DISTRICT OF COLUMBIA GENERAL HOSPITAL

RADIATION PROTECTION MANUAL

1983

"OFFICIAL RECORD COPY"

GOVERNMENT OF THE DISTRICT OF COLUMBIA

DISTRICT OF COLUMBIA GENERAL HOSPITAL

The attached "Radiation Protection Manual" sets forth official policies and procedures concerning radiation safety for all employees of District of Columbia General Hospital who use or direct programs using radioactive materials, x-ray machines or other sources of ionizing radiation. It describes the responsibilities for radiation protection of the "Hospital Radiation Safety Committee", the "Hospital Radiation Safety Officer", the supervisors of radiation workers and the radiation worker.

As described in detail herein, the Radiation Safety Committee reviews the status of radiation safety and recommends to the Executive Director of the Hospital policies and procedures necessarily needed to maintain adequate protection without unduly restricting desirable objectives of Hospital programs. The Committee also is empowered to approve or disapprove the use of radiation sources within the hospital on the basis of officially accepted protection concepts.

All radiation workers and their supervisors must be familiar with the contents of this manual and shall abide by the policies herein established.

Robert B. Johnson
Executive Director

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INTRODUCTION

1.00 The purpose of this manual is to set forth requirements and guidance for all persons at D.C. General Hospital who procure, receive, store, use, possess or dispose of radiation sources. It is designed to provide basic information concerning the authority and responsibilities of the D.C. General Hospital Radiation Safety Committee and the Radiation Safety Officer with respect for the use of radiation within the Hospital. It also describes the basic responsibilities, policies and proecedures for radiation workers and supervisors of these workers.

1.01 The rules and regulations of the U.S. Nuclear Regulatory Commission, CFR Title 10, Parts 19, 20, 30, 31 and 35 and the District of Columbia Radiation Protection Regulations are integral parts of this manual and must be adhered to by users of radioactive materials or radiation producing equipment.

1.02 The Compliance Division of the U.S. Nuclear Regulatory Commission (NRC) performs routine inspections of the D.C. General Hospital to insure that all programs are complying with all applicable NRC regulations. Violations of these regulations can result in the loss of the Hospital's NRC License.

1.03 All sources of radiation such as X-ray equipment and radium, that are not licensed by the NRC are subject to regulatory control under the provisions of the District of Columbia Radiation Protection Regulations. The standards used in the regulations are based on recommendations of the National Council on Radiation Protection and Measurements. Applicable references are listed in the Bibliography of the Manual.

2. RADIATION SAFETY COMMITTEE

2.0 The Radiation Safety Committee shall be appointed by the Medical Director with advice of the President, Medical/Dental Staff, of D.C. General Hospital to include one Surgeon, one Pathologist, one Radiologist, one Internist, one Hematologist, a representative of Nursing and a representative of Administration. The Chief Medical Officer in charge of Nuclear Medicine, the Medical Officer in charge of Radiotherapy and a Radiation Physicist shall also be members of this Committee. Additional members may be appointed on the basis of professional responsibilities and/or specialized value to the Committee. The Physician Chairman of the Committee will be appointed by the Medical Director from among the members of the Committee. Physician members of the Committee must be members of the active staff of D.C. General Hospital.

2.01 All members will be appointed yearly. Any member may be reappointed at the discretion of the Medical Director with the advice of the President of Medical/Dental Staff.

2.02 A simple majority of members including the Chairman shall constitute a quorum. Decisions of the Committee shall be arrived at by simple majority vote. In the event of a tie, the Chairman may defer an issue to a subsequent meeting.

2.03 The Committee shall meet at least quarterly. Any member may request a meeting, however, all meetings are convened by the Chairman. Upon the written request of any two members, an urgent meeting may be called and shall be held within a period of two weeks from the date of the request.

2.04 At an official meeting of the Committee convened by the Chairman, the Chairman may designate a Committee member as Acting Chairman, to preside over a meeting at which the Chairman will be absent. The Secretary, in his absence at a Committee Meeting, may designate an Acting Secretary who shall perform the duties of the Secretary at the Meetings. The Acting Secretary shall not be allowed voting privileges unless he is a duly appointed member of the Committee.

2.05 The Radiation Safety Committee shall receive, review, approve or disapprove all applications and renewals for the use of radiation sources in the D.C. General Hospital. These sources include radioisotopes to be used in human subjects, <u>in vivo</u> animals experiments or <u>in vitro</u> laboratory studies.

2.06 The Radiation Safety Committee shall recommend policies regarding patients and employee radiation safety for the D.C. General Hospital.

2.07 Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g., Nursing, Security and Housekeeping personnel) are properly instructed as required.

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

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

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

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

2.12 Ensure that the by-product material license is amended, when necessary prior to any change in facilities, equipment, policies, procedures and personnel.

2.13 In order to comply with the ALARA concept of the NRC the following will be observed:

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 by-product 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 the ALARA concept).

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 over-ruled, 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 RSO will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

2. The RSO 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 Section 15.0).

3. The NRC has emphasized that the Investigational Levels in this program are not new dose limits but, as noted in ICRP Report 26, "Recommendations of the International Commission on Radiological Protection", serve as check points above which the results are considered sufficiently important to justify further investigations.

The RSC will evaluate our institution's over-all 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.

3. RADIATION SAFETY OFFICER

3.0 The Radiation Safety Officer (RSO) will maintain general surveillance of all activities involving radiation at D.C. General Hospital, including both personnel and environmental monitoring. "Administratively, the RSO is responsible to the Assistant Medical Director of the Hospital". In this capacity, the RSO is under the technical direction of the D.C. General Hospital Radiation Safety Committee. It is the responsibility of the RSO to encourage and promote safety in radiation facilities and practices throughout the Hospital, and to ensure that all radiation facilities and associated operations are in compliance with applicable federal and D.C. regulations, national protection standards and the policies of the Hospital.

3.01 The RSO, with the cooperation of the Nuclear Medicine Division, will supervise and coordinate the procurement, receipt, shipment, storage and disposal of all radioactive material used in or destined for use in D.C. General Hospital.

3.02 Supervise the monitoring of Hospital facilities for radioactive contamination and supervise the decontamination of any contaminating incidents.

3.03 Distribute personnel monitoring equipment to employees of D.C.G.H. and insure that adequate records are being maintained throughout the Hospital. Notify individuals and their supervisors of exposures which are considered to be excessive and recommend appropriate remedial action.

3.04 Maintain records of all radioactive material received and the final location of these materials. The RSO must assure that possession limits prescribed by the Hospital's NRC License are not exceeded. Records of licensed materials shall be maintained in accordance with Title 10, Code of Federal Regulation, Part 20.

3.05 The RSO shall investigate any reported or suspected radiation hazard, over-exposure or accident within the Hospital which may indicate unsafe conditions from the stand-point of radiation exposure.

3.06 The RSO will insure that employees are adequately trained in the handling of radiation sources and the management of patients treated with radioactive material.

3.07 The RSO must keep the Radiation Safety Committee informed of the status of radiation safety within the D.C.G.H.; particularly with respect to (a) failure of individuals, program chiefs or facility directors to comply with the requirements of the D.C. Radiation Protection Regulations and (b) failure to comply with applicable regulations of the U.S. Nuclear Regulatory Commission.

3.08 The RSO will insure that all new radiation producing equipment to be used in the Hospital will meet the standard set by regulatory agencies.

3.09 The RSO will be responsible for the distribution of the Radiation Safety Manual and any amendments to all radiation workers in the Hospital.

3.10 The RSO will ensure that all Sealed Sources owned by the Hospital are Leak tested as required by applicable regulations.

