SOCIETY OF NUCLEAR MEDICINE AND MOLECULAR IMAGING
TECHNOLOGIST SECTION

# Positron Emission Tomography (PET) Technologist Scope of Practice and Performance Standards

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**Approved: January 26, 2013**

## Overview of Document

This document includes the Scope of Practice and the Performance Standards for health care professionals that, for the purposes of this document, will be referred to as a positron emission tomography (PET) technologist.

The spectrum of responsibilities for a PET technologist varies widely across the country. Practice components presented in this document provide a basis for establishing the areas of knowledge and performance for the PET technologist. The PET technologist must be in compliance with all federal, state, and institutional guidelines, including proper documentation of initial and continued competency in those practices and activities.

Continuing education is a necessary component in maintaining the skills required to perform all duties and tasks of the PET technologist in this ever-evolving field.

## Limitation of Scope and Disclaimer

This document is intended to set forth the standards in important areas of the PET nuclear medicine technologist's responsibilities. It may not cover all areas which may present themselves in actual practice. These standards do not supersede the judgment of the individual PET nuclear medicine technologist and other healthcare professionals serving the patient in light of all of the facts of the individual case. THE SOCIETY OF NUCLEAR MEDICINE AND MOLECULAR IMAGING AND THE SOCIETY OF NUCLEAR AND MOLECULAR IMAGING TECHNOLOGIST SECTION DISCLAIM ALL LIABILITY ARISING FROM USE OF THESE DOCUMENTS.

## Overview

PET is a medical technology that utilizes sealed and unsealed positron-emitting radioactive materials for diagnostic and research purposes. PET instrumentation may be combined with computed tomography (CT), magnetic resonance (MR) imaging, or other modalities to generate attenuation correction for PET and produce three-dimensional images with or without contrast (adjunctive medications) to enhance the evaluation of physiological processes at a molecular level.

## Technologist Qualified to Perform PET Procedures

Under the direction of an authorized user, the PET technologist is responsible for the use of ionizing and nonionizing radiation to generate fusion images for diagnostic and research purposes. The technologist will review the patient's medical history to understand the patient's illness and pending diagnostic procedure; instruct the patient before, during, and following the procedure; evaluate the satisfactory preparation of the patient before beginning a procedure; and recognize emergency patient conditions and initiate lifesaving first aid when appropriate.

Administrative functions may include supervising other technologists, students, and other personnel; participating in procuring supplies and equipment; documenting laboratory operations; participating in radiation safety protocols and taking an active role in radiation

reduction programs; participating in departmental inspections conducted by various licensing, regulatory, and accrediting agencies; participating in departmental quality assurance or quality improvement projects; and participating in scheduling patient examinations.

Education

**Two pathways exist to obtain an education and certification as a PET technologist:**

A certified nuclear medicine technologist is qualified to perform PET procedures at entry level. The certified nuclear medicine technologist is an individual who is registered or certified by the *Nuclear Medicine Technology Certification Board* (NMTCB) or the *American Registry of Radiologic Technologists* (ARRT) in nuclear medicine technology or is a registered technologist with the Canadian Association of Medical Radiation Technologists (CAMRT).

***Or***

Radiologic technologists and radiation therapy technologists who have qualified and passed the respective certification exams offered by the ARRT or the CAMRT ***and*** qualified and passed the PET specialty exam offered by the NMTCB also qualify as PET technologists. Post primary didactic and clinical training includes satisfactory completion of a minimum of fifteen (15) contact hours each of coursework in radiopharmacy, nuclear medicine instrumentation, and radiation safety and 700 hours of documented post primary clinical experience performing all aspects of PET imaging. Detailed information regarding the didactic and clinical educational requirements for the PET certifying exam can be found at www.nmtcb.org.

**Licensure**

Requirements for licensure of all imaging technologists vary from state to state, so it is important that technologists check the requirements of the state in which they plan to work.

**Certification**

Certification is available from the NMTCB PET specialty exam.

**Continuing Education**

In addition to the general certification requirements, certified technologists also must complete a certain number of continuing education hours to maintain certification. Continuing education is required primarily because of the frequent technological and radiopharmaceutical innovations.

