CHAPTER IV

THERAPEUTIC USES OF RADIATION

This chapter deals with sealed sources of radioactive materials, high voltage machines which produce ionizing or non-ionizing radiations in routine and non-routine therapeutic procedures and research protocols, and with the therapeutic uses of internally administered radionuclides.

Procedure for Obtaining Authorization

An individual who wishes to make use of ionizing or non-ionizing radiation in non-human research will submit an application (as shown in Appendix B) to the Radiation Safety Office. The Radiation Safety Office will review the application and will send it to the Radiation Usage Committee for approval. The full procedures for application are outlined in Chapter I - Procedure for Licensing.

An individual who wishes to use ionizing or non-ionizing radiations and/or radionuclides for the treatment of humans will submit an application to the Radiation Safety Office. See Chapter I - Procedure for Licensing.

An individual wishing to use radiation, in the form of radionuclides and/or ionizing or non-ionizing radiations, in the treatment of humans must use the services of the Radiation Safety Office and must submit his/her qualifications for review by the Radiation Usage Committee, and, if necessary, the Human Research Committee and the U.S. Food and Drug Administration (see Chapter I - Procedure for Licensing). If an individual is authorized to use radiation, such as interstitial implants, cesium seeds, etc., it will be necessary for that individual to make arrangements with the Director of Radiation Oncology to obtain the radioactive material. There will be no inventory of radioactive materials at the Medical University of South Carolina for the purposes described above, other than that maintained by the Division of Radiation Oncology. Only those individuals that have hospital privileges in Radiation Oncology may use radionuclides and/or ionizing or non-ionizing radiation in treatment of patients or who have special privileges in Nuclear Medicine for some designated procedures such as P-32 or Radioiodine Therapy.

Responsibilities of the Principal Investigator

The principal investigator (authorized user) will be responsible for ensuring compliance with these procedures in areas under his/her jurisdiction. In brief, the responsibilities of the principal investigator are:

1. To ascertain that the details of these procedures are known and understood by personnel under his/her supervision who work with ionizing or non-ionizing radiations; to see that new personnel are instructed as to the hazards and safety precautions attendant to their duties; to see that new personnel will be instructed in a course of action in emergencies.
Instruction will be given by the Radiation Safety Office at the request of the principal investigator.

2. To ascertain that proper use is made of personnel monitoring equipment assigned to those under his/her supervision.

3. To supervise the area survey program established in his/her area by the Radiation Safety Office.

4. To notify the Radiation Safety Office immediately of the following circumstances:
   a) when an over-exposure to radiation is indicated;
   b) when radioactive material is lost or stolen;
   c) any other situation which he/she believes could result in a hazard to persons occupying the area in question;
   d) whenever new equipment or radioactive sources are acquired that may pose a radiation hazard to personnel or patients.

5. To advise the Radiation Safety Office of any substantial change in the nature of his/her work and/or storage and use facilities.

6. To ascertain that copies of records requested by the Radiation Safety Office are promptly forwarded.

7. To supervise record keeping of the activities of his/her area as required by the Radiation Safety Office.

Personnel Monitoring

It is the responsibility of the principal investigator (authorized user) to request radiation monitoring service from the Radiation Safety Office for all personnel working in an area in which radioactive materials and/or ionizing or non-ionizing radiations are used. Persons not normally on monitoring service (and transients) who will be working in an area where radioactive materials and/or ionizing or non-ionizing radiations are used must request radiation monitoring service from the Radiation Safety Office. See Appendix C for a copy of the radiation badge request form, radiation monitor termination/change form, and the information sheet on the radiation monitor which should be issued to every person requesting badge service. Allow 7-10 days for delivery after the request is submitted. These forms may be copied as needed. The Radiation Safety Officer will determine the need for personnel radiation monitoring devices based upon RHA 3.17 and RHB 3.12.4.