3.11 The RSO will provide a mechanism for film badge services at D.C.G.H. All contracts for film badge services will be handled through the RSO. The RSO will also maintain a secondary record of data from these badges.

3.12 Annual and Quarterly Review

a. 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.

b. 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 Section 15.0 of this manual.

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

3.13 Education Responsibilities for an ALARA Program

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

b. 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 & the RSO are committed to implementing the ALARA concept.

3.14 Cooperative Efforts for Development of ALARA Procedures

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

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

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

3.15 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 know, the RSO will require changes in the program to maintain exposure ALARA.

4. THE RADIATION PHYSICIST SUPPORT ACTIVITIES

4.0 The following is a statement of the responsibilities of the Radiation Physicist with respect to the radiation safety program at D.C. General Hospital.

4.01 The RP has the responsibility of aiding the hospital RSO in enforcing the D.C. Radiation Protection Regulations throughout the entire hospital. In that capacity, the RP will be aiding in interpreting all applicable parts of these regulations and U.S. Nuclear Regulatory Commission regulations at D.C. General Hospital.

4.02 The RP will provide technical assistance to the Hospital's RSO and the Radiation Safety Committee.

4.03 The RP will advise RSO concerning personnel dosimetry equipment, such as film badges, for use by employees of D.C. General Hospital.

4.04 The RP will perform leak tests on all sealed sources owned by the Hospital. Records of the test results will be given to the primary user and the RSO.

4.05 The advice of the RP will be required for all radiation producing equipment to be used in the Hospital.

4.06 The RP will serve as a member of D.C. General Hospital Radiation Safety Committee.

4.07 The RP will advise the RSC regarding Radioactive Solid Waste Disposal Services for use by the Hospital.

5. AUTHORIZATION FOR THE USE OF RADIATION SOURCES

5.0 The following procedures for the authorization, procurement and/or transfer of radiation sources are intended to insure compliance with the terms of the D.C. General Hospital's License issued by the U.S. Nuclear Regulatory Commission.

Authorization for use of Radioactive Materials

5.01 If the use of radioactive material has not previously been approved by the Radiation Safety Committee, an application for authorization to use the material (s) must be made to the Committee prior to procurement request or use. All persons who plan to submit applications to the RSC must first meet with the RSO to eliminate un-necessary delays. The application shall be made by the applicant on Form AEC-313 or 313a for all radioactive material, including radium. DO NOT SUBMIT THE APPLICATION TO THE U.S. NUCLEAR REGULATORY COMMISSION. It should be submitted to the Chairman, D.C. General Hospital Radiation Safety Committee. Forms AEC-313 and AEC-313a with instruction sheets are available from the Nuclear Medicine Division (Telephone 675-5581).

5.02 In filling an application, two copies should be submitted on Form AEC-313 and two each of the supplemental sheets or other attachments. One complete copy should be prepared for the applicant's files. The information provided is evaluated by the RSC to determine whether the applicant has the necessary qualifications to conduct the proposed operations in compliance with Hospital's safety standards. While the purpose must be stated for which the radioisotope will be used, it should be understood that the Committee in issuing an authorization does not pass upon the technical merit of the project, but is concerned only with its safety. In the case of in vivo human use of radioisotope, however, the RSC will consider the technical necessity for and the merits of the radioisotopic procedures.

Acceptable Training and Experience for Medical Use of By-product Material

5.03 Outlined below are training and experience criteria that the Nuclear Regulatory Commission and the D.C. General Hospital Radiation Safety Committee has found acceptable for physicians who use radiopharmaceuticals. Each physician's training and experience will be examined on a case-by-case basis, however. If a physician wished to use radiopharmaceuticals but does not have the training and experience described, he may submit an application listing his specific qualifications and this will be reviewed by the D.C. General Hospital Radiation Safety Committee which will have the responsibility of the approval process.

I. GENERAL TRAINING

To qualify as adequately trained to use or directly supervise the use of by-product material listed in Groups I, II and/or III, Section 35.100 of 10 CFR Part 35, a physician should have.

A. Training in basic radioisotope handling techniques (200 hours) consisting of lectures, laboratory sessions, discussion groups or supervised experience in a nuclear medicine laboratory in the following areas:

1. Radiation physics and instrumentation (100 hours)

2. Radiation Protection (30 hours)

3. Mathematics pertaining to the use and measurement of radioactivity (20 hours)

4. Radiation biology (20 hours)

5. Radiopharmaceutical chemistry (30 hours)

(The hours listed next to each of the five subjects above are suggested values and should not be interpreted as specific requirements).

B. Experience with the types and quantities of by-product material for which the application is being made, or equivalent (500 hours).

C. Supervised clinical training in an institutional nuclear medicine program (500 hours). The clinical training should cover all appropriate types of diagnostic procedures and include:

1. Supervised examination of patients to determine the suitability for radioisotope diagnosis and recommendation on dosage to be prescribed.

2. Collaboration in calibration of the dose and the actual administration of the dose to the patient, including calculation of the radiation dose, related measurement and plotting data.

3. Follow-up on patients when required.

4. Study and discussion with preceptor of case histories to establish most appropriate diagnostic procedures, limitation, contraindication, etc.

NOTE:

The requirements specified in Sections A,B and C may be satisfied concurrently in a three month training program IF all three areas integrated into the program.

NOTE:

For each physician named in Item 4 of Form NRC-313M complete Supplements A and B of Form NRC-313M (Preceptor Statement & the statement of training in basic radioisotope handling techniques). For each subject covered in basic training, state where the training was obtained, the dates, total number of hours and type of training (e.g., lectures, laboratory sessions).

Alternative:

Certification by the American Board of Nuclear Medicine will be accepted as evidence that a physician has had adequate training and experience to use Groups I, II and III.

Certification by the American Board of Radiology in Diagnostic Radiology with Special Competence in Nuclear Radiology will be accepted as evidence that a physician has had adequate training in basic radioisotope handling techniques and has techniques and has had adequate clinical experience to use Groups II and III.

II. TRAINING REQUIREMENTS FOR SPECIFIC DIAGNOSTIC PROCEDURES

A physician who wished to be authorized for only one or two specific diagnostic procedures should have training in basic radioisotope handling techniques and clinical procedures commensurate with the procedures and quantities of by-product material being requested. Such requests will be examined on a case-by-case basis by the Radiation Safety Committee.

III. TRAINING REQUIREMENTS FOR THERAPY PROCEDURES INVOLVING RADIOPHARMACEUTICALS

To qualify as adequately trained to use or directly supervise the use of by-product material listed in Groups IV and/or, V, Section 35.100 of 10 CFR Part 35, a physician should have:

A. Training in basic radioisotope handling techniques (80 hrs.) including:

1. Radiation physics and instrumentation (25 hrs.)

2. Radiation Protection (25 hrs.)

3. Mathematics pertaining to the use and measurement of radioactivity (10 hrs.)

4. Radiation Biology (20 hrs.)

(These requirements are in lieu of, not in addition to, those specified in Section I.A., above)

B. Clinical training in specific therapy procedures:

For Group IV

(i) Iodine-131 for treatment of hyperthyroidism and/or cardiac conditions:

Clinical experience in the diagnosis of thyroid function and active participation in the treatment of ten patients.

(ii) Phosphorus-32 for treatment of polycythemia vera, leukemia and/or bone metastases:

Treatment of three patients with any combination of these three conditions.

(iii) Colloidal phosphorus-32 intracavitary treatment:

Active participation in the treatment of three patients.

For Goup V

(i) Iodine-131 for treatment of thyroid carcinoma:

Clinical experience in diagnosis of thyroid function and treatment of hyperthyroidism and/or cardiac dysfunction, and active participation in the treatment of three patients with thyroid carcinoma.

