NRC FORM 313M (9-81) 10 CFR 35	U.S. NUCLEAR REGULATORY COMMISSION **APPLICATION FOR MATERIALS LICENSE – MEDICAL**	Approved by OMB 3150-0041 Expires 9-30-83

INSTRUCTIONS – *Complete Items 1 through 26 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 26 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20 and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 26 and the appropriate fee enclosed.*

1.a. NAME AND MAILING ADDRESS OF APPLICANT *(institution, firm, clinic, physician, etc.)* INCLUDE ZIP CODE	1.b. STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE USED *(If different from 1.a.)* INCLUDE ZIP CODE
Flower Memorial Hospital 5200 Harroun R[illegible] Sylvania, Ohio [illegible] TELEPHONE NO.: AREA CODE (419) 885 - 1444	Log [illegible] Remitter Check No. 00[illegible] Amount $[illegible] Fee Category 20 Type of Fee
2. PERSON TO CONTACT REGARDING THIS APPLICATION David Close - Consultant NMA Medical Physics Services TELEPHONE NO.: AREA CODE (216) 641 - 5799	3. THIS IS AN APPLICATION FOR: *(Check appropriate item)* a. ☐ NEW LICENSE b. ☐ AMENDMENT TO LICENSE NO. c. ☒ RENEWAL OF LICENSE NO. 34-15184-01 Completed 9/2/87
4. INDIVIDUAL USERS *(Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)* See item #8	5. RADIATION SAFETY OFFICER (RSO) *(Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)* Robert Zwicker, Ph.D.

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)	ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
10 CFR 31.11 FOR IN VITRO STUDIES	x	0.2	IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM		
10 CFR 35.100, SCHEDULE A, GROUP I	x	AS NEEDED	PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES		
10 CFR 35.100, SCHEDULE A, GROUP II	x	AS NEEDED	PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
10 CFR 35.100, SCHEDULE A, GROUP III	x	2000	GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
10 CFR 35.100, SCHEDULE A, GROUP IV	x	AS NEEDED	IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA		
10 CFR 35.100, SCHEDULE A, GROUP V	x	AS NEEDED	XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	x	500
10 CFR 35.100, SCHEDULE A, GROUP VI	x	2000			

6.b. RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.a. *(Sealed sources up to 3 mCi used for calibration and reference standards are authorized under Section 35.14(d), 10 CFR Part 35, and NEED NOT BE LISTED.)*

ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	MAXIMUM NUMBER OF MILLICURIES OF EACH FORM	DESCRIBE PURPOSE OF USE
Sr-90	Sealed Source (Nuclear Enterprises Model 2503)	10 mCi	Instrument Calibration
Uranium depleted in U-235	Cadmium plated metal	182 kilograms	Shielding for a Varian Clinac Linear Accelerator

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CONTROL NO. 84076

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REG3 LIC30
34-15184-01 PDR

INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

For Items 7 through 23, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the medical licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10.8 , Rev. _____ Date: _____

7. MEDICAL ISOTOPES COMMITTEE	
	Names and Specialties Attached; and
	Duties as in Appendix B; or *(Check One)*
X	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
	Supplements A & B Attached for Each Individual User; and
	Supplement A Attached for RSO.
9. INSTRUMENTATION *(Check One)*	
X	Appendix C Form Attached; or
	List by Name and Model Number
10. CALIBRATION OF INSTRUMENTS	
	Appendix D Procedures Followed for Survey Instruments; or *(Check One)*
X	Equivalent Procedures Attached; and
	Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*
X	Equivalent Procedures Attached
11. FACILITIES AND EQUIPMENT	
X	Description and Diagram Attached
12. PERSONNEL TRAINING PROGRAM	
X	Description of Training Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL	
X	Detailed Information Attached
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS *(Check One)*	
X	Appendix F Procedures Followed; or
	Equivalent Procedures Attached
15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
X	Appendix G Rules Followed; or
	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
X	Appendix H Procedures Followed; or
	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
	Appendix I Procedures Followed; or
X	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
X	Appendix J Form Attached; or
	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
X	Appendix K Procedures Followed; or
	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
X	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
X	Equivalent Procedures Attached
21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon – 133)	
X	Detailed Information Attached
22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
	Detailed Information Attached
23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6b	
	Detailed Information Attached

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	R.S. Landauer, Jr. & Co.	Monthly
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
	X	TLD	R.S. Landauer, Jr. & Co.	Monthly
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

Log Dept 2
Remitter
Check No. 063736
Amount
Fee Category 7c
Type of Fee amd
Dat Completed 8/24/87
By:

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL

MAILING ADDRESS

CITY | STATE | ZIP CODE

b. ATTACH A COPY OF THE AGREEMENT LETTER SIGNED BY THE HOSPITAL ADMINISTRATOR.

c. WHEN REQUESTING THERAPY PROCEDURES, ATTACH A COPY OF RADIATION SAFETY PRECAUTIONS TO BE TAKEN AND LIST AVAILABLE RADIATION DETECTION INSTRUMENTS.

26. CERTIFICATE
(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30 and 35, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

a. LICENSE FEE REQUIRED
(See Section 170.31, 10 CFR 170)

(1) LICENSE FEE CATEGORY: 7C

(2) LICENSE FEE ENCLOSED: $ 580.00

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b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*
X Deborah F. Wiley

(1) NAME *(Type or Print)*
X Deborah F. Wiley

(2) TITLE
X Vice President

c. DATE
X Aug 24, 1987

NRC FORM 313M (9-81)

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the Nuclear Regulatory Commission on NRC Form 313M. This information is maintained in a system of records designated as NRC-3 and described at 40 Federal Register 45334 (October 1, 1975).

1. **AUTHORITY** Sections 81 and 161(b) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2111 and 2201(b)).

2. **PRINCIPAL PURPOSE(S)** The information is evaluated by the NRC staff pursuant to the criteria set forth in 10 CFR Parts 30-36 to determine whether the application meets the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, for the issuance of a radioactive material license or amendment thereof.

3. **ROUTINE USES** The information may be used: (a) to provide records to State health departments for their information and use; and (b) to provide information to Federal, State, and local health officials and other persons in the event of incident or exposure, for their information, investigation, and protection of the public health and safety. The information may also be disclosed to appropriate Federal, State, and local agencies in the event that the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, or local agency to the extent relevant and necessary for a NRC decision or to an appropriate Federal agency to the extent relevant and necessary for that agency's decision about you. A copy of the license issued will routinely be placed in the NRC's Public Document Room, 1717 H Street, N.W., Washington, D.C.

4. **WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION** Disclosure of the requested information is voluntary. If the requested information is not furnished, however, the application for radioactive material license, or amendment thereof, will not be processed.

5. **SYSTEM MANAGER(S) AND ADDRESS** Director, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

RADIATION SAFETY COMMITTEE

The licensee shall establish a Radiation Safety Committee to oversee the use of byproduct material.

(a) The Committee must meet the following administrative requirements:

(1) Membership must consist of at least three individuals and must include an authorized user of each type of use permitted by the license, the Radiation Safety Officer, a representative of the nursing service, and a representative of management who is neither an authorized user nor a Radiation Safety Officer. Other members may be included as the licensee deems appropriate.

(2) The Committee must meet at least quarterly.

(3) To establish a quorum and to conduct business, at least one-half of the Committee's membership must be present, including the Radiation Safety Officer and the managements's representative.

(4) The minutes of each Radiation Safety Committee meeting must include:

(i) The date of the meeting;
(ii) Members present
(iii) Members absent;
(iv) Summary of deliberations and discussions;
(v) Recommended actions and the numerical results of all ballots; and
(vi) ALARA program reviews described in 35.20(c).

(5) The Committee must promptly provide each member with a copy of the meeting minutes, and retain one copy for the duration of the license.

(b) To oversee the use of licensed material, the Committee must:

(1) Review recommendations on ways to maintain individual and collective doses ALARA;

(2) Review, on the basis of safety and with regard to the training and experience standards in Subpart J of Part 35 and approve or disapprove any individual who is to be listed as an authorized user, the Radiation Safety Officer, or a Teletherapy Physicist before submitting a license application or request for amendment or renewal;

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(3) Review on the basis of safety, and approve with the advice and consent of the Radiation Safety Officer and the management representative, or disapprove minor changes in radiation safety procedures that are not potentially important to safety and are permitted under 35.31 of Part 35;

(4) Review quarterly, with the assistance of the Radiation Safety Officer, a summary of the occupational radiation dose records of all personnel working with byproduct material;

(5) Review quarterly, with the assistance of the Radiation Safety Officer, all incidents involving byproduct material with respect to cause and subsequent actions taken; and

(6) Review annually, with the assistance of the Radiation Safety Officer, the radiation safety

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NAME OF AUTHORIZED USER	AUTHORIZATION
Philip J. Silverman, M.D.	Groups I, II, III and IV Xenon-133 Iodine-131 for treatment of thyroid carcinoma
Harvey Muehlenbeck, M.D.	Groups I, II and III Xenon-133 Soluble phosphorus-32 In vitro studies Iodine-131 for treatment of hyperthyroidism and cardiac conditions
Thomas V. Abood, M.D.	Groups I, II and III Xenon-133 In vitro studies
J. R. Marsa, M.D.	Group VI
Coun Il Mah, M.D.	Group VI
Steven Zeidner, M.D.	Group VI
Michael R. Hay, M.D.	Groups I, II and III Iodine-131 for treatment of thyroid carcinoma In vitro studies Xenon-133
Allan S. Kaufman, M.D.	Groups I, II and III In vitro studies Xenon-133
Leonard H. Madoff, M.D.	In vitro studies
Khalid Hameed, M.D.	In vitro studies

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NAME OF AUTHORIZED USER	AUTHORIZATION
Darko Desaty, Ph.D.	In vitro studies
William K. Mueller, M.D.	Groups IV and VI Iodine-131 for treatment of thyroid carcinoma
Daniel Singer, M.D.	Groups I, II and III and IV Xenon-133 Iodine-131 for treatment of thyroid carcinoma
William G. Novak, M.D.	Groups I, II and III Xenon-133
William D. Eggleston, M.D.	Group VI
Edmund P. Ho, M.D.	Group VI
Rajender K. Ahuja, M.D.	Groups VI, I-131 as iodide for treatment of thyroid carcinoma, and P-32 as colloidal phosphate for intracavitary treatment of malignant effusions.

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APPENDIX C

INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: Picker

      Manufacturer's model number: CDV-700

      Number of instruments available: one

      Minimum range: 0 mR/hr to .5 mR/hr

      Maximum range: 0 mR/hr to 50 mR/hr

   b. Manufacturer's name: Victoreen

      Manufacturer's model number: 470A

      Number of instruments available: one

      Minimum range: 0 mR/hr to 3 mR/hr

      Maximum range: 0 mR/hr to 1000 mR/hr

2. Dose Calibrator(s)

   Manufacturer's name: Capintec

   Manufacturer's model number: CRC-12

   Number of instruments available: one

3. Instruments used for diagnostic procedures

Type of Instrument	Manufacturer's Name	Model No.
Scintillation Camera	Technicare	100
Scintillation Camera	Technicare	410
Uptake probe	Picker	Magnasconner V

4. Other (e.g., liquid scintillation counter, area monitor, velometer)

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CALIBRATION OF INSTRUMENTS

A. Survey meters will be checked for operability each day of use. This will be accomplished by holding the detector against an instrument check source or the dose calibrator sealed constancy source depending on the instrument or range to be tested. If any reading with the same geometry is not within ± 20% of the reading displayed after calibration, the instrument will be recalibrated.

The units will be calibrated after servicing and at least annually by the manufacturer or by Nuclear Medicine Associates, Cleveland, Ohio, in accordance with the procedure outlined in application for NRC license #34-16272-01. Records of these calibrations will be maintained and recommendations for repair will be followed. A survey meter will not be used beyond the anniversary of its last successful calibration.

B. The dose calibrator will be calibrated as follows:

1. Sealed sources will be used to establish accuracy. They will consist of:

Nuclide	Suggested Activity	Activity
Co-57	.05 - 5 mCi	50 uCi or more
Ba-133	.05 - 0.5 mCi	50 uCi or more
Cs-137	.05 - 0.3 mCi	50 uCi or more

2. The accuracy of the assay of the above standards will be at least ± 5% and traceable to National Bureau of Standard sources.

3. The calibration procedure will be as follows:

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a. The dose calibrator will be checked for accuracy at annual intervals and following repair using the sealed sources listed in Item 1 above. The activity displayed by the dose calibrator must agree with the stated assay within ± 10% of the limits of the standard's calibration accuracy. If the unit displays readings with an error greater than ± 10%, arrangements will be made for immediate repair or adjustment.

b. The dose calibrator will be checked for constancy each day of use. This will be accomplished using a Cs-137 standard. The sealed source will be placed in the chamber and the unit set to measure that nuclide. The activity displayed with background and decay considered, must fall within ± 10% of the predicted activity based on the value obtained at the time of the last accuracy test.

The daily constancy check will be extended to include verification of displayed activities using the same standard but with the dose calibrator set to measure each of the different nuclides to be assayed on that day. With background and decay considered, variation in displayed activities must fall within ± 10% of the activity shown at the time of the most recent accuracy check. If variations greater than ± 10% are noted, arrangements will be made for immediate repair or adjustment.

c. The dose calibrator will be checked for activity linearity at quarterly intervals and following repair. This test will be performed using the maximum dose to be administered for patient studies. The linearity test will be continued by repeating the assay of the source several times a day over a two to three day period until a measurement is made in which the activity displayed is approximately the minimum dose likely to be used in a patient study, but not less than 10uCi, and also less than the activity displayed during the annual accuracy check utilizing the Co-57 accuracy standard. In this way, the accuracy of the dose calibrator will be assured throughout the entire ranges of doses drawn for patient studies.

The linearity test data will be plotted or calculated as a function of activity vs. time and compared to predicted activities vs. the same time. The acceptable range of error will be ± 10%. If test result error exceeds ± 10%, the unit may be used with correction factors.

As an alternative procedure, the linearity test can be performed with the use of the Calicheck Kit from Calcorp, Inc. The manufacturer's instructions for use dated 3/2/82 will be followed. The source used shall be the activity of the largest dose used for patient studies. Limits of acceptability and corrective actions will be as described above.

d. The dose calibrator will be tested for geometrical variation at the time of installation and following chamber or liner repair or replacement. This test will be performed using approximately 1 - 10 mCi of Tc-99m in a geometrical configuration approximating that of a point source. The source geometry will then be changed by dilution with assays performed at each step. A comparison will also be made to quantify the reduction in displayed activity caused by assaying sources in plastic versus glass containers.

The data will be analyzed relating the various readings to the reading acquired while the test source was in the geometry of the Co-57 accuracy standard. Correction factors will be used in clinical assays when geometry induced errors exceed ± 10%.

C. Diagnostic instrumentation will be calibrated as follows:

1. The camera pulse height analyzer will be calibrated and a uniform flood check will be performed each day of use.

2. Well counters will be calibrated each day of use with a long lived reference standard.

3. Uptake probes will be calibrated each day of use with a long lived reference standard.

FACILITIES AND EQUIPMENT DESCRIPTION

All radioactive sources are stored in such a manner (lead, concrete, refrigerator) so as to not exceed 2mR/hr at the surface of the barrier.

Mo-99/Tc-99m generator when used will be stored and eluted in the designated area. It will be shielded with lead bricks such that levels from all avenues of approach do not exceed 2.0mR/hr. Spent generators will be stored in the location identified in the attached diagram.

During elution, the eluate will be collected, assayed and stored in a vial held in a quarter inch lead pig except during brief periods of transfer. Transfer of the eluate or portions of the eluate will be made by the use of syringes retained in lead shields designed for this purpose.

Eluates and compounds made from eluates will be drawn, synthesized, assayed and stored in lead vials or syringes such that levels as measured at contact with a low level survey meter do not exceed 2.0mR/hr except for brief periods during the actual transfer.