An individual's radiation badge will be processed immediately when it is suspected that he/she may have received a single exposure greater than 1 mSv (100 mRem), or an accumulated exposure of greater than 3 mSv (300 mRem) in one week. A record of each individual's radiation exposure status (history plus current exposures) will be kept by the Radiation Safety Office. These records will be in compliance with the Federal Regulations outlined in 10 CFR 20 and State Regulations S.C. RHA 3.5. Personnel exposures shall be maintained as low as reasonably
possible in accordance with the ALARA concept. Maximum permissible dose limits are listed in Appendix G. Fetal dose for pregnant personnel shall be limited to one-tenth (0.1) the normal maximum permissible dose (or 5 mSv {0.5 Rems}) during the gestation period.

**AT NO TIME WILL A RADIATION BADGE BE EXPOSED TO RADIATION UNLESS WORN BY THE INDIVIDUAL TO WHOM IT WAS ISSUED.**

Any infraction of this regulation may result in the loss of that individual's privilege of working with radioactive materials and/or ionizing or non-ionizing radiations at the Medical University of South Carolina.

The Radiation Safety Office will distribute and collect all radiation badges on a monthly or quarterly basis. It is the responsibility of the principal investigator to ensure the cooperation of personnel under his/her supervision.

Pocket dosimeters will be assigned to personnel conducting experiments with ionizing radiation, in accordance with the judgment of the Radiation Safety Office. If it is decided that pocket dosimeters shall be worn, it will be the responsibility of the principal investigator (authorized user) to ensure that a daily record of the readings is maintained. A copy of these records will be sent to the Radiation Safety Office on a weekly basis.

### Requirements for Caution Signs and Labels

All signs and labels required pursuant to this section which are to be posted due to the presence of sealed sources of radioactive material shall have the conventional radiation symbol and shall be colored magenta or purple on a yellow background. Posting of areas shall be in compliance with 10 CFR 20 and S.C. RHA. 3.21 and 3.22.

Entrance doors to rooms and laboratories in which x-rays are used will be posted with a conventional sign bearing the words "CAUTION - RADIATION AREA". Also, in addition to the foregoing requirement, some areas may be posted with a sign of the conventional type bearing the words "CAUTION - HIGH RADIATION AREA". These areas will be designated by the Radiation Safety Office in compliance with the requirements of this section.

Posting requirements due to the presence of high voltage equipment for the production of ionizing or non-ionizing radiation shall be made on the recommendations of the Radiation Safety Office.

Posting of signs on the rooms of patients containing implanted radioactive materials will be in compliance with 10 CFR 20 and S.C. RHA. 3.22 and 3.23.

Other posting to signs may be required by the Radiation Safety Office, the Director of Radiation Oncology or the Radiation Usage Committee.

"RADIOACTIVE" labels on shipping cartons must be defaced or destroyed before disposal of the cartons in normal (NOT marked "Caution - Radioactive Material) waste.
A sign "NOTICE TO EMPLOYEES: Standards of Protection Against Radiation" will be posted in all radiation areas in compliance with State regulations, S.C. RHA. Part VI. See sample in Appendix C.

Other Personnel Safety Requirements

All areas in which radioactive materials and/or ionizing or non-ionizing radiations are used will be in compliance with the Occupational Safety and Health Act, 1970 (OSHA), where applicable.

Leak Testing

All sealed sources of radioactive material shall be tested for leakage at intervals not to exceed six (6) months, except that sources designated to emit alpha particles shall be tested at intervals not to exceed three (3) months. The leak tests required pursuant to this section will be performed under the authorization of the Radiation Safety Office.

Radiation Surveys

New facilities will be surveyed by the Radiation Safety Office or a qualified Radiation Physicist prior to scheduling routine use, to determine that no hazard will exist to operators or other persons in the area. These surveys will be conducted according to the recommendations in the National Council on Radiation Protection and Measurements, Reports No. 33 and 34, or with later reports whose recommendations supersede those in Reports No. 33 and 34. As a result of these surveys, recommendations will be made by the Radiation Safety Office concerning any restrictions on operation which is deemed advisable. The Radiation Safety Office will send a written report to the authorized user, informing him/her of the requirements. Any proposed change of operating procedure must be authorized by the Radiation Usage Committee before being instituted.

After the initial survey, biannual surveys will be performed by the Radiation Safety Officer or members of his staff, or at his discretion or the request of the authorized user.

