by the RSO.

c. Rubber and plastic gloves should be worn while cleaning contaminated equipment. These gloves should be washed with soap and running water while on the hands and dried before removal and disposal.

d. The sink in the patient's room should be used for washing contaminated equipment. This sink should be washed after each use with soap and water and scrubbed with a brush to prevent collection of radioactivity and subsequent dissemination.

e. Thoroughly wash with soap and running water, items such as bedpan, urinals, and basins. Use items for same patient until treatment is complete. Have this equipment monitored by the RSO before it is used for other patients.

15.5 Nursing Care:

a. Postpone bathing a patient for first 48 hours unless specifically ordered.

b. Use paper plates and plastic utensils for first 48 hours and place in plastic bag, to be checked by Radiation Safety Officer.

c. Discharge - Notify the Radiation Safety Officer when patient is discharged. The room will be surveyed under his supervision. The results of this survey will be conveyed to the head nurse, who will arrange for decontamination by Building Management if levels are minimal.

15.6 Emergency Situations. If there are any questions of contamination, techniques for handling contamination, or personnel exposure, a member of Nuclear Medicine Service or the Radiation Safety Officer (ext. 723) should be contacted.

REFERENCE

1. Adapted from ENVIRONMENTAL ASPECTS OF THE HOSPITAL, VOLUME III - SAFETY FUNDAMENTALS, U.S. Department of Health, Education and Welfare, Public Health Service, Division of Hospital and Medical Facilities and Division of Environmental Engineering and Food Protection, Washington, D.C., 20201, (Public Health Service Publication No. 930-C-17, July 1967), pp. 23-25.

16. NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC DOSES OF RADIOACTIVE PHOSPHORUS.

16-1 General Principles

a. If the P-32 (radioactive phosphorous) is given intravenously there is no radiation hazard near the patient and no special precautions are necessary.

b. If the P-32 is given orally, there is no radiation hazard unless the patient vomits the first 12 hours. If the patient vomits during the first 12 hours, follow the instructions given below under Special Instructions, Section 16-2.

c. If the P-32 is used for Intracavity Therapy no special precautions are necessary unless a previous surgical wound incident to the cavity shall reopen. In this event the attending physician and/or the Chief of Nuclear Medicine and RSO shall be notified immediately and the instructions given in Section 16.3c below.

d. Nurses may spend whatever time necessary near a patient for routine nursing care.

e. Patients are allowed visitors in accordance with the Medical Center rules.

f. No special precautions are needed for sputum, stools, dishes, instruments, or bedding. (See below Special Instructions, (Section 16.2) for precautions to be used for vomitus). Urine is usually radioactive and should be handled with care, using rubber gloves. (See Section 16-2 below).

16.2 Special Instructions

a. If the P-32 has been given intravenously, and the patient vomits, no special precautions are necessary.

b. If the P-32 has been given orally and the patient vomits within 12 hours, the vomitus and any soiled clothing, bedding and utensils should be collected and put into a metal can labeled radioactive. Wear rubber or plastic gloves to do this, and then still wearing the gloves, wash them with soap and water at any sink. Use plenty of water to wash down the sink. Place the gloves after removal with other contaminated items. Call the RSO who will arrange for the disposal of the contaminated items. (See Emergency Situations below).

c. If a urinal or bedpan is used, care should be taken to avoid spillage in tranferring urine to the toilet. Rubber or plastic gloves are advised when handling urine. If urine collection has been oriered, carefully transfer it to a five-pint bottle. The bottle should be labeled with the patient's name, number and time of collection and sent to the ordering physician (in a suitable shielded container as advised by the RSO). Urine spillage should be wiped up with paper tissues and these may be flushed through the nearest toilet. Gloves

should be thoroughly washed with soap and water while still on the hands and then disposed of in the usual way. Likewise the urinal should be thoroughly washed at any sink before reuse.

d. If the P-32 is used topically (direct application to the skin under a surgical dressing) do not touch the dressing. If the dressing becomes loose or needs changing, call the attending physician or the Chief, Nuclear Medicine and/or the Radiation Safety Officer (RSO).

e. P-32 should not be used for Intracavity Therapy if there is any evidence of fluid loculation or any possibility of mechanical leakage from a surgical wound site. In the event, however, that a previously closed surgical wound should reopen or there is any possibility of leakage of the radioactive phosphorous call the attending physician and the Chief of Nuclear Medicine and/or the RSO immediately.

16.3 Emergency Situations. In case of loose dressing or any problem or question not answered above, call the attending physician or the Chief, Nuclear Medicine and/or the RSO.

