

13.2 General Points About Nursing Care Hazards of Radioactive Isotopes

Hazards may arise from three sources.

1. Skin contamination with radioactive materials.
2. Inhalation or ingestion of radioactive materials.
3. External irradiation of the body by the radiations emitted by radioactive materials.

No special precautions are needed for patients who have received diagnostic doses of radioactive materials. The usual procedures in handling blood, urine, vomitus, excrement is sufficient to protect from contamination or ingestion. External irradiation from these diagnostic doses are absolutely minimal.

13.2.1 General Principles Of Protection

1. Skin contamination is prevented in part by practicing good housekeeping, use of gloves, hand washing and clean work habits.
 - a. Radioactive materials should not be allowed to come in contact with the skin.
 - b. Eating and smoking where radioactivity is present is forbidden.
 - c. Become knowledgeable concerning which items are likely to be contaminated and which items are not.

2. External irradiation of the worker's body can be reduced by:

- a. Spending a minimum amount of time when performing necessary procedures.

The allowable times are posted on the patient's door by Radiation Safety

Office Personnel.

13.2.2 General Precautions

1. The length of time nurses, visitors and other personnel may spend at particular distances from the patient will be posted on the door. A copy of the posting sheet is found in Appendix H.
2. If there is a threat of contamination, the room will be so posted. Standard (formerly Universal) precautions, that is, the use of gloves, foot coverings, and careful hand washing will prevent contamination.
3. All contaminated materials shall be placed in the radiation designated container, the yellow can, or yellow marked container.
4. If visiting time is required to be limited, this will be posted on the door by Radiation Safety Office Personnel.

13.2.3 Care of Patients Receiving Radioactive Iodine-131

13.2.3.1 Minor Therapy

Patients receiving more than 8 millicuries but less than 30 mCi of Iodine-131 who are hospitalized, must be treated using the following precautions:

1. Standard (formerly Universal) precautions will be observed by all persons

entering the patient's room (see Appendix L).

2. A "Caution, Radioactive Materials" sign will be placed at the entrance of the patient's room and on the exterior of the patient's chart. The patient will wear a bracelet indicating radioactive material.
3. Other restrictions may be applied by the Radiation Safety Officer (RSO) on a case by case basis.
4. The major threat from these patients is that of contamination by the urine, saliva or other body fluids. Standard (formerly Universal) precautions should ensure that this contamination will be kept to a minimum.

13.2.3.2 Major Therapy Doses Greater Than 30 Millicuries

1. The patient will be admitted to a single room with a private toilet.
2. Disposable gloves, gowns and shoe covers shall be positioned outside the patient's room and used. Clearly labeled receptacles should be positioned in the patient's room to contain contaminated food, gloves or other materials. Nurses shall use pocket dosimeters if they are going to work for extended periods of time at the patient's side. No pregnant nurses shall be assigned to routine care of these patients. However, minimal care or emergency care can be carried out by a pregnant nurse.
3. The urine and vomitus from I-131 patients shall be disposed of through

the sanitary sewer in the normal way. Male patients shall be instructed to sit while urinating. Extra special care shall be used with urine and saliva to ensure no contamination.

4. Patients containing I-131 shall be confined to their rooms except for special procedures approved by Nuclear Medicine or the Radiation Safety Office.
5. Attending personnel shall wear rubber gloves when handling the patient urinals or other possibly contaminated materials.
6. Disposable items should be treated as potentially radioactive unless otherwise determined.
7. All clothes and bed linen should be placed in the laundry bag and retained in the patient's room to be checked by the RSO.
8. If the urine is to be collected, a special container should be provided and labeled as radioactive. This container must be kept in a shielded location.
9. Disposable plates, cups and eating utensils should be used by patients who have received greater than 30 millicuries of I-131.
10. Vomitus within 48 hours after oral administration shall be considered as highly radioactive. The Radiation Safety Office and Nuclear Medicine shall be called if this occurs.

11. If anyone that has contact with the patient suspects that their skin may have been contaminated, the Radiation Safety Office should be notified immediately to perform a survey.
12. If a patient who has received more than 5 millicuries of I-131 should die, the RSO and Nuclear Medicine department should be notified immediately. The funeral director must be notified by completing the notification form which accompanies the body to the mortuary. A "Caution Radioactive Material" Toe-tag should be attached to the body. It is recommended that the funeral director be contacted by the RSO in order to discuss any radiation safety precautions which may be necessary.
13. Patient discharges shall be as recommended by the RSO. Generally when the patient contains less than 30 millicuries of I-131, the patient may be discharged. The dose rate for these patients should in general be less than 5 mRem per hour at 1 meter. Upon discharge, Nuclear Medicine and the Radiation Safety Office will supervise the clean up of the room. After it is determined that the room meets fixed and removable radioactive contamination limits, general housekeeping procedures shall be instituted.