(ii) Coloidal gold-198 for intracavitary treatment:

Active participation in the treatment of three patients.

IV. TRAINING REQUIREMENTS FOR THERAPY PROCEDURES INVOLVING SEALED SOURCES

To qualify as adequately trained to use or directly supervise the use of by-product material listed in Group IV, Section 35.100 of 10 CFR Part 35, a physician should have:

A. Training in basic radioisotope handling techniques (200 hours) as described in Section I.A.

B. Clinical training in specific therapy procedures:

(i) Radiation sources for interstitial, intracavitary, or surface treatment of cancer:

Active practice in therapeutic radiology with a minimum of three years experience.

(ii) Beta ray applicators for the treatment of superficial eye disease:

Active practice in therapeutic radiology or onthalmology and experience in the therapeutic use of beta rays or soft x-rays.

(Evidence of certification by the American Board of Radiology in Radiology or Therapeutic Radiology may be submitted in lieu of the information requested in Sub-sections A and B, above).

V. Beginning July, 1984, the training and experience of physicians who apply for authorization to use radioactive material at D.C. General Hospital must satisfy the recent NRC regulation 10 CFR Part 35.

6. PROCUREMENT or TRANSFER OF RADIATION SOURCES

6.0 Radiation Producing Machines

The Chairman, Radiation Safety Committee, must be notified in advance of the procurement, receipt or transfer of all radiation producing machines such as X-ray Units, Neutron Generators, Particle Accelerators, etc. This notification is made through the Assistant Medical Director, giving specifications of the unit and a scale drawing of the proposed location, showing structural materials and identification of use of adjoining areas. Upon completion of its review, the Chairman, Radiation Safety Committee, will attach his comments or approval and forward it for processing.

6.01 Radioactive Material:

Requisitions for radioactive materials must be forwarded on the appropriate forms through the Chairman, Radiology and Nuclear Medicine, prior to procurement, except in emergency situations. An Emergency situation is one in which, because of the seriousness of a patient's condition, or other unforeseen developments, the order for the radioactive material must be placed by telephone for immediate shipment. In such situations, notification must be made to the Procurement Division, and to Nuclear Medicine Division. Emergency orders will not be approved without strong justification. The office and home phone numbers of the Chairman, Radiology and Nuclear Medicine are listed Section 6.03 b. For emergency orders with the approval of the Procurement Division, the requisition showing the purchase order number must be forwarded through the Nuclear Division within seven days of the order. In all cases the requisition must show the name and authorization number of the responsible user.

Purchases of radioactive material made through funds other than those administered by the D.C. General Hospital should also be approved by the Chairman of Radiology and Nuclear Medicine and the Radiation Safety Officer. Approval may be obtained by means of a memorandum request. All radioactive materials stored or used within the D. C. General Hospital must be delivered to the Radiation Safety Officer within the Nuclear Medicine Division of the Hospital where the packages will be monitored for damage and contents recorded. The isotope then will be forwarded to the appropriate user. The Radiation Safety Officer will determine whether assay of pharmaceutical quality or radiochemical purity of shipment is necessary with the advanced concurrence of the user.

Radioactive materials procured under a license not issued to the Hospital, may not be transported into the Hospital without the prior notification and consent of the RSO.

6.02 Radioactive materials procured under a license not issued to the Hospital may not be transported into the Hospital without the prior notification and consent of the RSO.

Radioactive material will be delivered and received as follows:

a. During normal duty hours:

(1) All radioactive material will be delivered directly to Nuclear Medicine Department, Room 1481.

(2) Damaged packages will be received with a notation from the driver indicating that the package is damaged. The RSO must be notified immediately▸procedure listed in paragraph 6.03 will be followed for handling damaged packages.

(3) If there is no damage to the material, the receipt will be signed and the delivery man may leave.

b. During week-ends, nights and holidays:

(1) All radioactive material will be delivered to the night telephone operator's office, Room G-419.

(2) All packages will be inspected for excessive damage, signs of mishandling and visual signs leakage.

(3) If there is no damage the receipt will be signed and the delivery man may leave.

(4) The telephone operator will then open the locked storage container located in Room G-419 where the un-opened shipping packages will be stored until removed to the Nuclear Medicine Laboratory by a technician.

(5) If inspection shows there is excessive damage, obvious signs of mishandling and visual leakage the telephone operator will not sign the receipt. She will follow procedures listed in Paragraph 6.03 for handling damaged packages.

6.03 Handling Damaged Deliveries of Radioactive Packages

a. During normal duty hours:

(1) Notify the Nuclear Medicine Division, telephone extension 5581 or 5582 immediately. Contact the Radiation Safety Officer, telephone extension 7562.

(2) Avoid contact with spilled material. Put package on a shielded secure area.

(3) All persons will leave the room immediately.

(4) Detain all personnel who have come in contact with the container. This includes delivery personnel and their trucks. Explain that this precautionary measure is being taken to insure their safety.

(5) All personnel detained will wait in Nuclear Medicine.

(6) Individuals detained will wash all skin surfaces that have been in contact with any package. Use mild soap and water.

(7) Call the security guard to assist in detaining exposed personnel.

b. On week-ends, nights and holidays:

(1) The telephone operator will immediately notify a member of the Radiological Health Team. Contact should be made in order listed below:

a. Mrs. Harwood, Ext. 5581	Home:	Call Hospital Operator
b. Dr. Motazedi, Ext. 5581		Call Hospital Operator
c. Dr. Walker, Ext. 7145		Call Hospital Operator
d. Mr. R. Keys, Ext. 7562		Call Hospital Operator

(2) Put package in a plastic bag and place it in a safe and secure box at the far end of the telephone operator's office.

(3) Personnel will leave the immediate vicinity of the package.

(4) The security guard will be notified so that persons exposed to contamination may be detained. Delivery men and their trucks are included.

(5) Persons exposed will wash all skin surfaces that have come in contact with the packages, using mild soap and water.

c. Personnel who have come in contact with the damaged package must be detained until an individual listed in Paragraph 6.03 b (1) above has arrived and checked for possible contamination.

7. RESPONSIBILITIES OF THE SUPERVISORS OF RADIATION WORKERS

7.0 Supervisors are responsible for insuring that the radiation workers under their control discharge their responsibilities as set forth in Section 5.

7.01 Adequate Planning. Before a procedure is performed using radioactive material, the supervisor shall determine the types and amount of radiation or radioactive material to be used, including the protection required. The procedure must be well outlined. In many cases before the procedure is actually performed with radiation, it should be rehearsed so as to preclude accidents or unexpected circumstances. In a situation where there is appreciable radiation hazard, the Radiation Safety Officer shall be consulted before proceeding.

7.02 Instructing Employees. Those employees for whom the supervisor is responsible, should receive adequate instruction in the safe use of the radiation sources and the safety standards are discussed in this manual. A copy of this manual shall be available to all radiation workers.

7.03 Furnishing Information. The supervisor must furnish the Radiation Safety Officer with information concerning radiation workers and activities in their areas, such as names of radiation users, and type of work in which they will be engaged. The Radiation Safety Officer is also to be notified whenever major changes in operational procedures, techniques, or physicial facilities are contemplated, if such changes might alter personnel exposure.

7.04 Compliance with Safety Standards. The supervisor must see that all sources of radiation under his control are handled in accordance with the safety standards as discussed in this manual, and as set forth by the United States Nuclear Regulatory Commission and the District of Columbia Government.

7.05 Posting Emergency Procedures. When appropriate, specific emergency procedures setting forth effective action in the event of an accident involving radioactive material shall be posted in a conspicuous place near areas in which accidents are possible. The Radiation Safety Officer must review and approve these procedures.

