CHAPTER III

DIAGNOSTIC USE OF RADIATION EQUIPMENT

This chapter deals with the routine and non-routine uses of ionizing and/or non-ionizing radiation for diagnostic purposes in humans and non-humans.

The use of diagnostic ionizing or non-ionizing equipment for clinical or research use (human or non-human) falls under the purview of the Radiation Control Council and Radiation Usage Committee. This is to protect personnel of the Medical University of South Carolina, as well as its patients. Therefore, prior to any individual receiving authorization to use or order any diagnostic ionizing or non-ionizing equipment, he/she must make application to the Radiation Usage Committee through the Radiation Safety Office.

Procedure for Obtaining Authorization - Human Use

To be able to obtain authorization for use in humans, the applicant must have had prior experience with the use of radiation in a diagnostic setting. He/she must also have had training in the biological aspects and radiation safety aspects of ionizing radiation. In addition, he/she must give demonstrable evidence of diagnostic radiology experience in an approved clinical environment.

When applying for authorization to use diagnostic x-rays on humans, the applicant will fill out the form shown in Appendix B. He/she should complete all sections. Special attention is directed to the section on past training and experience. This information is necessary in order that the Radiation Usage Committee may evaluate his/her expertise in the human use of radiation. The conditions for approval are considered met if the applicant is a graduate of a residency program approved by the American Board of Radiology.

NOTE: All technologists who do radiation studies on humans (diagnostic radiology, cardiac catheterization, operating room, etc.) must be certified by the American Registry of Radiologic Technologists or the American Registry of Clinical Radiologic Technologists. Technologists who are eligible to take the certifying exam may be hired for a period not to exceed 18 months. Student technologists may conduct human studies provided they are supervised by a certified technologist.

In addition to the above training requirements, it will be necessary that each individual who requests x-ray equipment for human use, institute and maintain an approved quality assurance program that will include the x-ray equipment and the processing of the image receptor.

The quality assurance program must meet the basic criteria as established by the Federal Register and the Radiation Safety Officer of the Medical University of South Carolina. The
requirement for such a quality assurance program is based on the concept of as low as possible
dose. This is a cost-benefit relation designed to produce high quality radiology at minimum
exposure to the patient. Thus, basic requirements as to maintenance of beam quality and other
machine parameters to minimize exposure and retakes will be developed and maintained.

Each authorized user will be responsible for all costs and personnel required the quality assurance
program.

Procedure for Obtaining Authorization - Non-Human Use

For non-human uses of diagnostic x-rays, the applicant must have had training in the safe
use of x-rays and training in the areas of radiation biology and radiation safety. The criteria for
approval for non-human use will not be as stringent as those for human use. However, special
attention will be given to the radiation safety program of the applicant in order that personnel,
visitors, and patients will be adequately protected. A sample application form is in Appendix B.

Dental Radiographic Procedures

All dental radiographic procedures shall be carried out under the supervision of a
responsible individual who has had special training in all aspects of dental radiography including
radiation safety and radiation biology.

All technologists who do dental radiography under the guidance of an approved investigator
should meet the criteria established by the American Academy of Dental Radiography. See
Appendix E.

All dental radiographic and film processing equipment shall also be required to meet a
quality assurance program established by the Radiation Safety Officer.

Responsibilities of the Principal Investigator

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

1. To ascertain that the details of these procedures are known and understood by personnel
   under his/her supervision who work with ionizing radiations; to see that new personnel are
   instructed as to the hazards and safety precautions attendant to their duties; to see that new
   personnel will be instructed in a course of action in emergencies; to ensure a completed
   "Certificate of Training" is on file with the Radiation Safety Office for all personnel under
   his/her supervision; to mandate an annual refresher course in an appropriate field of
   radiation. Instruction will be given by the Radiation Safety Office at the request of the
   principal investigator.

2. To ascertain that proper use is made of personnel monitoring equipment assigned to those
   under his/her supervision. It is the responsibility of the principal investigator to ensure
cooperation of personnel under his/her supervision in the distribution and collection of film badges.

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

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

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

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

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

8. To meet all requirements as specified under Title B of the S.C. Rules and Regulations for Radiation Control.

Personnel Monitoring

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

An individual's film badge will be processed immediately when it is suspected that he/she may have received a single exposure greater than 1 mSv (100 mRem), or an accumulated exposure of greater than 3 mSv (300 mRem) in one week. A record of each individual's radiation exposure status (history plus current exposures) will be kept by the Radiation Safety Office. These records will be in compliance with the Federal Regulations outlined in 10 CFR 20 and State Regulations S.C. RHA. 3.5. Personnel exposures shall be maintained as low as reasonably possible in accordance with the ALARA concept. Maximum permissible dose limits are listed in Appendix G. Fetal dose for pregnant personnel shall be limited to one-tenth (0.1) the normal maximum permissible dose (or 5 mSv {0.5 Rems}) during the gestation period.
AT NO TIME WILL A FILM BADGE BE EXPOSED TO RADIATION UNLESS WORN BY THE INDIVIDUAL TO WHOM IT WAS ISSUED.

Any infraction of this regulation may result in the loss of that individual's privilege of working with radioactive materials at the Medical University of South Carolina.

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

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

Requirements for Caution Signs and Labels

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

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

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

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

A sign "NOTICE TO EMPLOYEES: Standards of Protection Against Radiation" will be posted in all radiation areas in compliance with State regulations, S.C. RHA Part VI. See sample in Appendix C.

Other Personnel Safety Requirements

All areas in which ionizing radiations are used will be in compliance with the Occupational Safety and Health Act, 1970 (OSHA), where applicable.
Radiation Surveys

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

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

The authorized user shall bear all costs of Radiation Safety Services.

Diagnostic Non-Ionizing Equipment

The procedures above for the use of ionizing radiation equipment in human and non-human use apply also to the use of diagnostic equipment utilizing non-ionizing radiation. This includes, but is not limited to, ultrasonic, nuclear magnetic resonance imaging, lasers and other non-ionizing imaging modalities currently in use or to be placed in use in the future. The requirements for training of authorized user, equipment operating personnel, and quality assurance program for such equipment applies as in the case of ionizing radiation equipment usage. The same procedure must be adhered to in obtaining authorization for human and non-human use as with ionizing radiation equipment.