**Code of Ethics**

Technologists qualified to perform PET procedures are members of the health care profession and must strive as individuals and as a group to maintain the highest of ethical standards by adhering to the *Nuclear Medicine Technologist Code of Ethics* approved by the *Society of Nuclear Medicine and Molecular Imaging Technologist Section* (SNMMITS).

The principles of the *Nuclear Medicine Technologist Code of Ethics* as listed below are not laws, but standards of conduct to be used as ethical guidelines by nuclear medicine technologists.

Principle 1

The Nuclear Medicine Technologist will provide services with compassion and respect for the dignity of the individual and with the intent to provide the highest quality of patient care.

Principle 2

The nuclear medicine technologist will provide care without discrimination regarding the nature of the illness or disease, gender, race, religion, sexual preference, or socioeconomic status of the patient.

Principle 3

The nuclear medicine technologist will maintain strict patient confidentiality in accordance with state and federal regulations.

Principle 4

The nuclear medicine technologist will comply with the laws, regulations, and policies governing the practice of nuclear medicine.

Principle 5

The nuclear medicine technologist will continually strive to improve his or her knowledge and technical skills.

Principle 6

The nuclear medicine technologist will not engage in fraud, deception, or criminal activities.

Principle 7

The nuclear medicine technologist will be an advocate for his or her profession.

## Definitions

**Adjunctive Medication:** Involves the identification, preparation, calculation, documentation, administration, and monitoring of adjunctive medication(s) used during an in-vivo, diagnostic imaging, or therapeutic procedure. Adjunctive medications are defined as those medications used to evoke a specific physiological or biochemical response. Also included are the preparation and administration of oral and IV contrast used in the performance of imaging studies.

**ALARA:** Acronym for **A**s **L**ow **A**s **R**easonably **A**chievable. This is a radiation safety principle for minimizing radiation doses and releases of radioactive materials by employing all reasonable methods.

**Authorized User:** The NRC definition under 10 CFR Part 35.2 of an *Authorized User* can be found here: http://www.nrc.gov/reading-rm/doc-collections/cfr/part035/part035-0002.html

**Computed Tomography:** A medical imaging technology that uses a computer to acquire a volume of x-ray–based images, generally reconstructed as two-dimensional (2D) or three-dimensional (3D) pictures of inside the body. These images can be rotated and viewed from any angle. Each CT image is effectively a single "slice" of anatomy.

**Diagnostic Imaging:** Diagnostic imaging uses technologies such as x-ray, CT, MR, ultrasound, traditional nuclear medicine, PET, and single-photon emission computed tomography (SPECT) to provide physicians with a way to look inside the body without surgery. Diagnostic imaging is considered a non-invasive diagnostic technique, as opposed to a biopsy or exploratory surgery. PET, SPECT, and some types of MR imaging also provide information about how certain tissues and organs are functioning.

**Diagnostic Nuclear Medicine:** The use of very small amounts of radioactive materials (called radiopharmaceuticals or radiotracers) to evaluate molecular, metabolic, physiological, and pathologic conditions of the body for the purposes of diagnosis and research. Nuclear medicine procedures often identify abnormalities very early in the progression of a disease.

**Hybrid Imaging:** The combination of two imaging technologies that allows information from two different studies to be presented as a single set of images.

**Imaging Device:** A technological apparatus used to produce detailed images of the inside of the body for diagnostic or therapeutic purposes. Examples of these devices include the gamma camera, CT scanner, PET scanner, MR unit, optical imaging detector, and ultrasound machine.

**Isotope:** Atoms of a single element that have differing masses. Isotopes are either stable or unstable (radioisotope). Radioisotopes are radioactive: they emit particulate (alpha, beta) or electromagnetic (gamma) radiation as they transform or decay into stable isotopes.

**Magnetic Resonance Imaging:** Magnetic resonance (MR) imaging is a diagnostic scan that uses high-strength magnetic fields rather than radiation. MR imaging techniques are used primarily to

study anatomy, but a special type of MR scan, functional MR imaging (fMRI), can be used to map blood flow for functional studies.