Radioactive materials obtained from radiopharmacy suppliers will be stored in their original shipping containers. If necessary, the doses will be placed behind additional shielding to reduce activity levels emitted from the container to 2mR/hr or less.

Syringe shields will be used on all accessories requiring the transfer of radiopharmaceuticals from vial to vial and in drawing up patient doses. Syringe shields will also be used in the administration of doses to patients except when the patient's well-being may be compromised. Under these circumstances, the dose containing syringes will be kept shielded up to the moment of injection.

Steps in the preparation of compounds requiring periods of heating, shaking, agitation or mixing will be performed utilizing lead shielding and/or mechanical or ultrasonic agitation equipment and/or remote handling devices (tongs, forceps, etc.) such that levels during the above period as measured by a low level survey meter do not exceed 2.0mR/hr.

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Nuclear Medicine
Facilities and Equipment

Diagram

Air Supply
Air Exhaust
___ Scanner
1 Uptake/Well
2 Camera
3 Lockable Door
4 Receipt Area
___ Generator
5 Kit Preparation
6 Isotope Storage (under counter)
5 Dose Preparation
6 Waste Storage (under counter)
7 Dose Calibrator
8 Refrigerator (under counter)
9 Fume Hood

Sink
Lead Castle

Adjacent Areas

___ _____
___ _____
___ _____
___ _____

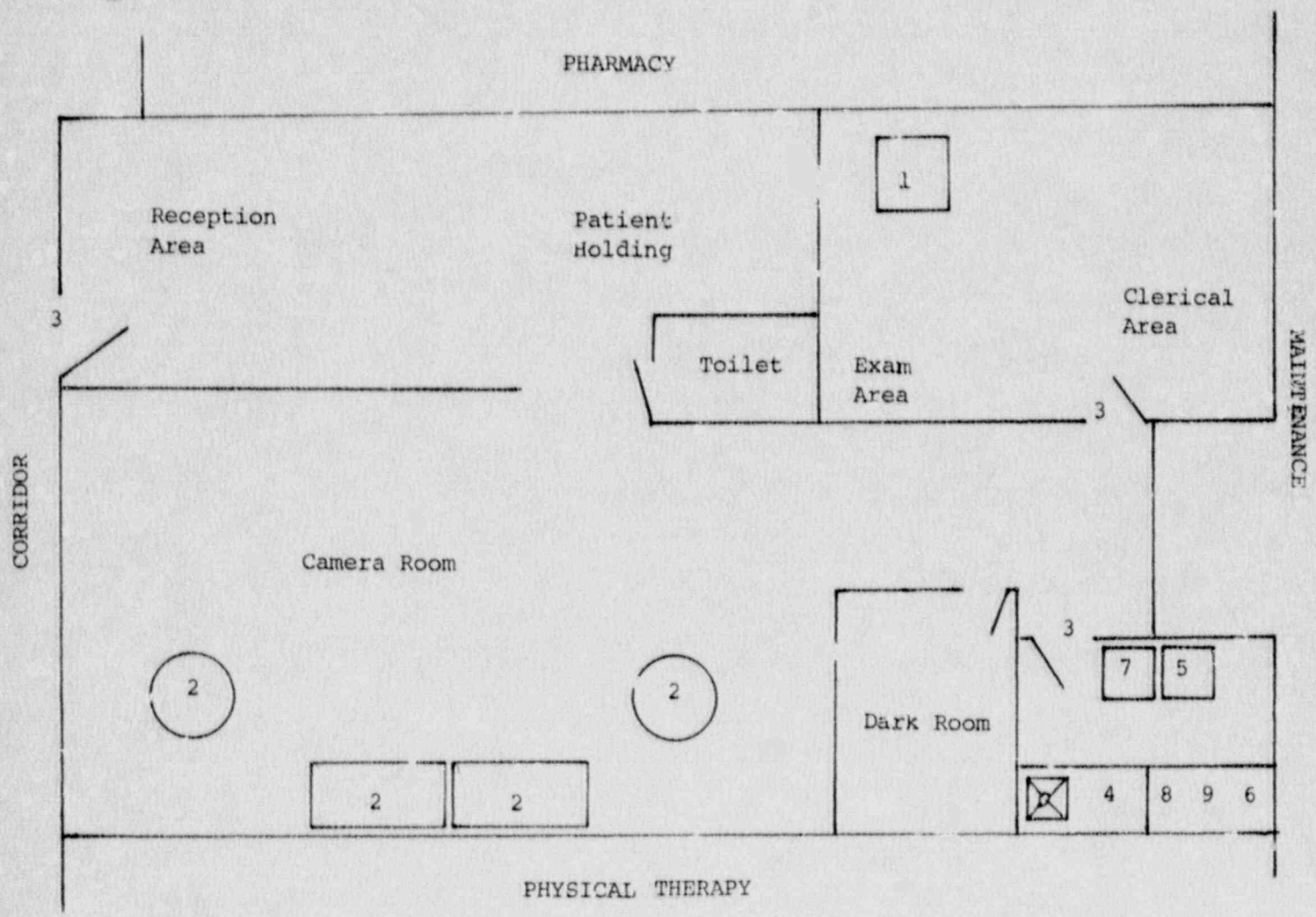
Lead Shielding

5 L-Shield
12" L x 12" W x 16" H x ¼" T

6 Storage
12" L x 12" W x 8" H x 1" T

___
___ L x ___ W x ___ H x ___ T

___
___ L x ___ W x ___ H x ___ T



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Decay Area

Facilities and Equipment

Diagram

Air Supply

Air Exhaust

___ Scanner

___ Uptake/Well

___ Camera

L Lockable Door

___ Receipt Area

___ Generator

___ Kit Preparation

___ Isotope Storage

___ Dose Preparation

___ Waste Storage

___ Dose Calibrator

___ Refrigerator

Sink

Lead Castle

Adjacent Areas

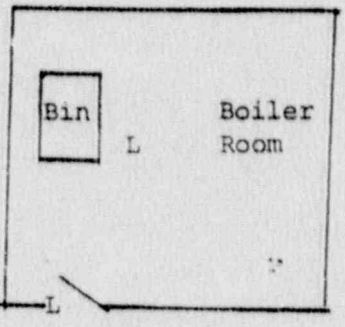
Lead Shielding

___ ___ ___L x ___W x ___H x ___T

___ ___ ___L x ___W x ___H x ___T

___ ___ ___L x ___W x ___H x ___T

___ ___ ___L x ___W x ___H x ___T



Decay Area:
4 feet above ground.
Lead lined walls
of concrete blocks.
With lockable doors.
Located i b[illegible]ler
room.

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Oncology Hot Room

Facilities and Equipment

Diagram

Air Supply

Air Exhaust

___ Scanner
___ Uptake/Well
___ Camera
L Lockable Door
___ Receipt Area
___ Generator
___ Kit Preparation
___ Isotope Storage
___ Dose Preparation
___ Waste Storage
___ Dose Calibrator
___ Refrigerator

Sink

Lead Castle

Adjacent Areas

___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____

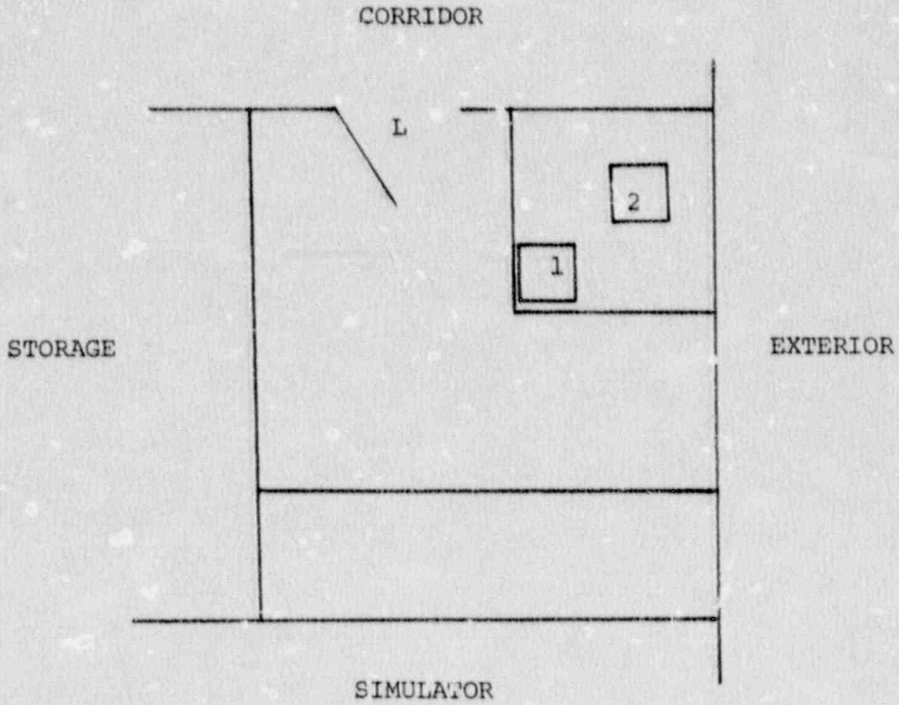
Lead Shielding

1 L-Shield
16" L x 14" W x 22" H x 2" T

2 Lead Safe
12" L x 15" W x 14" H x 4" T

___
___L x ___W x ___H x ___T

___
___L x ___W x ___H x ___T



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PERSONNEL TRAINING PROGRAM

In accordance with Section 19.12 of 10 CFR, Part 19, the following is a description of the training required for all personnel who work with or in the vicinity of radioactive materials:

1. The nuclear medicine department will be staffed by individuals who will be classified as occupational employees. These individuals will perform their duties from the radiation safety viewpoint under the direction of the physician(s) named on the license application.

2. Every effort will be made to hire nuclear medicine technology registered or registry eligible personnel to work with radioactive material. Orientation of such personnel for a day or two by the physician(s) named on the license and/or by the supervising technologist will include the following:

   a. Indicate areas where radioactive materials are used or stored.
   b. Potential hazards associated with radioactive materials.
   c. Radiological safety procedures appropriate to their respective duties.
   d. Pertinent NRC regulations.
   e. The rules and regulations of the license.
   f. The pertinent terms of the license.
   g. Their obligation to report unsafe conditions.
   h. Appropriate response to emergencies or unsafe conditions.
   i. Their right to be informed of their radiation exposure and bioassay results.
   j. Location where the licensee has posted or made available notices, copies of pertinent regulations, and copies of pertinent licenses and license correspondence), as required by 10 CFR, Part 19.

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3. Personnel will receive refresher training relative to duties, regulations, or terms of the license at least annually or more frequently, as needed.

4. Access into areas where radioactive material is stored or used will be restricted for nonoccupational personnel. When it is necessary for nonoccupational personnel to enter these areas, as in the case of certain patients who need special care, personnel so involved will be present under the direction of the nuclear medicine technologist, who will ensure that the exposure of these persons is held to the minimum required for the performance of the nuclear medicine procedure. Further, all nonoccupational personnel will receive instruction as to the location and potential hazards associated with radioactive material during their orientation process and annually thereafter in the form of verbal instructions and/or interdepartment memos.

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PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. Radioactive material for Nuclear Medicine will be ordered by the Nuclear Medicine Technical Chief or designee. Orders for radioactive material for Group VI activities in Oncology will be approved by Medical Physics and Radiation Safety. For each order, action will be taken to ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

2. Packages containing radioactive material delivered to Flower Hospital will be accepted only by those personnel authorized to receive them and who have adequate procedures for the safe handling of the package.

PROCEDURE

1. Delivery of radioactive material by a common carrier will normally be to Receiving during normal working hours.

2. Delivery may be made directly to Nuclear Medicine, Laboratory or Oncology if arrangements have been made by the respective department for delivery to be made in that manner. Such deliveries may be made by a radionuclide supplier when the department is not attended, provided that the material is placed in a secure area designated for radionuclide storage.

3. If a courier or common carrier attempts delivery of radioactive material during hours in which Receiving is closed and prior arrangements have not been made for delivery directly to the department for which the material is destined, the Security Guard on duty is to be contacted. The Security Guard will escort the carrier to the Nuclear Medicine Department, and allow the package to be placed in the Hot Lab of the Nuclear Medicine Department.

4. If the above procedures cannot be implemented, the courier or common carrier is to be instructed not to attempt delivery.

5. When delivered packages are wet or appear to be damaged, the Radiation Safety personnel are to be immediately contacted via the switchboard radiation emergency call procedure. The carrier should be requested to remain until it can be determined that neither he nor the delivery vehicle is contaminated.

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APPENDIX F

PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. Special requirements will be followed for packages containing quantities of radioactive material in excess of the Type A quantity limits as specified in paragraphs 20.205 (a)(1) and (c)(1) of 10 CFR Part 20 (more than 20 Ci for Mo-99 and Tc-99m). They will be monitored for surface contamination and external radiation levels within 3 hours after receipt if received during working hours or within 18 hours after receipt if received after working hours, in accordance with the requirements of paragraphs 20.205 (a) through (c). All shipments of liquids greater than exempt quantities will be tested for leakage. The NRC Regional Office will be notified in accordance with the regulations if removable contamination exceeds 0.01 uCi/100 cm^2 or if external radiation levels exceed 200 mR/hr at the package surface or 10 mR/hr at 1m.

2. For all packages, the following additional procedures for opening packages will be carried out:

   a. Put on gloves to prevent hand contamination.

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

   c. Measure exposure rate at 1m from package surface and record. If > 10 mR/hr, stop procedure and notify Radiation Safety Officer.

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

   e. Open the package with the following precautionary steps:

      (1) Open the outer package (following manufacturer's directions if supplied) and remove packing slip.

      (2) Open inner package and verify that contents agree with those on packing slip. Compare requisition*, packing slip, and label on bottle.

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*In the case of special order (e.g., therapy doses) also compare with physician's written request.

(3) Check integrity of final source container (i.e., inspect for breakage of seals or vials, loss of liquid, and discoloration of packaging material).

(4) Check also that shipment does not exceed possession limits.

f. Wipe external surface of final source container shield and remove wipe to low background area. Check wipes with a thin-end window G-M survey meter, and take precaution against the spread of contamination as necessary.

g. Monitor the packing material and packages for contamination before discarding.

(1) If contaminated, treat as radioactive waste.

(2) If not contaminated, obliterate radiation labels before discarding in regular trash.

3. Maintain records of the results of checking each package.

ADDENDUM ITEM #14

The procedure for safely opening packages containing radioactive materials as outlined in Appendix F, Licensing Guide 10.8 will be subscribed to with the following exceptions. The procedures shall not be applicable to prepackaged in vitro kits received without evidence of shipping damage except that radiation labels will be obliterated. Evaluation of final source container wipe smears will be performed with a survey meter listed in Item #9 of license application.

APPENDIX G

GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL IN THE NUCLEAR MEDICINE DEPARTMENT

1. Wear laboratory coats or other protective clothing at all times in areas where radioactive materials are used.

2. Wear disposable gloves at all times while handling radioactive materials.

3. Monitor hands and clothing for contamination after each procedure or before leaving the area.

4. Always use syringe shields for routine preparation of patient doses and administration to patients, except in circumstances such as pediatric cases when their use would compromise the patient's well-being. In these exceptional cases, use other protective methods such as remote delivery of the dose (e.g., through use of a butterfly valve).

5. a. Do not eat, drink, smoke, or apply cosmetics in any area where radioactive material is stored or used.

   b. Do not store food, drink, or personal effects with radioactive material.