16.4 Radiation Protection Program for Sealed Cesium-137 Sources

a. All cesium sources will be stored in a protective enclosure equipped with locks to prevent theft. This enclosure, in turn, will be kept in the Radiation Therapy Department in a room accessible to only the technical and professional staff. This room will be equipped with protective devices that minimize personnel exposure during source preparation.

b. All cesium soruces will be tested for leakage twice per year when in use. Swipes will be compared with a standardized cesium source in a well-type scintillation detector capable of detecting 0.005 microcuries of cesium-137 or a instrument of equal sensitivity

c. All personnel who participate in cesium-137 procedures, and subsequent patient care will be provided with radiation monitors such as film badges.

d. A running inventory of cesium sources will be maintained, especially during and just after patient treatment. All sources will be counted prior to and immediatly after procedure.

e. Patients wll be monitored for radioactivity after the sources are removed to insure that all of the sources have, in fact, been removed. Bedding and other areas of the patients room will also be monitored. For this purpose, A geiger type survey meter will be maintained at the nursing station on the floor where radioactive patients are housed.

REFERENCE

1. Adapted from ENVIRONMENTAL ASPECTS OF THE HOSPITAL, VOLUME III - SAFETY FUNDAMENTALS, U.S. Department of Health, Education and Welfare, Public Health Service, Division of Hospital and Medical Facilities and Division of Environmental Engineering and Food Protection, Washington, D.C., 20201, (Public Health Service Publication No. 930-C-17, July 1967), pp. 23-25.

17. SEALED SOURCE LEAK TESTING PROCEDURES

17.1 General. At the present time the Medical Center is licensed by the Nuclear Regulatory Commission (NRC) to possess and use various sealed sources of radioactive compounds. The sealed sources are housed, when not in use or transit, in Radiation Therapy and Nuclear Medicine Service.

17.2 Specific. Conditions of the License specify, in part, that the sources shall be tested for leakage and/or contamination at intervals not to exceed six months when in use. Tests shall be capable of detecting the presence of 0.005 microcuries and maintained for inspection by the RSO. Presence of 0.005 microcuries or more of removable contamination of the test samples shall result in the immediate withdrawal of the source from use with subsequent decontamination or disposal in accordance with guidelines.

The procedure for the leak test of the sources is as follows: The exterior surfaces of the sources are wiped with filter papers which have been moistened with 70% alcohol. Each filter paper is tested relative to a leak test comparison standard. Recorded results, in units of microcuries, are maintained by the RSO.

17.3 Sealed Sources. A label stating the type and amount of activity shall be attached to sealed sources.

REFERENCE

1. USA Standard, CLASSIFICATION OF SEALED RADIOACTIVE SOURCES, Approved April 22, 1968, Sponsored by American Institute of Chemical Engineers, 345 East 47 Street, New York, New York 10017, pp. 8-10.

18. FIRE SAFETY

18.1 Procedure. The radioactive materials presently in use at the WHVAMC DO NOT present any special hazard in relation to the fire and safety program. In the event of fire or other emergency relating to radioactive materials:

a. Notify all other persons in the room and building at once.

b. Attempt to put out fires if radiation hazard is not immediately present.

c. Notify the RSO.

d. Govern fire-fighting or other emergency activities by the restrictions of the RSO.

e. Following the emergency, monitor the area and determine the protective devices necessary for safe decontamination.

f. Decontaminate

g. Permit no person to resume work without approval of the RSO.

h. Monitor all persons involved in combating the emergency.

i. Prepare a complete history of the emergency and subsequent activity related therto for the record.

19. EMERGENCY PROCEDURES

19.1 Introduction. Either the Nuclear Medicine Service or the Radiation Safety Officer shall be notified immediately at the numbers noted below of all accidents involving radioactive materials. These may include minor and major spills of radioactive material, sealed source ruptures, accidents involving possible body contamination or ingestion of radioactivity by personnel, overexposure to radiation, contamination of equipment, spread of contamination, or difficulty in cleaning a contaminated area.

The RSO must be notified immediately in the event of loss of radionuclides. If necessary outside consultants experienced in radiation hazards should be called in and their advice followed.

A copy of Emergency Procedures Involving Radioactive Materials, which has been distributed to each radioactive material user, shall be required reading for all personnel in each user's unit and should be ultimately posted for easy reference.

The Nuclear Medicine Service and the Radiation Safety Officer can be reached via telephone as follows:

Daytime (work days):	Nuclear Medicine Service Extension 723, 661 or Pager 246.
After Hours, Weekends, Holidays:	Radiation Safety Officer (call Medical Center Operator or Security Office).

19.2 Minor Radioactive Material Spills. These are usually spills involving no personnel radiation hazard and must be cleaned up promptly. The responsibility for cleaning or for calling for experienced assistance rests on the individuals working in the area involved and responsible for the spill.

The following procedures will be followed for minor spills.

a. Notify all other persons in the room at once.

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

c. Confine the spill immediately.

Liquid spills: Don protective gloves. Drop absorbent paper on spill.

Dry Spills: Don protective gloves. Dampen throughly, taking care not to spread the contamination. (Water may generally be used except where chemical reaction with the water would generate an air contamination. Oil should be used for latter case).

d. Notify the RSO as soon as possible.

e. Decontaminate.

f. Monitor all persons involved in the spill and cleaning

g. Permit no person to resume work in the area until a survey is made and approval of the RSO is secured.

h. Prepare a complete history of the accident and subsequent activity related thereto for the laboratory record.