Radiation Calibrations

All units which are used for therapy will be calibrated for dose rate at intervals not to exceed six months. The determination will include all treatment distances and field sizes used in routine therapy programs. The measurements will be made, where applicable, at all high voltage and current settings used for treatment.

Initial calibrations will be performed by a qualified Radiation Physicist. A written report of the results of a calibration will be sent to the authorized user.
Radiation Sources

Before any new source of radiation is put into use, the user will obtain authorization from the Radiation Safety Office and will request that the Radiation Safety Office perform a calibration of the source and conduct a Radiation Safety Survey if applicable.

Cesium

I. Medical Applications - Interstitial, Intracavity, and Superficial

A. The medical application of cesium, P-32, and other brachytherapy sources will be under the supervision of the Director of Radiation Oncology, a Radiation Therapist, or a Radiology Resident at the discretion of the Director.

B. Personnel who are authorized to handle the loading of cesium are the above mentioned and the Cesium Curator, Radiation Physicist, and Residents assigned to the patient who are familiar with the proper handling procedure.

C. A physician who desires to have a patient treated with cesium, P-32, or other radioactive material will contact the Director of Radiation Oncology who will arrange the treatment with the physician. It will be the responsibility of the Director of Radiation Oncology to make arrangements to have the required radioactive material in the patient area at the time agreed upon. It will be the responsibility of the physician managing the care to inventory the radioactive material in the patient area both at the time of insertion and at the time of removal. The inventory of the amount put in and the amount taken out must balance at the time of removal. Transfer of responsibility for radioactive material from an individual to another shall be acknowledged in writing. Only those individuals with staff privileges in Radiation Oncology will be allowed to perform brachytherapy.

D. Accountability of all sources shall be the responsibility of the Cesium Curator. The Radiation Safety Officer or a member of his staff will perform monthly (formerly weekly) inventory and inspection of the Radiation Storage Area. A written record will be made of this inventory and a copy sent to the Director of Radiation Oncology.

The Cesium Curator will keep a permanent written record of the issue and return of all sources. This record shall include:

1. sources ordered and date requested;
2. name of patient and physician who issued orders;
3. source(s) issued: state type and identification number of sources and total activity, person to whom issued, signature of individual who received material, date and time of issue;
4. date of expected return, date of return of source(s), signature of individual certifying complete return.
The cesium sources shall be inventoried each month (formerly week each). A complete inventory will be compiled from the following:

1. actual amount of sources in storage safes;
2. sources stored in carriers or in storage containers in cesium storage room;
3. sources accounted for by transfer of records;
4. sources notated in log book or upon word of Cesium Curator as to location.

**Cesium In and Out Procedures**

1. a Cesium Request Form is to be completed in full and given to the Cesium Curator;
2. the Cesium Curator will fill out the request and attach a cesium card to the loaded Cesium carrier. The radiotherapist or resident will fill out the relevant information on this card, such as hours-in or hours-out, date, mg-hours, and signatures;
3. the log book will be filled out by the resident. When the cesium with applicators is returned to the cesium room, the resident will notify the Cesium Curator.
4. the Cesium Curator will check the number of sources, their condition and store the sources in the cesium safes, clean and store the applicators, and make appropriate entries in the log book.

**E.** Radioactive sealed sources should be handled only by qualified personnel (Cesium Curator, Radiotherapist, Radiation Physicist). Handling of sources by OB/GYN and other residents should be limited to, and in most cases would involve only, removal of sources from patients and subsequent transport to the Cesium Storage Room.

**F.** When not in use or in transit, sources shall be stored in the storage safes in the 10 East Cesium Storage Room. Sources to be stored for more than 24 hours shall be placed in the appropriate drawer to the two cesium safes. Those sources, either in short-term storage before or after being used, may be stored in the portable Cesium Carrier in the Cesium Room. Cesium not in use or stored in the Cesium Room shall never be left unattended.

**G.** Transportation of radioactive sealed sources shall be such that no individual shall receive a maximum permissible dose. Sources shall be transported within the hospital in shielded containers or portable carriers designed for that purpose. These sources will remain within the hospital unless consent is given by the Radiation Safety Officer.

