A. Purpose

To establish guidelines for training individuals occupationally exposed to ionizing radiation.

B. Applicability/Scope

These procedures apply to all individuals conducting operations under the jurisdiction of the Columbia University Radiation Safety Program, including Columbia University, Columbia University Medical Center,

C. Definitions

- **ALARA**: Stands for "As low as is reasonably achievable" and means making every reasonable effort to maintain exposures to radiation as far below the dose limits in the NYC Health Code Article 175 as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

- **Authorized Medical Physicist (AMP)**: An individual who:
  (i) Is a "professional medical physicist" as provided for in Article 166 of the New York State Education Law (§§8700-8709), and meets the requirements of §§175.103(j)(2) and 175.103(j)(15) of the NYC Health Code Article 175; or
  (ii) Is identified as an authorized medical physicist or teletherapy physicist on:
    (A) A specific medical use license issued by the Commission or Agreement State;
    (B) A medical use permit issued by a Commission master material licensee;
    (C) A permit issued by a Commission or Agreement State broad scope medical use licensee; or
    (D) A permit issued by a Commission master material license broad scope medical use permittee.

- **Medical Authorized User (AU)**: A physician, dentist, or podiatrist who:
  (i) Meets the requirements in §§175.103(j)(15) and 175.103(j)(4)(i), 175.103(j)(5)(i), 175.103(j)(6)(i), 175.103(j)(7)(i), 175.103(j)(8)(i), 175.103(j)(10)(i), 175.103(j)(12)(i), or 175.103(j)(13)(i) of the NYC Health Code Article 175; or
  (ii) Is identified as an authorized user on:
    (A) A Department, Agreement State, or U.S. Nuclear Regulatory Commission license that authorizes the medical use of byproduct material; or
    (B) A permit issued by a Commission master material licensee that is authorized to permit the medical use of byproduct material; or
    (C) A permit issued by a Commission or Agreement State specific licensee of broad scope that is authorized to permit the medical use of byproduct material; or
    (D) A permit issued by a Commission master material license broad scope permittee that is authorized to permit the medical use of byproduct material; or
  (iii) Who is named as an authorized user on a certified registration issued by the Department.
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- Millisievert (mSv): The International System of Units (SI) unit of any of the quantities expressed as dose equivalent. The dose equivalent in Sievert is equal to the absorbed dose in gray multiplied by the quality factor. One Sievert is equal to 100 rem.

- Radiation Safety Officer (RSO): An individual who:
  (i) Meets the requirements in §§175.103(j)(1)(i) and 175.103(j)(15) of the NYC Health Code Article 175; or
  (ii) Is identified as a Radiation Safety Officer on:
      (A) A specific medical use license issued by the Department, the Commission, or Agreement State; or
      (B) A medical use permit issued by a Commission master material licensee.

- U.S. Nuclear Regulatory Commission (NRC): An independent agency of the United States government created to ensure the safe use of radioactive materials for beneficial civilian purposes while protecting people and the environment

- Written Directive (WD): An authorized user's written order for the administration of byproduct material or radiation from byproduct material to a specific patient or human research subject, as specified in §175.103(b)(6) of the NYC Health Code Article 175.

D. Procedures

The program provides topics for training, based on the experience, duties, and previous training of individuals. The topics chosen will depend on the purpose of the training, the audience, and the state of learning (background knowledge) of the audience. The program may also be useful to identify topics for annual refresher training. Refresher training should include topics with which the individual is not involved frequently and topics that require reaffirmation. Topics for refresher training need not include review of procedures or basic knowledge that the trainee routinely uses. The program also includes training for Authorized Medical Physicists (AMPs) and Medical Authorized Users (AUs) who engage in or prescribe certain specialized practices.

1. Training for individuals involved in the medical usage of radioactive material or radiation-producing equipment

   Training for professional staff that provide or are involved in the care of patients during diagnostic or therapeutic procedures (e.g., AU, AMP, Authorized Nuclear Pharmacist (ANP), Radiation Safety Officer (RSO), nurse, dosimetrist, technologist, and therapist) should contain the following elements, commensurate with their duties:
   - Basic radiation biology (e.g., interaction of ionizing radiation with cells and tissues);
   - Basic radiation protection to include concepts of time, distance, and shielding;
   - Concept of maintaining exposure ALARA (as low as reasonably achievable);
   - Risk estimates, including comparison with other health risks;
   - Posting requirements;
   - Proper use of personnel dosimetry (when applicable);
   - Access control procedures;
   - Proper use of radiation shielding, if used;
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- Patient release procedures;
- Instruction in procedures for notification of the Radiation Safety Officer and Authorized User, when responding to patient emergencies or death, to ensure that radiation protection issues are identified and addressed in a timely manner. The intent of these procedures should in no way interfere with or be in lieu of appropriate patient care;
- Occupational dose limits and their significance;
- Dose limits to the embryo/fetus, including instruction on declaration of pregnancy;
- Individuals right to be informed of occupational radiation exposure;
- Each individual’s obligation to report unsafe conditions to the RSO;
- Applicable regulations, license conditions, information notices, bulletins, etc.;
- Where copies of the applicable regulations, the Nuclear Regulatory Commission (NRC) license, and its application are posted or made available for examination;
- Recordkeeping requirements;
- Appropriate surveys to be conducted;
- Proper use and calibration of required survey instruments;
- Emergency procedures;
- Decontamination and release of facilities and equipment;
- Dose to individual members of the public; and
- Licensee’s operating procedures (e.g., survey requirements, instrument calibration, waste management, sealed-source leak testing).