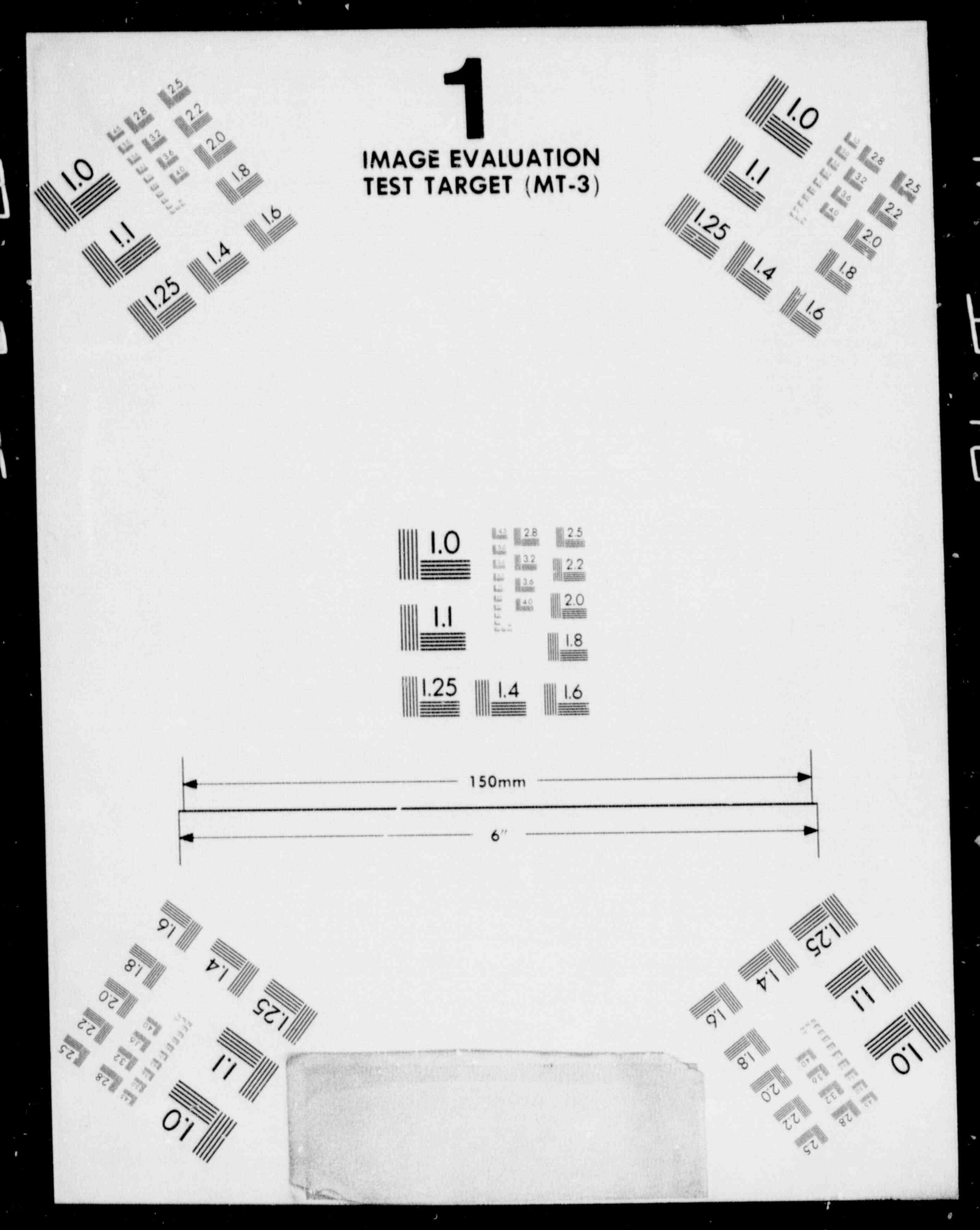
6. a. Assay each patient dose in the dose calibrator prior to administration. Do not use any doses that differ from the prescribed dose by more than 10 percent.

   b. For therapeutic doses, also check the patient's name, the radionuclide, the chemical form, and the activity vs. the order written by the physician who will perform the procedure.

7. Wear personnel monitoring devices (film badge or TLD) at all times while in areas where radioactive materials are used or stored. These devices should be worn at chest or waist level. Personnel monitoring devices when not being worn to monitor occupational exposures should be stored in a designated low background area.

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

9. Dispose of radioactive waste only in specially designated and properly shielded receptacles.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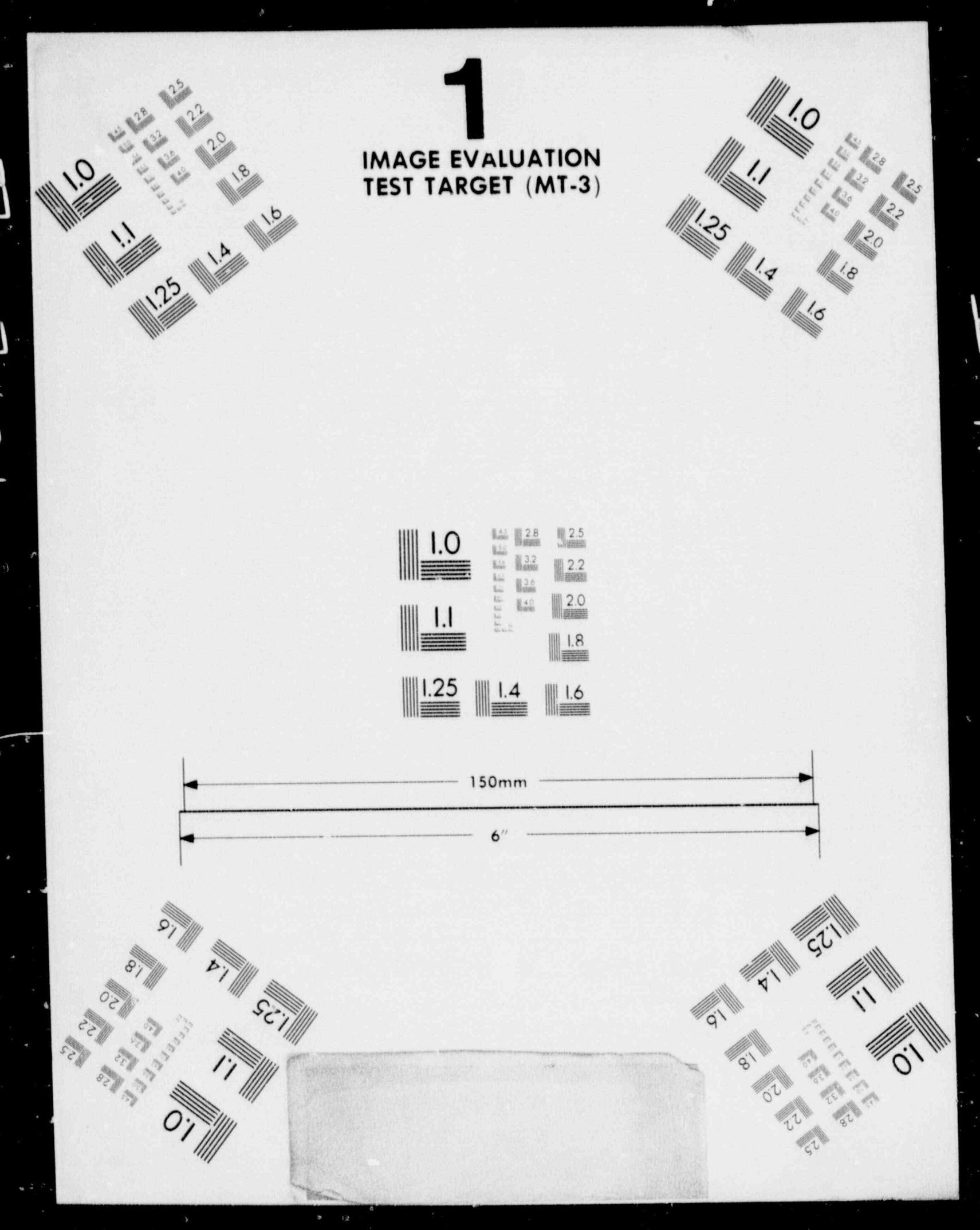
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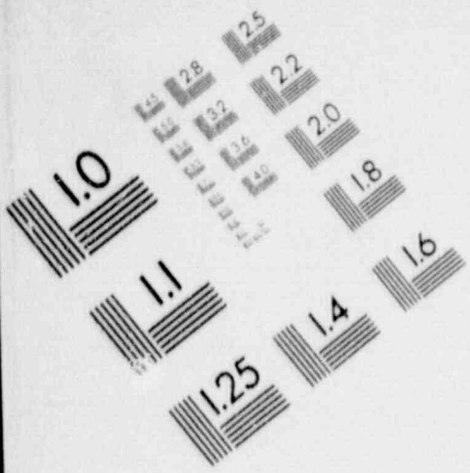

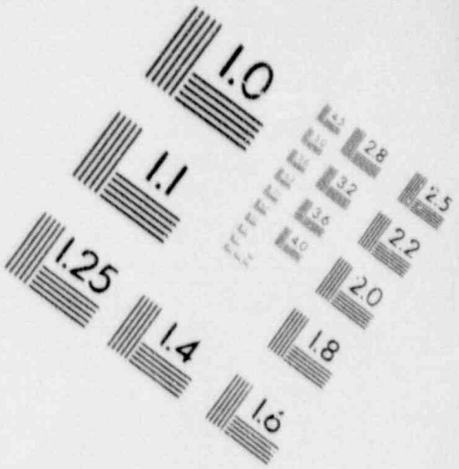

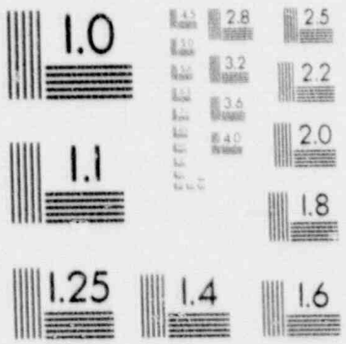

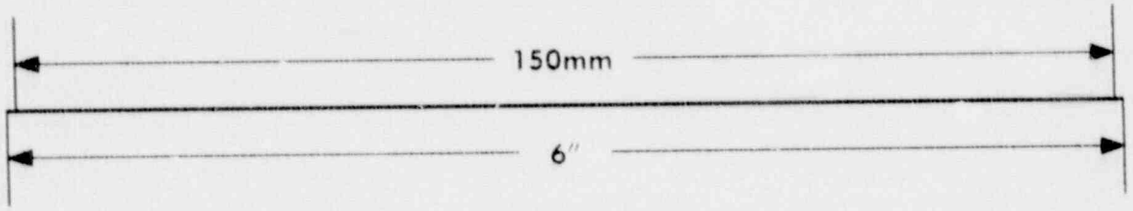

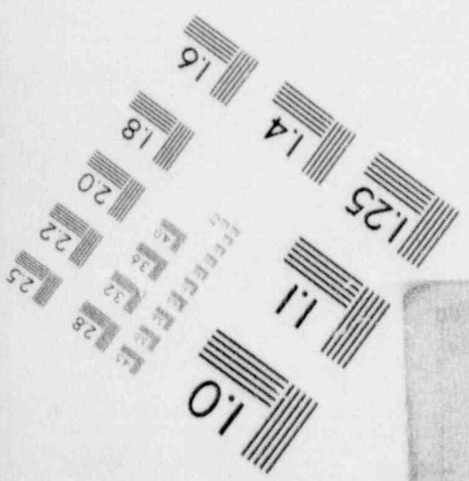

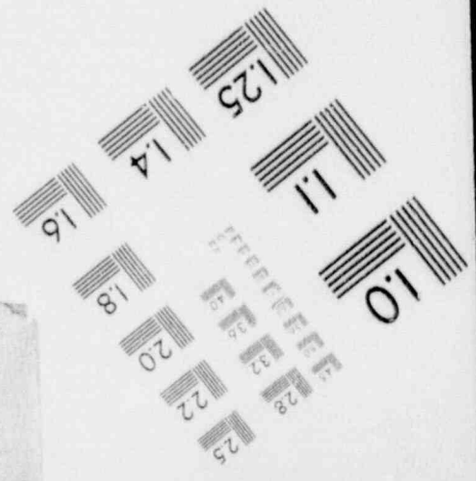

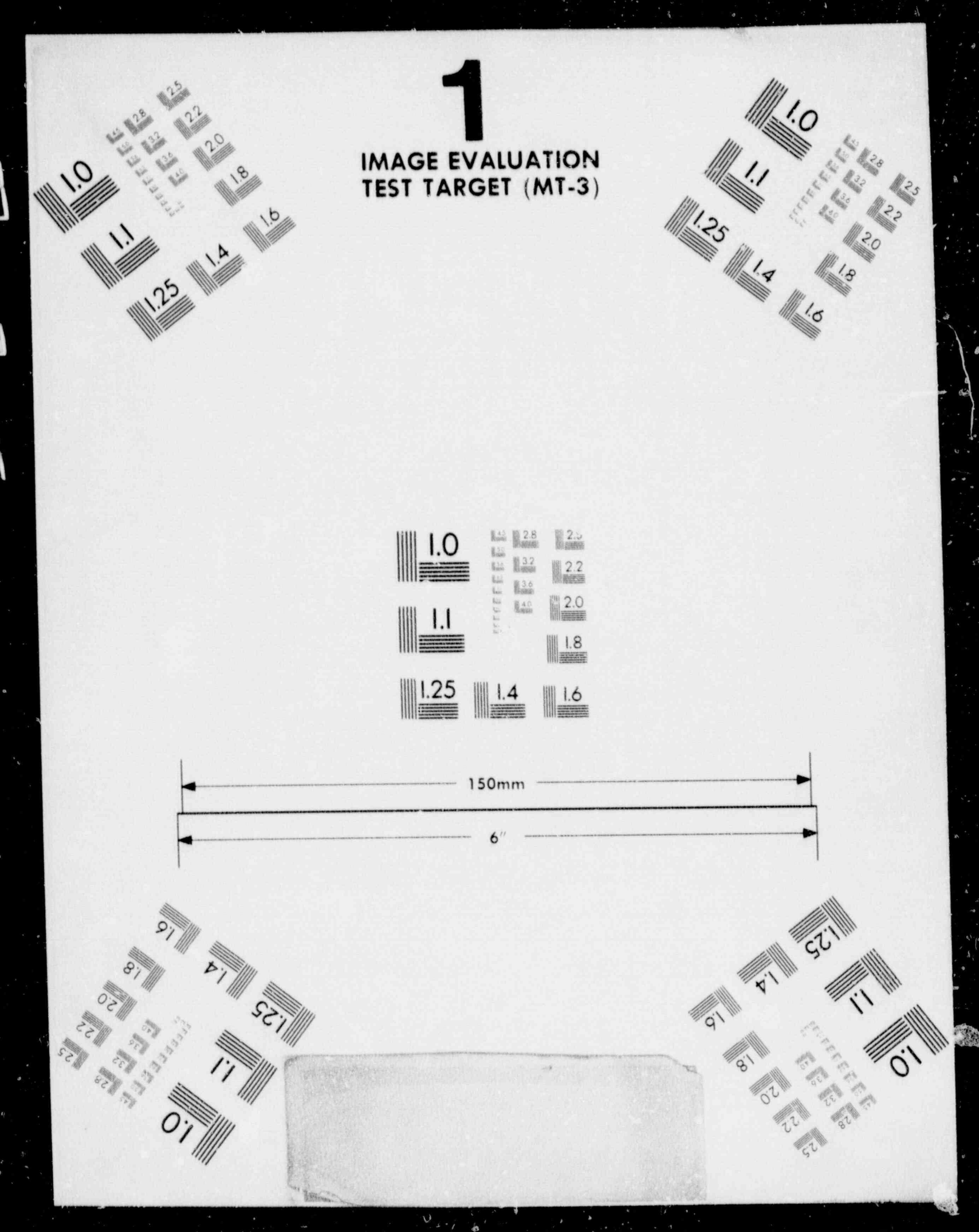
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10. Never pipette by mouth.

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

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

13. Always transport radioactive material in shielded containers.

APPENDIX H
EMERGENCY PROCEDURES

Minor Spills

1. **NOTIFY:** Notify persons in the area that a spill has occurred.

2. **PREVENT THE SPREAD:** Cover the spill with absorbent paper.