**Molecular Imaging:** Molecular imaging is an array of non-invasive, diagnostic imaging technologies that can create images of both physical and functional aspects of the living body at a molecular level. Molecular imaging technologies include, but are not limited to, traditional nuclear medicine, optical imaging, spectroscopy, PET, and SPECT.

**Positron Emission Tomography:** Positron emission tomography is a medical imaging technology using radiopharmaceuticals emitting positrons which annihilate into two photons. These photon pairs are detected by the PET scanner, and the location of the original positron atom can be extrapolated.

## THE SCOPE OF PRACTICE

The scope of practice in PET technology includes, *but is not limited to*, the following areas and responsibilities:

**Patient Care:** Requires the exercise of judgment to assess and respond to the patient's needs before, during, and after diagnostic imaging procedures and in patient medication reconciliation. This includes record keeping in accordance with the Health Insurance Portability and Accountability Act (HIPAA).

**Instrumentation/Quality Control:**
Involves the operation of:

PET imaging systems:
With or without sealed sources of radioactive materials, x-ray tubes, or MR systems for attenuation correction, transmission imaging, or diagnostic CT or MR (when appropriately trained and/or credentialed).

Non-imaging instrumentation:
- Dose calibrators
- Survey instrumentation for exposure and contamination
- Probe and well instrumentation
- Ancillary patient care equipment as authorized by institutional policies
- Infusion systems
- PET radionuclide generators

Quality control:
The evaluation and maintenance of a quality control program for all instrumentation to ensure optimal performance and stability.

**Diagnostic Procedures:** Requires the utilization of appropriate techniques, radiopharmaceuticals, and adjunctive medications as part of a standard protocol to ensure quality diagnostic images and/or laboratory results. Obtains biological samples to perform testing as required for the optimization of patient care and diagnostic quality of procedures.

**Adjunctive Medications:** Involves the identification, preparation, calculation, documentation, administration, and monitoring of adjunctive medication(s) used during a PET procedure. Adjunctive medications are defined as those medications used to evoke a specific physiological or biochemical response. Also included are the preparation and administration of oral and IV contrast used in the performance of imaging studies.

**PET Radiopharmaceuticals:** Involves the safe handling and storage of PET radiopharmaceuticals. This includes, but is not limited to, the procurement, identification, dose calculation, and administration of PET radiopharmaceuticals. It also includes all associated documentation and disposal as appropriate.

**Radiation Safety:** Involves practicing techniques that will minimize radiation exposure to the patient, health care personnel, and general public, through consistently using protective devices, shields, dose reduction, and monitors consistent with ALARA principles and establishing protocols for managing spills and unplanned releases of radiation.

## THE CLINICAL PERFORMANCE STANDARDS

The clinical performance standards for the PET technologist include, *but are not limited to*, the following areas and responsibilities:

### I. Patient Care

A. A PET technologist prepares the patient by:

1. Verifying patient identification, date of last menstrual period, pregnancy/breastfeeding status (and alerting the authorized user if there are concerns about possible pregnancy), and written orders for the procedure.
2. Assuring study appropriateness based on indication and patient symptoms. Consulting with the authorized user and/or referring physician whenever the request is called into question.
3. Obtaining a pertinent medical history, including medications and allergies, and confirming the patient's candidacy for the procedure.
4. Ensuring that any pre-procedural preparation has been completed (e.g., fasting, diet, hydration, glucose levels, voiding, bowel cleansing, and suspension of interfering medications).
5. Ensuring that informed consent has been obtained, as prescribed by the institution, whenever necessary.
6. Properly explaining the procedure to the patient and/or family and, where appropriate, to the parent and/or legal guardian, and when necessary, obtaining the assistance of an interpreter or translator. This includes, but is not limited to, patient involvement, length of study, radiation safety issues, and post-procedure instructions.
7. Collecting specimens and performing pertinent laboratory procedures. Performing in vitro diagnostic testing laboratory analyses as required by established imaging protocols. Additionally, performing in vitro diagnostic testing laboratory procedures to measure the biodistribution of PET radiopharmaceuticals.