7.06 License Requirements. The supervisor must see that all radioactive material under his supervision is within the possession limits of the Department's NRC License and the authorization of the Radiation Safety Committee, and is used in accordance with the terms of the license and the Committee's authorization. (See also Chapters 6, 8, and 9).

7.07 Changes in Procedures. Any change in approved emergency, operational or disposal procedures must be submitted in writing to the Radiation Safety Officer to determine if the proposed changes should be approved by the RSC.

7.08 All facilities using radioactive materials must display a copy of form NRC-3 entitled, "Notice to Employees" as required by NRC regulations.

7.09 RESPONSIBILITY OF THE AUTHORIZED USER TO THOSE HE SUPERVISES

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

b. 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.

8. RESPONSIBILITIES OF RADIATION WORKERS USING RADIATION PRODUCING EQUIPMENT

8.01 Radiation employees shall strive to keep their exposure to radiation as low as possible and below the Maximum Permissable Exposure as listed in Section 16.0 Appendix C of this manual.

8.02 The presecribed monitoring equipment such as film badges and/or pocket dosimeters shall be worn in radiation areas. Whenever protective lead aprons are worn, the body film badge shall be worn on the outside of the apron at the collar or on the sleeve at the shoulder level. The wrist badges or dosimeters on the unprotected hands and forearms should be considered if they must come within 3 feet of the edge of the beam. Monitoring devices will be made available by RSO when a need exists and he will assist in determining requirements for such services.

8.03 Accidental over-exposure or suspected over-exposure to radiation shall be reported immediately to the worker's supervisor and the Radiation Safety Officer. An employee must carry out the recommended corrective measures of his supervisor and the Radiation Safety Officer shall cooperate in all attempts to evaluate his exposure.

8.04 A Radiation Survey will be made by the RSO or his designee of all new installations and existing installations after every change that might increase the radiation hazard (i.e. replacement of X-ray tube, changes in filtration of beam, etc.).

8.05 Annual full beam calibration shall be made for all units used therapeutically on human subjects and will be reported to the responsible user. In addition, as required by NRC, a monthly calibration check will bemade. Also the dose rate at the panel surface on all fluoroscopes shall be measured and posted annually on the machine at a place where fluoroscopist can easily see it.

8.06 No person shall be regularly employed to hold patients during exposure, nor shall anyone from radiology services be permitted to perform such duties. The person holding the patient shall be completely shielded by aprons, gloves, or portable barriers from the useful beam and any scattered radiation.

8.07 All protective devices that may become defective due to use or abuse, such as lead protective aprons or gloves, shall be inspected with the aid of a fluroscope at least annually, for excessive radiation leakage.

8.08 The operator of radiation equipment shall insist that all non essential personnel leave the exposure area before activation of the unit. He should also see that all essential personnel are properly shielded and utilizing protective barriers, leaded aprons, and gloves as indicated for the procedure.

8.09 The operators shall provide adequate protection and safety supervision of visitors, consultants, or service personnel who must enter control areas to perform service or exchange information.

8.10 The operator should see that procedures are in accordance with the recommendations of the Radiation Safety Officer, and the guidelines of the National Council of Radiation Protection and Measurements as published in the appropriate handbooks. (See Bibliography)

8.11 The operator should strive to use the least radiation necessary for the clinical objectives.

A. High speed film and film cassettes should be employed in radiography (medical and dental) when such use will not seriously limit the diagnostic requirements.

B. Exposure factors such as KVP and MA should be as recommended by the film manufacturer.

C. Films must be fully developed in accordance with the time and temperature recommendations of the manufacturer. If such full development results in excessive density, this is usually indicative of excessive exposure factors, namely: filament current, kilovoltage, and/or exposure time.

D. Fluoroscopic work shall be performed in the minimum time possible using the lowest dose rate and smallest aperture consistent with clinical requirements.

E. Gonadal shields shall be used on all patients of reproductive age or younger when such use will not obscure the area of clinical interest.

9. RESPONSIBILITIES OF RADIATION WORKERS USING RADIOACTIVE MATERIAL

9.01 Radiation employees shall strive to keep their exposure to radiation as low as possible and below the Maximum Permissible Exposure as listed in Section 16.0, Appendix c of the manual.

9.02 The prescribed monitoring equipment such as film badges and pocket dosimeters shall be worn in radiation control areas. No film badges will be needed in certain areas of low radiation intensity, or for work using alpha or low energy beta emitters only. Wrist badges or dosimeters shall be worn near the unprotected hands and forearms if they must come in close proximity to radiation levels which could expose the hands to an accumulated dose in excess of 400 millirem in any one week. Monitoring devices will be made available by the Radiation Safety Officer of the Division will assist in determining requirements for such devices.

9.03 Accidental inhalation, ingestion, injury or possible over-exposure involving radioactive materials must be reported to one's supervisor and the Radiation Safety Officer. The individual shall cooperate in recommended corrective measures and in all attempts to evaluate his exposure.

9.04 Radiation users and their supervisors shall provide adequate protection and supervision of the visitors or service personnel who must enter radioisotope laboratories to perform consulting, contractural service, or provide information. Service personnel shall not be permitted to work on equipment in radiation areas without the presence of a member of the radiation staff to provide specific information and maintain radiation control.

9.05 Radioisotope users are responsible for maintaining good personal hygiene. Fingernails should be kept short and clean; employees should not engage in work involving radioactive material with a break in the skin below the wrist. Wash hands and arms thoroughly after working with radioisotope and before handling an object which goes to the mouth, nose or eyes.

9.06 Protective mechanical devices should be used whenever their aid will assist in minimizing that potential hazard. For example, hand operated pipetting. Proper type hoods or glove boxes should be employed for work with radioactive materials which are, or could become volatile or airborne.

9.07 Smoking or eating in laboratories containing radioisotopes shall not be permitted. Refrigerators shall not be used jointly for foods and radioactive materials.

9.08 Areas such as hood, benches, etc., in which radioactive material is used should be checked for contamination at least once daily during periods of use of the materials. Any significant contamination observed should be removed immediately. If removal is not possible the area shall be clearly marked and the Radiation Safety Officer notified by phone. Written records shall be kept of all such contamination checks.

9.09 Radioactive waste and equipment used in laboratories for radioactive materials shall be properly labeled. Once used for radioactive substances, equipment (including glassware) should not be used in uncontrolled areas, or sent from the radiation area to cleaning facilities, repair shops, or to surplus, until demonstrated to be free of contamination.

9.10 Personnel working with radioactive material shall wear protective clothing whenever radioactive contamination is possible. When-ever solutions containing radioactivity are being handled, gloves shall be worn. (Protective clothing from contaminated areas shall not be worn into non-contaminated areas).

9.11 All disposal of radioactive materials will be in accordance with the rules set down in Chapter 14.0 of this manual.

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

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

9.14 Use syringe shields for preparation of patient doses and administration to patients except in circumstances where their use would compromise the patient's well being (such as in Pediatric Patients).

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

9.16 Always transport radioactive material in shielded containers.

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

9.18 Dispose of radioactive waste only in specially designated receptacles.

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

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

9.21 NEW PROCEDURES INVOLVING POTENTIAL RADIATION EXPOSURES

A. 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.

B. 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..

9.22 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 resources are available if he feels that ALARA is not being promoted on the job.

C. Physician and personnel working with or administering more than 10 Millicurie I 131 whether in liquid or capsule form must have thyroid count within 12 - 48 hours.

10. EMERGENCY PROCEDURES FOR ACCIDENTS INVOLVING RADIOACTIVE MATERIAL

10.1 Rupture of Sealed Sources (Solids, Gases, Powders, etc).

In the event of a rupture of a sealed source containing hazardous quantities of radioactive dusts, mists, fumes, organic vapors, or gases, the following emergency measures should be taken.