3. **CLEAN UP:** Use disposable gloves and remote handling tongs. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Also insert into the plastic bag all other contaminated materials such as disposable gloves.

4. **SURVEY:** With a low-range, thin window G-M survey meter, check the area around the spill, hands and clothing for contamination.

5. **REPORT:** Report incident to the Radiation Safety Officer.

Major Spills

1. **CLEAR THE AREA:** Notify all persons not involved in the spill to vacate room.

2. **PREVENT THE SPREAD:** Cover the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

3. **SHIELD THE SOURCE:** If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

4. **CLOSE THE ROOM:** Leave the room and lock the door(s) to prevent entry.

5. **CALL FOR HELP:** Notify the Radiation Safety Officer immediately.

6. **PERSONNEL DECONTAMINATION:** Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

RADIATION SAFETY OFFICER: Robert Zwicker, Ph.D.
OFFICE PHONE: Ext. 2004 **HOME PHONE:** Via Hospital Operator

ALTERNATIVE NAMES AND TELEPHONE NUMBERS DESIGNATED BY RADIATION SAFETY OFFICER: Radiation emergency call procedure via Hospital Operator

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SURVEY PROCEDURES

A. All routine elution, preparation and designated injection areas will be surveyed at the end of each day of use with a G-M survey meter and decontaminated, if necessary.

B. Laboratory areas where only small quantities of radioactive material are used (less than 200 uCi) will be monitored monthly, via wipe test.

C. All other laboratory areas will be surveyed weekly.

D. The weekly and monthly survey will consist of:

1. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr.

2. A series of wipe tests to measure contamination levels. The method for performing wipe tests will be sufficiently sensitive to detect 2000 dpm.

E. A permanent record will be kept of the survey results, including negative results. The records will include:

1. Location, date, and equipment used.

2. Initials of person conducting the survey.

3. Drawing of area surveyed, identifying relevant features.

4. Measured exposure rates, keyed to location on drawing (point out rates that require corrective action).

5. Detected contamination levels, keyed to locations on drawing.

6. Corrective action taken in the case of contamination or excessive exposure rates, reduced contamination levels or exposure rates after corrective action, and any appropriate comments.

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APPENDIX J

WASTE DISPOSAL

1. Liquid waste will be disposed of:

_X_ A. In the sanitary sewer system in accordance with 20.303 of 10 CFR, Part 20.

_X_ B. Held for decay until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated, and the generators will be disposed of as normal trash.

_X_ C. Other (specify): Return to radiopharmacy.

2. Mo-99/Tc-99m generators will be:

_X_ A. Returned to manufacturer for disposal.

_X_ B. Held for decay until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated, and the generators will be disposed of as normal trash.

___ C. Disposed of by commercial waste disposal service.

___ D. Other (specify): Return to radiopharmacy.

3. Other solid waste will be:

_X_ A. Held for decay until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated, and the waste will be disposed of in normal trash.

___ B. Disposed of by commercial waste disposal service.

_X_ C. Other (specify): Return to radiopharmacy.

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APPENDIX K

RADIATION SAFETY PROCEDURES FOR
THERAPEUTIC USE OF RADIOPHARMACEUTICALS

1. All patients treated with I-131 or Au-198 will be placed in a private room that has a toilet. The large surfaces in the room and toilet areas that are more likely to be contaminated will be covered with absorbent pads or protective material as appropriate to the amounts of contamination to be expected. Attention should be given to objects likely to be touched by the patient, e.g., telephones, doorknobs, and other items that would be difficult to decontaminate. Plastic bags or wrappings that are waterproof and easily disposable should be used on the smaller items.

2. The patient's room will be properly posted or attended in accordance with paragraphs 20.203 or 20.204 of 10 CFR Part.20.

3. Surveys of the patient's room and surrounding areas will be conducted as soon as practicable after administration of the treatment dose. Exposure rates will be measured at the patient's bedside and 3 feet (or 1 m) from the patient after administration and at the entrance to the room. The Radiation Safety Officer or his designee will then determine how long a person may remain at these positions and will post these times on the patient's chart and on his door. The results of daily surveys will be used to recalculate permitted times, which will be posted on the patient's chart and on his door.

4. The form, Nursing Instructions for Patients Treated with Phosphorus-32, Gold-198, or Iodine-131 (or a similar form containing all the requested information), will be completed immediately after administration of the treatment dose. A copy will be posted on the patient's chart.

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

6. All linens will be surveyed for contamination before being removed from the patient's room and, if necessary, will be held for decay.

7. Disposable plates, cups, eating utensils, tissue, surgical dressings, and other similar waste items will be placed in a specially designated container. The material will be collected daily by the Radiation Safety Officer or his designee, checked for contamination, and disposed of as normal or radioactive waste, as appropriate.

8. Nondisposable items used for these patients will be held in plastic bags in the patient's room and will be checked for contamination by the Radiation Safety Officer or his designee. Items may be returned for normal use, held for decay, or decontaminated, as appropriate.

9. If urine and vomitus from I-131 therapy patients are collected, they will be stored for decay in the radioactive waste storage area. Such stored wastes will be retained until they have reached background levels, as measured with a low-level survey meter. They will then be released to the sanitary sewer system.

10. Before a therapy patient's room is reassigned to another patient, the room will be surveyed for contamination and decontaminated if necessary, and all radioactive waste and waste containers will be removed.

11. Nursing Instructions:

    a. Nurses should spend only that amount of time near the patient required for ordinary nursing care. Special restrictions may be noted on the precaution sheet on the patient's chart. Nurses should read these restrictions before administering to the patients. Call the Nuclear Medicine Department or the Radiation Safety Officer with any questions about the care of these patients. Nursing personnel who attend the patient will wear personnel monitoring devices as advised by the Radiation Safety Office.

    b. 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.

    c. Patients must remain in bed while visitors are in the room and visitors should remain at least 3 feet (or 1 m) from the patient.

d. Patients containing radioactive materials are to be confined to their rooms except for special medical or nursing purposes approved by the Nuclear Medicine Department.

e. No nurse, visitor, or attendant who is pregnant should be permitted in the room of a patient who has received a therapeutic amount of radioactivity until the patient no longer presents a radiation hazard. Female visitors should be asked whether they are pregnant.

f. Attending personnel should wear rubber or disposable plastic gloves when handling urinals, bedpans, emesis basins, or other containers having any material obtained from the body of the patient. Wash gloves before removing and then wash hands. The gloves should be left in the patient's room in the designated waste container. These gloves need not be sterile or surgical in type.

g. Disposable items should be used in the care of these patients, whenever possible. These items should be placed in the designated waste container. Contact the Radiation Safety Officer or his designee for proper disposal of the contents of the designated waste container.

h. All clothes and bed linens used by the patient should be placed in the laundry bag provided and should be left in the patient's room to be checked by the Radiation Safety Officer or his designee.

i. All nondisposable items should be placed in a plastic bag and should be left in the patient's room to be checked by the Radiation Safety Officer or his designee.

j. Surgical dressings should be changed only as directed by the physician. Au-198 leaking from a puncture wound may stain the dressings dark red or purple. Such dressings should not be discarded but should be collected in plastic bags and turned over to the Radiation Safety Officer or his designee. Handle these dressings only with tongs or tweezers. Wear disposable gloves.

k. For I-131 patients:

(1) To the degree possible with cooperative patients, urine will be collected in special containers provided by the Radiation Safety Officer or his designee. The patient should be encouraged to collect his own urine in the container. If the patient is bedridden, a separate urinal or bed pan should be provided. The urinal or bed pan should be flushed several times with hot soapy water after use.

(2) If the nurse helps to collect the excreta, disposable gloves should be worn. Afterward, hands should be washed with the gloves on and again after the gloves are removed. The gloves should be placed in the designated waste container for disposal by the Radiation Safety Officer or his designee.

(3) Disposable plates, cups, and eating utensils will be used by patients who are treated with I-131.

(4) Vomiting within 24 hours after oral administration, urinary incontinence, or excessive sweating within the first 48 hours may result in contamination where the patient's room may be contaminated or if radioactive urine and/or feces is spilled during collection, call the Radiation Safety Officer or his designee, Ext.2004. Meanwhile, handle all contaminated material with disposable gloves and avoid spreading contamination.

(5) Keep all contaminated wastes and vomitus in plastic bags in the patient's room for disposal by the Radiation Safety Officer or his designee. Feces need not be routinely saved unless ordered on the chart. The same toilet should be used by the patient at all times and it should be well flushed (3 times). The Radiation Safety Officer will establish procedures for disposal of wastes (see Item 12 below).

l. If a nurse, attendant, or anyone else knows or suspects that his or her skin or clothing, including shoes, is contaminated, notify the Radiation Safety Officer or his designee immediately. This person should remain in an area adjacent to the patient's room and should not walk about the hospital. If the hands become contaminated, wash them immediately with soap and water.

m. If a therapy patient should need emergency surgery or should die, notify the Radiation Safety Officer or the Nuclear Medicine Department immediately.

n. When the patient is discharged, call the Radiation Safety Officer or his designee or the Nuclear Medicine Department and request that the room be surveyed for contamination before remaking the room.

12. Waste Disposal

When contaminated wastes are transported to the Waste Storage/Disposal area, precautions will be taken to minimize external irradiation of personnel. Stored wastes will be shielded to maintain exposure to personnel in restricted and unrestricted areas ALARA.

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH
PHOSPHORUS-32, GOLD-198, OR IODINE-131

Patient's Name: _____

Room No: _____ Physician's Name: _____

Radioisotope Administered: _____

Date and Time of Administration: _____

Dose Received: _____ Method of Administration: _____

Exposure Rates in mR/hr

Date	3 feet from bed	10 feet from bed

(Comply with all checked items)

_____1. Visiting time permitted. _____
_____2. Visitors must remain _____ from patient.
_____3. Patient may not leave room.
_____4. Visitors under 18 are not permitted.
_____5. Pregnant visitors are not permitted.
_____6. Film or TLD badges must be worn.
_____7. Pocket chambers will be worn for supplementary personnel monitoring of individual tasks.
_____8. Tag the following objects and fill out the tag:

_____door _____bed _____chart _____wrist

_____9. Disposable gloves must be worn while attending patient.
_____10. Patient must use disposable utensils.
_____11. All items must remain in room until approved for removal by the Radiation Safety Officer or his designee.
_____12. Smoking is not permitted.
_____13. Room is not to be released to Admitting Office until approved by the Radiation Safety Officer or his designee.
_____14. Other instructions.

In case of an emergency contact:

RSO _____
Name On-duty/Off-duty Telephone numbers

ADDENDUM ITEM #19

The procedures and precautions for radiopharmaceutical therapy as described in Appendix K of Regulatory Guide 10.8 will be implemented for compliance with 35.75, with the following exceptions:

For I-131 Therapy

1. The urine will not normally be collected when patients are treated with I-131.

2. Appendix K procedures may be terminated when patient activity becomes less than 30 mCi or the exposure rate at one meter becomes less than 5 mrem/hr.

3. Liquid sources will be opened in a vented hood if available. Gloves, tongs, and lead shielding will be utilized by personnel handling I-131 sources.

4. Bioassays of personnel will not necessarily be performed if capsules or remote displacement devices are used.

STORAGE

1. Brachytherapy sources will be stored in the Hot Room of the Oncology Center. Radiation Safety and handling instructions supplied by the manufacturer will be followed. These instructions will be maintained for the duration of source use.

2. Cesium sources will be kept in the storage safe provided for that purpose.

3. Iridium-192 and Iodine-125 will be stored in their respective shielded shipping containers or other containers with equivalent or greater shielding.

HANDLING

1. A list of names of individuals permitted to handle brachytherapy sources will be maintained by the RSO and kept in the brachytherapy source data book.

2. All personnel handling brachytherapy sources will wear a body dosimeter and a finger dosimeter.

3. The principles of time, distance and shielding should be conscientiously applied to minimize personnel exposure.

4. Brachytherapy sources are not to be handled with the hands, but rather with the long handled tools provided in the Hot Room.

5. Whenever possible, the sources should be handled behind the L-block provided in the Hot Room.

6. A survey meter should be immediately available for monitoring the radiation levels during handling of the sources. After the sources are returned to a shielded container, the area should be monitored with a survey meter to verify that no sources remain unshielded.

RECEIPT OF BRACHYTHERAPY SOURCE SHIPMENTS

1. The procedure for receiving a shipment of brachytherapy sources should be implemented the same day as the arrival of the sources.

2. A visual inspection of the package should be made to check for possible damage to the container with subsequent loss of integrity of the shielding or actual loss of sources from the container. If the package does appear to be damaged, exercise caution in further handling of the package. Consideration should be given to the possible need for notification of the carrier and the Nuclear Regulatory Commission.

RECEIPT OF BRACHYTHERAPY SOURCE SHIPMENTS (CONTINUED):

3. Using an ion chamber type survey meter, measure the exposure rate at the surface of the package and at 3 feet from the surface of the package.

   a. If the exposure rate at 3 feet from the surface of the package is much greater than the transport index indicated on the exterior of the package, exercise caution in further handling of the package.

   b. If the exposure rate at 3 feet is greater than 10 mr per hour or if the exposure at the surface is greater than 200 mr per hour, the radiation levels exceed maximum regulatory limits, and the carrier and the Nuclear Regulatory Commission should be notified. Exercise caution in the handling of the package.

   c. Enter the results of the measurements on a previously unused "Receipt, Use and Disposal of Brachytherapy Sources" form.

4. Open package, remove packing slip, and verify that the contents agree in name and quantity with the packing slip, and that the shipment does not exceed possession limits.

5. Wipe external surface of final source container and remove wipe to low background area. Check wipes with a GM survey meter and take precautions against the spread of contamination as necessary.

6. Enter the name and quantity of the sources and survey results on the "Receipt, Use and Disposal of Brachytherapy Sources" form.

7. Survey the packing material and packages with a low-level survey meter and take precautions as necessary.

8. Attach a lot number tag to the shielded container in which the sources will be kept, with the lot number corresponding to that indicated on the receipt form.

9. If the sources are intended to be eventually returned to the supplier for disposal, the shipping container should be saved for that purpose.

DISPOSAL

1. Sources may be disposed of by shipment to the supplier or transferred to a licensed radioactive waste disposal firm.

   a. Prior to shipping the material, permission must be received from the company to receive the shipment.

   b. The shipment must be made in accordance with appropriate DOT regulations, and must be inspected and approved by Medical Physics.

DISPOSAL (CONTINUED):

2. Sources with physical half-life less than 65 days may be stored for decay in an appropriately shielded container in the Hot Room or in the designated radioactive waste storage area in the Boiler Room. The sources must be stored for a minimum of 10 half-lives before disposal. Prior to disposal with the normal trash, the sources must be surveyed with the GM type survey meter to verify that the count rate is less than background, and the radioactive labels on the container must be defaced.

3. The appropriate information relating to the disposal must be entered on the "Receipt, Use and Disposal of Brachytherapy Sources" form.

LEAK TEST

Cesium-137 brachytherapy sources are to be leak tested at no greater than 6 month intervals. The Cesium-137 leak test procedure in the Medical Physics Procedure Manual should be followed. The leak test results should be documented on the appropriate form and signed by the Radiation Safety Officer.

SURVEY

A formal survey of the Hot Room and surrounding area will be performed quarterly with an ion chamber-type survey meter. The results of the survey will be recorded on the "Hot Room Survey" form, to include date of survey, a plan of the area surveyed, measured dose rates at the specified points in the area expressed in millirem per hour, and the survey instrument used. These results will be reviewed and signed by the Radiation Safety Officer.

Between quarterly surveys, informal surveys will be performed, but not recorded, each time sources are exposed or handled (See Handling, Item 5, above).

PREPARATION AND TRANSPORT OF SOURCES

1. When the brachytherapy sources are removed from storage, they must be logged out according to the brachytherapy source accountability procedure. At the same time a radioactive material inventory tag will be prepared to accompany the sources until they are returned to their normal storage location.

