

**GUIDELINES  
FOR  
NUCLEAR PHARMACY TECHNICIAN  
TRAINING PROGRAMS**



Prepared by Ad Hoc Committee on Nuclear Pharmacy Technicians  
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## NUCLEAR PHARMACY TECHNICIAN TRAINING OBJECTIVES

### Objective I

The nuclear pharmacy technician should demonstrate appropriate knowledge and understanding of the nuclear pharmacy practice site with emphasis on the technician duties and responsibilities, including standards of ethics governing pharmacy practice.

**Competencies.** The nuclear pharmacy technician should be able to:

1. Interpret the pharmacy's organizational chart in terms of general responsibilities and job status of personnel with whom the technician will have contact in carrying out assigned duties;
2. State the general employee performance standards of the pharmacy including reasons for initiation of disciplinary actions;
3. State all of the nuclear pharmacy technician's primary job responsibilities, the duties falling under each, and how these differ from the primary responsibility of the nuclear pharmacist;
4. State the pharmacy policies applicable to each of the primary job responsibilities and describe the procedures for each;
5. Define what is meant by a "decision requiring a pharmacist's professional judgement" and cite at least ten (10) examples;
6. Demonstrate the use of correct written skills by drafting a memorandum to the supervisor requesting a change in work schedule;
7. State the general requirements of any local, state, or federal laws that specifically affect any of the nuclear pharmacy technician's responsibilities;
8. Demonstrate appropriate working knowledge of any additional training or safety requirements mandated by the pharmacy or by any local, state, or federal agency by successful completion of any required program(s) (e.g. Notice and Instruction to Workers Frequenting a Restricted Area, Bloodborne Pathogens Instruction); and
9. Demonstrate appropriate working knowledge of the Nuclear Pharmacy Practice Standards as they relate to assisting nuclear pharmacists in providing comprehensive radiopharmaceutical services that include but are not limited to procurement, compounding, quality assurance, dispensing, distribution, and health and safety in the workplace.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Organization, functions, and responsibilities of the pharmacy;
2. Pharmacy policies and procedures, including employee handbook;
3. Orientation to nuclear pharmacy technician duties (job description);
4. Relationship of technicians to pharmacists and other staff;
5. Legal aspects of technician functions, such as:
  - a. Accountability and liability
  - b. Pharmacy regulations; and
6. Other aspects of licensing and regulatory compliance specific to the practice site, such as:
  - a. Radiation Health regulations
  - b. OSHA regulations
  - c. Hazardous Materials management regulations.

## **Objective II**

The nuclear pharmacy technician should have a working knowledge of the radiopharmaceutical terms, abbreviations, and symbols commonly used in prescribing, compounding and dispensing radiopharmaceuticals.

**Competencies.** The technician should be able to:

1. Transcribe and generate computer labels without error for twenty-five (25) radiopharmaceutical orders selected at random from at least four (4) different institutions serviced by the radiopharmacy;
2. Demonstrate a working knowledge of the brand and generic names and abbreviations of commonly used radiopharmaceuticals. (e.g., Cardiolite®, sestamibi, MIBI ); and
3. Define terms specific to the measurement of radioactivity in both the traditional Curie System and International System of Units ( *SI* ) designations that include routine prefixes, decimals and scientific notation.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Radiopharmaceutical-medical terminology; and
2. Radiopharmaceutical abbreviations, symbols and radionuclide abbreviations.

### **Objective III**

The nuclear pharmacy technician should demonstrate an ability to perform the mathematical calculations required for the usual dosage determinations and solution preparations in the preparation and dispensing of radiopharmaceuticals.

**Competencies.** The technician should be able to:

1. Perform conversion calculations between and within the SI and the traditional Curie based system of measurements of radioactivity.
2. Convert without error any given activity to pre and post calibration activity;
3. Perform the calculations necessary to prepare a standard cold kit from a generator elution;
4. Perform the calculations necessary to prepare a time-specific unit dose from a pre or post calibrated prepared radiopharmaceutical; and
5. Perform the calculations necessary to prepare weight-in-volume and volume-in-volume solutions.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Review of fractions, decimals, scientific notation, ratios, and percentages;
2. Review of weights and measures including the English System, Metric System, and Apothecary System;
3. Review of the decay equation;
4. Review of dosage calculations; and
5. Preparation of solutions.

### **Objective IV**

The nuclear pharmacy technician should demonstrate the ability to perform the essential functions relating to drug purchasing and inventory control.