19.3 Major Radioactive Material Spills. These are usually spills involving a radiation hazard to personnel. Under no circumstances should any untrained person attempt to examine or clean up a major spill of radioactive material. The cleanup 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 be turned off and left off to prevent spread of contamination. PROPER PRECAUTIONS TAKEN IMMEDIATELY WILL PROTECT HUMAN LIFE AND REDUCE FINANCIAL LOSSES.

The following procedures will be followed for MAJOR spills.

a. Notify all persons not involved in the spill to vacate the room at once and NOTIFY THE RSO. (If necessary, outside consultants experienced in radiation hazards should be called in and their advice followed).

b. If the spill is liquid, and the hands are protected, right the container of the spilled liquid.

c. Take immediate steps to decontaminate personnel involved.

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

e. If the spill is on the clothing, discard outer or protective clothing at once.

f. Switch off all fans and ventilating apparatus.

g. Ensure that contamination is kept to the least area practicable.

h. Vacate the room.

i. Decontaminate the area(s) involved. (Personnel involved in decontamination must be adequately protected).

j. Monitor all persons involved in the spill and cleaning to determine adequacy of decontamination.

k. Permit no person to resume work in the area(s) involved until a survey is made and approval of the RSO is secured.

l. Prepare a complete history of the accident and subsequent activity related thereto for the laboratory records. A copy should be provided for the RSO.

19.4 Accidents Involving Radioactive Dusts, Mists, Fumes, Organic Vapors and Gases.

a. Notify all other persons to vacate the room immediately.

b. Hold breath and close escape valves, switch off air circulating devices, etc., if time permits.

c. Vacate the room. Notify the RSO at once. (If necessary, outside consultants experienced in radiation hazards should be called in and their advice followed).

d. Ascertain that all doors giving access to the room are closed and post conspicuous warnings or guards to prevent accidental opening of doors.

e. Report at once all known or suspected inhalations of radioactive materials.

f. Evaluate the hazard and the necessary safety devices for safe reentry.

g. Determine the cause of contamination and rectify the condition.

h. Decontaminate the area.

i. Perform air survey of the area before permitting work to be resumed.

j. Monitor all persons suspected of contamination.

k. Prepare a complete history of the accident and subsequent activity related thereto for the laboratory records.

19.5 Injuries To Personnel Involving Radiation Hazards. The following procedures should be followed:

a. Wash minor wounds immediately, under running water, while spreading the edges of the gash.

b. Report all radiation accidents to personnel (wounds, overexposure, ingestion, inhalation) to the RSO as soon as possible.

c. Call a physician qualified to treat radiation injuries at once. (Call Nuclear Medicine Service and/or RSO - Ext. 723, 661 or Pager 246).

d. Permit no person involved in a radiation injury to return to work without the approval of the RSO and the attendant physician.

e. Prepare a complete history of the accident and subsequent activity related thereto for the laboratory records, and provide a copy to the RSO.

20. PROTECTION POLICIES FOR RADIATION PRODUCING MACHINES AND AREAS.

20.1 All operating personnel and personnel in the immediate area will be required to wear a film badge or other personnel monitoring device. A copy of the monthly report on film badges should be kept in the Department and should be available to the Personnel working in the Department.

20.2 An annual, schedule survey of all radiation producing equipment used on patients shall be made by a certified health physicist. In addition, radiation surveys will be made of all new installations and all existing installations after every change that might change the radiation (e.g., replacement of x-ray tube changes in filtration of beam). Report of findings should be filed in the Department.

20.3 Unless measurements indicate that they are not needed, protective aprons shall be worn by the physician, nurse, technician, and all other persons within the room or area who are frequently or habitually exposed to radiation.

20.4 Dose rates for the beam shall be determined for all units used on human subjects and will be reported to the operator in milliroentgens per-second or milliroentgens per minute.

20.5 In the operation of mobile and dental units:

a. The operator will verbally notify personnel in area that x-ray is to be taken and verify that warning was acknowledged.

b. The operator should stand as far as possible from the tube and patient during exposure, and should wear a protective apron, or step behind an adequate shield.

c. An operator, standing at least 6 feet from the tube and patient. Rotation of operators or the use of portable shield is recommended, available doors should be closed during procedures.

20.6 The hand of the fluoroscopist should never be placed in the useful beam unless the beam is attenuated by the patient and a protective glove of at least 0.25 mm lead equivalent is worn.

20.7 No person shall be regularly employed to hold patients during exposure, nor shall anyone from the Diagnostic Radiology Department ever be permitted to perform such service. The person holding the patient shall wear protective gloves and a protective apron. No part of this person's body should be in the unattenuated direct beam.

20.8 Shutter mechanisms and interlocking devices should not be tampered with and shall be inspected at frequent intervals to insure proper operation.

20.9 All protective devices that may become defective due to use or abuse, such as protective lead aprons or gloves, should be inspected for radiation leakage at least every six months, or whenever the integrity of the equipment is suspect. Necessary replacement and report findings should be filed in the Department.