B. A PET technologist provides patient care by:

1. Verifying the patient ID according to institutional policy and verifying the appropriateness of the test being ordered.
2. Assuring comfort and care to the patient prior to, during, and after a procedure. This includes, but is not limited to, the monitoring of intravenous lines (i.e., central lines, peripherally inserted central catheters [PICC]), oxygen supplies, and drains. This also includes the operation of blood pressure cuffs, electrocardiogram (ECG) machines, pulse oximeters, glucometers, intravenous pumps, and oxygen delivery regulators as authorized by institutional policies.
3. Inserting and monitoring peripheral intravenous catheters.
4. Monitoring patients who are under minimal sedation in accordance with the American Society of Anesthesiologists [ASA] guidelines for conscious sedation and per institutional guidelines.

5. Establishing and maintaining proper communication with patients (i.e., proper introduction, appropriate explanation of procedure, etc.).
6. Maintaining a professional demeanor at all times to assure the preservation of patients' rights, resulting in the provision of the highest-quality patient care possible.
7. Following recognized infection control practices to provide a safe and sanitary working environment for patients and the general public.
8. Recognizing and responding to an emergency situation at a level commensurate with one's training and competency, including cardiopulmonary resuscitation (CPR); the use of automatic external defibrillators (AED), if applicable; advanced cardiac life support (ACLS); and advanced pediatric life support (PALS).
9. Recognizing, responding to, reporting, and documenting adverse events.

C. A PET technologist performs administrative procedures by:
1. Maintaining an adequate volume of medical/surgical supplies, pharmaceuticals, radiopharmaceuticals, storage media, and other items required to perform procedures in a timely manner.
2. Scheduling patient procedures appropriate to the indication and in the proper sequence.
3. Maintaining appropriate records of administered radioactivity, quality control procedures, patient reports, and other required records applying state and federal guidelines and institutional policies.
4. Developing and revising, when necessary, policies and procedures in accordance with applicable regulations.
5. Actively participating in total quality management/continuous quality improvement programs (i.e., age-specific competencies, patient education, and patient restraint and immobilization).
6. Complying with licensing standards and institutional policies. The PET technologist involved with research must also follow Institutional Research Board protocols and comply with Institutional Animal Care and Use Committee and Food and Drug Administration standards.

## II. Instrumentation/Quality Control

A. A PET technologist evaluates equipment performance, initiates corrective action when necessary, and maintains required records for the quality control program of PET and hybrid imaging systems, CT, and/or MR in accordance with federal and state regulations and institutional policy. Responsibilities include but are not limited to:
1. Identifying system-specific quality control requirements by following recommended initial acceptance quality control procedures and daily, weekly, monthly, quarterly, and annual quality control procedures to evaluate allowable parameter ranges for photon detection/discrimination, spatial resolution, scatter correction, count loss, measurement of random interactions, sensitivity, dead-time loss, and randoms count correction accuracy as recommended by the manufacturer, and required by institutional and accreditation policies.

Recognizing image artifacts requiring imaging system correction and performing corrections and quality assurance as directed by institutional and manufacturer recommendations.

2. Performing and evaluating sinogram acquisition or other routine quality control procedures per manufacturer recommendations to evaluate detector integrity.
3. Acquiring phantom studies to evaluate standard uptake value (SUV) accuracy and/or system performance.
4. Performing PET/CT system quality assurance.
    a. Performing CT system quality assurance.
        i. Daily: Follow manufacturer's described warm-up procedure and automatic monitoring, at various tube voltage (kVp) or current (mAs) settings, of the tube output and detector response.
        ii. Monthly: Perform a phantom evaluation to determine tomographic uniformity accuracy of the CT number for water, image noise, and slice thickness.
    b. Acquiring consistent 2D and/or 3D PET images, using appropriate reconstruction techniques, to display images for interpretation.
    c. Acquiring consistent CT images, depending on scanner capability, with appropriate reconstruction and displaying them.
    d. Setting CT/AC protocols, including mAs, kVp, pitch, and helical scanning.
    e. Verifying the accuracy of ECG and respiratory gating if available and used routinely.
5. Performing PET radionuclide generator quality assurance, daily and before the use of the generator, to include dose calibrator/generator calibration and parent/daughter breakthrough.
6. Performing infusion device quality control per manufacturer recommendations.
7. Operating imaging systems, storage media, and radiation detection and counting devices, including but not limited to imaging detectors, dose calibrators, survey instruments, scintillation probes, well counters, and data processing and image production devices.
    a. Maintaining and operating auxiliary equipment used in PET procedures.
    b. Actively participating in total quality management/continuous quality improvement programs by:
        i. Identifying indicators to be analyzed.
        ii. Gathering and presenting data in appropriate formats, analyzing data, and recommending changes.
8. Operating scintillation probes, well counters, and other laboratory equipment:
    a. Calibrating a spectrometer with a long–half-life radionuclide source.
    b. Determining energy resolution.
    c. Conducting sensitivity measurements at appropriate energies with a standard, long-lived source such as Cs-137 or I-129.
    d. Checking background and determining the cause for levels greater than established normal levels.
    e. Conducting a chi-square test.