**Competencies.** The technician should be able to:

1. Prepare a written report of a physical inventory of pharmacy drugs and supplies using prepared forms and records;

2. Identify expired radiopharmaceuticals and drug products and appropriately delete the expired products from inventory;
3. Determine, from established reorder levels, which inventoried items should be ordered and in what quantity;
4. Demonstrate an ability to check in a drug shipment by using the packing list or invoice and purchase order, completing the receiving report, and adding the items to the inventory;
5. Demonstrate the ability to appropriately store and retrieve from storage at least ten (10) randomly designated items; and
6. Describe the procedure for lost shipments and for shipments received short or over quantity ordered.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Inventory and purchasing procedures and records;
2. Maintaining radioactive materials records; and
3. Use of computer terminals.

### **Objective V**

The nuclear pharmacy technician should demonstrate a working knowledge of drug dosages by imaging procedure, routes of administration, dosage forms, and be able to distinguish therapeutic from diagnostic radiopharmaceutical utilization.

**Competencies.** The technician should be able to:

1. Distinguish unit-dose and multi-dose prescription amounts;
2. Demonstrate knowledge of the routes of administration for common radiopharmaceuticals;
3. Identify an appropriate radiopharmaceutical dose for a specified imaging procedure for common radiopharmaceuticals (e.g. Tc-99m dosage for thyroid scan, Meckel's diverticulum, red blood cell labeling, or testicular scan); and
4. Distinguish the dose appropriate for diagnostic or therapeutic use of a given radiopharmaceutical (e.g., I-131 for uptake and scan, whole body imaging, hyperthyroidism, or thyroid ablation).

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Sources of radionuclides, radiopharmaceuticals and supplies;
2. Review of diagnostic procedures using radiopharmaceuticals;
3. Review of therapeutic procedures using radiopharmaceuticals;
4. Review radiopharmaceutical dosage forms (capsules, solutions, injectables, gases); and
5. Review of radiopharmaceutical dosages for specific procedures.

### **Objective VI**

The nuclear pharmacy technician should have working knowledge of the procedures and operations relating to the reconstitution, packaging and labeling of radiopharmaceuticals.

**Competencies.** The technician should be able to:

1. Repackage and label twenty-five (25) unit doses from bulk prepared radiopharmaceuticals and correctly complete all necessary records;
2. Demonstrate, for each of five (5) technetium-99m labeled radiopharmaceuticals, the reconstitution and unit or multiple dose packaging in terms of:
  - a. Proper selection and use of each ingredient;
  - b. Correct selection of necessary equipment;
  - c. Proper assembly, use and maintenance of the equipment;
  - d. Accurate calculation and measurement of each ingredient;
  - e. Proper completion of worksheet records and other required information;
  - f. Correct procedure for mixing and preparing radiopharmaceutical;
  - g. Correct procedure for quality control testing of the radiopharmaceutical;
  - h. Proper selection and preparation of dosage containers and closures;
  - i. Proper packaging technique for both unit and multi dose prescriptions and;
  - j. Correct selection and preparation of labels;
3. Identify from the pharmacy reconstitution procedure those functions that must be performed by a pharmacist only; and
4. Demonstrate proper completion of all record-keeping requirements for each formulation.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Measurements of quantity (volume, weight, activity, and number);

2. Use, assembly, and maintenance of equipment and apparatus;
3. Control and recordkeeping procedures;
4. Packaging considerations;
5. Storage and inventory control;
6. Lot numbers and expiration dates and times;
7. Types of drug containers and packages; and
8. Labeling of drug containers and packages.

### **Objective VII**

The nuclear pharmacy technician should have a working knowledge of the procedures and techniques relating to aseptic compounding of radiopharmaceuticals and drug products and the associated parenteral admixture operations.

**Competencies.** The technician should be able to:

1. Define or describe:
  - a. Microbial growth and transmission;
  - b. Origin, pharmacologic effect and prevention of pyrogens;
  - c. Sterility;
  - d. Heat sterilization; and
  - e. "Cold" sterilization;
2. List five (5) different possibilities for contamination of an injectable solution during its preparation and for each possibility a precaution that would prevent the contamination;
3. Describe the occasions when hand washing is required and demonstrate the proper technique.
4. Identify the major components of a laminar airflow hood and state their functions;
5. Demonstrate the proper technique for cleaning and maintaining a laminar airflow hood, including appropriate record keeping;
6. Demonstrate the proper selection of and technique for using a syringe and needle for aseptic withdrawal of the contents of:
  - a. A rubber-capped vial; and
  - b. A glass ampule;

7. Demonstrate the efficacy of employed aseptic techniques by successfully completing a sterile media fill validation test;
8. Demonstrate the proper technique for aseptic reconstitution of a cold kit;
9. Demonstrate the proper technique for visual inspection of radioactive parenteral solutions; and
10. Demonstrate the correct technique and procedure for preparing at least three (3) technetium-99m radiopharmaceuticals, including the proper preparation of the label and completion of appropriate records.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Parenteral routes of administration common to nuclear pharmacy (rationale, precautions and problems);
2. Equipment and systems used with radiopharmaceuticals for parenteral administration (needles and syringes, administration sets, containers, filters, pumps, syringe shields and other shielding devices);
3. Aseptic compounding techniques (specific to the system in use and including the prefilling of syringes);
4. Labeling and recordkeeping; and
5. Quality control (particulate matter inspections and monitoring of contamination).