20.10 When fluoroscopy is performed, a manual reset cumulative timing device shall be used which will either indicate elapsed time or turn off the apparatus when the total exposure reaches a certain previously determined limit.

20.11 In cineradiography, tube currents and potentials are often higher than those used in fluoroscopy. Thus, special care should be taken to limit patient exposure. The exposure rates on these cineradiography units shall be determined during the annual survey. Recommendations should be displayed.

20.12 X-ray diffraction equipment can be particularly hazardous because of high exposure rates in the primary beam (e.g., in excess of 500,000 roentgens per minute at the x-ray tube port).

a. A radiation survey shall be made by the Radiation Safety staff before a new installation is placed in routine operation and whenever changes are made which could adversely affect radiation protection. The equipment shall be frequently inspected for radiation leakage and a radiation survey shall be made at least annually by Radiation Safety personnel.

b. Appropriate operating procedures and safety measures approved by the Radiation Committee shall be established and followed for these units.

20.13 Personnel specifically responsible for such equipment shall insure that all workers in the area are monitored in accordance with the requirements for the specific unit.

APPENDIX #1

Program for Maintaining Occupational
Radiation Exposures As Low As Readily Achievable
Veterans Administration Medical Center
West Haven, CT.

August 15, 1980

I. Management Commitment

a. We the management of the Veterans Administration Medical Center, West Haven, CT., are committed to the program described in this document for keeping exposures from radioactive materials used at the VAMC (individual and collective) as low as reasonably achievable (ALARA). The administrative organization for radiation safety has the responsibility of developing the necessary policy, procedures and instructions to foster the ALARA concept within our institution. The organization includes a Medical Isotopes - Radiation Safety Committee (RSC) Radiation Safety Officer (RSO) and a consultant.*

b. We will perform a formal annual review of the radiation safety program including ALARA considerations. This shall include reviews of operating procedures and past exposure records, inspections, etc., and consultations with the radiation protection staff and/or outside consultants.

c. Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost, in our judgment, is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been sought, that modifications have been considered, and that they have been implemented where reasonable. Where modifications have been recommended but not implemented, we will be prepared to describe the reasons for not implementing them.

d. In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all individuals exposed to radioactive materials will also be maintained at the lowest achievable level consistent with growth in service.

II. Medical Isotopes - Radiation Safety Committee (RSC)

a. Licensure

1. The RSC will be responsible for obtaining all the necessary licenses from the USNRC for use of radioactive materials at the VAMC. In addition, the RSC will be responsible for establishing policy relating to the use of radioactive materials at the VAMC. This program is one such policy.

*Consultant Certified Health Physicist

b. Review of Proposed Users and Uses

1. The RSC will thoroughly review the qualifications of each potential authorized user with respect to the types and quantities of radioactive materials and uses for which he has applied to ensure that the user will be able to take appropriate measures to maintain exposure ALARA.

2. When considering a new use of radioactive material, the RSC will review the efforts of the authorized user to maintain exposure ALARA. The user should have systematized procedures to ensure ALARA, and should have considered the use of special equipment such as syringe shields, rubber gloves, in his proposed use.

3. The RSC will ensure that the user justifies his procedures and that they will result in ALARA doses (individual and collective).

4. The RSC will also act as the institution's Radioactive Drug Research Committee.

c. Delegation of Authority

1. The RSC will delegate sufficient authority to the RSO for enforcement of the ALARA concept.

2. The RSC will support the RSO in those instances where it is necessary for the RSO to assert his authority. Where the RSO has been overruled, the Committee will record the basis for its action.

d. Review of ALARA Program

1. The RSC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

2. The RSC will perform a quarterly review of occupational radiation exposure with particular attention to instances where Investigational Levels in Table I are exceeded. The principle purpose of this review is to assess trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded (see paragraph VI).

3. The RSC will evaluate our institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of management.

III. Radiation Safety Officer (RSO)

a. Annual and Quarterly Review

1. Annual review of the Radiation Safety Program. The RSO will perform an annual review of the Radiation Safety Program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.

2. Quarterly review of Occupational Exposures. The RSO will review at least quarterly the external radiation exposures of authorized users and workers to determine that their exposures are ALARA in accordance with the provisions of paragraph VI of this program.

3. Quarterly review of records of Radiation Level Surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

b. Education Responsibilities for an ALARA Program

1. The RSO will schedule briefings and educational sessions to inform workers of ALARA program efforts.

2. The RSO will assure that authorized users, workers, and ancillary personnal who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the RSC and the RSO are committed to implementing the ALARA concept.

c. Cooperative Efforts for Development of ALARA procedures

Radiation workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

1. The RSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials.

2. The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and encourage the use of those procedures.

3. Suggestions of individual workers for improving health physics practices may be sent directly to the RSO c/o Nuclear Medicine/115.

IV. Authorized Users

a. New Procedures Involving Potential Radiation Exposures

1. The authorized user will consult with, and receive the approval of, the RSO and/or RSC during the planning stage before using radioactive materials for a new procedure.