2. Sources will be transported in the portable shielded brachytherapy transport container, or their shipping container, or another container offering equivalent shielding.

3. Whenever possible, afterloading techniques will be used and the sources will not be inserted until the patient is in his room. When it is necessary to implant the sources in the Oncology Center or Surgery, special precautions must be taken to minimize the exposure to persons in the corridors and elevator during transport of the patient back to his room.

   a. Place a radiation warning sign on each end of the patient's gurney.
   b. Maintain as much distance as practicable between the patient and other personnel. In using the elevators, inform anyone waiting to use the elevator that you are transporting a radioactive implant patient and instruct them to wait for the next elevator.
   c. Inform the nursing floor to which the patient is being transported of the radiation hazard.

4. Immediately after the sources are implanted a radiation survey of the patient and area of use will be carried out to confirm that no sources have been misplaced. The results will be recorded on the Radiation Survey Form for radioactive implants.

SURVEYS AND PRECAUTIONS ON THE NURSING FLOOR

1. A radiation precautions ID bracelet will be placed on the patient's arm when the sources are inserted.

2. The patient should be in Room 605 or 618, which are private rooms located at each end of the ward adjacent to the stairwells. The patient's room should be arranged (preferrably before the sources are inserted) so that the implant is near the stairwell wall and as far as possible from the adjacent patient's room. The bedside radiation shield should be positioned beside the patient's bed so that protection is afforded to nurses while caring for the patient, as well as to persons in the adjacent patient's room. Visitors chairs should be placed at least 6 feet from the patient and preferably so that they are shielded by the bedside radiation shield.

3. When the sources have been inserted and the patient is in his room, the radioactive material inventory tag will be placed on the door handle inside the patient's room.

SURVEYS AND PRECAUTIONS ON THE NURSING FLOOR (CONTINUED)

4. A radiation survey of the room and surrounding area will be performed using an ion chamber type survey meter and recorded on a radiation survey form for radioactive implants. The radiation levels in non-controlled areas (outside the patient's room) must be less than 2 mR per hour. If the radiation levels exceed this limit, the room must be rearranged so that this restriction is complied with.

5. Using the results of the survey and the formulas provided in the calculations section of this procedure, the visitation restrictions and the nursing time restrictions will be calculated.

6. The visitation restrictions and nursing time restrictions will be entered on the radioactive implant restrictions sign which is then fastened to the outside of the patient's door.

7. The radiation warning form will be completed and placed inside the front of the patient's chart.

8. The temporary implant warning sticker will be completed and placed on the outside of the patient's chart.

TERMINATION OF IMPLANT

1. The sources may be removed from the implant applicator by a radiation oncologist, radiation therapy technologist, or radiation physicist. A gynecological applicator or interstitial implant will be removed by a physician. When the sources are removed, they will be visually inspected to ensure that no sources have been lost. The quantity of sources transferred from the implant to the transport container may be compared with that indicated on the radioactive material inventory tag, which is then transferred from the patient's door to the transport container.

2. The patient and surrounding area will be surveyed with a GM type survey meter to ensure that no sources remain. The results of the survey will be entered on the radiation survey form for radioactive implants, which was initiated at the beginning of the treatment. This form is then returned to the Oncology Center and placed in the permanent record.

3. After the sources have been removed and the survey has been performed, the termination of radiation precautions form in the patient's chart can be completed.

4. The radiation precaution bracelet, the radiation warning sign on the door, and the radiation warning sticker on the outside of the patient's chart will then be removed. This may be done by one of the nursing staff.

5. The transport container containing the sources will be transported immediately to the Oncology Hot Room. It must not be left unattended outside the Hot Room.

TERMINATION OF IMPLANT (CONTINUED)

If it is left in the Hot Room for another person to transfer the sources back to their normal storage location, the radioactive material inventory tag must remain on the transport container as an indication of the presence of the sources in the transport container.

6. The sources will be returned to their normal storage location as soon as practicable after return of the sources to the Hot Room. If the sources are returned to the Hot Room by a physician at night or on a weekend, the sources will be transferred to their normal storage location on the next normal work day.

7. When the sources are transferred from the transport container to their normal storage location, they will be logged in according to the brachytherapy source accountability procedure.

CALCULATIONS

1. Visitation time restrictions will be calculated to limit exposure to visitors less than 10 mR per day.

$$\text{Daily time limits (in minutes/day)} = \frac{600}{\text{(mR/hr @ 6 ft.)}}$$

2. Nursing time restrictions will be calculated to limit exposure of each nurse to less than 15 mR/day with two implant patients on the nursing floor (i.e. 7.5 mR per patient/day).

$$\text{Daily time limit (in minutes/day)} = \frac{450}{\text{(mR/hr @ X ft.)}}$$

3. Cesium activity, for record keeping purposes, may be calculated from the number of mg-Ra-equivalent.

$$\text{Activity (mCi)} = (2.5)\ (\text{mg-Ra-equivalent})$$

_____ HOSPITAL

PATIENT'S NAME _____ UNIT NUMBER _____

CAUTION

PATIENT CONTAINS RADIOACTIVE MATERIAL

DO NOT REMOVE THIS LABEL UNTIL

1) Radioactive material is removed from patient, or
2) Removal is authorized by Radiation Protection Supervisor (Ext _____).

VISITORS MUST CHECK WITH NURSING STATION BEFORE GOING TO PATIENT.

Date _____ Signature _____
RADIATION PROTECTION SUPERVISOR

09-484 Nuclear Associates Carle Place, N.Y. Printed in U.S.A.

VISITATION RESTRICTIONS

_____ MINUTES PER DAY PER VISITOR

VISITORS SHOULD NOT REMAIN CLOSER THAN 6 FEET FROM PATIENT.

NO PREGNANT VISITORS.

NO VISITORS UNDER AGE 18

NURSING RESTRICTIONS

_____ MINUTES PER DAY AT 3 FT FROM IMPLANT

OR _____ MINUTES PER DAY AT 6 FT FROM IMPLANT.

PREGNANT EMPLOYEES SHOULD NOT ATTEND PATIENT.

_____ HOSPITAL

PATIENT'S NAME _____ UNIT NUMBER _____

CAUTION

RADIOACTIVE MATERIAL

TEMPORARY IMPLANT

Radionuclide _____ mCi _____

Inserted _____
(DATE)

Initial Exposure Rate at 1 Meter _____ mR/h

(SIGNATURE) _____

To Be Removed _____
(DATE)

INSTRUCTIONS:

Patient must remain in hospital until implant is removed. When implant is removed, "Radioactivity Precautions Tags" may also be removed.

For further information call Radiation Protection Office (Ext _____).

In case of emergency, the telephone operator has a call list for use when the Radiation Protection Office is not open.

Date _____ Signature _____
RADIATION PROTECTION SUPERVISOR

09-486 Nuclear Associates Inc., Carle Place, N.Y. Printed in U.S.A.

Item #20

CAUTION
RADIOACTIVE
MATERIALS

CAUTION
RADIATION AREA

THIS PATIENT IS NOW RECEIVING TREATMENT BY A TEMPORARY RADIOACTIVE IMPLANT OF _____ mCi OF _____ IN THE _____.

DATE AND TIME OF ADMINISTRATION _____.

EXPOSURE RATES IN MR/HR

3 FT FROM IMPLANT: _____ 6 FT FROM IMPLANT _____

VISITATION TIME LIMITS: _____ MINUTES PER DAY AT 6 FT FROM IMPLANT.

NURSING TIME LIMITS:

3 FT FROM IMPLANT: _____ MINUTES PER DAY, OR
6 FT FROM IMPLANT: _____ MINUTES PER DAY.

REFER TO APPROPRIATE NURSING PROCEDURE FOR FURTHER RADIATION SAFETY PRECAUTIONS. THIS NOTICE IS IN EFFECT UNTIL TERMINATION OF RADIATION PRECAUTIONS IS INDICATED BELOW.

TERMINATION OF RADIATION PRECAUTIONS

THE RADIOACTIVE IMPLANT WAS REMOVED FROM THE PATIENT AT _____ A.M./P.M. ON _____.

FURTHER RADIATION SAFETY PRECAUTIONS ARE NOT REQUIRED.

BY: _____

RADIATION SURVEY FORM

PATIENT NAME: _____

IMPLANT AREA SURVEY: Survey Meter _____

A radiation survey of the patient and implant area was performed on _____ (date)

at: _____ (time) which confirmed that no sources have been misplaced.

Implant Area _____ Signature _____

ROOM SURVEY: Survey Meter _____

Room Diagram

Indicate location of measurements on diagram.

Exposure Rates (mR/hr)

(1) 3 ft from implant beside bed: at 1.0 m:

(2) 6 ft from implant beside bed:

(3) Foot of bed: (4) Door to room:

(5) Adjacent room: (6) Stairwell:

(7) Bathroom: (8) Lounge:

(9) Other:

_____ _____

Certified by Date & Time

FINAL SURVEY: Survey Meter _____

A radiation survey of the patient and room was performed on _____ (date)

at _____ (time) which confirmed that all sources had been removed. Dose rate at 1.0m: _____ mrem/hr

Patient Stamp

_____

Certified by

RECEIPT OF SHIPMENTS

1. When a brachytherapy source shipment is received, it will be recorded on the receipt section of a "Receipt, Use and Disposal of Brachytherapy Sources" form.

2. The source container will be tagged with a lot number corresponding to that on the form.

3. Any radiation safety and handling instructions supplied by the manufacturer will be maintained for the duration of source use.

USE OF SOURCES

1. When Cesium sources are removed from the storage safe the number and activity of sources removed, the patient's name and room number, the time and date of removal, the number and activity of sources remaining in storage after removal, and the initials of the individual removing the sources will be recorded on the "Cesium Brachytherapy Usage" form. If sources are being removed for some other reason, the use and location of the sources should be indicated in place of the patient's name and room number.

2. For sources other than Cesium (e.g. Iridium-192 or Iodine-125) removal from or return to the Hot Room or storage container will be logged on the appropriate section of the "Receipt, Use and Disposal of Brachytherapy Sources" form. This will contain the same information described above for the "Cesium Brachytherapy Usage" form in addition to receipt and disposal entries.

3. When sources for a temporary implant (e.g. Cesium or Iridium) are removed from their normal storage location and placed into a portable transport container, or implanted into a patient, a radioactive materials tag will accompany the sources until they are returned to their normal storage location. The nuclide, number of sources and their activities should be indicated on the tag. During an implant, the tag will be hung from the inside handle of the door to the patient's room. This is an inventory tag and enables anyone handling the sources at any time to verify that no sources have been lost.

4. When an implant is terminated by removal of the sources from the patient, a visual inspection of the sources and/or applicators will be made at that time to verify that no sources have been lost. The room and patient will be monitored with a GM type survey meter to verify that no sources remain. The radioactive material inventory tag will be transferred from the patient's door to the transport container, which will then be returned to the Hot Room of the Oncology Center. If the personnel responsible for returning the sources to permanent storage are not immediately available, the presence of the inventory tag on the transport container acts as an indicator to them of the presence of the sources and the need to transfer them to permanent storage. The sources will be returned to permanent storage as soon as practicable and logged on the appropriate form. The number and activity of sources returned to storage, the patient's name and room number, the time and date they were returned to storage, the number and activity of sources in storage after the return and the initials of the individual who returned the sources to storage will be recorded at this time. While the sources are in the transport container, they should

USE OF SOURCES - CONTINUED...

not be left unattended outside the Hot Room at any time.

5. After use of I-125 sources for a permanent implant, the number of sources remaining in that container should be inventoried. The container should then be sealed with a self-adhesive non-removable sticker containing the date, number of sources, and the initials of the individual sealing the sources.

INVENTORY OF BRACHYTHERAPY SOURCES

1. All brachytherapy sources will be inventoried at least once each calendar quarter. Inventories will be signed quarterly by the Radiation Safety Officer.

2. The Cesium brachytherapy source inventory will be recorded on the form having that title. The inventory record is broken down according to the type of source and activity, and indicates the number of sources in the safe and the number of sources in use at the time of the inventory. The record will contain the model number of each source and the serial number if applicable.

3. Inventory of all brachytherapy sources other than Cesium will be recorded on the "Brachytherapy Source Inventory" form. The inventory is recorded by lot number and the quantity should be checked against those indicated on the "Receipt, Use and Disposal of Brachytherapy Sources" form. The inventory will contain source model and serial number if applicable, source type and activity, and source location.

4. For I-125 sources or other sources stored for decay, for which the source container is sealed and labeled with the number of sources in the container, it is only necessary to verify the presence of the container and the integrity of the seal, and record on the inventory form the number of sources indicated on the sealed container.

DISPOSAL OF SOURCES

When sources are disposed of, whether by transfer to another licensed facility, or by decay and disposal with normal trash, the disposal section of the "Receipt, Use and Disposal of Brachytherapy Sources" form will be completed. This form can then go into the inactive file.

ORDERING OF SOURCES

Sources will be ordered only with the approval of Medical Physics to ensure that restrictions as to types and quantities of radioactive materials are not exceeded.

CESIUM BRACHYTHERAPY USAGE

Patient name	Room No.	Date	Time	Out	In	TUBE SOURCES					MICRAD		TOTAL IN STORAGE		Initials
						NA-B1 2.75mg	3M-B1 NA-Gr 5 mg	3M-Gr NA-Y1 10 mg	3M-Y1 NA-Y/R 15 mg	3M-Or NA-Rd 20 mg	Wh-Br 37 mg	Wh 48 mg	No.	Act. (mg)	

TOTAL SOURCES - Tubes: 41 , Micrads: 2

TOTAL ACTIVITY (Nominal): 545 mg Ra equiv.

CESIUM BRACHYTHERAPY SOURCE INVENTORY

INVENTORY DATE:

TYPE SOURCE	Nominal Activity	In Safe	In Use	In Safe	In Use	In Safe	In Use	In Safe	In Use	In Safe	In Use	In Safe	In Use	In Safe	In Use
Tube (3m)	5.0														
Tube (3m)	10.0														
Tube (3m)	15.0														
Tube (3m)	20.0														
Mic rad (NA)	48.0														
Mic rad (NA)	37.0														
Tube (NA)	20.73*														
Tube (NA)	10.40*														
Tube (NA)	2.75*														
Tube (NA)	5.40*														
Sr-90 (calib)	10.0mCi														
Initial															

Mnfr.	Type	Activity mg	Model #	Ser.#
3m	Tube	5.0	6500	756
3m	Tube	5.0	6500	757
3m	Tube	10.0	6501	3901
3m	Tube	10.0	6501	3905
3m	Tube	10.0	6501	3916
3m	Tube	10.0	6501	3930
3m	Tube	10.0	6501	3955
3m	Tube	10.0	6501	3957
3m	Tube	10.0	6501	4633
3m	Tube	10.0	6501	4634
3m	Tube	15.0	6502	2466
3m	Tube	15.0	6502	2472
3m	Tube	15.0	6502	2502
3m	Tube	15.0	6502	2888
3m	Tube	15.0	6502	2895

Mnfr.	Type	Activity mg	Model #	Ser.#
3m	Tube	15.0	6502	2901
3m	Tube	20.0	6503	1742
3m	Tube	20.0	6503	1745
3m	Tube	20.0	6503	2139
3m	Tube	20.0	6503	2193
NA	Mic rad	37.5	67-61X-35	AA26
NA	Mic rad	48.3	67-61X-45	AA27
NA	Tube	5.4	67-801	x-6
NA	Tube	5.4	67-801	x-7
NA	Tube	5.3	67-801	x-9
NA	Tube	2.76	67-801m	x-1
NA	Tube	2.73	67-801m	x-0
NA	Tube	10.7	67-802	x-2
NA	Tube	10.3	67-802	x-3
NA	Tube	10.2	67-802	x-4

Mnfr.	Type	Activity mg	Model #	Ser.#
NA	Tube	10.2	6502	x-5
NA	Tube	10.2	6502	w-0
NA	Tube	10.4	6502	w-1
NA	Tube	10.3	6502	w-2
NA	Tube	10.4	6502	w-3
NA	Tube	10.7	6502	y-0
NA	Tube	10.8	6502	y-1
NA	Tube	10.8	6502	y-2
NA	Tube	10.4	6502	y-3
NA	Tube	10.3	6502	y-4
NA	Tube	10.6	6502	y-5
NA	Tube	20.57	67804	w-8
NA	Tube	20.88	67804	w-9
NE	Sr-90	10.mCi	250373	568BA

* Mean Activity

RECEIPT, USE, AND DISPOSAL OF BRACHYTHERAPY SOURCES

RECEIPT Date _____

Package Condition _____ Lot. No. _____

Radionuclide _____ Supplier _____

No./activ. of sources _____

_____

Survey (mR/hr): surface _____; 3 ft _____

Wipe Test _____

Survey Meter _____

Comments _____

Initials _____

DISPOSAL Date _____

Normal trash No. of sources _____

Half-life (d) _____. Time stored (d) _____

Survey count rate at background? _____

Labels defaced? _____.