Appropriate radioactive material transfer forms will be filled out by the transferor (MUSC) and the transferee. The Radiation Safety Office will supply these forms and must retain a copy. The actual transport of sources will always be in containers specifically approved by the Radiation Safety Officer. Containers shall have appropriate DOT labels and radiation warning signs.

Sources transported to the Operating Room for interstitial application shall remain in
the shielded carriers until ready to use. Physicians shall use appropriate shielding to minimize operating room personnel exposure. Handling of cesium seeds and needles should always be done behind a portable shield provided for this purpose. After sources are placed in the patient, the empty storage container must always remain with the Cesium patient for later removal of the sources. After sources are removed from the patient, they shall be returned to the Cesium Room promptly.

H. Application of Sources to the Patient

1. The Cesium Curator, authorized physician or resident, or Radiation Safety Officer will bring the required sources to the Operating Room. A portable shield and work area will be available for preparing the sources insertion. Proper handling instruments shall be provided and their use strictly enforced. Under no circumstances are physicians, nurses, or other personnel permitted to handle sources with their hands. The Cesium Curator, Radiation Safety Officer, or other authorized individual will survey the Operating Room with a GM survey meter after the patient is removed to ascertain that no sources were misplaced during the insertion procedure. The portable cesium carrier shall be sent to the patient's room.

2. The patient shall be placed in a private room or a room designated by the Radiation Safety Officer. The room shall be isolated as much as possible. Under no circumstances is a radioactive patient to be placed in a room with a non-radioactive patient. The room, as well as the patient's chart, should be posted with appropriate radiation warning signs. The Radiation Safety Office or radiation oncologist will survey the patient area and make appropriate recommendations as to nursing stay-times and/or visitor restrictions.

Patients with removable sources in or upon their bodies will not be permitted to leave the hospital room until the sources are removed, except as requested by the physician and approved by the Radiation Safety Officer.

Patients with non-removable sources or short-lived sources may be allowed to leave their room when determined by the physician or the Radiation Safety Officer. They should receive instructions in the necessary precautions to prevent other persons from receiving more than a maximum permissible dose. Such patients should wear a wrist band or other suitable identification.

3. The same precautions observed at the time of insertion should be observed at the time of removal. All sources must be accounted for before the patient is dismissed or before the room can be released for further use. After the sources are placed in a portable shielded carrier and removed from the area, a GM survey meter shall be used to survey the area for possible missing sources and to ascertain that all sources are accounted for.

4. After removal of the sources from the room, the patient will be surveyed and the results noted on the patient chart and ward receipt.
II. Emergency Precautions

If the patient accidentally or intentionally removes the source from his/her body, the resident on duty shall place the sources in the portable carrier and/or notify the physician in charge or the Director of Radiation Oncology.

In the event a source is damaged or is ruptured, do not attempt to handle the source, but stop all traffic into the area and notify the Radiation Safety Officer and/or the Director of Radiation Oncology immediately. Close all air vents and turn off all ventilators.

III. Leak Tests

The cesium sources shall be leak tested at intervals not to exceed six months. The results of these tests shall be recorded and submitted to the Radiation Safety Office. The procedure for testing shall be as follows: Each cesium source shall be wiped individually using alcohol swabs or wipe papers saturated with decontamination solution using large handle forceps. The wipe tests are counted in an appropriate counting system. Leaking sources shall be placed in a lead-shielded pig and returned to the manufacturer for repair, replacement or disposal. Every precaution shall be taken to shield the testing individual and the sources at the times during the testing process.

Monthly (formerly weekly) wipe tests shall be performed by the Radiation Safety Office of the cesium storage area safe drawers. Any significant counts above background will indicate possible leaking sources and a complete leak test will be performed.

Any deviation from the above procedures for cesium and other sources must have the approval of the Radiation Usage Committee.

IV. Record Keeping

Records to be maintained by persons handling sealed sources, high voltage equipment and therapeutically administered radioactive materials are:

1. results of radiation surveys;
2. results of radiation calibration, where applicable
3. results of leak tests, where applicable
4. inventories and users of cesium, etc., used for therapy;
5. any other records required by the Radiation Usage Committee and/or the Radiation Safety Officer.