A. No immediate attempt should be made to clean up the spill. All windows should be closed, fans and air conditioners should be shut off, and everyone should leave the room.

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

C. Every person who might have been contaminated should be monitored for radioactivity, and if contaminated, should remove his contaminated garments and take other steps in decontamination. If no means are available for monitoring, it should be assumed that the person is contaminated.

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

E. For protection of personnel and property and to comply with applicable regulations, the Radiological Health Division and the Radiation Safety Officer shall be notified immediately. For other information concerning notifications and obtaining assistance of radiation consultants see paragraph 8.03.

10.02 Radioactive Liquid Spills

All spills of liquid radioactive material must be cleaned up promptly. The responsibility for cleaing or for calling for experienced help rests on the individuals working or in charge in the area involved and responsible for the spill. Under no circumstances should any untrained persor attempt to examine or clean up a maior spill material. (The cleanup technique should be planned with the same care as is used in quantative chemical analyses or in bacteriological handling of virulent organisms). The following procedures shall be followed:

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

B. If hands are protected from contamination with gloves wash the container of the spilled liquid.

C. With protective gloves drop absorbent paper on the spill.

D. If the spill is on clothing, remove all contaminated clothing at once and leave it in the contaminated room.

E. Detain all personnel in an area immediately outside the room and take immediate steps to decontaminate involved personnel.

F. Follow notification procedures as outlined in Section 10.3 for assistance.

10.03 Notifications and Emergency Assistance

The Facility Radiation Safety Officer shall be notified immediately of all accidents involving possible body contamination or ingestion of radioactive material. For assistance on any radiation problems, one of the individuals listed below may be contacted.

A. D.C. General Hospital:

1. Facility Radiation Safety Officer-Contact Mr. R. Keys, Office Phone: 7562.

2. Chairman of Radiology and Nuclear Medicine, Ext. 7145 or Hospital Operator.

3. Radiation Physicist, Mr. Richard C. Granke, Office Phone: 622-1235.

The following agencies should be contacted only in extreme emergencies or when one of the individuals listed in Paragraph 10.03A cannot be reached.

B. U.S. Unclear Regulatory Commission

1. Germantown Office: (24 hours duty) 973-3222

2. NRC, Region I, King of Prussia, Pa. (215) 337-1150

11. NURSING CARE FOR PATIENTS RECEIVING THERAPEUTIC QUANTITIES OF RADIOACTIVE MATERIAL

11.01 Patients who have received therapeutic doses of Iodine-131 for thyrotoxicosis or for heart disease ordinarily do not need to be isolated from the nursing staff visitors or other patients. Patients receiving under 30 millicuries of radioactive iodine also can be handled as a routine patient in general. However, these patients are best not cared for by pregnant individuals. The form "Nursing Instructions for Patients Treated with Phosphorous-32, Gold-198, or Iodine-131" will be included in these patient's charts with specific instructions.

11.02 All patients receiving P-32, Au-198 or I-131 other than as noted in 11.01 must be placed in a private room with a private toilet. The following rules apply in these cases.

A. The room will be posted in accordance with Section 20.203, 10 CFR Part 20. This manual is available in the Nuclear Medicine Division.

B. Surveys of the patient's room and surrounding area will be conducted as soon as practicable after administration of the treatment dose. Exposure rates will be measured at the patient's bed-side, three feet away 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 time at the patient's door and on the patient's chart. The results of daily surveys will be used to recalculate permitted times and these will be posted as above.

C. The Nursing Instructions for Patients Treated with Radioactive Materials will be completed immediately after administration of dose and included in the chart.

D. Visitors will be limited to those 18 years of age or over unless other instructions are noted.

E. Patients must remain in bed while the visitors are in the room and visitors should remain at least six feet from the patient.

F. Patients who contain radioactive materials are to be confined to their rooms except for special medical or nursing purposed approved by the Nuclear Medicine Department.

G. Nursing personnel should attend the patient for routine purposes, but if special nursing care is required, the problem of radiation exposure of nursing staff will be evaluated by the Nuclear Medicine Division and the Radiation Safety Officer and posted on the chart. In general, nurses should spend only that amount of time near the patient required for ordinary nursing care.

H. The supervisory nursing staff should secure sufficient film badges or pocket dosimeters for all shifts of the nursing personnel to be in attendance. These may be obtained from the Hospital Radiation Safety Officer. A badge shall not be exchanged between individuals.

I. In care of the patient, excretions or contaminated bed linens or other articles, it should be remebered that the basic principles of protection are maintaining distance from the source of radiation, use of shielding, or limiting exposure to short exposure times.

J. Attending personnel must wear rubber or disposable plastic gloves when handling patients, urinals, bedpans, emesis basins, other containers or materials obtained from the body of the patient. Wash gloves before removing and then wash hands. The gloves must be left in the patient's room in the designated waste container.

K. All clothes and bed linens used by the patient should be placed in the laundry bag provided and left in the patient's room to be checked by a member of the Nuclear Medicine Division.

L. Disposable items such as dishes, gowns and etc. will be placed in a designated waste container in the room and surveyed by the Nuclear Medicine Division before disposal. All patients will use disposable dishes.

M. All non-disposable items should be placed in a plastic bag and left in the patient's room to be checked by the Nuclear Medicine Division.

N. Surgical dressings should be changed only as directed by a physician. All dressings should be handled as best as possible with forceps. All dressings should be kept in the plastic bags provided.

O. At the conclusion of treatment, a survey of the room and toilet will be performed to ensure that radiation levels are at background. The room and toilet cannot be re-used until this survey is conducted, all radiation badges and moitors are collected, and the special radiation signs removed by a member of the Nuclear Medicine Division.

P. Contaminated Equipment - Any equipment suspected of being contaminated with urine or vomitus should be monitored by the Nuclear Medicine Division (Extension 5581).

11.03 Excretions from Patients Treated with Therapeutic Doses of Radioactive Iodine Should be Handled as Follows:

A. Urine should be collected only when requested, or when it is suggested that the patient is incontinent. Urine when collected should be placed directly into a lead shielded bottle via a funnel. The

funnel, bottle and shielding may be obtained from the RSO. The urine will be disposed of by the Nuclear Medicine Division. Using rubber gloves, any spillage should be placed in the marked radioactivity disposal can. Encourage thepatient to take care of his own collection if possible. In cases where urine is not being retained, it may be disposed of in a toilet, followed by three flushes, taking care not to spill.

B. Stools - They may be disposed of in the ususal way via the toilet, unless retention is requested by the physician.

C. Sputum and Vomitus - should the patient vomit after therapy, the vomitus (and sputum) should be collected in a water-proofed container and saved within the room. It should be labeled with the name of the patient, date, and time of vomiting. If the vomitus is spilled it should be wiped up with towels by the nursing staff wearing rubber gloves. All linens soiled by vomitus and other contaminated materials should be deposited in the plastic bags provided.

D. Incontinence - If there has been a large spill of urine or vomitus, notify the Nuclear Medicine Division. Do not handle the damp bed clothes without plastic or rubber gloves.

11.03 General Radiation Safety Precautions in the use of Sealed Brachytherapy Sources

I. Hospitalization

A. Patients receiving permanent implants of sealed sources, such as radon seeds or I-125 seeds shall be hospitalized until the total activity is less than 30. mc. No patient having more than 10. 0mc of activity will be released from the hospital without the consent of the Radiation Safety Officer.

B. Patients receiving temporary implants or applications of sealed sources will be hospitalized until the sources are removed.