f. Maintaining required records for quality control programs in accordance with federal and state regulations and institutional policies.
g. Performing glucometer quality assurance using high and low standards.

9. Operating survey meters:
   a. Ensuring that calibration has been completed within the last 12 months.
   b. Performing a battery check to verify the meter is operational.
   c. Performing a check-source test and comparing with previous results.
   d. Maintaining required records for the quality control program.
10. Operating dose calibrator:
   a. Verifying constancy every day that isotopes are administered to patients, including weekends and on-call hours, and checking channels of the isotopes used that day using a check source with a long half-life.
   b. Verifying linearity quarterly over the entire range of radionuclide activity to be administered to patients, comparing calculated activities to measured activities, and determining correction factors when necessary.
   c. Determining accuracy annually by comparing a set of known activities to measured activities using isotopes of varying energy emissions such as Co-57, Ba-133, and Cs-137.
   d. Upon installation, testing for significant geometric variation in activity measured as a function of sample volume or configuration and determining correction factors when necessary.
   e. Maintaining required records for the quality control program in accordance with federal and state regulations and institutional policies
11. Operating image processors/computer monitors.
   a. Verifying the calibration of the instrument.
   b. Maintaining required records for the quality control program.

## III. Diagnostic Procedures

A. A PET technologist performs imaging procedures by:
   1. Determining appropriate imaging parameters.
      a. Preparing (see Section V.C.), evaluating, and properly administering the prescribed amount of various radiopharmaceuticals and/or pharmaceuticals and contrast.
      b. Selecting the appropriate imaging or data collection parameters.
   2. Administering PET radiopharmaceuticals and/or pharmaceuticals through various routes after appropriate access has been verified and obtained in accordance with established protocols and verifying that the PET radiopharmaceutical meets quality specifications prior to administration (i.e., expiry time, pH, half-life, etc.).
   3. Administering adjunctive medications or PET radiopharmaceuticals.
      a. Verifying patient ID according to institutional policy.
      b. Determining route of administration according to established protocol.
      c. Establishing and/or verifying venipuncture access using aseptic technique.
      d. Using and maintaining established venous access routes (e.g., heparin infusion or infusion pump).

e. Reconciling patient medications per policy to ensure that the patient's current medications will not interact with the PET radiopharmaceutical and/or adjunctive medication used for the ordered exam.
f. Preparing (see Section IV.C.) and administering adjunctive pharmacologic agents, including oral and IV contrast agents, per the appropriate route.
g. Documenting medications and/or PET radiopharmaceutical administrations in the patient medical record in accordance with federal and state regulations and institutional policies.
h. Observing the patient carefully after any pharmaceutical administration for any side effects, and handling such side effects appropriately as described in established policies or as directed by medical staff.