V. Misadministration

All misadministrations as defined in Title 10 CFR, Part 35.33, shall be reported to Radiation Safety and the SC DHEC, Bureau of Radiological Health. Appropriate records shall be maintained.
Strontium-90 Beta Ray Eye Applicator

I. Medical Applications

The medical use of the Strontium-90 Beta Ray Eye Applicator is under the supervision of the Director of Radiation Oncology. A physician who desires to have a patient treated with the Beta-Ray Eye Applicator will contact the Director of Radiation Oncology who will arrange the treatment with the physician. Only authorized physicians will be assigned the use of the applicator. Transfer of responsibility of the source from one responsible individual to another shall be acknowledged in writing. A request form for use of the source must be completed and filed with the Director of Radiation Oncology. See sample form, Appendix C.

II. Storage

Primary storage area will be in room H771D 7W, Medical University Hospital. This storage area must be labeled with a "CAUTION - RADIOACTIVE MATERIALS" sign. The storage area must be locked at all unsupervised times.

Secondary storage areas will be designated by the Radiation Safety Officer in consultation with physicians checking out the source. This source must be locked or unlocked or under the direct supervision of the person signing out the source. If stored outside the primary storage area for more than 24 hours, the secondary storage area must be labeled with a "CAUTION - RADIOACTIVE MATERIALS" sign supplied by the Radiation Safety Office.

III. Transportation

The source is well shielded in its carrying case and should never be carried unless it is secured within its case. The device should only be carried by persons cognizant of its value, nature of action, and possible radiation hazards involved. If the device is used outside the Radiation Oncology Treatment areas, it must be signed out at Radiation Oncology Nurses Station.

IV. Accountability

Any person removing the device from the Radiation Oncology area must sign the proper request form, thereby assuming full responsibility for the safe handling and use of the device. This person shall provide information as to use, physician's name, patient name, location of use, phone extension, etc. This device can only be used within the Medical University or Eye Institute. At no time is it permitted to leave the Medical University of South Carolina.

V. Emergency Precautions
A placard shall be affixed to the device giving necessary instruction to follow in the event of an incident involving the device. Notify the Director of Radiation Oncology or the Radiation Safety Officer in the event of emergency.

**Internally Administered Radionuclides**

All patient doses will be prepared in Nuclear Pharmacy, or in a laboratory approved by the Radiation Safety Office.

All therapeutic doses of radionuclides will be administered to patients in the Nuclear Medicine Laboratory, unless special arrangements have been made with the consent of the Director of the Nuclear Medicine Laboratory, or with the Radiation Safety Officer.

General principles of protection are:

1. All handling of containers and patient doses will be with the use of approved handling equipment -- NOT THE TECHNICIANS’ HANDS!

2. All transfers of radioactive solutions from shipping containers, dilution bottles, etc., will be made with remote pipettes -- IN NO INSTANCE MAY RADIOACTIVE SOLUTIONS BE PIPETTED BY MOUTH.

3. Skin contamination, ingestion, or inhalation of radioactive material can be avoided by practicing good housekeeping, clean work habits, and frequent hand washings.

4. Radioactive materials must not be allowed to come in contact with the skin. Disposable plastic (or rubber) gloves shall be worn whenever such contact is possible.

5. Personnel must not smoke, eat, drink, or apply cosmetics when there is any possibility that the hands are contaminated.

6. External irradiation from patients may be reduced to a minimum by spending the minimum amount of time close to patients who have received therapeutic doses of radionuclides - note the instructions on the sheets inserted in the patient's chart.

General precautions for therapeutic doses are:

1. Time spent close to patients should be regulated according to the instructions on the sheets inserted in the patient's chart.

2. Hands should be washed after contact with a patient, with particular attention being given to cleaning the fingernails.

3. Burnable materials, such as paper handkerchiefs, which are contaminated should be placed in non-porous paper or plastic trash bags and disposed of by Nuclear Medicine Laboratory personnel.
4. Articles or utensils suspected of being contaminated should be monitored or disposed of by Nuclear Medicine Laboratory personnel.