C. Hospitalized patients will be confined to a private room and will be restricted to the portion of the room which will ensure that the exposure rates in adjoining unrestricted areas are at levels less than those specified in Section 20.105 (b), 10 CFR 20. The patient's room will be posted in accordance with Section 20.203, 10 CFR Part 20.

D. Visitors will be limited to non-pregnant individuals 18 years of age or older.

II. Surveys

A. Exposure rate surveys will be made within and around the patient's room at the earliest practical time. Records shall be made of these observations and will be transmitted to the Radiation Safety Officer,

or his designate, who will then post the permissible exposure times for personnel at the bedside, 6 feet from the bedside, and at the entrance to the room.

B. At the conclusion of the treatment, a survey shall be made to ensure that the sources have all been recovered. All signs and postings pertaining to the use of radioactive materials will be removed from the patient's room and adjoining areas.

III. Instructions to Nursing Personnel

The physician applying the brachytherapy sources and the Radiation Safety Officer are responsible for the notification of nursing personnel that radiation safety precautions have been instituted.

Written notice shall be entered into the patient's chart and verbal notice shall be given to the head nurse. The form "Instructions for Persons Attending Patients being Treated with Brachytherapy Sources" will be posted at the door to the Patient's room. At the removal of the sources, notification of the termination of the radioactive precautions shall be written into the patient's chart and verbal notice will be given to the head nurse. The Radiation Safety Officer will also be notified.

11.04 Specific Precautions for Patients Receiving Radium, Cesium, or Cobalt Needle Therapy

A. No special precautions are needed for sputum, urine, stools, dishes, instruments, utensils, or bedding unless specifically ordered.

B. Never handle needles, capsules or small boxes containing radioactive needles with hands. Use forceps, 12 inches or longer and put it in the corner of the room or in the shielded container and contact Radiation Therapy (Ext. 7145) at once.

C. Bed baths given by the nurse should be omitted while the source is in place.

D. All nurses involved in the personal care of a patient treated with these needles should wear a film badge at waist level. Supervisory nursing staff are responsible for requesting film badges for each shift. Badges may be obtained from the Radiation Safety Officer, Extension 7562. The badges will be collected and replaced monthly. A badge shall be worn by the nurse to whom it is issued and shall not be exchanged between nurses. TLD finger badges will also be assigned to nurses who must provide extended personal care to the patient.

E. Pregnant nurses should not be assigned to the personal care of patients receiving these radioactive inserts.

G. Surgical dressings and bandages used to cover the area of needle insertion may be changed only by the attending physician or radiologist and MAY NOT BE DISCARDED until directed by the radiologist. Dressing should be kept in a basin for examination by the radiologist before disposal by routine methods.

H. Special orders will be written for oral hygiene of patients having radium, cesium, or cobalt inserts at the oral cavity.

I. Visitors in the room must stay at least 4 feet from the edge of the bed and for no longer than 1 hour per day. More stringent restrictions may be imposed to meet individual needs.

J. If the radioactive needles or capsules become loose or fall out, call the Radiologist (or Radiology Resident on call) immediately. (See also Section 10.0 Emergency Plans).

11.05 Nursing Care of Patients Receiving Radioactive Gold

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

B. For patients treated with radioactive gold, nurses should spend only the necessary time near a patient for routine nursing care, and must obtain and wear a film badge. Film badges should be worn at waist level. The badges are to be replaced monthly. A badge shall be worn only by the nurse to whom it is issued and shall not be exchanged between nurses. Pregnant nurses should not be assigned to the care of a patient treated with radioactive gold. TLD finger badges will be assigned to nurses who must provide extended personal care.

C. Surgical dressing and badages may be changed only as directed by the physician administering the radiation treatment. If there is no drainage from the puncture wound, dressings may be handled in the usual manner after the first 2 or 3 days. Surgical dressings used over the puncture wound during the first few days may not be discarded until directed by the Chief, Nuclear Medicine Division, or the Radiation Safety Officer.

D. Bed baths for patients treated with Radioactive Gold should be omitted for the first 48 hours unless specifically ordered.

E. Bedding may be changed as usual unless there has been drainage from the puncture wound, in which case the Chief, Nuclear Medicine Division or RSO should be notified and he will direct handling of the soiled bedding.

F. If there is any question of contamination of bedding, furniture, instruments, clothing, floor, utensils, etc., immediately call the RSO, Extension 7562, to have materials monitored and direct cleaning and disposal operations. Do not touch with bare hands any damp or bloodly dressings or other soiled objects. Keep such materials in a basin near the patient's bed or table until further instructions are obtained from the RSO or Nuclear Medicine Division. (See also Section 10.0 Emergency Plans).

11.06 Nursing Care of Patients Receiving Radioactive Phorphorus in Therapeutic Doses

A. If the P-32 radioactive phorphorus is given intravenously, there is no radiation hazard near the patient and no special precautions are necessary .

B. If given orally, there is no radiation hazard unless the patient vomits within the first 12 hours, in which case follow the instruction given below under "Special Instructions", Paragraph 11.06 G.

C. Nurses may spend whatever time necessary near a patient for routine nursing care, and patients are allowed visitors in accordance with the usual hospital rules.

D. Film badges are not required for nursing personnel handling patients treated with P-32.

E. No special precaution are needed for sputum, stools, dishes, instruments, or bedding. See below (Special Instructions, 11.04 for precautions to be used for vomitus. Urine may be radioactive and should be handled with care as discussed in Paragraph 11.06 below.

F. Special Instructions

1. If the P-32 has been given orally and the patients vomits within 12 hours, the vomitus and any soiled clothing, bedding and utensils should be collected and put into any available covered metal can which should be labeled "Radioactive".

   Wear rubber gloves to do this, and wash the gloved hands at any sink using soap and water. Use plenty of water to wash down the sink. Place the washed gloves after removal with other contaminated items. Call the Nuclear Medicine Division, Ext. 5581 for disposal of these items.

2. If a urinal or bedpan is used, care should be taken to avoid spillage in transferring urine to the toilet. Rubber gloves are advised when handling urine. If urine collection has been ordered, carefully transfer it to a bottle labeled with the patient's name, number, and time of collection which then should be sent to the ordering physician. Urine spillage should be wiped up with paper tissues and these may be flused through the nearest toilet. Gloves should be thoroughly washed with soap and water while still on the hands and then disposed of in the usual way. Likewise, the urinal should be washed at any sink before re-use.

3. If the P-32 is used topically (direct application to the skin under a surgical dressing) do not touch the dressing. If the dressing becomes loose or needs changing, call the Nuclear Medicine Division, Extension 5581 for disposal of these items.

G. In case of loose dressings or any problem or question not answered above, call the Nuclear Medicine Division (Extension 5581) See also Section 10.0 Emergency Plans.

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH

RADIOACTIVE MATERIALS

Patient _____ _____ Room No. _____

Responsible Physician _____ Telephone No. _____

Dose _____ mc* Form _____
Liquid/Capsule

Date & Time Administered _____

Permissible Time for Nursing Duties (each nurse)

Location	Time
At bedside	_____ Minutes/hours
6 feet from patient	_____ Minutes/hours
At doorway	_____ Hours

Rules

1. No pregnant persons or persons under the age of 18 years may enter the room.

2. Hospital personnel entering the room must carry a pocket dosimeter. The readings of the dosimeter must be recorded upon entry and upon exit.

3. Visitors may stay in room for _____ hour each day, but must remain away from the area delineated by the warning tape placed on the floor, at least 6 feet from the patient.

4. The patient must remain in his room until the radiation safety precautions are terminated. Except for trips to the toilet, the patient must remain well within the warning tape area.