Transfer No. of sources _____

Transferred to: _____

Initials _____

Date	Time	Patient name	Room No.	Removed from storage		Returned to storage		Sources In use		Sources In storage		Initials
				No.	Activ.	No.	Activ.	No.	Activ.	No.	Activ.	

BRACHYTHERAPY SOURCE INVENTORY

Date	Nuclide/ & type	Mnfr.	Lot No.	Model No.	S.N.	Nominal Activity	No. of Sources	Location	Init.
						RSO _____			
						RSO _____			
						RSO _____			
						RSO _____			

FLOWER HOSPITAL - LAKE PARK HOSPITAL
POLICY and PROCEDURE MANUAL

Subject: I-125 IMPLANTS
Section Number: MEDICAL PHYSICS

1. Surveying will be done with a thin window GM counter. Exposure rate measurements will be done with the Victoreen Panoramic survey meter with the chamber cap removed.

2. Implanted patients and surrounding area will be surveyed as the patient leaves the OR. All possible seed locations including floor, suction, sponges, surgical table area, drapes, Mick applicator, surgical instruments, waste containers, etc. will be surveyed.

3. When patient is transferred into his room appropriate signs and labels will be posted, and verbal notification and special precautions will be given to the nurse in charge.

4. If the patient has any NG suction into which a seed could be discharged, the suction apparatus will be surveyed daily.

5. For superficial implants from which sources could be lost, dressings and bandages will be saved and must be monitored before disposal.

6. For prostate implants, the foley catheter should be monitored after removal and prior to disposal.

7. Bed linens will be saved and surveyed each day prior to releasing to the Laundry.

8. When a patient is discharged, a survey of the room will be done prior to cleaning by Housekeeping or admission of another patient. The radioactive precaution signs and labels may be removed by the surveyor at that time.

9. Prepare a patient imformation sheet and wallet card for the Radiation Oncologist to give to the patient.

DATE ORIGINATED	DATE REVIEWED	DATE AMENDED	INITIALS
		8/87	RDZ

_____ HOSPITAL

PATIENT'S NAME _____ UNIT NUMBER _____

CAUTION

PATIENT CONTAINS RADIOACTIVE MATERIAL

DO NOT REMOVE THIS LABEL UNTIL

1) Radioactive material is removed from patient, or
2) Removal is authorized by Radiation Protection Supervisor (Ext. _____).

VISITORS MUST CHECK WITH NURSING STATION BEFORE GOING TO PATIENT.

Date _____ Signature _____

RADIATION PROTECTION SUPERVISOR

09-484 Nuclear Associates Carle Place, N.Y. Printed in U.S.A.

_____ HOSPITAL

PATIENT'S NAME _____ UNIT NUMBER _____

CAUTION

RADIOACTIVE MATERIAL

PERMANENT IMPLANT OR INTERNAL DOSE

Radionuclide _____ mCi _____

Administered _____
(DATE)

Initial Exposure Rate at 1 Meter _____ mR/h

(SIGNATURE) _____

INSTRUCTIONS:

Patient must remain in hospital until _____
(DATE)

"Radioactivity Precautions" tag may be removed _____
(DATE)

The Radiation Protection Office (Ext. _____) must be notified before discharge or removal of patient.

For further information call Radiation Protection Office. In case of an emergency, the telephone operator has a call list for use when the Radiation Protection Office is not open.

Date _____ Signature _____

RADIATION PROTECTION SUPERVISOR

09-488 Printed in U.S.A.

"I-125 IMPLANT FORM" Item #20

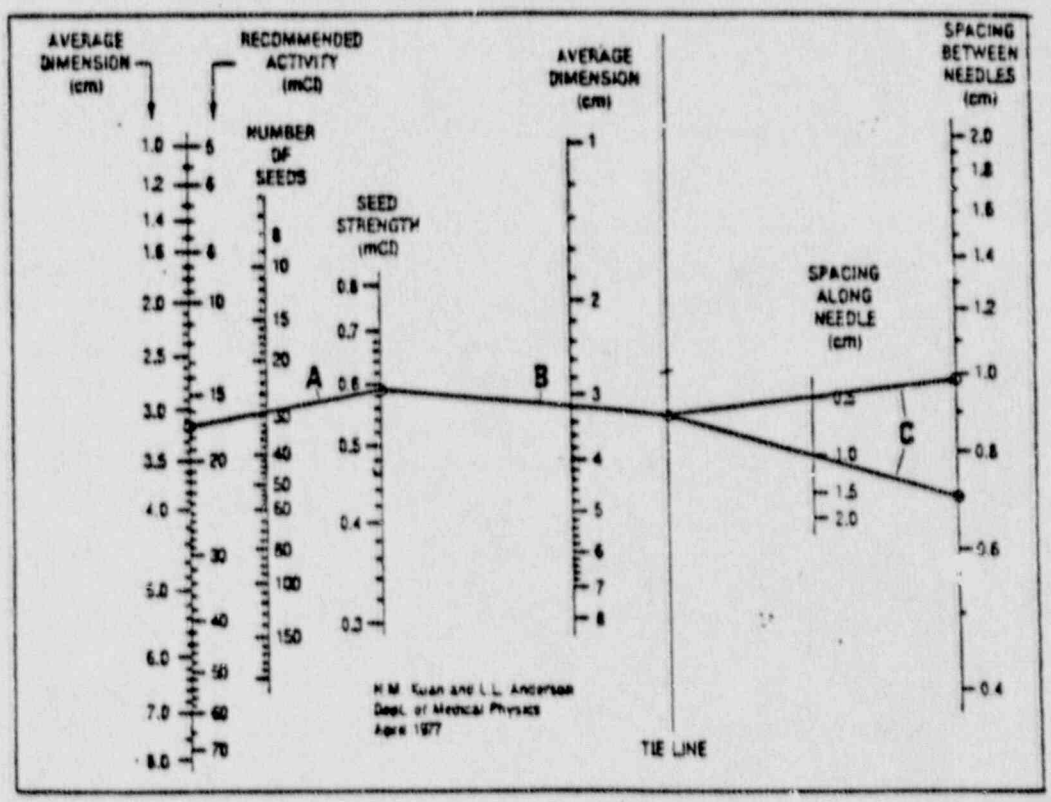
PATIENT'S NAME _____ DATE _____

Tumor Dimensions _____ x _____ x _____ cm Average Dimension _____ cm

Seed strength _____ mCi Recommended no. of seeds _____

Spacing along needle _____ cm Spacing between needles _____ cm

Number of seeds used _____



EXPOSURE RATES AFTER IMPLANT (mR/hr)

	Anteriorly	Laterally
at surface:		
at 1 meter:		

FLOWER MEMORIAL HOSPITAL
SYLVANIA, OHIO 43560
419/885-1444

RADIATION SAFETY CHECK LIST
FOR DISCHARGED PATIENTS CONTAINING RADIONUCLIDES

PATIENT'S NAME: _____ AGE: _____

ADDRESS: _____

NAME OF PERSON INTERVIEWED: _____

DESCRIPTION OF DWELLING (proximity of neighbors): _____

_____

HOUSEHOLD MEMBERS (names, relationship, ages): _____

_____

_____

REGULAR VISITORS TO DWELLING: _____

_____

PERSONS REGULARLY VISITED BY THE PATIENT OUTSIDE DWELLING: _____

_____

MATTERS DISCUSSED:

_____ HANDLING OF EXTRUDED SOURCE
_____ SEPARATE BEDS
_____ DISTANCE AND TIME
_____ SPECIAL PRECAUTIONS IN REGARD TO YOUNG PERSONS
_____ PROCEDURE IN CASE OF HOSPITALIZATION OR DEATH
_____ OTHER: _____

FILM BADGES ISSUED: _____ DATE: _____

IDENTIFICATION CARD ISSUED: _____ DATE: _____

_____ _____

Date Physician or RSO

FLOWER MEMORIAL HOSPITAL
SYLVANIA, OHIO
(419) 885-1444

INSTRUCTIONS FOR RADIOIODINE -125 PATIENTS AND FAMILY MEMBERS

_____ has received a sealed source implant containing _____ mCi of Iodine-125 on _____. The measured radiation exposure rate on that date at 1.0 meter from the implant was _____ mR/hr.

NO SPECIAL RADIATION SAFETY PRECAUTIONS ARE NECESSARY AFTER _____.

UNTIL THAT DATE, persons under 45 years of age should not remain closer than the following distance from the patient:

Permissible distance _____ feet, for _____ hours per week (at other times, remain farther than 6 feet).

Note: During the above times brief periods of closer contact (e.g., for shaking hands, kissing, etc.) are permissible. Touching the patient will not contaminate anyone.

SPECIAL PRECAUTIONS:

(a) To prevent the loss of Iodine seeds in the home, inspect the bandages, dressings or linens that come into direct contact with the implant site for the possible presence of small metallic seeds (about 1/4 inch long, and about as thick as a straight pin). If seed(s) are found, pick them up with a long-handled utensil, place them in the container given to you for this purpose, and place the container in some inaccessible place in your home. At your next appointment return the container and seed(s) to the undersigned physician for proper disposal.

(b) Children and pregnant women are particularly susceptible to the harmful effects of radiation. Their visits should be brief and a distance of at least 9 feet from the patient should be maintained.

(c) Sleeping arrangements:

(d) Other precautions:

FOR FURTHER INFORMATION CONCERNING RADIATION SAFETY PRECAUTIONS, CONTACT THE RADIATION SAFETY OFFICE, FLOWER MEMORIAL HOSPITAL, (419) 885-1444 ext. 2038

PLEASE SHOW THIS FORM TO EVERY PHYSICIAN CONSULTED CONCERNING THE PATIENT UNTIL _____.

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

_____, _____

(TEL. 419/885-1444 ext. 2038)

_____
Physician

_____ _____
Patient Date of Interview

PROCEDURE: Nursing care of the patient receiving temporary intracavitary gynecological radio nuclide implants.

RATIONALE: Nurses who care for patients receiving temporary intracavitary gynecological radionuclide implants must use knowledge and skill:

1. To maintain proper positioning for patients during radiation therapy.
2. To prevent dislodgement or dislocation of implant.
3. To protect persons from unnecessary radiation exposure.

EQUIPMENT:

Private Room
Radiation Signs *
Bags for Linen and Waste
Chux
Peri Pads
Shielded Transport Container *
Long Handled Forceps *
Radiation Monitoring Badge
Rolling Radiation Shield (if available)
*To be provided by radiation safety.

NURSING CONSIDERATIONS:

1. Patient is to be in room 618 or 605 designated for single occupancy or other room on 6th floor designated by Radiation Safety Office.
2. Shielded transport container and long handled forceps to be placed in room by radiation safety and remain in room during therapy.
3. Nurses providing care are to wear radiation monitoring badge at collar level.
4. Pregnant nurses are not to be assigned to care for these patients.
5. Radiation oncology is to be notified when patient returns to room after applicator insertion. The radio nuclide will normally be inserted into the applicator after the surgery when the patient is in her room. If a "Caution Radioactive Materials" sign accompanies the patient, appropriate radiation precautions are to be taken. This indicates the radionuclide sources were inserted in surgery.
6. While radioactive source is in place nurses should spend only the minimum amount of time necessary for routine nursing care using rolling radiation shield if available. Maximum amount of time to be spent in room by the nurse to be posted on door by Radiation Safety.
7. Inspect linen and dressings before disposal to ensure radioactive sources have not been dislodged.
8. Do not perform routine cleaning tasks during the hours when radioactive source is in place.
9. The following visitation restrictions will be enforced:
   a. Visitors must be 18 years of age or older
   b. No visitors are allowed who are or may be pregnant.
   c. The duration of visit will be limited to times posted on the door
   d. Visitors should remain no less than 6 feet from the patient.

10. Physician to be notified of rash, skin eruptions, temperature over 102°, excessive bleeding, vaginal discharge, or abdominal distention.
11. Radiation oncologist to be notified if radioactive source becomes loose or falls out. If a source becomes displaced and is seen on bed or cart, the nurse may pick it up with long handled forceps and place in shielded transport container. Refer to emergency call procedure for more details. Standard cesium sources as used in gynecological implants appear as metallic cylinders about 3/4 inch in length. On rare occasions straight wire sources may be used.
12. The room is not to be cleaned and/or assigned to another patient until radiation survey of room has been performed. "Certification of Radiation Hazard Status Form" will be placed in chart when radiation precautions are no longer needed.
13. If patient needs to be transported during therapy see procedure for transport of patients undergoing gynecologic radionuclide implant therapy.
14. Nursing staff and visitors to sign in/out of room on sign-in sheet kept on door.
15. Any revisions of procedure to be approved by Radiation Safety.
16. Notify Radiation Safety Officer and radiation oncologist in the event of the patient's death or medical emergency. The Radiation Emergency Call Procedure may be used for this if the Oncology Department is closed. If the patient expires, the body must remain in the room until the radionuclide is removed and the body is released by Radiation Safety.

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
1. Family, visitors, staff prone to unnecessary radiation exposure due to lack of proper precautions.	1. Explain radiation precaution procedure and rationale to patient, family, and visitors before and during radioactive therapy.	To alleviate fear and misconceptions. To ensure radiation safety.
	2. Visitors:	To ensure radiation safety.
	a. Limitations on visiting time will be posted on patient's door.	
	b. Should remain 6 feet away from the patient except for brief 1-2 minute greeting. A chair should be placed at a suitable location in the room.	To ensure radiation safety.
	c. Must be 18 years of age or older while radioactive source is in place.	
	d. Must not be pregnant.	To prevent fetal damage from radiation exposure.
	3. Patient must have private room on 6th floor, designated by Radiation Safety Office and remain in room	To minimize exposure of persons in adjacent rooms and prevent exposure of persons in other areas.
		To ensure that nursing personnel are familiar with radiation safety precautions and are assigned radiation monitoring badge patients must be on 6th floor.
	4. Nursing Staff	
	a. Nurse who cares for patient must not be pregnant.	
	b. Radiation safety monitoring badge to be worn at collar level. Badges will be available on nursing unit and assigned to each nurse. Nurses are to wear only their assigned badge. Any personnel requiring a new or temporary badge may obtain one from medical physics section.	To record level of exposure and alert radiation safety officer of any problems of radiation exposure.

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
	c. Organize care to decrease number and length of exposures: Time limit to be posted on door of patient's room. Staff to be rotated to provide proper care and limit exposure.	To ensure radiation safety.
	d. Perform nursing care behind lead shield if available.	
	e. Spend little time at foot end of bed.	High area of radiation.
	f. Routine cleaning tasks and linen changes are not to be performed.	To limit time spent in room.
	5. Environmental Precautions: a. Notify Radiation Safety if the following precautions are not taken following insertion of radio nuclide:	To ensure posting of proper notices of radioactive materials.
	1. Radioactive precautions ID band placed on patient. 2. Radioactive materials sign placed on door. 3. Adhesive backed sticker on chart. 4. Form placed in chart 5. Radio nuclide source inventory tag placed on the door.	To alert staff and visitors of presence of radioactive materials.
	b. Keep long handled forceps and shielded transport container provided by Radiation Safety in patient's room at all times radioactive source is in place.	To contain radioactive sources if needed.
	c. Inspect all linen, chux, and peri pads for radioactive sources.	To ensure radiation safety.