4. Positioning the patient and obtaining images.
   a. Waiting an appropriate time following the administration of a PET radiopharmaceutical or pharmaceutical to begin the imaging procedure protocols, and acquiring additional views as necessary to optimize information content.
   b. Exercising professional judgment in positioning a patient to best demonstrate pathology and to adapt to the patient's limitations.
   c. Positioning the patient using supportive materials and immobilizers, as necessary.
   d. Indicating appropriate anatomic landmarks for each view of the procedure.
   e. Reviewing images to ensure that the required information has been acquired and that the images have been processed properly and are of the highest quality.
5. Assisting in exercise and pharmacologic cardiac testing procedures.
   a. Preparing patients to include the correct placement of ECG electrodes.
   b. Determining if the appropriate test has been ordered based on the ECG rhythm, medical history, and current medications.
   c. Recognizing and responding to ECG changes.
   d. Recognizing the parameters that indicate termination of a cardiac stress study.
   e. Recognizing ECG patterns that are appropriate for image gating.
6. Performing data collection, processing, and analysis.
   a. Performing data collection, processing, and analysis in accordance with established protocols.
   b. Exercising independent judgment in selecting appropriate images for processing.
   c. Obtaining quantitative measurements such as SUV, coronary flow reserve, kinetic modeling, and regional brain analysis as appropriate for the procedure performed.
   d. Defining regions of interest (ROIs) with reproducible results and correctly applying background subtraction.
   e. Performing computer data manipulations as required.

f. Labeling processed images (e.g., anatomical positioning, ROIs, date, and time).
g. Archiving and retrieving data from storage media.

B. A PET technologist may perform non-imaging in vitro and/or radioassay studies by:
1. Operating laboratory equipment, including well counters, probes, and other detection devices to measure the biodistribution of PET radiopharmaceuticals.
2. Preparing doses:
a. Quantitating doses.
i. Calculating and confirming the activity to be used.
ii. Calculating the volume necessary to deliver activity for the prescribed dose.
b. Preparing standard solutions or dosage for phantom use as needed using appropriate volumetric or gravimetric techniques to dilute the standard per institutional protocol.
3. Collecting appropriate biological specimens for procedures using standard precaution techniques as required by protocol.
4. Gathering, validating, and documenting data.
a. Subtracting room background or patient background from appropriate samples.
b. Applying appropriate formulas, including conversion and dilution factors.
c. Calculating results according to the procedure used.
d. Plotting a graph, if necessary, and determining half time by extrapolating to zero time.
e. Reporting both calculated values for a patient and normal range of specific procedures used.
f. Evaluating results for potential error.
5. Managing biohazardous, chemical, and radioactive waste in accordance with applicable state and federal regulations and institutional policy.

**IV. Adjunctive Medications**

A PET technologist displays:

A. A thorough understanding and knowledge of indications, contraindications, warnings, precautions, proper use, drug interactions, and adverse reactions for each adjunct medication to be used.

B. The ability to procure and maintain pharmaceutical products and adjunct supplies by:
1. Anticipating and procuring a sufficient supply of pharmaceuticals for an appropriate period in accordance with anticipated need.
2. Storing pharmaceuticals and supplies in a manner consistent with labeled product safeguards and established facility policies.

C. The ability to properly prepare and administer pharmaceuticals under the direction of an authorized user in accordance with all federal and state regulations and institutional policies by:

1. Employing aseptic technique for manipulation of sterile products and preparations.
2. Selecting and preparing pharmaceuticals in accordance with the manufacturer's specifications.
3. Confirming the quality of a pharmaceutical in accordance with accepted techniques and official standards.
4. Documenting the administered dose, date, and time of all pharmaceuticals in a permanent medical record.
5. Observing the patient for possible complications (e.g., adverse reactions) of adjunctive medication administration, and handling such complications appropriately in conjunction with other available staff.

## V. PET Radiopharmaceuticals

A. A PET technologist displays a:
1. Thorough knowledge of indications, contraindications, warnings, precautions, proper use, drug interactions, and adverse reactions for each PET radiopharmaceutical to be used.
2. Thorough knowledge of molecular-level physiological functions that relate to, but not limited to, glucose metabolism, blood flow, brain oxygen utilization, perfusion, and receptor–ligand binding rates.
3. Thorough knowledge of the physiological processes that relate to organ system function and anatomy and PET radiopharmaceutical demonstration of normal and pathologic states.

B. A PET technologist maintains PET radiopharmaceutical products and adjunct supplies by:
1. Anticipating and procuring a sufficient supply of PET radiopharmaceuticals for an appropriate period in accordance with anticipated need and license possession limits.
2. Maintaining security while storing pharmaceuticals, PET radiopharmaceuticals, and supplies in a manner consistent with the manufacturer's labeled product safeguards, radiation safety considerations, and established facility policies.
3. Performing and documenting radiation survey and wipe tests upon receipt of radioactive materials in accordance with federal and state regulations and institutional policies.
4. Recording receipt of radioactive materials in a permanent record in accordance with federal and state regulations and institutional policies.
5. Following Department of Transportation (DOT) regulations and radiation safety guidelines in the transport, receipt, and shipment of radioactivity in accordance with federal and state regulations and institutional policies.