13.2.3.3 Nursing Instructions For Patients Treated With Brachytherapy Sources

1. Special restrictions may be noted on the precaution sheet on the patient's chart. Nurses should read these instructions before caring for the patient. The Radiation Safety Office should be contacted, x46510, or

the Radiation Oncology resident on call, x45276 to answer any questions concerning these patients.

2. Nurses should only spend the minimum time necessary near a patient for routine nursing care.
3. When the nurses are assigned to a therapy patient, the film badge or the pocket dosimeter should be used. Film badges shall only be worn by the nurse to whom it is issued.
4. Pregnant nurses shall not be assigned to the personal care of radioactive patients. Occasional care or care during an emergency is allowable however. (The total effective dose equivalent for pregnant nurses is 500 mRem for the entire 9 month gestation period.) The radioactive patient does not present a significant hazard to the pregnant nurse unless there is an extended period of time. Any questions shall be referred to the Radiation Safety Office.
5. Do not touch needles, tubes or containers holding brachytherapy sources. If a needle or tube becomes dislodged, use forceps and put it in the corner of the room or in the shielded container provided. Contact Radiation Oncology and the Radiation Safety Officer as soon as possible. Bed baths may be omitted while the sources are in place. Perineal care is not given during gynecological treatment. Perineal pads may be changed when necessary unless orders to the contrary have been written.
6. Surgical dressings and bandages used to cover the area of insertion may be changed only by the attending physician, the Radiation Oncology physician or the Radiation Oncology resident. These dressings shall not

be discarded until it is clear there is no source in them.

7. Special orders will be written for oral hygiene for patients with oral implants.
8. No special instructions are required for sputum, urine, vomitus, stools, dishes, instruments or utensils unless specially ordered. These items should be checked to ensure that no source has been inadvertently displaced into them.
9. All bed linens must be checked with the radiation survey meter before being removed from the patient's room to ensure that no dislodged sources are inadvertently removed.
10. These patients must stay in bed unless orders to the contrary are written and shall remain in their assigned rooms during the normal course of their treatment.
11. Visitors will be limited to those 18 years or older or as otherwise instructed on the precaution sheet. Visitors should stay at least 1 meter from the patient and remain no longer than the time specified on the visitor form. Pregnant nurses or attendants shall not be allowed in the room of a patient undergoing brachytherapy sources under normal circumstances. Female visitors shall be asked whether they are pregnant.
12. Emergency procedures:
 1. If an implanted source becomes loose or,

2. If the patient expires or,
 3. If the patient requires emergency surgery, immediately call the Radiation Oncology physician, 464-5276 (**on weekends and at night, a recording will give instructions as to where to call).
13. At the conclusion of treatment, the patient and the room shall be surveyed. The radiation sources shall be removed and inventoried. A note shall be made in the patient's chart. If there are permanent sources in the patient, the Radiation Safety Officer or the Radiation Oncology physician or resident shall brief the patient on necessary precautions for minimizing radiation to others after discharge from the hospital.

See Appendix H for the various forms related to this section.

13.3 Typical Stay Times For Nursing Care

	Thyroid CA	GYN-Implant	Breast or Mouth	Gold Grain	Brain
	I-131 (200 mCi)	Cs-137 (80 mgRaEq)	Ir-192 (25 mCi)	Au-198 (50 mCi)	I-125 (40 mCi)
Bedside	10 min.	6 min.	30 min.	30 min.	No limit
1 m	30 min.	20 min.	1.5 hr.	1.5 hr.	No limit
2 m	2 hrs.	1.5 hrs.	6 hrs.	6 hrs.	No limit

(20 mR/day at 5 days/yr is ALARA limit, 250 days/yr gives MPD)

13.4 Pocket Dosimeters

1. All nurses caring for patients undergoing radiopharmaceutical or brachytherapy treatment procedures shall use a pocket dosimeter.
2. Dosimeters are worn on the trunk of the body, preferably at the collar

level.

3. Individuals must enter the appropriate information in the dosimetry log prior to entering and after leaving the patient's room.
4. Instructions on use of the pocket dosimeter are posted. They can also be obtained from the charge nurse.