5. Urine will be collected only if requested (Collect/do not collect) by the Radiation Safety Officer or the responsible physician.

6. All soiled linen and clothing will be bagged and held for release by the RSO.

7. Personnel must wear rubber or plastic gloves when handling urinals, bed pans, emesis basins, or soiled linen or clothes.

8. Disposable dishes, cups, and eating utensils will be used by the patient.

9. If the patient's condition require his or her removal from the assigned room (emergency surgery), etc.), the RSO and the responsible physician must be notified immediately.

10. The patient may be discharged only after consultation with the RSO or the responsible physician.

11. Upon discharge or removal of the patient from the assigned room, that room may not be cleaned until it is released by the RSO or his designate.

*Radiation Safety Precautions need not be instituted for patients receiving 10.0 millicuries of I-131 or less.

Instructions for Persons Attending Patients being Treated
with Brachytherapy Sources
(To be posted at doorway)

Patient_____ Room No._____

Responsible Physician_____Telehone No._____

Source Description

Isotope_____No. of Sources_____

Total activity_____Applicator type _____

Location of sources in patient_____

Date and Time of Source Application _____ _____

Date and Time of Anticipated Source Removal _____ _____

Permissible Duration of Nursing Duties (each nurse):

At bedside _____(hours) (minutes) (per day)

6 feet from patient ___ _____(hours) (minutes) (per day)

At doorway _____(hours per day)

Rules

1. Pregnant visitors, pregant nurses, and persons under 18 years of age may not enter the room.

2. Eligible visitors may visit for _____hours each day but must remain away from the area delineated by the warning tape placed on the floor.

3. Housekeeping personnel and nurses must wear pocket dosimeters while in the room. Readings of the dosimeters must be recorded when entering and leaving the room. Personnel must remain as far from the patient as duties will permit.

4. Hold soiled linen until released by the Radiation Safety Officer or his designate.

5. The patient may not leave the room and must remain as far as practical from the warning tape on the floor while the sources are applied to the patient. Should the patient's condition require his removal from the room (emergency surgery, intensive care, etc.), the Radiation Safety Officer and the responsible physician must be notified immediately.

6. The Radiation Safety Officer, his designate, or the responsible physician must perform a dismissal survey before the patient is discharged.

7. The Radiation Safety Officer and the responsible physician must be notified immediately if it is suspected that a source or a portion of the applicator has become dislodged from its intended location.

RSO _____
on duty / off duty Telephone Nos. _____/_____

12. HANDLING OF CADAVERS CONTAINING RADIOACTIVE MATERIAL

12.01 Procedure Following Death of a Patient

If a patient contains less than 5 millicuries of a radioactive material and dies in the Hospital, no special precautions are necessary. If the deceased patient contains more than 5 mCi, the doctor signing the death certificate should inform the pathologist & the Hospital RSO of this fact and insure that the cadaver is tagged if there is an autopsy. (See 11.04, 11.05) If no autopsy is performed and the patient contains more than 30 mCi, the doctor signing the death certificate should notify the RSO (ext. 7562) who will notify the funeral director of the radioisotope content, and the precautions required, if any.

12.02 Autopsy Procedures

A. When a cadaver suspected to contain more than 5 mCi of radioactive material is to autopsied, the RSO should be notified. The amount of activity remaining in the body should be estimated by reference to the time elapsed since the administration of the isotope and its biological fate. If the remaining amount is less than 5 mCi, no special precautions are necessary other than the usual wearing of gloves, except in cases of I-131 therapy, where the handling of the thyroid gland should be minimized.

B. Where the residual activity exceeds 5 mCi the following precautions should be followed:

1. Survey the body before it is open if necessary to establish maximum working times.

2. Drain carefully all body fluids and save for assay. In cases of I-131 therapy, the blood and urine will be radio-assayed.

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

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

5. In cases of I-131, the thyroid gland will produce a gamma-ray exposure of about 0.5 r/min near its surface for each 10 mCi in it, and consequently should not be touched by the hand directly. Its removal may be accomplished using long instruments.

C. Highly radioactive fluids should be stored behind a shield and handled carefully to minimize exposure until they have decayed to neligible levels when they can be disposed via the sewage system.

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

13. CARE OF ANIMALS CONTAINING RADIOACTIVE MATERIAL

13.01 Injections of radioactive materials in animals shall be carried out in stainless steel, plastic or enamel trays having absorbent materials in the bottom. Rubber or plastic gloves shall be worn by the worker.

13.02 All cages housing animals injected with radioactive material shall be clearly marked as follows:

a. Name of the radioisotope

b. Amount of radioactive material injected per animal

c. Date of injection

d. Principal investigator's name & phone number

e. "Caution Radioactive Material" tape must be affixed to the cage

13.03 Animals containing radioactive material must be kept in cages apart from other animals.

13.04 All animals excreta which contain radioactivity shall be collected and disposed of, if necessary after storage as determined by the RSO. There are not restrictions for disposal throught the sewage system if the excreta are in a suitable form - i.e., not mixed with saw-dust or wood shavings and if radioactivity levels are within allowable limits. If the excreta show no significant activity above background when monitored by a survey meter appropriate to the radioisotope involved, it may be discarded with normal trash in a suitable container. In all other cases, the excreta shall be labeled with the name of the isotope and the estimated amount of the activity, stored prior to disposal. For information; concerning disposal contact Radiation Safety Officer, Extension 7562.

13.05 The carcasses or dissected parts of injected animals shall be wrapped in absorbent materials and placed in a watertight container so as to prevent dripping during transportation from one area to another.

13.06 Adequate ventilation and air cleaning must be provided in instances where animals are stored after an injection of radioactive materials that may be volatilized and dispersed in the room.

13.07 Animals placed in a refrigerator prior to disposal must be labelled as to isotope, quantity, and date of assay or estimate.

13.08 All disposal should be according to Section 14 of this manual. Questions regarding disposal are to be referred to the RSO.

14. RADIOACTIVE WASTE DISPOSAL

14.01 The disposal of all radioactive waste must be accomplished in accordance with applicable regulations (Ref; Part 20.301 to 20.305 of the U.S. Nuclear Regulatory Commission). The following sections of this manual provide general guidance and requirements for waste disposal methods:

14.02 Disposal of Solid Radioactive Waste:

The disposal of all solid Radioactive waste must be accomplished through delivery to the Nuclear Medicine Division. Arrangements for the receipt of wastes must be made in advance with the NMD. The following package requirement must be met:

1. Package size must not exceed 22x22x30

2. All material must be in waterproof containers.

3. All needles or sharp edges must be contained or protected to prevent punctures.

4. The inner leak proof container must be surrounded with sufficient absorbing material so that any liquids which might be released will be absorbed. These packages should not include any significant liquid volumes. Absolutely no gaseous waste shall be included.

5. Exposure rates on the surfaces of the container are to be measured and recorded.

6. The package must have a label bearing the Radiation Caution Symbol and the words, "Caution, Radioactive Material" or "Danger, Radioactive Material" also on the label must be a notation of the type of radioactive materials and estimate of their quantities.

14.03 Incineration:

Absolutely no incineration of radioactive materials is permitted except by written authority from the U.S. Nuclear Regulatory Commission.

14.04 Disposal of Liquid Waste (See 14.05 for Human Wastes)

There are two methods available for the liquid wastes.

A. Disposal to Sanitary Sewer
Disposal to the sanitary sewer is permitted provided that:

1. The liquid is soluble or readily dispersible in water.

2. The total activity released during one day at one approved disposal sink does not exceed 100 microcuries.

3. The sink used for such disposal has been approved for this use by the RSO and that it has been posted with signs bearing instructions for waste disposal. Instructions for keeping records of all disposals and the location and telephone number of the RSO should be posted.