C. A PET technologist is responsible for the identification and labeling of all PET radiopharmaceutical preparations by:
1. Labeling vials and syringes in accordance with federal and state regulations and institutional policies.

2. Recording PET radiopharmaceutical and medication information on a patient's administration form and permanent preparation records in accordance with federal and state regulations and institutional policies.
3. Labeling and segregating radioactive waste and recording the information in a permanent record in accordance with federal and state regulations and institutional policies.

D. A PET technologist prepares individual dosages under the direction of an authorized user by:
1. Applying radioactive decay calculations to determine the required volume or unit form necessary to deliver the prescribed radioactive dose.
2. Selecting and preparing prescribed dosages and entering the information on a patient's administration form and other permanent records.
3. Appropriately labeling the dose for administration.
4. Checking the dose activity prior to administration in a dose calibrator and comparing this measurement against the shipment documentation.
5. Recording use and/or disposition of radioactive materials in a permanent record by properly storing pharmaceuticals and PET radiopharmaceuticals as stated in federal and state regulations and institutional policies

## VI. Radiation Safety

A. A PET technologist performs all procedures utilizing ionizing radiation safely and effectively in accordance with federal and state regulations and institutional policies including, but not limited to:
1. Maintaining security of radioactive materials.
2. Notifying the appropriate authority when changes occur in the radiation safety program.
3. Assisting in the preparation of license amendments when necessary.
4. Keeping up to date on regulatory changes and complying with all applicable regulations.
5. Maintaining required records.
6. Posting appropriate radiation signage in designated areas.
7. Following federal and state regulations regarding receipt, storage, disposal, and usage of all radioactive materials.
8. Recommending the purchase of radiation protection equipment to meet federal and state regulations and institutional policies.
9. Packaging and monitoring radioactive material for transport according to federal and state regulations, and keeping accurate records of transfer.

B. A PET technologist follows appropriate radiation protection procedures by:
1. Using personnel monitoring devices (film badges, optically stimulated luminescence [OSL] thermoluminescent dosimeters, etc.).
    a. Reviewing personnel exposure records in regard to maximum permissible dose limits.
    b. Taking appropriate measures to reduce exposure.

c. Notifying proper authorities of excessive exposure upon discovery/occurrence.

2. Selecting and using proper syringe shields and other shielding configurations to reduce radiation exposure to patients, personnel, and the general public.
3. Using proper shielding and disposal procedures in compliance with federal and state regulations to maximize patient, technologist, and public protection.
4. Working in a safe but timely manner in order to decrease radiation exposure in consideration of ALARA guidelines.
5. Reviewing personal monitoring device readings to determine if radiation exposure can be further reduced.
6. Working in a manner that minimizes potential contamination of patients, technologists, the public and work areas.

C. A PET technologist monitors for radioactive contamination by:
1. Ensuring that instruments are calibrated at regular intervals or after repairs, according to federal and state regulations.
2. Setting the frequency and locations for surveys and following schedules.
3. Using appropriate survey meters for each type and level of activity.
4. Following federal and state regulations regarding personnel surveys and reporting to the designated authorized user or radiation safety officer.
5. Performing constancy checks on survey meters.
6. Performing wipe tests where applicable.
7. Performing leak tests on sealed sources, when so authorized.
8. Recording data in the required format (e.g., dpm instead of cpm).
9. Evaluating the results of wipe tests and area surveys to determine if action is required.
10. Notifying the radiation safety officer when actions are required by federal and state regulations and institutional policies.