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
	d. "Termination of Radiation Precautions" form will be signed by person removing sources and performing radiation survey, indicating that radiation precaution signs can be removed and normal housekeeping may resume.	So that personnel can be aware therapy is discontinued.
	e. Should radio nuclide source or applicator become loose or ejected- use long handled forceps to carefully place the dislodged source or applicator into shielded transport container found in patient's room. Immediately notify radiation oncologist. Follow radiation emergency call procedure at the switchboard if Oncology Department is not open.	
2. Prone to development of pain, skin rashes, bleeding, or uterine contractions related to adverse effects of radioactive isotope.	1. Assess T.P.R., B/P every 4 hours. Report deviations from normal.	To identify adverse effects of radiotherapy.
	2. Assess patient for any signs of petichiae, rashes, bleeding, (rectal, vaginal), uterine contractions every 4 hours.	To identify endometrial infection.
	3. Promptly report temp greater than 102^{O} or other adverse effect to radiation oncologist.	Physician may terminate treatment and prescribe antibiotics.
3. Prone to dislodging radioisotope related to lack of knowledge of limited body movement and altered hygienic care.	1. Explain to patient rationale for limited body movement and best rest. Review basis of care listed below.	
	2. Upon returning to room from applicator insertion carefully assist patient to bed taking care to prevent dislodgement.	
	3. Give partial bath daily: face, hands, upper chest.	

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
	4. Do not bathe below waist.	To prevent excessive exposure and to limit mobility.
	5. No backrubs except shoulder/neck message.	
	6. Avoid routine linen change, change only soiled linen.	
	7. Demonstrate and remind patient to do active R.O.M. upper extremities every 4 hours.	
	8. Administer analgesics sedatives, and antiemetics as indicated.	To help maintain patient comfort and decreases mobility.
	9. Do not give routine perineal or foley cath care. Chux and peri pads may be changed as necessary when drainage present. Surgical dressings to be changed only as directed by Radiation Oncologist.	Chux and peri pads used to absorb excess drainage since other dressings cannot be used.
	10. Remind patient to remain on bed rest, lying flat on back, not on abdomen or sides. Head of bed may be elevated 30-45°.	To prevent dislodging of radioisotope.
	11. Check that applicators are in proper position every shift.	
4. Fear of dislodging radio-isotope during bowel movement related to lack of knowledge of altered eliminating patterns.	1. Check to see that physician has ordered low residue diet. Explain its purpose to patient.	To decrease the need to move bowels, patient is given constipating medication, i.e., LOMOTIL, and low residue diet.
	2. Discuss rationale of altered bowel/bladder function during radiotherapy.	
	3. Check to see that physician has ordered medication to alter bowel patterns.	
	4. Promote verbalization of feelings through use of open-ended questions.	

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
	5. Use fracture bedpan.	To decrease mobility.
	6. Check carefully for loss of sources or applicators contents of bedpan.	
	7. Feces may be disposed of in toilet.	Body wastes not radioactive
5. Prone to development of urinary tract infection related to: -immobility -low p.o. fluid intake -lack of knowledge	1. Assess color, clarity, amount of urine output, via foley catheter, every 4 hours. Report deviations promptly.	To prevent development of urinary tract infection related to foley catheter and immobility.
	2. Closely monitor I & O and record every 8 hours. Urine may be disposed of in toilet.	Urine is not radioactive.
	3. Review rationale for drinking 1800 cc 7-3; 1000 cc 3-11; 200 cc 11-7. Determine fluid likes, have available. Administer antiemetic if necessary.	To ensure fluid intake.
	4. Instruct patient on measurement of intake and have her record on I & O sheet, if possible.	To decrease nurses time in room.
	5. Explain need to drink more fluids to assist kidneys in removal of wastes caused by more cellular breakdown and to prevent urinary tract infection.	
	6. Do not give routine perineal/catheter care.	To prevent dislodgement of applicator
6. Prone to development of upper respiratory infection related to immobility.	1. Discuss rationale and instruct patient on the need to deep breath every 2 hrs. (Demonstrate procedure et, assess return demo.)	To prevent development of upper respiratory infection.
	2. Auscultate breath sounds every 8 hrs.	

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE Item #20
7. Apprehension, periods of crying, anger or withdrawn behavior related to: - fear of rejection and neglect - unknown rationale for visitation limits - loneliness - fear of unknown	1. Review rationale for limited visits by staff, visitors - to decrease exposure and decrease risk of altering body tissues.	To assist with psychosocial emotional support during isolation experience required by the therapy.
	2. Use open-ended questions to promote verbalization of feelings.	
	3. Determine preference for diversional activities such as reading, T.V., crafts.	
	4. Encourage family visits within specified times of exposure.	
	5. Assess non-verbal cues such as quietness, withdrawal, crying, anger.	
	6. Be receptive to family members emotional needs.	
	7. Explain that precautions will be stopped once radioactive isotope is removed.	
8. Removal of implant following completion of therapy.	1. Radioactive sources to be removed by radiation oncologist or Oncology personnel at end of treatment.	
	2. Person removing sources will perform radiation survey of patient and room.	To ensure that no sources remain.
	3. After "Termination of Radiation Precautions" form has been completed, the following may be removed: a. Radiation ID bracelet from patient b. Radiation precautions sign from door c. Radiation precautions sticker from front of chart	
	4. Applicator to be removed by physician	
	5. Assist patient/physician as needed during procedure.	To make procedure easier.
	6. Note any vaginal bleeding or other untoward reactions following removal.	
	7. Room is not to be assigned to another patient until radiation survey of room has been performed.	

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
9. Reluctance to be discharged related to: -fear of unknown -fear of being radioactive	1. Review that she is no longer radioactive after isotope is removed.	To ensure understanding of discharge instructions.
	2. Discuss need to exercise to tolerance - have planned rest periods.	
	3. Daily shower.	
	4. Check with physician re: resumption of intercourse (usually 6 weeks).	
	5. Continue to drink fluids, avoid constipation.	
	6. Stress importance of follow-up care.	
	7. Instruct to report to physician: -vaginal or rectal bleeding -abdominal distension or pain -nausea or vomiting -high temperature -hematuria, burning, or odor to urine	To ensure early treatment of side effects.

FLOWER HOSPITAL

NURSING CHECKLIST — GYN. RADIATION IMPLANTS

To facilitate care of patients requiring radiation safety precautions during gynecological implants, please check room and patient before radiation present for the following items:

	Place ✓ and initial when completed
1. Glass thermometer	
2. BP cuff on shielded side, keep on patient's arm if possible.	
3. Move head of bed away from wall to decrease foot of bed exposure.	
4. Position bed so table will fit over shield side. Requires bed in HIGH position.	
5. Ensure that siderails are also on foot of bed.	
6. Egg crate mattress on bed.	
7. Prepare bed with layers of chux and drawsheet.	
8. Restraints: chest restraint in place, tie prn other restraints if needed.	
9. Hook foley to lead shield, NOT bed once patient returns.	
10. Equip room with patient care items before implant.	
11. Pre-procedure patient/family teaching regarding isolation, bedrest, etc. (if possible)	
12. Ensure that TED hose on patient BEFORE going to O.R.	

ONCE RADIATION PRESENT:

1. Wear badge when caring for patient.
2. Ensure lead lined container and forceps are in room.
3. Keep sign in sheet up-to-date.
4. Observe radiation safety precautions.

FLOWER HOSPITAL - LAKE PARK HOSPITAL
POLICY and PROCEDURE MANUAL

Subject: NURSING CARE OF PATIENT WITH INTERSTITIAL IRIDIUM-192
Section Number: IMPLANT

PROCEDURE: Nursing care of patients receiving temporary interstitial Iridium-192 implants. This includes the use of Iridium-192 as seeds in nylon ribbon or Iridium-192 wire.

RATIONALE: Nurses who care for patients receiving temporary Iridium-192 interstitial implants must use knowledge and skill:

1. To prevent unnecessary exposure of self and/or others to radiation.
2. To prevent dislodgement or dislocation of isotope.

EQIPMENT:

Private Room
Radiation signs*
Radiation Monitoring Badge
Rolling Radiation Shield
Shielded Transport Container*
Long Handled Forceps*

* To be provided by radiation safety.

NURSING CONSIDERATIONS:

1. Radionuclide implantation patients will be assigned to Room 605 or 618, or another room designated by the Radiation Safety Officer. The room is to be designated for single occupancy.

2. In the case of Iridium-192 implants, the radioactive sources are normally implanted prior to returning the patient to his room. In this case, a "Caution-Radioactive Materials" sign affixed to the patient's gurney when he arrives will indicate that radiation precautions must be taken immediately.

3. As soon as possible after the patient is in his room and the radionuclide is implanted, the Medical Physics Section will perform a radiation protection survey of the patient's room and surrounding areas in order to determine any special precautions or restrictions to assure safety of employees, visitors, and occupants of adjacent rooms.

4. At the time the Medical Physics Section performs the radiation protection survey, the following additional precautions will be taken:

   A. A radioactivity precaution ID bracelet will be placed on the patient.
   B. A sign will be placed on the patient's door.

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C. An adhesive-backed sticker will be placed on the outside of the patient's chart.
D. A form will be placed in the patient's chart.
E. A radionuclide source inventory tag will be placed on the door to the patient's room.

5. The extent of the radiation hazard will be indicated on the patient's room door and on the notification form in the chart. Limitations on working time near the patient as well as limitations on visitation time are included on these forms.

6. The following visitation restrictions will be enforced:

A. Visitors must be 18 years of age or older.
B. No visitors are allowed who are, or may be, pregnant.
C. The duration of each visit will be limited to the times posted on the door to the patient's room.

7. Attending personnel should work with speed and efficiency to minimize their radiation exposure time, while not neglecting patient care. As great a distance as possible from the implant should be maintained. If a bedside radiation shield is provided, it should be used whenever possible. The working time limitations posted on the door to the patient's room shall be observed.

8. Personnel who are, or may be, pregnant shall not be assigned to the care of this patient during the radionuclide implant treatment.

9. All attending personnel are to wear only their assigned radiation monitoring badge. When it is not in use, it shall be placed on the badge storage board. Any personnel requiring a new or temporary badge may obtain one from the Medical Physics Section.

10. The patient should remain in his room for the duration of the treatment. In the event he must be transported to another area, follow the precautions specified in the procedure for transport of patients undergoing radionuclide implant therapy and notify the Medical Physics Section as soon as possible.

11. Bed linens and dressings are to be checked carefully and routinely for the presence of radionuclide sources.

12. Should a radionuclide source become loose, or ejected, use forceps to carefully place the dislodged source into the shielded container found in the patient's room. Immediately notify the Radiation Oncologist and Medical Physics. Call the switchboard operator and initiate radiation safety call procedure if Oncology Department is not open. Iridium sources ordinarily appear as a line of small metallic seeds embedded in a nylon strand or, rarely, as a section of metallic wire.

13. If the patient's temperature rises above 102°F., notify the Radiation Oncologist in charge. He may terminate the implant and prescribe antibiotics for infection control, as deemed appropriate.

14. Surgical dressings should be changed only as directed by the Radiation Oncologist in charge.

15. After termination of the treatment by removal of the implant, a radiation survey of the patient and room will be performed by Medical Physics or a Radiation Oncologist to ensure that no sources remain. After the surveyor completes the "Termination of Radiation Precautions" form in the chart, all radiation precaution signs and labels may be removed. The room is not to be assigned to another patient until the survey of the room has been performed.

16. See specific section relating to care of patient's cancer treatment site, i.e., breast, oral, perineal.

17. Notify Radiation Safety Officer and radiation oncologist as soon as possible in the event of the patient's death or medical emergency. Radiation emergency call procedure may be used for this if the Oncology Department is closed.

18. Any revision of procedure to be approved by Radiation Safety.

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
1. Family, visitors, staff prone to unnecessary radiation exposure due to lack of proper precautions.	1. Explain radiation precaution procedure and rationale to patient, family, and visitors before and during radioactive therapy.	To alleviate fear and misconceptions. To ensure radiation safety.
	2. Visitors: a. Limitations on visiting time will be posted on patient's door.	To ensure radiation safety.
	b. Should remain 6 feet away from the patient except for brief 1-2 minute greeting. A chair should be placed at a suitable location in the room.	To ensure radiation safety.
	c. Must be 18 years of age or older while radioactive source is in place.	
	d. Must not be pregnant	To prevent fetal damage from radiation exposure.
	3. Patient must have private room on 6th floor, designated by Radiation Safety Office and remain in room at all times during therapy.	To minimize exposure of persons in adjacent rooms and prevent exposure of persons in other areas.
		To ensure that nursing personnel are familiar with radiation safety precautions and are assigned radiation monitoring badge patients must be on 6th floor.
	4. Nursing Staff	
	a. Nurse who cares for patient must not be pregnant.	

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
	b. Radiation safety monitoring badge to be worn at collar level. Badges will be available on nursing unit and assigned to each nurse. Nurses are to wear only their assigned badge. Any personnel requiring a new or temporary badge may obtain one from medical physics section.	To record level of exposure and alert radiation safety officer of any problems of radiation exposure.
	c. Organize care to decrease number and length of exposures: Time limit to be posted on door of patient's room. Staff to be rotated to provide proper care and limit exposure.	To ensure radiation safety.
	d. Perform nursing care behind lead shield if available.	
	e. Routine cleaning tasks and linen changes are not to be performed.	To limit time spent in room.
	5. Environmental Precautions: a. Notify Radiation Safety if the following precautions are not taken following insertion of radio nuclide:	To ensure posting of proper notices of radioactive materials.
	1. Radioactive precautions ID band placed on patient. 2. Radioactive materials sign placed on door. 3. Adhesive backed sticker on chart. 4. Form placed in chart 5. Radio nuclide source inventory tag placed on the door.	To alert staff and visitors of presence of radioactive materials.
	b. Keep long handled forceps and shielded transport container provided by Radiation Safety in patient's room at all times radioactive source is in place.	To contain radioactive sources if needed.

USUAL PROBLEM	NURSING INTERVENTION	RATIONALE
	c. Inspect all linen, chux, and dressings for radioactive sources.	To ensure radiation safety.
	d. "Termination of Radiation Precautions" form will be signed by person removing sources and performing radiation survey, indicating that radiation precaution signs and labels can be removed and normal housekeeping may resume.	So that personnel can be aware therapy is discontinued.
	e. Should radionuclide source or applicator become loose or ejected use long-handled forceps to carefully place the dislodged source or applicator into shielded transport container found in patient's room. Immediately notify radiation oncologist and Medical Physics. Follow radiation emergency procedure located at switchboard if Oncology Department is not open.	
2. Possible development of pain, skin rashes, or infection related to adverse effects of radioactive isotope.	1. Assess T.P.R., B/P every 4 hours. Report deviations from normal.	To identify adverse effects of radiotherapy.
	2. Assess patient for any signs of petichiae, rashes, bleeding (at site) every 4 hours.	To identify potential infection or other complications.
	3. Promptly report temp greater than 102° or other adverse effect to radiation oncologist.	Physician may terminate treatment and prescribe antibiotics.
3. Apprehension, periods of crying, anger or withdrawn behavior related to: - fear of rejection and neglect - fear of unknown - unknown rationale for visitation limits -loneliness	1. Review rationale for limited visits by staff, visitors - to decrease exposure and decrease risk of altering body tissues.	To assist with phychosocial emotional support during isolation experience required by the therapy.
	2. Use open-ended questions to promote verbalization of feelings.	
	3. Determine preference for diversional activities such as reading, T.V., crafts	

4. Encourage family visits within specified times of exposure.

5. Assess non-verbal cues such as quietness, withdrawal, crying, anger.

6. Be receptive to family members emotional needs.

7. Explain that precautions will be stopped once radioactive isotope is removed.

4. Removal of the interstitial implant following completion of therapy.	1. Radioactive sources to be removed by radiation oncologist or oncology personnel at end of treatment.	
	2. Person removing sources will perform radiation survey of patient and room.	To ensure that no sources remain.
	3. After "Termination of Radiation Precautions" form has been completed, the following may be removed:	
	a. Radiation ID bracelet from patient. b. Radiation precautions sign from door. c. Radiation precautions sticker from front of chart.	
	4. Interstitial implant to be removed by physician.	
	5. Assist patient/physician as needed during procedure.	To make procedure easier.
	6. Note any bleeding or other untoward reactions following removal.	
	7. Room is not to be assigned to another patient until radiation survey of room has been performed.	