2. The authorized user will evaluate all procedures before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

V. Persons Who Receive Occupational Radiation Exposure

a. The worker will be instructed in the ALARA concept and its relationship to his working procedures and work conditions.

b. The worker will know what recourses are available if he feels that ALARA is not being promoted on the job.

VI. Establishment of Investigational Levels in Order to Monitor Individual Occupational External Radiation Exposures.

This institution hereby establishes Investigational Levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the Radiation Safety Committee and/or the Radiation Safety Officer. The Investigational Levels that we have adopted are listed in Table 1 below. These levels apply to the exposure of individual workers.

Table 1

		Investigational Levels - (mrems per calendar quarter)	
		LEVEL I	LEVEL II
1.	Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads	125	375
2.	Hands and forearms; feet and ankles	1875	5625
3.	Skin of whole body*	750	2250

*Not normally applicable to nuclear medicine operations except those using significant quantities of beta emitting isotopes.

The Radiation Safety Officer will review and record on Form NRC-5, Current Occupational External Radiation Exposures, or an equivalent form (e.g., dosimeter processor's report), results of personnel monitoring, not less than once in any calendar quarter, as is required by 10 CFR 20, 20.401. The following actions will be taken at the Investigational Levels as stated in Table 1:

a. Quarterly exposure of individuals to less than Investigational Level I.

Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table I values for the Investigational Level I.

b. Personnel exposures equal to or greater than Investigational Level I, but less than Investigational Level II.

The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I. He will report the results of his reviews at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the Committee. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

c. Exposure equal to or greater than Investigational Level II.

The RSO will investigate in a timely manner the cause(s) of all personnel exposures equaling or exceeding Investigational Level II and, if warranted, take action. A report of the investigation, actions taken, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the RSC at the first RSC meeting following completion of the investigation. The details of these reports will be recorded in the Committee minutes. Committee minutes will be sent to the management of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

d. Re-establishment of an individual occupational worker's Investigational Level II Above That Listed in Table I

In cases where a worker's or a group of worker's exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consisten with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented.

The Radiation Safety Committee will review the justification for, and will approve, all revisions of Investigational Levels II. In such cases, when the exposure equals or exceeds the newly established Investigational Level II, those actions listed in paragraph c. above will be followed.

VII. Signature of Certifying Official

I hereby certify that this institution has implemented the ALARA Program set forth above.

FOR AND IN THE ABSENCE OF

H. Benson Werthan

Signature

ALBERT M. BLECICH, Medical Center Director

Name (print or type)

APPENDIX #2

WEST HAVEN VETERANS ADMINISTRATION MEDICAL CENTER

FOR OFFICE USE ONLY
Approved by:

RADIOACTIVE ISOTOPES USE APPLICATION

Fill out, (in duplicate) sign, and return to:

_____

_____

_____

_____

Mr. Otto Motzer
Nuclear Medicine Service/115
Building 5, Rm. C-223
West Haven VA Medical Center
West Spring Street
West Haven, CT. 06516

Tel: X-723 or X-684

Date_____(Authorization will expire 24 months from application date).

1. Name of Principal Investigator_____Rank_____
Faculty or Staff

Room No. & Bldg._____All rooms in which Isotope is to be used_____

Service_____Telephone No._____

2. Isotope desired (Please complete one set of forms for each isotope)_____

3. A. Estimated quanitity to be used during next 2 years_____Millicurie(s)
B. Maximum quantity to be purchased at any one time_____Millicurie(s)
C. Maximum quantity to have on hand at any one time_____Millicurie(s)
D. Form: Liquid ( ) Gas ( ) Powder ( ) - Will powder be dissolved in shipping vial? ( ) - Please describe alternative procedures in Item 5.
E. Are any of the following items to be used?
Infectious viruses Yes ( ) No ( ) - (If answer to either is Yes, please outline deactivation in Item 5).
Carcinogenic agents Yes ( ) No ( )
Other biohazards Yes ( ) No ( ) - (If Yes, explain in Item 5).

F. Are animals to be used? Yes ( ) No ( ) - Type_____
Care be involved in caring for radioactive animals? Yes ( ) No ( )

3. Please list experience of Principal Investigator, relating to isotopes:

4. The following list of persons who will use or be exposed to radiation under this authorization, have been instructed by the Principal Investigator in the radiation protection problems and appropriate precaustions to minimize exposure associated with the above isotope. Everyone using radioactive isotopes must be listed and attend a Radiation Safety Seminar presented by the Health Physics Division, Yale University, or the WHVAMC Radiation Safety Seminar Series.

Principal user_____ Others:_____

5. Outline projected research, with COMPLETE details on proposed procedure for handling isotope. Also, the microcurie or millicurie amounts which will be used for each experiment. If human use is anticipated, attach a copy of Human Use Application Form. If animal use is anticipated, attach request to use hazardous agents or materials in animals.