13.5 General Regulations Regarding Visitors

1. No visitors under 18 years old.
2. No pregnant visitors.
3. Visitors should wear pocket dosimeters obtained from the charge nurse.
4. Visitors shall remain at 2 meters away from the patient for most of the visit.
5. Visitation times are posted on the sheet at the door.
6. In the case of unsealed sources (I-131), visitors shall not have physical contact with the patient.

13.6 Quality Assurance Program for Brachytherapy Procedures Utilizing Temporary Implants

I. Training and Experience for Preparation of Sources

Sources will be prepared according to a physician's written prescription. Sources shall be prepared by any one of the following:

- a) Qualified radiation oncologists
- b) Qualified medical radiation physicists
- c) Qualified medical dosimetrists

The above personnel must be on the SUNY-Upstate and Crouse Hospital's authorized user lists for brachytherapy sources. They shall include radiation oncologists who are authorized for brachytherapy procedures according to a New York State Department of Health Radioactive Materials License or a medical radiation physicist certified by the American College of Radiology in either radiation oncology physics or radiological physics or by the American Board of Medical Physics certified in radiation oncology physics. The medical dosimetrist shall have at least one year of full time experience in radiation

oncology dosimetry and shall have been trained by and work under the direction of the certified medical radiation physicists described above. The above personnel may be assisted by resident physicians in radiation oncology working under the direct supervision of either the radiation oncologists, the radiation medical physicists or the radiation dosimetrist.

II. Procedures for Dosimetry Calculation and Check

Dosimetry calculations shall be performed by either the medical radiation physicists or the medical radiation dosimetrist. This initial calculation usually utilizes a radiation therapy treatment planning computer. The calculations shall be checked by another person who did not do the original calculation utilizing a hand calculation within one working day of the initial calculation. The person performing the check shall be either a medical radiation physicist or a qualified dosimetrist and it shall be totally independent of the initial calculation.

III. Evaluation of Patients During Treatment

A radiation oncology physician or resident physician shall evaluate the patient daily including a visual inspection to ensure that radioactive sources are in the proper position. Attending nurses shall have been instructed concerning the proper positioning of these sources and shall have been instructed to notify the physician in the case of source dislocations.

IV. Source Removal

Radioactive sources shall be removed from the patient only by a qualified radiation oncology physician or by a resident physician working under the direction of the radiation oncology physician. The physician may be assisted by a medical radiation physicist or a radiation dosimetrist. Upon removal of the sources, the radiation oncology physician, physicists, or dosimetrists, shall ensure that all sources are accounted for. They shall be placed in the shielded container and returned to the storage location by either the physician, the physicists, the dosimetrist or the Radiation Safety Officer of the hospital. It shall be properly logged in when returned to the storage location. After removal of the radiation sources from the patient's room, the room shall be surveyed to ensure that no sources are left behind. Again, it should be emphasized that the person removing the sources shall ensure that all sources are accounted for, either by counting the sources, counting the ribbons or any other technique which virtually assures that all sources are accounted for.

V. Written Orders.

The authorized radiation oncology physician shall prepare a written order for the radioactive sources prior to the commencement of therapy.

VI. MODEL PROCEDURES

MODEL RADIATION SAFETY PROCEDURES FOR THERAPEUTIC USE OF SEALED SOURCES IN IMPLANTS

MODEL PROCEDURE

1. All patients treated with brachytherapy sources will be placed in a

private room (unless the dose rate at one meter from the implant meets the requirements of 16.7 (a)) that has a toilet. The room will be as far away from the nursing station and heavy traffic hallways as is consistent with good medical care.

2.
 - a) The patient's room will be properly posted with a "radioactive Materials" sign.
 - b) The patient will be briefed on radiation safety procedures as appropriate.
3. Mark a visitors' " safe line" on the floor with tape as far from the patient as possible.

conducted as soon as practicable after sources are implanted. Exposure rate measurements will be taken at 3 feet (or 1 m) from the patient, at the patient's bedside, and at the visitors' "safety line." The Radiation Safety Officer or his designee will then determine how long a person may remain at these positions and will post these times and the exposure rate at 3 feet (or 1 m) from the patient on the patient's chart.