FLOWER HOSPITAL - LAKE PARK HOSPITAL
POLICY and PROCEDURE MANUAL

Subject: Radioactive I-125 Implants
Section Number: NURSING

PROCEDURE:

Radiation precautions during nursing care of radioactive I-125 implant patients.

RATIONALE:

Radioactive Iodine-125 (I-125) is permanently implanted into various tumor sites in the form of many small (1 mm x 3 mm) metal seeds containing the radioactive material. Although the radiation from the implanted I-125 is largely absorbed by the patient's body, some radiation does escape, and some precautions listed below are because of this small radiation level. The precautions are not as restrictive as for temporary implants, such as gynecological Cesium-137 or interstitial Iridium-192 implants, because the radiation levels are much lower. With some I-125 implants there is a possibility of a few sources becoming unintentionally removed from the patient and ending up on the floor, in the bed, in excreta, surgical dressings, or NG suction, depending on the implant site. The radiation hazard from one of the many seeds in the implant is small, but precautions are taken to minimize the exposure to employees and visitors from these radioactive sources.

PRECAUTIONS:

1. The patient is placed in a private room when available. When unavailable, a semi-private room will be designated for single occupancy.
2. Radiation safety signs will be placed outside the patient's room and on the front of the chart by Medical Physics. A wrist band with radiation symbol will be provided to the patient.
3. The patient may leave the room but should not spend prolonged periods very near children or pregnant women.
4. Pregnant nurses should not be direct care providers.
5. Visitors should:
   a. Be 18 years or older
   b. Sit at least 3 feet from the patient's bed
   c. Not be pregnant
   d. Not be restricted in length of visits
6. When the patient is discharged, a survey of the room will be done by Oncology prior to cleaning by Housekeeping or admission of another patient. The radiation signs and labels will be removed by the surveyor at that time.
7. Film badges should be worn by personnel regularly assigned to brachytherapy patients.
8. In the case of prostate or pancreas implants, or other implant sites for which radioactive seeds could be excreted, urine or stools collected for lab analysis shall be monitored by Medical Physics prior to sending to the lab.
9. For superficial implants from which radioactive seeds could be lost, dressings and bandages shall be saved and monitored for presence of seeds by Medical Physics prior to disposal.
10. Linens are to be saved and checked by Medical Physics prior to sending to the Laundry.

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PRECAUTIONS (continued)

11. For prostate implants, the foley catheter should be monitored by Medical Physics after removal and prior to disposal.

12. For pancreas implants, NG suction should be monitored by Medical Physics prior to disposal.

13. If an object is found which is suspected of being a radioactive seed, call Medical Physics. If they are not immediately available, pick up the seed with forceps and place in a container in the patient's room until it can be checked by Medical Physics.

14. Notify Radiation Safety Officer and radiation oncologist in the event of the patient's death or medical emergency. The radiation emergency call procedure may be used for this if the Oncology Department is closed.

POLICY:

A radionuclide implant patient for whom radiation safety precautions are in effect is restricted to his room. If circumstances arise which require the patient to be transported to another area for proper medical care, certain precautions may be required.

For interstitial I-125 implants, the following precautions should be taken:

1. Inform the department to which the patient is being transported of the implant.

2. Notify Medical Physics within 24 hours.

For cesium-137 or iridium-192 implants, the following precautions should be taken:

1. In some cases it may be desirable to temporarily remove the radionuclide until the patient returns to his room. If time permits, check with Oncology to see if that precaution is appropriate.

2. Place a "Radioactive Material" sign on the gurney or wheelchair.

3. Maintain as much distance as practicable between the patient and other personnel. In using the elevators, inform anyone waiting to use the elevator that you are transporting a radioactive implant patient and instruct them to wait for the next elevator.

4. Inform the department to which the patient is being transported of the radiation hazard.

5. Notify Medical Physics as soon as possible. If necessary, initiate the Radiation Emergency Call Procedure to determine if additional precautions need be taken.

Procedures and Precautions for Use of Radioactive Gases

1. Quantities to be used:

   A. Patient information

      1. 20 studies per week
      2. 15 mCi per study

   B. Possession limit: 500mCi

2. Use and Storage Areas:

   A. The camera room and the hot lab are used for the storage and use of Xenon. Storage of the Xenon is in the fume hood located in the hot lab. This same fume hood is used to store tubing, face masks, etc., that have been contaminated until the Xenon has decayed. Saturated charcoal filters will be stored in the hot lab.

   B. The fume hood is on a dedicated exhaust system (Fan F-7) that exhausts to the outside at 1370 cfm. Air supplied to the hot lab is at 88cfm. Hence, the hot lab will be at negative pressure whenever the fume hood is operating.

      Air supply to the camera room is at a total of 2150 cfm. When Xenon studies are performed, a motorized damper defeats the normal air return system. All air is then exhausted from the camera room by a dedicated exhaust system (Fan F-9). This exhaust rate is at 2600 cfm and will be on for 1.5 hrs for each Xenon study performed. The camera room is at negative pressure when the dedicated exhaust is on.

   C. The ventilation will be checked semi-annually with a velometer to assure that no change in exhaust rate has occurred and the rooms are at negative pressure.

3. Procedures for Routine Use:

   A. The dose will be prepared and assayed in the dose calibrator. Shielding of the dose will be maintained at all times up to patient administration, except during identification and assay. Unnecessary personnel except desired observers will be excluded from the camera room during Xenon use. Patients will be instructed as to the procedure and trial runs will be conducted if at all possible. Finger badges will be worn by all personnel handling Xenon. The dedicated exhaust will be turned on prior to administration.

B. Face masks or a mouthpiece and nose clamps along with a Xenon rebreathing system (Atomic Products 130 - 330 or equivalent) and charcoal Xenon gas trap will be employed. Tubing and values, etc., will be inspected prior to use to assure continuity.

4. Emergency Procedures:

A. In the event a dose of Xenon is accidentally released into the camera room, the room will be evacuated until levels have been reduced to 1×10^{-5} uCi/ml. Removal of personnel from the room will be effected if the patient's condition permits. Complete evacuation is often not appropriate as another patient study may be in progress with the other camera. The evacuation time will be 10 minutes. Prior to re-entry, a measurement will be made using a low level G-M near the floor. A reading equivalent to background shall be considered as evidence that the ventilation has cleared the room of Xenon as calculated.

B This evacuation time can be shown to be adequate based on the following:

Initial concentration (Co) $= \frac{15{,}000 \text{ uCi}}{1.60 \times 10^{8} \text{ ml}}$

$= 9.38 \times 10^{-5}$ uCi/ml

Clearance rate (λ) $= \frac{2600 \text{ cfm}}{5640 \text{cft.}} = 0.461 \text{ min}^{-1}$

Concentration (C) $= C_o e^{-\lambda t}$

$= 9.38 \times 10^{-5}$ uCi/ml $(e^{-.461 \times 10})$

$= 9.38 \times 10^{-5}$ uCi/ml (.00995)

$= 9.3 \times 10^{-7}$ uCi/ml

Further, it can be shown by similar calculation that the Xenon concentration in the department will be less than 3×10^{-7} uCi/ml in 12.5 min.

5. Air concentrations in restricted areas:

A. The hood exhaust will be operated whenever Xenon doses are in inventory and following placement of face mask apparatus, used cartridges,etc. into the fume hood.

The camera room fan and fume hood will be set into operation prior to administering the Xenon dose to the patient and will be allowed to run for 90 min. following completion of the ventilation study.

Assuming 20 procedures per week, a total on-time of 30 hours will result. The total air available for exhaust is:

$$\text{Volume (V)} = (1370\text{cfm} + 2600\text{cfm}) \times 60\ \text{min/hr} \times 30\ \text{hrs} \times 2.83\ \text{ml/ft}^3$$

$$V = 2.02 \times 10^{11}\ \text{ml/week}$$

The concentration in restricted areas assuming a 20% loss of the total activity handled will be:

$$\text{Concentration (C)} = \frac{\text{Activity (A)}}{\text{Volume (V)}}$$

$$= \frac{300\ \text{mCi/week} \times .20 \times 10^3\ \text{uCi/mCi}}{2.02 \times 10^{11}\ \text{ml/week}}$$

$$(C) = 2.97 \times 10^{-7}\ \text{uCi/ml}$$

which is less than the 1×10^{-5} uCi/ml limit.

6. Air concentrations in unrestricted areas:

A. The same assumptions are used here as in #5 above and therefore the air concentrations in unrestricted areas will be less than the 3×10^{-7} uCi/ml limit.

B. After every 20 procedures, the trapping efficiency of the charcoal trap will be evaluated. A low-level G-M probe will be placed against the inlet tube of the trap during the equilibrium phase of the study and a reading taken. The probe will then be placed against the outlet from the trap at the initiation of the washout phase. The maximum reading during washout will be noted. If the maximum exhaust reading exceeds 10% of the inlet reading, taking background into consideration, the trap will be considered to be saturated and the cartridge will be replaced.

C. Saturated charcoal traps will be stored in the hot lab for decay. After decay, a survey will be performed using a low level G-M on contact with the unshielded column. If the reading is equivalent to background, the column may be disposed.

Facilities and Equipment Diagram

- Air Supply
- Air Exhaust
- ___ Scanner
- ___ Uptake/Well
- ___ Camera
- ___ Lockable Door
- ___ Receipt Area
- ___ Generator
- ___ Kit Preparation
- ___ Isotope Storage
- ___ Dose Preparation
- ___ Waste Storage
- ___ Dose Calibrator
- ___ Refrigerator

Adjacent Areas

___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____

- Sink
- Lead Castle

Lead Shielding

___ ___L x ___W x ___H x ___T
___ ___L x ___W x ___H x ___T
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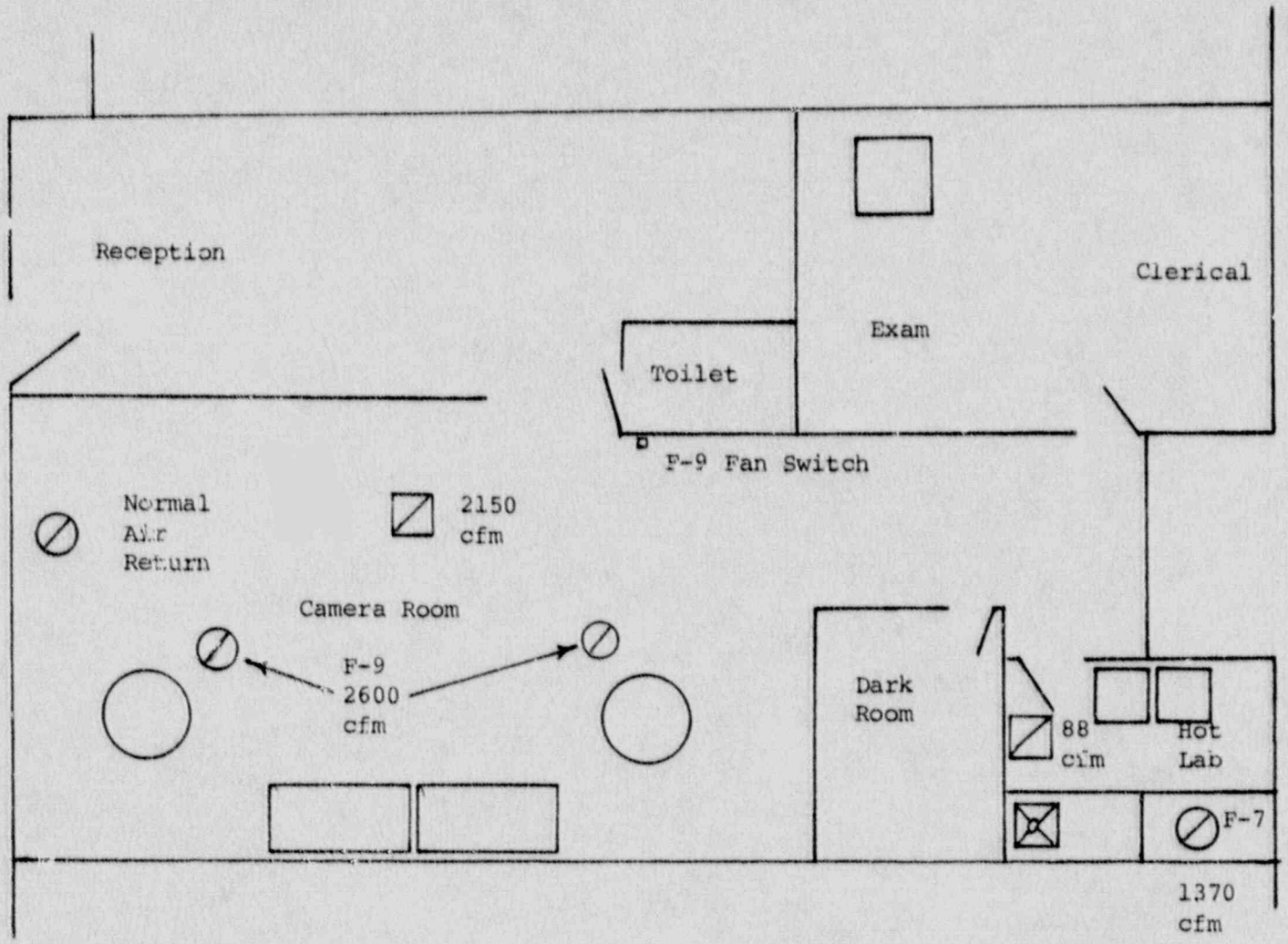

Item #21
5 of 5 pages
Prepared 7/31/87
Lic. # 34-15284-01

Model Program for Maintaining Occupational Radiation Exposures at Medical Institutions ALARA

Flower Memorial Hospital
(Licensee's Name)

July 31, 1987
(Date)

I. Management Commitment

a. We, the management of this facility are committed to the program described in this paper for keeping exposures (individual and collective) as low as reasonably achievable (ALARA). In accord with this commitment, we hereby describe an administrative organizatiion for radiation safety and will develop the necessary written policy, procedures and instructions to foster the ALARA concept within our institution. The organization will include a Radiation Safety Committee (RSC) and a Radiation Safety Officer (RSO).

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 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 judgement, 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 exposed individuals will also be maintained at the lowest practical level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

II. Radiation Safety Committee (RSC)

a. Review of Proposed Users and Uses

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

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

3. The RSC will ensure that the user justifies his procedures and that dose will be ALARA (individual and collective).

b. Delegation of Authority

The judicious delegation of RSC authority is essential to the enforcement of an ALARA program.

1. The RSC will delegate 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 in the minutes of the Committee's quarterly meeting.

c. 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 below 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 personnel 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

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.

d. Reviewing Instances of Deviation from Good ALARA Practices

The RSO will investigate all known instances of deviation from good ALARA practices; and, if possible, determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

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.

b. Responsibility of the Authorized User to Those He Supervises

1. The authorized user will explain the ALARA concept and his commitment to maintain exposures ALARA to all of those he supervises.

2. The authorized user will ensure that those under his supervision who are subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

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 I 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 consistent with good ALARA practices Investigational Level 1I will be documented.

The Radiation Safety Committee will review the justification for, and will approve, all revisions of Investigational Level 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.