6. List facilities for handling isotope. (Note: dry smears, using #41 Whatman filter paper and counted in a liquid scintillation counter, should be taken to survey areas and equipment for radioactive contamination resulting from work using C-14 and H-3):

Hood	( )	Appropriate warning signs and labels	( )
Shielding	( )	Waterproof backed absorben material	
Disposable gloves	( )	for bench and floor covering	( )
Geiger counter	( )	Film Badges, Body	( )
Mechanical pipette	( )	Film Badges, Wrist	( )
Stainless steel sink	( )	Air Sampling Equipment	( )
Liquid scintillation counter	( )	Glove Box	( )

7. What local plans have been made, by Principal Investigator, for decontamination in case of accident?

8. WASTE DISPOSAL - NRC and State regulations require written records of the disposition of all isotopes received. Have you:

	YES	NO
A. Made arrangements with Nuclear Medicine Service to obtain appropriate radioactive waste containers.	( )	( )
B. Planned for a record-keeping system to enable you to correctly label waste as to isotope, date, quantity, and investigators name.	( )	( )
	( )	( )
C. If using animals, made provision for forzen storage of carcasses in your area, or the animal research facilities. (If large animals are to be used, adequate storage must be provided by Principal Investigator).	( )	( )
D. Any possibility of a radioactive gas release?	( )	( )
E. Read the Radiation Safety Procedures concerning radioactive waste disposal procedures?	( )	( )

9. Signature below affirms that the applicant has read and will comply with the regulations set forth by the WHVAMC Medical Isotopes Committee regarding the use of radioactive materials. (In case of prolonged absence or termination, please notify the Nuclear Medicine Service, Ext. 684, Mr. Otto Motzer).

_____

(Signature)

SUPPLEMENT A - HUMAN USE

If radioactive material is for "human use" (internal administration of radioactive material, or the radiation therefrom to human beings), complete this Supplement and attach to application.

1. A. Name of Applicant:

   B. Area(s) where material is to be used.

2. A. Describe purpose for which radioactive materials will be used, including specific conditions or diseases to be diagnosed or treated.

   B. Chemical form administered:

   C. Describe procedures which will be observed to minimize hazard from handling, storage and disposal of radioactive material.

3. Proposed maximum single dose to each patient.

   Proposed maximum total dose to each patient.

   Calculated dosage in rads to critical organ(s).

APPENDIX #4

TRANSFER OF RADIOACTIVE MATERIALS

As the Radiation Safety Officer for _____
(Institution)

_____
(Address)

I hereby receive and accept full responsibility for the safe handling and transportation. I am licensed to possess and use the following radioactive material.

_____, _____, _____, _____.
(Amount) (Isotope) (Chemical Form) (Specific Activity)

I accept any liability which may arise while on the premises of the lending institution, on public or private property during transportation, and within my own institution after affixing my signature.

_____, _____, _____, _____.
(Time) (Date) (R.S.O. Signature) (NRC Lic. No.)

As Radiation Safety Officer for _____
(Institution)

_____
(Address)

I hereby resign and transfer any responsibility for the above mentioned isotope.

_____, _____, _____, _____.
(Time) (Date) (R.S.O. Signature) (NRC Lic. No.)

APPENDIX #5

QUANTITIES OF SOME RADIOACTIVE MATERIALS REQUIRING SIGNS

RADIONUCLIDE	Column I Minimum Quantity for Radioactive Material Sign in Room MICROCURIES	Column II Minimum Quantity for Radioactive Material Label on Container MICROCURIES
Au-198	1000	100
C-14	1000	100
Ca-45	100	10
Cl-36	100	10
Co-60	10	1
Cr-51	10000	1000
Cs-137	100	10
Cu-64	1000	100
F-18	10000	1000
I-125	10	1
Fe-59	100	10
H-3	10000	1000
1-131	10	1
K-42	100	10
Na-24	100	10
P-32	100	10
Po-210	1	0.1
Ra-226	.1	.01
S-35	1000	100
Sc-46	100	10
Sr-85	100	10
Tc-99n	1000	100
Zn-65	100	10

This Table is based on Appendix C, 10 CFR 20. For radionuclides or combinations of radionuclides not lited above consult 10 CFR 20, Appendix C.

TABLE 2

RECOMMENDED ACTION LEVELS FOR REMOVABLE SURFACE CONTAMINATION IN MEDICAL INSTITUTIONS*

	Type of Radioactive Material					
	Alpha Emitters		Beta or X-Ray Emitters		Low-Risk Beta or X-Ray Emitters	
Type of Surface	(uCi/cm^2)	($dpm/100cm^2$)	(uCi/cm^2)	($dpm/100cm^2$)	(uCi/cm^2)	($dpm/100cm^2$)
1. Unrestricted areas	10^{-7}	22	10^{-6}	220	10^{-5}	2,200
2. Restricted areas	10^{-6}	220	10^{-5}	2,200	10^{-4}	22,000
3. Personal clothing worn outside restricted areas	10^{-7}	22	10^{-6}	220	10^{-5}	2,200
4. Protective clothing worn only in restricted areas	10^{-6}	220	10^{-5}	2,200	10^{-4}	22,000
5. Skin	10^{-6}	220	10^{-6}	220	10^{-5}	2,200

References NRC Regulatory Guide 8.23

APPENDIX #7

VETERANS ADMINISTRATION MEDICAL CENTER WEST HAVEN, CT.