- b) The measured exposure rate at 2 meters will be compared to the calculated value and deviations greater than 10% will be evaluated as possible indications of error in the source activity implanted.
 - c) If the implant is performed other than in the patient's room, the area used for the procedure will be surveyed immediately afterward. In the case of seeds, any area where the seed were handled (i.e. sterilization area, source storage room) will be surveyed immediately after use.
5. Radiation levels in unrestricted areas (surrounding hallways and rooms) will be maintained less than the limits specified in Section 16.7, New York State Sanitary Code (10 NYCRR 16).
6. Immediately after sources are implanted, the form "Nursing Instructions for Patients Treated with Brachytherapy Sources" will be completed and attached to the patient's chart.
7. Nurses caring for brachytherapy patients will use pocket dosimeters or film badges when providing care.
8. At the conclusion of treatment, a survey will be performed to ensure that all sources other than permanent implants have been removed from the patient and that no sources remain in the patient's room or in any other area occupied by the patient. At the same time, all radiation signs will be removed and all pocket dosimeters assigned to nurses will be collected. If the patient is to be discharged, the final survey will also include a notation on the patient's chart that the activity remaining in the patient meets conditions for release from the hospital.
9. Instructions to Nurses
 - a) Special restrictions may be noted on the precaution sheet on the patient's chart. Nurses should read these instructions before administering to the patient. The Radiation Safety Officer should

be contacted to answer any questions about the care of these patients in regard to radiation safety precautions.

- b) Nurses should spend only the minimum time necessary near a patient for routine nursing care. Obtain and wear a film or TLD badge or a pocket chamber as instructed by the Radiation Safety Officer.
- c) When a nurse is assigned to a therapy patient, a pocket dosimeter should be obtained.
- d) Pregnant nurses should not be assigned to the personal care of these patients.
- e) Never touch needles, capsules, or containers holding brachytherapy sources. If a needle becomes dislodged, use long forceps and put it in the corner of the room or in the shielded container provided; contact Radiation Therapy, the Radiation Safety Officer, or the Nuclear Medicine Department at once.
- f) Bed bath given by the nurse should be omitted while the sources are in place.
- g) Perineal care is not given during gynecologic treatment; the perineal pad may be changed when necessary unless orders to the contrary have been written.
- h) Surgical dressings and bandages used to cover the area of needle insertion may be changed only by the attending physician or radiologist and MAY NOT BE DISCARDED until directed by the radiologist. Dressings should be kept in a basin until checked by the Radiation Safety Officer or his designee.

Special orders will be written for oral hygiene for patients with oral implants.

- i) No special precautions are needed for sputum, urine, vomitus, stools, dishes, instruments, or utensils unless specifically ordered, but these items should be saved for a check with a radiation survey meter to ensure that no sources have been inadvertently displaced into them.
- j) All bed linens must be checked with a radiation survey meter before being removed from the patient's room to ensure that no dislodged sources are inadvertently removed.
- k) These patients must stay in bed unless orders to the contrary are written. In any event, patients will remain in their assigned rooms during the treatment period.
- l) Visitors will be limited to those 18 years of age or over unless other instructions are noted on the precaution sheet on the patient's chart.
- m) Visitors should sit at least 9 feet (or 3 m) from the patient and should remain no longer than the time specified on the form posted on the patient's door and on his chart.

n) No nurse, visitor, or attendant who is pregnant should be permitted in the room of a patient while brachytherapy sources are implanted in the patient. Female visitors should be asked whether or not they are pregnant.

o) Emergency Procedures

1. If an implanted source becomes loose or separated from the patient, or

2. If the patient dies; or

-----TELEPHONE NO. (days) ----- (nights)-----

13.7 Transportation Of Radioactive Patients

Often radioactive patients must be transported from their rooms to Radiation Oncology, Nuclear Medicine, or other areas for necessary procedures such as dosimetry x-rays or nuclear scans.

The hazard associated with transport can be made negligibly small if proper procedures are followed. The Transport Procedure Checklist (in Appendix H) shall be filled out by the Radiation Oncologist, Nuclear Medicine physician or the Radiation Safety Office. Procedures to be followed are detailed on that checklist.

13.8 Policy For Discharge Of Patients Being Treated With Radioactive Materials

This policy applies mainly to patients who have received therapeutic amounts of radioactive materials.

1. For patients undergoing therapeutic procedures involving the use of gamma-ray emitting nuclides with half-lives greater than 60 days, the patients shall be hospitalized for the duration of the treatment. Cesium-137 is the nuclide in this category. These sources shall be removed before discharge of the patient from the hospital.
2. Patients having received therapeutic amounts of nuclides with half-lives less than 60 days can be released from the hospital within the following guidelines:
 - a. As a general rule, patients will be released from the hospital only when the amount of radionuclide they contain will not give a total effective dose equivalent to other members of the household greater than 0.5 rem in one year. For examples of these levels, refer to Columns 3 & 4 of Table III.
 - b. Often it is necessary or highly desirable to release a patient carrying a significant amount of radioactive material. In these cases, the restrictions in Table III shall be followed as well as pertinent sections of NCRP Report No.37 (specifically Section 4.1.2 (d) (e) and pertinent tables).