D. A PET technologist performs decontamination procedures in accordance with federal and state regulations and institutional policies by:
1. Wearing personal protective equipment as necessary.
2. Restricting access to the affected area and confining a spill.
3. Removing contamination and monitoring the area and personnel, and repeating the decontamination procedure until activity levels are acceptable.
4. Closing off all areas of fixed contamination that are above acceptable levels, shielding the area, and posting appropriate signs.
5. Identifying, storing, or disposing of contaminated material in accordance with federal and state regulations and institutional policies.
6. Maintaining appropriate decontamination records.
7. Notifying the appropriate authority (e.g., radiation safety officer) in the event of possible overexposure or other violations of federal and state regulations and institutional policies.

E. A PET technologist disposes of radioactive waste in accordance with federal and state regulations and institutional policies by:
   1. Maintaining appropriate records.
   2. Disposing according to license specifications.
   3. Maintaining long- and short-term storage areas.

F. A PET technologist participates in programs designed to instruct other personnel about radiation hazards and principles of radiation safety by:
   1. Using the following teaching concepts:
      a. Types of ionizing radiation.
      b. Biological effects of ionizing radiation.
      c. Limits of dose, exposure, and radiation effect.
      d. Concepts of low-level radiation and health.
      e. Concept of risk versus benefit.
   2. Providing appropriate radiation safety measure instructions.
   3. Providing proper emergency procedures instruction.
   4. Modeling proper radiation safety techniques and shielding in the course of daily duties.

## References

Accreditation Standards for Nuclear Medicine Technologist Education. 2011. http://www.jrcnmt.org/essentials.asp.

American College of Radiology. Technical Guidelines for Nuclear Medicine and Radiopharmaceuticals. 2006. http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/tech-standardsnm.aspx.

American Registry of Radiologic Technologists. Content Specifications. https://www.arrt.org/examinations/contentspecs/NMT_CS_2011.pdf

American Registry of Radiologic Technologists. Task Inventory for Nuclear Medicine Technologist. https://www.arrt.org/pdfs/Examinations/NMT-Task-Inventory.pdf. Published July 2010. Last accessed January 19, 2012.

American Society of Radiologic Technologists. Nuclear Medicine Practice Standards. 2010 https://www.asrt.org/media/pdf/practicestds/GR10_OPI_Strds_NM_PS.pdf

American Society of Radiologic Technologists. Nuclear Medicine Practice Standards. http://www.asrt.org/media/pdf/standards_nm.pdf. Last accessed January 19, 2012.

Blondeau K, Hearten S, Pickett M, Bridges J. Critical Task Analysis Report. Tucker, Georgia: Nuclear Medicine Technology Certification Board; 2000.

Bureau of Labor Statistics. Occupational Outlook Handbook, 2010-11 Edition. Nuclear Medicine Technologists. http://www.bls.gov/oco/ocos104.htm

Glossary of Molecular Imaging Terms. http://interactive.snm.org/index.cfm?PageID=11120

Joint Review Committee on Educational Programs in Nuclear Medicine Technology. Accreditation Standards for Nuclear Medicine Technologist Education. http://jrcnmt.org/sites/jrcnmt/uploads/documents/Accred__Policy_Documents/Standards10_2011.pdf. Published 2010. Updated May 2011. Last accessed January 19, 2012.

Nuclear Medicine Technology Certification Board. Components of Preparedness. Nuclear Medicine Exam: Components of Preparedness. http://www.nmtcb.org/exam/cops.php. Updated 2009. Last accessed January 19, 2012.

Nuclear Medicine Technology Certification Board (NMTCB) Report: Equipment and Procedures in Current Practice (2002).

Performance and Responsibility Guidelines for the Nuclear Medicine Technologist, Socio-Economic Affairs Committee, SNMTS (September 1994).

Performance and Responsibility Guidelines for the Nuclear Medicine Technologist, Socio-Economic Affairs Committee, SNMTS (September 1998).

SNMTS Socioeconomic Affairs Committee. Performance and Responsibility Guidelines for the Nuclear Medicine Technologist. *J Nucl Med Technol.* 2003;31:222–229.

SNMTS Scope of Practice Task Force. Nuclear Medicine Technologist Scope of Practice (September 2008).

SNMTS Educators Task Force Curriculum Subcommittee. NMT Entry-Level Curriculum Guide, 4th Edition (August 2008).

SNMTS Position Paper. Baccalaureate Degree proposed as entry level educational requirements. 2005. http://interactive.snm.org/index.cfm?PageID=4715