5. No special precautions are necessary for dishes, instruments or utensils unless contamination by vomiting or incontinence is known to have occurred.

6. It is not usually necessary to limit visitors other than the general rules of the Hospital concerning visitors. If any restrictions are necessary, special instructions will be noted on the instruction sheet inserted in the patient's chart. (See Appendix A for samples of the Instructions to Nurses.)

 Occasionally there is a need for special precautions in nursing care of patients who have been administered radionuclides. In all cases involving patients who have had radionuclides, the type, amount, and required precautions will be inserted in the patient's chart.

 Hazards to nurses in routine care of patients will arise primarily from direct radiation from the patient or from contamination which results from handling contaminated clothing or the patient. When handling materials suspected of being contaminated, always wear disposable plastic (or rubber) gloves. These gloves should be saved (in a labeled bag) for pick-up by Nuclear Medicine Laboratory personnel.

 Except in the case of radionuclides which emit high energy gamma-rays, there will be no external radiation hazard from patients who have received 1110 MBq (30 mCi) or less of radioactive materials; however, if such a patient vomits or is incontinent within the first 24 hours, immediately notify the Residents in Radiation Oncology or Nuclear Medicine on call who will have instructions concerning the best handling of the situation. Any hazard which does exist due to internally placed or deposited radionuclides will be noted on the insertion sheet in the patient's chart.

 Specific instructions for the general nursing care of patients who have been administered therapeutic doses of radionuclides are:

1. **Equipment**

   a) A metal can lined with a plastic bag will be provided to collect linen where there is danger of contamination by vomiting, incontinence, or profuse perspiration. The disposal of possibly contaminated linens will be determined by the Radiation Safety Office.

   b) Items such as bedpans, urinals, and basins are to be thoroughly washed with soap and running water. These same items are to be used for the same individual until his/her treatment is terminated. If these items are used for a patient who has received a large dose of I-131, they will be monitored by the Nuclear Medicine technician or Radiation Safety before being disposed of or returned to general stock.

   c) The floors of the bathroom and patient room shall be covered with disposable plastic lined paper pads prior to the administration of the therapeutic dose to prevent contamination of these areas.

   d) Disposal plastic (or rubber) gloves should be worn while cleaning possibly
contaminated equipment. If rubber gloves are used, they must be washed with soap and running water while on the hands, and dried before removal. They should be periodically monitored by the Nuclear Medicine laboratory.

2. Bathing

Unless specifically ordered by the attending physician, the bath should be postponed for the first 48 hours. In this period the radioactivity of patients treated with Iodine-131 or Gold-198 will have decreased by almost half. The possibility of Iodine-131 contamination in perspiration, saliva, or excreta, or of Gold-198 at the puncture wound is at an end by this time.

3. Excretions

Disposable plastic (or rubber) gloves should be worn whenever handling excreta of patients or contaminated material such as soiled bedding.

a) Urine - Accurate urine collections are frequently desired by the Director of Nuclear Medicine or the attending physician. Great care should be taken not to lose any part of the specimen. In the case of Iodine therapy, the urine collection bottles will be provided by the Nuclear Medicine Laboratory.

The patient should be encouraged to take care of his/her own urine collection, if possible.

If the urine is not to be collected, it may be disposed of in the usual way.

Male patients should be instructed to sit on the toilet while urinating or collecting a specimen.

b) Stools - Usually there is very little radioactivity in stools. They may be disposed of in the usual way unless collection is especially requested.

c) Sputum, Vomitus, and Perspiration - If the radionuclide has been administered by mouth, the vomitus expelled during the first 24 hours is to be collected in a waterproof container and sent to the Nuclear Medicine Laboratory. For Iodine therapy patients, excessive sputum should be collected in a similar manner for the first 24 hours. For I.V. administration, no precautions are necessary, except with iodine for the first 24 hours when excessive sputum should be collected and if there is excessive perspiration, sheets should be monitored for contamination.

d) Soiled Tissues and Sponges - All such material should be placed in a non-porous paper or plastic trash bag attached to the patient's bed and later turned over to the Nuclear Medicine Laboratory for disposal.

e) Incontinence - If there has been a large spill of urine, the Radiation Safety Office, the Director of Nuclear Medicine Laboratory, or the Nuclear Medicine Laboratory should be notified immediately. The damp bedding should not be handled without
disposable plastic (or rubber) gloves.

f) Draining from the Site of Injection of Colloidal Gold or Phosphorus (Au-198 or P-32)
- The nurse should not attempt to change the dressing, but should immediately call the
  Director of Nuclear Medicine or the attending physician, and the Radiation Safety
  Office.