Table No. III

Activities for Which Records and Instructions Should Be Prepared
and Dose Rates Below Which Patient May Be Released¹

Radionuclide	Column 1 ² Activity Below Which Patients May Be Released		Column 2 ³ Dose Rate at 1 meter at Which Patients May Be Released mrem/hr	Column 3 ² Activity Above Which Instructions to Patients and Records Should Be Prepared MCi GBq		Column 4 ³ Dose Rate at 1 meter Above Which Instructions and Records Should Be Prepared mrem/hr
	mCi	GBq		MCi	GBq	
Ag-111	390	14	8	77	2.9	2
Au-198	93	3.4	21	19	0.69	4
Cu-64	230	8.4	28	45	1.7	5
I-125	8.7	0.32	1	1.7	0.06	0.2
I-131	33	1.2	7	6.5	0.24	1
Pd-103	40	1.5	3	7.9	0.29	0.7
Re-186	780	29	16	160	5.8	3
Re-188	790	29	21	160	5.9	4
Sc-47	300	11	17	60	2.2	3
Sm-153	660	25	30	130	4.9	6
Tc-99m	960	36	58	190	7.1	11
Yb-169	7.6	0.28	2	1.5	0.06	0.4

¹This table does not include radionuclides not regulated by NRC such as In-111, Tl-201, or Ga-67

²Values have been rounded to two significant figures.

³Most values have been rounded to the nearest whole number.

EXCERPT FROM NCRP REPORT No. 37:

4.1.1 Patients Containing Radioactive Nuclides with Half-lives greater than 60 Days . It is recommended that for therapeutic procedures involving the use of gamma-ray emitting nuclides with half-lives greater than 60 days, the patients *shall* be hospitalized for the duration of the treatment. These sources *shall* be removed before discharge of the patient.

4.1.2 Patients Containing Radioactive Nuclides with Half-lives Less than 60 Days .

(a) It is recommended that in the case of iodine-125, iodine-131, chromium-51, and Pd-153, patients may be released without restrictions when their radioactive content does not exceed the amount listed in Table III, column 3. The physician, with the concurrence of the Radiation Protection Supervisor, *shall* be permitted to increase these values slightly for the short-lived nuclides. However, it is suggested that rather than making any

substantial increase he *should* make use of one of the restrictive procedures discussed in Section 4.1.2 (d)

(b) It is recommended that hospitalization be required for at least 48 hours following the intraperitoneal or intrapleural administration of colloidal gold-198. Accidental loss of colloidal gold occurs usually via the insertion site and a period of at least 48 hours permits observation of the progress of healing of the puncture wound. After this period release can be in accordance with Section 4.1.2 (a)

(c) Patients treated with the long-lived tantalum-182 or iridium-192 need special consideration (see 4.1.2 (e) below)

(d) Following hospitalization, as recommended in (a) and (b) above, discharge of all patients who have received therapeutic amounts of any radioactive nuclide *shall* be governed by the following provisions.

(1) A patient *shall not* be discharged from the hospital if the maximum integrated exposure, at a distance of one meter from the patient, for continuous exposure, exceeds 0.5 R in one year.

The initial exposure rates at one meter, or the activities which will result in an integrated exposure (for continuous exposure) of approximately 5 R in one year, can be obtained from columns 1 and 2 of Table III.

(2) If the initial exposure rate at one meter, or the activity remaining in the patient, indicates by the above application of values in columns 1 and 2, Table III, that the integrated exposure will not exceed 5 R in one year, provision for release from the hospital *shall* be made for one of two different situations, as follows:

(i) In the event that all persons in the household of the radioactive patient, and hence all those persons with whom the patient will have appreciable contact, are *over the age of 45 years*:

-The patient *should* be instructed to remain at distances greater than 3 feet (one meter) from other people, except for brief periods for necessary procedures.

-Babies and young people (*of ages less than 45 years*) *should not* visit the patient, but if they do, the visits *should* be brief, and a distance of at least 9 feet (three meters) from the patient *should* be maintained.