4. All materials disposed in the sink are well diluted with tap water.

5. See Section 14.06 for required records.

6. Permission to exceed the 100 microcuries per day must be obtained from the RSO prior to release.

B. Delivery of Liquids to Nuclear Medicine Division

Liquids may be delivered to NMD for disposal provided that:

1. Arrangements for receipt of the material has been made in advance with the NMD.

2. All liquids must be delivered in waterproof, sealed containers surrounded with sufficient material to absorb twice the enclosed liquid volume.

3. Containers must be adequately shielded.

4. Containers must have a label bearing the words "Caution, Radioactive Materials". Also on the label must be a notation of the type of radioactive materials and an estimate of their quantities.

14.05 Human Waste:

A. Urine and Stool

Specific instructions for the disposal of urine or stool from a patient who has received a therapeutic dose of radioisotopes are given in the section of this manual dealing with nursing procedures. In all other cases urine & stool should be disposed of in the normal manner unless the RSO directs otherwise.

B. Sputum and Vomitus

See specific instructions in nursing procedures section of this manual. Normally these wastes are disposed in the usual manner.

14.06 Records of Waste Disposal:

The U.S. Nuclear Regulatory Commission requires that records be kept of all radioisotopes which are disposed. The information listed below must appear on these records.

1. The specific isotope discarded.

2. The chemical form of each isotope.

3. The total activity of each chemical form of each isotope.

   The activity is to be recorded in units of microcuries.

NOTE: Units such as counts per minute or mr/hr are acceptable.

4. The method of disposal must be specified.

5. The date of the disposal.

6. The name of the person performing the disposal.

7. The record will be kept by RSO.

15. INVESTIGATIONAL LEVELS OF INDIVIDUAL OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

15.01 Occupational exposure to ionizing radiation is that exposure incurred as a result of an individual's employment or duties. Occupational exposure shall not be deemed to include the exposure of an individual to sources of ionizing radiation for the purpose of medical diagnosis or therapy of that individual.

15.02 No user shall possess, use, or transfer a radiation source in such a manner as to cause any individual in a Radiation Controlled Area to receive a dose in excess of the limits specified as in the following sections.

15.03 No individual under eighteen (18) years of age shall be occupationally exposed to ionizing radiation.

15.04 Establishment of Investigational Levels In Order to Monitor Individual Occupational External Radiation Exposures

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

INVESTIGATION LEVELS
(mrems per calendar quarter)

	LEVEL I	LEVEL II
1. Whole body; head & trunk; active blood forming organs; lens of eyes; or gonads	125	375
2. Hands & forearms: feet & 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.

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 0-1 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 Infestigational Level I and will report the results of the 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 in index of ALARA program quality and will record the review in the Committee minutes.

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, will 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 RSC 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. Reestablishment of an individual occupational worker's Investigational Level II to a level above that listed in Table 0-1.

In cases where a worker's or a group of workers' exposure 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 for that individual or group. Justification for a new Investigational Level II will be documented.

The RSC 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 6.c above will be followed.

16. BIBLIOGRAPHY

16.01 Nuclear Regulatory Commission, Code of Federal Regulations, Title 10, Parts 19 (December, 1983), Part 20 (May, 1983), Part 30 (September, 1982), Part 31 (September, 1982) and Part 35 (January, 1983).

16.02 Radiation Protection Standards of the District of Columbia, effective March 19, 1976.

16.03 The following reports have been published by the National Council on Radiation Protection and Measurements (NCRP).

NCRP Publications
7910 Woodmont Avenue, Suite 1016
Bethesda, Maryland 20815

Report No. 8 Control and Removal of Radioactive Contamination in Laboratories (1951).

No. 9 Recommendations for Waste Disposal of Phosphorus-32 and Iodine-131 for Medical Users (1951)

No. 22 Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure (1959) (includes Addendum 1 issued in August, 1963)

No. 30 Safe Handling of Radioactive Materials (1964)

No. 32 Radiation Protection in Educational Institutions (1966)

No. 33 Medical X-ray and Gamma-ray Protection for Energies up to 10 Mev - Equipment Design and Use (1968)

No. 35 Dental X-ray Protection (1970)

No. 37 Precautions in the Management of Patients Who Have Received Therapeutic Amounts of Radionuclides (1970)

No. 39 Basic Radiation Protection Criteria (1971)

No. 40 Protection Against Radiation From Brachytherapy Sources (1972)

No. 43 Review of the Current State of Radiation Protection Philosophy (1975)

No. 45 Natural Background Radiation in the United States (1975)

No. 48 Radiation Protection for Medical and Allied Health Personnel (1976)

Report No. 49 Structural Shielding Design and Evaluation for Medical Use of X-rays and Gamma-Rays of Energies Up to 10 Mev (1976)

No. 53 Review of NCRP Radiation Dose Limit for Embryo and Fetus in Occupationally Exposed Women (1977)

No. 54 Medical Radiation Exposure of Pregnant and Potentially Pregnant Women (1977)

No. 57 Instrumentation and Monitoring Methods for Radiation Protection (1978).

No. 58 A Handbook of Radioactivity Measurements Procedures (1978)

No. 59 Operational Radiation Safety Program (1978)

No. 65 Management of Persons Accidentally Contaminated With Radionuclides (1980)

No. 68 Radiation Protection in Pediatric Radiology (1981)

APPENDIX

A. GLOSSARY

1. By-Product Material (U.S. NRC) (Radioactive Isotope)

   Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

2. Contamination (Radioactive)

   a. A condition in which an undesirable radioactive substance is mixed with a desired substance.

   b. A condition in which radioactive material has spread to places where it may harm persons, spoil experiments, or make products or equipment unsuitable or unsafe for some specific use.

3. Controlled Areas (Radiation Areas)

   A defined area in which the occupational exposure of personnel to radiation or to radioactive material is under the supervision of an individual in charge of radiation protection. (This implies that a controlled area is one that requires control of access, occupancy, and working conditions for radiation protection purposes).

4. Decay (Radioactive)

   The spontaneous transformation with a measurable lifetime of a nuclide into one or more different nuclides. The process involves the emission from the nucleus of alpha particles, electrons, positrons, gamma rays, or the nuclear capture or ejection of orbital electrons, or fission. A synonym for radioactive disintegration.

5. Exposure

   The exposure of X or gamma radiation at a certain place is a measure of the radiation that is based upon its ability to produce ionization in air. The unit of exposure is the roentgen.

APPENDIX

B. ABBREVIATIONS

1. RSC.....Radiation Safety Comittee
2. NRC.....U.S. Nuclear Regulatory Commission
3. NCRP.....National Council on Radiation Protection and Measurements
4. RSO.....Radiation Safety Officer
5. RP.....Radiological Physicist
6. NMD.....Nuclear Medicine Division

BETWEEN: William O. Miller, Chief
License Fee Management Branch
Office of Administration

John E. Glenn, Chief
Nuclear Materials Section B
Division of Engineering and
Technical Programs

~~Money Needed~~

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED

Applicant/Licensee: District of Columbia General Hospital

Application Dated: 7/2/84

Control No.: 02614

License No.: 08-04289-06

2. FEE ATTACHED

Amount: 0

Check No.: 0

7/31/84
0 2120 EX
7B

3. COMMENTS

Signed Brenda P. Latchek

Date 7/3/84

B. LICENSE FEE MANAGEMENT BRANCH

1. Fee Category and Amount: no fee due

2. Correct Fee Paid. Application may be processed for:

Amendment _____

Renewal ✓

License _____

Signed F. Brown

Date 7/12/84

REGION I FORM 213
(MARCH 1983)