RADIATION PROTECTION - FILM BADGE MONITORING

1. This memorandum establishes uniform procedures and safeguards to insure protection against radiation hazards.

2. All employees, who are exposed to any source of radiation hazard, will be required while on duty to continuously wear the radiation monitoring Film Badge on their outer garment.

3. Responsibility:

(a) The Radiation Safety Officer, at the request of the Chief of each using service, will issue numbered monitor film badges to all personnel whose employment involves regular or irregular exposure to any source of radiation hazard. (The same serial number will be assigned to one individual as long as he is employed at this Medical Center in areas of radiation hazard). In the event the employee leaves our employ or is reassigned from his position, the numbered film badge will be turned in to his department head and held until the routine collection time. The exposed numbered films of the film badges will be collected by the using service Chief on a monthly basis and the exposed films will be returned to the Contract Company.

(b) The "Film Badge Radiation Exposure Reports" furnished by the Contractor who performs the radiation exposure processing, will be sent to the Radiation Safety Officer, Nuclear Medicine Service. He will circularize the exposure reports through the appropriate department heads.

(c) Permissible Dosage Rate - See Appendix 1

(d) Chief, Radiology Service:

(1) The Chief of Radiology will be responsible for establishing and maintaining safeguards against radiation hazards.

(2) He will develop and publish instructions and rules for personnel, concerning:

(a) Safe working procedures for dealing with radiation from x-ray.

e. Chief, Nuclear Medicine Service:

The Chief of Nuclear Medicine Service will develop and publish instructions and rules for personnel concerning:

(1) Safe working procedures for dealing with radiation from radioisotopes,

and

(2) The nature of injuries resulting from overexposure.

f. Chief, Supply Service

(1) The Chief, Supply Service will be responsible for the procurement of Film Badge service.

g. Radiation Safety Officer

Any telegraphic or telephonic reports, indicating radiation on any film badge, greater than 40 mrems per month, received from the Contractor by the Radiation Safety Officer investigated.

h. Personnel Health Physician:

(1) Will give particular attention to the Pre-employment Physical examination of prospective employees who will be exposed to possible radiation hazards in the performance of their duties. Previous occupational and unusal radiation exposure should be recorded.

(2) A complete physical examination of employees exposed to the hazard of radiation exposure will be performed when requested by the Chairman, Medical Isotope and Radiation Safety Committee and when deemed advisable by the Personnel Health Physician.

i. Chief of Services:

(1) The Chiefs of the respective Services will be responsible for determining that their employees, who will be requlary or irregularly exposed to radiation, have received and comprehend the instructions in the proper use of radioactive material or operation of radiation producing equipment before they are assigned to duties in areas of radiation exposure.

(2) The Chiefs of Services will direct those employees, to whom film badges are issued, to wear the badges on their outer garment at all times while in areas of radiation exposure.

j. Employees:

(1) Any employee whose work is classified as beng regularly or irregularly exposed to any source of radiation, will be responsible to become throughly informed of all instructions and rules established for protection against the hazards of radiation exposure.

(2) The employee can review the "Film Badge Radiation Exposure Reports" The employee will feel free to discuss the exposure report reading with the Radiation Safety Officer or Chairman of Medical Isotopes and Radiation Safety Committee.

(3) All employees exposed to the hazard of radiation will respond to the requests for Physical examinations and diagnostic tests made by the Personnel Health Physician.

APPENDIX #8

VETERANS ADMINISTRATION MEDICAL CENTER
WEST HAVEN, CONNECTICUT

RADIOACTIVE WASTE DISPOSAL PROCEDURES

The West Haven Veterans Administration Medical Center is licensed to receive, possess, use, and transfer certain radioactive materials persuant to the rules and regulations of the National Regulatory Commission. The Medical Isotope and Radiation Safety Committee at the WHVAMC has among its responsiblities the implementation of these rules and regulations which includes radioactive wastes disposal. The following details the radioactive waste disposal procedures to be followed by the users of radioactive materials at the WHVAMC.

2. Solid Wastes to include contaminated glassware, syringes, pipettes, paper, and useless and unwanted radioactive compounds shall be placed into containers approved for use by the RSO. Each time contaminated material is placed into the container(s) the following information should be recorded: contaminant (Radionuclide), estimated activity, and date. The container(s) should have a suitable form conspicuously attached, for recording this required information. In addition, this information must be recorded in a waste disposal log to be retained by the user. The containers will be located in a central location (Ground Floor, Bldg. #4) Room DB-10. Neither liquids nor emulsified tissues, animals, etc., will be accepted in the solid waste container(s). Laboratory animals likewise will not be accepted in the solid waste container(s).

3. Laboratory Animals shall be placed in heavy duty plastic bags with lime and drying agent, sealed, and labeled according to user, number and species of animal, radionuclide, estimated activity, and date. They should be taken by the user or his designate to the freezer provided for this purpose and entries should be made as above. All animals, especially dogs, shall be bound and packaged in such a way so that the frozen animals may be easily placed into RSO approved containers at the time of pick up by the commercial waste disposal vendor.