(ii) In the event that a person *under the age of 45 years* lives in the household of the patient:

-Stricter precautions *shall* be observed than when all contacts are with persons over 45 years of age.

-Children and persons under 45 years of age *shall not* be allowed in the same room, nor at a distance of less than 9 feet (three meters), for more than a few minutes a day. Observance of these conditions will insure that persons under 45 years of age will not be exposed to more than 0.5 R per year from the radioactive individual.

-Other restrictions may be specified by the physician.

All restrictions may be removed when the activity reaches that listed in columns 3 and 4 of Table III. The Radiation Protection Supervisor *shall* determine this time, and give the necessary instructions. The instructions *should* be printed or typewritten. These conditions for release are summarized in Table III.

13.9 Handling of Patients Who Die Containing Radioactive Materials

If a patient containing more than 5 mCi of radioactivity should expire, the Radiation Safety Office must be notified. A radioactivity report shall be filled out on every cadaver containing more than 5 mCi of radioactivity as prescribed by New York State law (Part 16.9(d)). The form on the next page of this manual shall be completed by the Radiation Safety Officer and accompany the body to the funeral director. A copy of the report will be sent to the New York State Department of Health.

NOTE: The Radiation Safety Officer or designee has the final authority on release of patients from the hospital who contain radioactive materials.

RADIOACTIVITY REPORT ACCOMPANYING BODY
SUNY Upstate Medical University

A completed copy of this form must accompany each body leaving the Upstate Medical University if RADIOACTIVE MATERIALS were administered to the patient during this hospitalization period. RADIOACTIVE MATERIALS are defined as either radiopharmaceuticals given by injection or taken orally or sealed sources which are permanently implanted.

REPORT ON RADIOACTIVITY TO FUNERAL DIRECTOR FROM THE RADIATION PROTECTION SUPERVISOR OR DELEGATE:

[] This body does not contain significant amounts of radioactive materials. No special precautions are required if standard embalming procedures are employed.

[] This body contains a significant amount of radioactive material.

Location:

Type of material:

The following precautions are to be observed:

Signed: _____
Radiation Protection Supervisor or Delegate

Date: _____

13.10 Protocol For The Safe Handling Of Radioactive Gases In The Hospital

Several radionuclides (Xenon-133, Technetium-99m and Iodine-131), used for patient diagnosis and/or treatment, are employed in the gaseous, vapor or aerosol forms. Consequently, these materials may become sources of internal and external contamination. In order to minimize the potential hazard from this source, the following protocol will be followed:

1. **Xenon-133**: A gas used for patient diagnosis. Xenon-133 will be administered to the patient using a closed system. Any material unused by the patient will be trapped in the apparatus used for administration. The trapping system will be tested for leakage biannually by an appropriate method. If the trap is found not to be operating properly, the trap or trapping material will be replaced according to the manufacturer's specifications. Results of the air sampling will be expressed in microcurie per milliliter. From this data and the number of patients handled by each technologist, the percentage received of the Annual Limit on Intake (ALI) will be determined. Appropriate action will be taken on the advice of the Radiation Safety Officer, if, at any time, the projected intake might exceed 25% of the ALI.

2. **Technegas (Technetium-99m-carbon aerosol)**: This radionuclide is attached to extremely small carbon particles (~1 uM). Administration of this material will be carried out with special apparatus designed for this procedure and which uses a closed breathing system with disposable trap.

- 3, **Iodine-131**: Radioactive iodine, as sodium iodide in a liquid solution, is on rare occasion administered orally to patients for diagnosis and treatment of thyroid disease. I₂, as a vapor, can be evolved from the solution. Administration of radioactive liquid iodine will be done using a

closed system. Air sampling during administration may be used to assess exposure to others in the area. Air concentrations will be measured and projected intake will be determined. If the projected intake exceeds 25% of the ALI, appropriate action, as recommended by the Radiation Safety Officer, will be taken to minimize further exposure. As a standard practice, each person routinely handling liquid radioiodine in the Division of Nuclear Medicine will undergo thyroid bioassay 48 hours after contact. When major therapy doses (100 to 200 millicuries) of radioiodine are administered to inpatients, thyroid bioassay of nursing personnel and all persons assisting inpatient administration of the radionuclide may be conducted by the Radiation Safety Officer after each administration. Biannual estimates and projections on intake will be done. If the projected intake exceeds 25% of the ALI, appropriate action will be taken by the Radiation Safety Officer.

ALARA. All use of radioactive gases, aerosols and vapors will be carried out in such a manner so as to keep exposure as low as is reasonably achievable.