### 2. Training for individuals involved in nonmedical usage of radioactive material or radiation-producing equipment

Training of individuals working with radioactive material or radiation-producing equipment for nonmedical uses or animals containing radioactive material may include, as appropriate, the elements that are listed above (Section D.1). All training should be commensurate with the individual’s duties.

### 3. Training for individuals directly involved in administration to or care of patients administered radioactive material for which a written directive is required (including greater-than-30 microcuries of i-131), or therapeutic treatment planning

In addition to the topics identified above, the following topics may be included in instruction for staff involved in the therapy treatment of patients (e.g., nursing, RSO, AMP, AU, and dosimetrist), commensurate with their duties:
- Leak testing of sealed sources;
- Emergency procedures (including emergency response drills);
- Operating instructions;
- Computerized treatment planning system;
- Dosimetry protocol;
- Detailed pretreatment quality assurance checks;
- Safe handling (when applicable) of the patient’s dishes, linens, excretions (saliva, urine, feces), and surgical dressings that are potentially contaminated or that may contain radioactive sources;
- Patient control procedures;
- Visitor control procedures, such as visitors’ stay times and safe lines in radiation control areas (patient’s room);
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- Written Directive (WD) Procedures, to ensure that each administration is in accordance with the WD, patient identity is verified, and where applicable, attention is paid to correct positioning of sources and applicators to ensure that treatment is to the correct site (or, for Gamma Stereotactic Surgery (GSR), correct positioning of the helmet);
- Proper use of safety devices and shielding to include safe handling and shielding of dislodged sources (or, in the case of remote after-loaders, disconnected sources);
- Size and appearance of different types of sources and applicators;
- Previous incidents, events, and/or accidents; and
- For remote after-loaders, teletherapy units, and GSR units, initial training provided by the device manufacturer or by individuals certified by the device manufacturer that is device model-specific and includes:
  i. Design, use, and function of the device, including safety systems and interpretation of various error codes and conditions, displays, indicators, and alarms;
  ii. Hands-on training in actual operation of the device under the direct supervision of an experienced user, including “dry runs” (using dummy sources) of routine patient setup and treatment and implementation of the licensee’s emergency procedures;
  iii. A method, such as practical examinations, to determine each trainee’s competency to use the device for each type of proposed use.

4. Additional training for authorized medical physicists (AMPs)

Certain tasks requiring special training should ensure that the AMP is trained in the activities (e.g. remote afterloader therapy, teletherapy, stereotaxic radiosurgery, the use of the treatment planning systems, as well as the calculation of activity of Strontium-90 sources used for ophthalmic treatments.) Medical physicists must also have training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use, and the operation of a treatment planning system.

5. Additional training for authorized users for medical uses of radioactive materials for which a written directive is required

Authorized Users should carefully consider the type of radiation therapy that is contemplated. In addition to the training and experience requirements described above, attention should be focused on additional training and experience necessary for treatment planning and quality control systems, and clinical procedures associated with specialized uses of radiation.

6. Training for ancillary staff

For the purposes of this section, ancillary staff includes personnel engaged in janitorial and housekeeping duties, dietary, laboratory, security, and life-safety services. The training program for ancillary staff performing duties that are likely to result in a dose in excess of 1 mSv (100 mrem) will include instruction commensurate with potential radiological health protection problems present in the work place. Alternatively, prohibitions on entry into controlled or restricted areas may be applied to ancillary personnel unless escorted by trained personnel. Topics of instruction may include the following:

- Storage, transfer, or use of radiation and/or radioactive material;
• Potential biological effects associated with exposure to radiation and/or radioactive material, precautions or procedures to minimize exposure, and the purposes and functions of protective devices (e.g., basic radiation protection concepts of time, distance, and shielding);
• The applicable provisions of regulations, licenses and permits for the protection of personnel from exposure to radiation and/or radioactive material (e.g., posting and labeling of radioactive material);
• Responsibility to report promptly to the licensee any condition that may lead to or cause a violation of NRC regulations and licenses or unnecessary exposure to radiation and/or radioactive material (e.g., notification of the RSO regarding radiation protection issues);
• Appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and/or radioactive material; and
• Radiation exposure reports that workers may request.

E. Responsibilities

Principal Supervisor: Identify individuals that must receive radiation safety instruction before assuming duties with, or in the vicinity of, radioactive materials or radiation-producing equipment. Individuals must also receive radiation safety instruction during annual refresher training, and whenever there is a significant change in duties, regulations, terms of the license / permit, or type of radioactive material or therapy device used.

Radiation Safety: Develop and deliver training of course content to necessary individuals in an appropriate fashion and maintain training records.

F. Emergency Contact

CUMC Radiation Safety: (212) 305-0303

G. Medical Surveillance - N/A

H. Recordkeeping

Records of worker training will be maintained for at least 3 years. The training record sign-in sheets should include: the date of training, name(s) of the instructor(s), and name(s) of the attendee(s).

I. Appendices - N/A

J. Forms - N/A

K. References

Joint Radiation Safety Manual
NYC Health Code Article 175 - Radiation Control
10 NYCCR Part 16 - Radiation Control
10 CFR Part 20 – Standards for Protection Against Radiation

L. Acknowledgements - N/A