4. Special Orders of Instructions

The Director of Nuclear Medicine Laboratory, the attending physician, or the Radiation
  Safety Office will write any of the following orders which may be applicable.

a) Room or bed restrictions;
b) Special restrictions on nursing time;
c) Visitor restrictions;
d) Instructions for collection of excreta, or bathroom privileges;
e) Diet;
f) Special medication;
g) Special nursing care, including special attention to dressings.

Specific instructions for the control of patient excreta in patients who have been
 administered radionuclides are:

1. When doses of excretable radionuclides of less than 1110 MBq (30 mCi) have been
   administered (see Item 4d above), no collection of patient excreta is required pursuant to
   this section; however, the patient should be informed that it is necessary to flush the toilet at
   least three times upon each use.

2. Instructions for collection of urine and/or feces will be included in the physician's
   instructions for nursing care of in-patients. Written instructions for collection of excreta
   will be given to out-patients at the time of administration of the radionuclides.

3. When it is necessary for the collection of urine from in-patients, the collection will be made
   in special receptacles provided by the Nuclear Medicine Laboratory. The Nuclear Medicine
   Technician will remove the urine from the patient area according to the instructions from
   the Director or the Radiation Safety Officer.

4. Fecal samples will be collected only upon special instructions from the physician, Director,
   or the Radiation Safety Officer.

5. IF THE PATIENT HAS HAD A DOSE IN EXCESS OF 1110 MBq (30 mCi), UNDER NO
   CIRCUMSTANCES WILL ROUTINE LABORATORY ANALYSIS BE PERFORMED
   ON THE PATIENT'S BLOOD, URINE, STOOL, OR OTHER BODY FLUID UNLESS
   THE DIRECTOR OF NUCLEAR MEDICINE HAS BEEN CONSULTED.

6. Disposal of radioactive excreta is outlined in the section on the disposal of radioactive
   waste, below.
Specific instructions for the control of patients and visitors not covered in the sections above are:

1. Out-patients can be those patients who have received a dosage of 1110 MBq (30 mCi) or less. When the patient is released from the Nuclear Medicine Laboratory, he/she will be given a set of written or verbal instructions concerning excreta, patient restrictions, and visitor regulations.

2. In-patients will be those patients who have received doses greater than 1110 MBq (30 mCi) or other patients who are hospitalized by the attending physician. Excreta is discussed above. Visitor restrictions are shown on the insert sheet "Nursing Precautions". In general, patients with less than 1850 MBq (50 mCi) dosage can be either ward or semi-ward patients; however, when the dosage is greater than 1850 MBq (50 mCi), the patient will be in a private room with a private bath.

3. Expired patients who have a total body activity of less than 185 MBq (5 mCi) may be processed as usual, in so far as autopsy is concerned. For patients with greater than 185 MBq (5 mCi) total body activity, the Radiation Safety Office must be consulted before an autopsy is performed. An expired patient who has less than 1110 MBq (30 mCi) of total body activity may be released to the funeral director for embalming. For bodies with greater than 1110 MBq (30 mCi) of activity, the Radiation Safety Office must be consulted before release can be made.

IN ALL CASES OF EXPIRED PATIENTS WHO HAVE RECEIVED RADIONUCLIDES, THE BODY WILL BE TAGGED WITH A LABEL STATING: RADIONUCLIDE(S), COMPOUND, METHOD OF ADMINISTRATION, AMOUNT OF ACTIVITY, AND DATE OF ADMINISTRATION.

An acceptable tag will be provided by the Nuclear Medicine Laboratory. It will be the responsibility of the physician signing the death certificate, or the Director of the Nuclear Medicine Laboratory, to ensure compliance pursuant to this section.