### **Objective VIII**

The nuclear pharmacy technician should demonstrate the ability to perform the usual technician functions associated with a specific nuclear pharmacy.

**Competencies.** The technician should be able to:

1. Demonstrate the proper technique for Molybdenum-99 / Technetium-99m generator elution, including appropriate record keeping;
2. Describe the specific dispensing and record keeping procedures that apply to the dispensing of:
  - a. Diagnostic radiopharmaceuticals;
  - b. Therapeutic radiopharmaceuticals;
  - c. Non-radioactive drugs; and



- d. Investigational radiopharmaceuticals;
3. List for each of thirty (30) common radiopharmaceuticals the;
    - a. Trade name(s);
    - b. Generic name;
    - c. Usual dose associated with a given procedure; and
    - d. Manufacturer(s), calibration date/time, and expiration time;
  4. Describe for at least ten (10) technetium-99m radiopharmaceuticals, as appropriate:
    - a. Quality control testing for radiochemical purity;
    - b. Quality control testing for radionuclidic purity;
    - c. Quality control testing for chemical purity; and
    - d. Procedural errors that result in substandard radiopharmaceuticals;
  5. Describe the following as they relate to medication errors:
    - a. Potential sources of medication errors;
    - b. Techniques that assist the technician in avoiding and preventing errors;
    - c. Proper procedures for reporting potential errors to the pharmacist; and
    - d. Time-critical component of identifying, reporting and correcting potential medication errors.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Setting up doses for patients;
2. Checking doses;
3. Equipment used to perform quality control testing;
4. Quality control techniques;
5. Review of prescription orders; and
6. Manufacturer package inserts.

### **Objective IX**

The nuclear pharmacy technician should demonstrate the ability to perform the appropriate handling techniques and record keeping functions associated with the reconstitution and dispensing of radiopharmaceuticals.

**Competencies.** The technician should be able to:

1. Demonstrate appropriate radiation safety techniques employed in handling radioactive materials;
2. Carry out the following functions for ten (10) randomly selected radiopharmaceuticals:
  - a. Correctly prepare, using a typewriter or computer, the label;
  - b. Select the proper drugs and desired lots from dispensing stock;
  - c. Accurately measure the product and place in the proper container;
  - d. Properly label the dose container and exterior shielding; and
  - e. Complete the necessary records and documents;
3. Correctly determine the availability of radiopharmaceuticals not in dispensing stock, including:
  - a. Manufacturer;
  - b. Calibration and expiration time;
  - c. Soonest availability; and
  - d. Appropriate order quantity; and
4. Designate from of a list of ten (10) steps involved in radiopharmaceutical dispensing those functions that only a pharmacist may carry out.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Preparing prescription labels;
2. Manufacturer package inserts and information sheets; and
3. Measuring and assaying radioactive materials, radiopharmaceuticals, and other chemical and drug products.

### **Objective X**

The nuclear pharmacy technician should demonstrate the appropriate handling techniques and record keeping functions associated with quality control testing of radiopharmaceuticals.

**Competencies.** The technician should be able to:

1. Carry out the following functions for ten (10) randomly selected radiopharmaceuticals:
  - a. Select the appropriate solvents and media for the radiopharmaceutical chromatographic analysis;
  - b. Accurately perform the appropriate physical test;
  - c. Describe the species identified with the appropriate procedure; and

- d. Complete the necessary records and documents;
3. Correctly carry out the following functions for any generator elution:
    - a. Select the equipment necessary to perform radionuclidic purity;
    - b. Accurately perform the purity test according to the equipment manufacturer's specification;
    - c. Determine the expiration time of the generator elution; and
    - d. Complete the necessary records and documentation; and
  4. Correctly perform sterility testing of both radioactive and non-radioactive products according to pharmacy protocols.

**Training Guidelines.** Suggested topics include, but are not limited to:

1. Performing quality control testing;
2. Review of radiochemical and radionuclidic purity testing;
3. Review of sterility testing of radiopharmaceuticals; and
4. Review of USP and pharmacy standards of quality.