4. Liquid Wastes, if readily soluble or dispersible in water may be discharged into a sink approved by the RSO. A record of the liquid wastes discharged showing the radionuclide, estimated activity, and date shall be maintaine by the user. General disposal limits are given in the following Table. Consult the RSO before disposing of any material above these limits.

a. Liquid wastes not readily soluble or dispersible in water, shall be placed into an approved, breakproof container. A record of the wastes placed into such containers showing the user, the radionuclide, estimated activity, and date shall be maintained and affixed to the container. When full, the container should be taken by the user or his designate to a room specified by the RSO.

b. Washing of contaminated glassware is acceptable at a sink approved and designated by the RSO.

5. Miscellaneous: Special arrangements should be made with the RSO or his designate in regard to semiliquids, such as emulsified tissues or animals or other contaminated radioactive waste for disposal.

Empty scintillation vials may be disposed of in the solid waste container. Arrangements for disposal of full scintillation vials should be made with RSO or his designate.

Attachment #1

VETERANS ADMINISTRATION MEDICAL CENTER
West Haven, Connecticut

SEWAGE DISPOSAL OF RADIOACTIVE MATERIALS

ISOTOPE	DISPOSAL METHOD	MAX MILLICURIE/WK.
^{3}H	Flush Down Sink Approved (by RSO) with continuous flow of water for at least one hour.	2 Millicuries per Principal Investigator
^{14}C	"	0.4 millicuries per Principal Investigator
All other	"	0.4 millicuries per Principal Investigator

*ALL WASTE MUST BE WATER SOLUBLE OR DISPERSIBLE. LIQUID SCINTILLATION MEDIA MUST NOT BE DISPOSED OF BY THIS METHOD.

TOTAL OR ISOTOPES THAT CAN BE DISPOSED OF TO SANITARY SEWER PER YEAR.

^{3}H	5 Curies
^{14}C	1 Curie
All Others	1 Curie

*From 10 CFR, Part 20, NRC Rules and Regulations.

APPENDIX #9

RADIATION SAFETY CHECK LIST FOR DISCHARED
PATIENTS CONTAINING RADIONUCLIDES*

Name of Patient_____ Age:_____

Address:_____Tel. No._____

Name of Person Interviewed:_____

Description of dwelling:_____

In multifamily buildings, possible proximity of neighbors.
Household: Names, relationship, ages:_____

_____

Regular visitors to dwelling:_____

_____

Persons regularly visited by patient outside dwelling:_____

_____

Matters discussed:

_____Handling of extruded source
_____Importance of separate beds
_____Importance of distance
_____Importance of special care in regard to young persons
_____Procedure in case of hospitalization or death

Film Badges issued_____

Identification card, or wristband issued_____

_____

Date_____ _____
Radiation Safety Officer

This should be a part of the patient's record.

*From NCRP Report No. 37, p. 45

APPENDIX #10

INSTRUCTIONS FOR FAMILY OF RELEASED PATIENTS*

Name of Patient_____
Name of Hospital_____ Address _____Tel. No._____
For further information contact_____Tel. No._____
Please show this form to every physician consulted concerning the patient until_____
(Date)
_____ was treated on _____, 19__
(Name of Patient)
with _____ millicuries of _____ in the form of _____

NO SPECIAL RADIATION SAFETY PRECAUTIONS ARE NECESSARY AFTER_____
(Date)

UNTIL THAT DATE:

Persons under 45 years of age should not remain closer than the following distances from the patient, for the time period indicated:

a)_____ to _____
(Date) (Date)
Permissible distance _____ feet or more, for _____ hours per week.
(At other times, remain farther than 6 feet).

b)_____ to _____
(Date) (Date)
Permissible distance _____ feet or more, for _____ hours per week.
(At other times, remain farther than 6 feet).

Note: During the above times brief periods of closer contact (for example while shaking hands, or kissing the patient) are permissible.

SPECIAL PRECAUTIONS:

a) Spouse or other person caring for patient:
_____
_____
_____

b) Children of pregnant women:_____
_____
_____

c) Sleeping Arrangemenst: _____
_____
_____

IF THE PATIENT IS TO BE HOSPITALIZED, OR IF DEATH SHOULD OCCUR NOTIFY THE FOLLOWING INDIVIDUAL(S) IMMEDIATELY:

_____
_____

A copy of this form should be kept with the patient's record

*From NCRP Report No. 37, p. 46

APPENDIX #11

RADIOACTIVITY REPORT ACCOMPANYING THE BODY*

_____ HOSPITAL

Report on Radioactivity to Funeral Director from Radiation Safety Officer

( ) This body does not contain significant amounts of radioactive materials. No special precautions are required if standard embalming procedurs are employed.

( ) This body contains a significant amount of radioactive material. The following precautions are to be observed.

_____

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Signed _____
Radiation Safety Officer

Date _____

*From NCRP Report No. 37, p. 47