For each patient who has received a therapeutic dose of radionuclides there will be an "Instruction to Nurses" sheet inserted in the chart, to be referred to by all persons handling the patient.

Disposal of radioactive waste generated by the therapeutic use of radionuclides will be handled in the following manner.

1. Material which has not been used in patient treatment may be disposed of in compliance with 10 CFR 20 and S.C. RHA 3.27 and 3.29. "RADIOACTIVE" labels on shipping cartons, etc., must be defaced or destroyed before disposal of the cartons in the normal waste.

2. Urine specimens which have been collected in the Nuclear Medicine Laboratory in one gallon jars will be disposed of in a toilet with copious flushings.
3. Soiled waste (cups, towels, etc.) will be collected in marked ("Radioactive Waste") containers in the Nuclear Medicine Laboratory for disposal by the Radiation Safety Office.

Caution signs and labels will be posted in compliance with 10 CFR 20 and S.C. RHA. 3.21 and 3.22. In brief, the requirements are:

1. The entrance door to the Nuclear Medicine Laboratory will be posted with the conventional sign bearing the words "CAUTION - RADIOACTIVE MATERIAL".

2. Individual shipping bottles, receiving flasks, transfer bottles, storage containers, waste containers, etc., will be labeled with tape bearing the conventional symbol and words "RADIOACTIVE MATERIAL".

3. In addition to the sign on the entrance door, it will be necessary, in some cases per 10 CFR 20 and S.C. RHA. 3.22.2, to post signs of the conventional type bearing the words "CAUTION (OR DANGER) - RADIATION AREA" or "CAUTION (OR DANGER) - HIGH RADIATION AREA". These areas will be designated by the Radiation Safety Office.

4. Patient rooms will be marked with signs (as in #1 and #3 above) at the discretion of the Director of Nuclear Medicine and/or the Radiation Safety Office.

5. The sink and toilet on each floor which are designated as "hot" sink and toilet will be marked with a sign as in #1 above. The use of a certain sink or toilet will be decided by the Director of Nuclear Medicine and/or the Radiation Safety Office and the floor supervisor. It will be the responsibility of the floor supervisor, once a sink or toilet has been so designated, to make certain that it is not used for other purposes. A sink or toilet will not be designated as "hot" if it can be used for other purposes, i.e., if the radioactivity will be low enough that it would not be a hazard, the facility will not be marked at all.

The records to be maintained on patients administered a therapeutic dose of radionuclides will include:

1. the nature of treatment;
2. the radionuclide(s) administered;
3. the dosage administered;
4. an analysis of the results.

An information sheet "Instructions to Nurses" for each particular nuclide will be inserted in the patient's chart for reference by any person handling the patient. Samples of instruction sheets are shown in Appendix A. All patient records will be maintained in the office of the Director of Nuclear Medicine. All other records pertaining to the use of radionuclides will be kept as detailed in Chapter I.
EMERGENCY

IN THE EVENT THAT RADIOACTIVE MATERIAL IS SPILLED, LOST, OR STOLEN:

CALL THE RADIATION SAFETY OFFICE IMMEDIATELY

Radiation Safety Office Number:  792-4255
Radiation Safety On Call Pager Number:  27390

** If the accident is a spill, stop all traffic into and out of the area.

No person shall leave the area until the Radiation Safety Office can check them for contamination.

DO NOT LET ANYONE LEAVE - DO NOT ATTEMPT TO CLEAN UP!!

** In an emergency involving a patient, call the Director of the Nuclear Medicine Laboratory, in addition to the Radiation Safety Office.

** In case of an accidental release of gaseous radioactive materials into the room, turn on all ventilating systems; evacuate the area, closing all doors. Remain outside the area until ten (10) air changes have occurred. Then the room should be checked to see if it is safe to re-enter.

** FOR ANY EMERGENCY, CONTACT THE RADIATION SAFETY OFFICE AT 792-4255 DURING NORMAL BUSINESS HOURS OR PAGE THE ON CALL DESIGNEE AT PAGER NUMBER 27390.