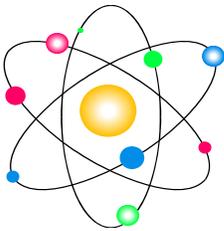
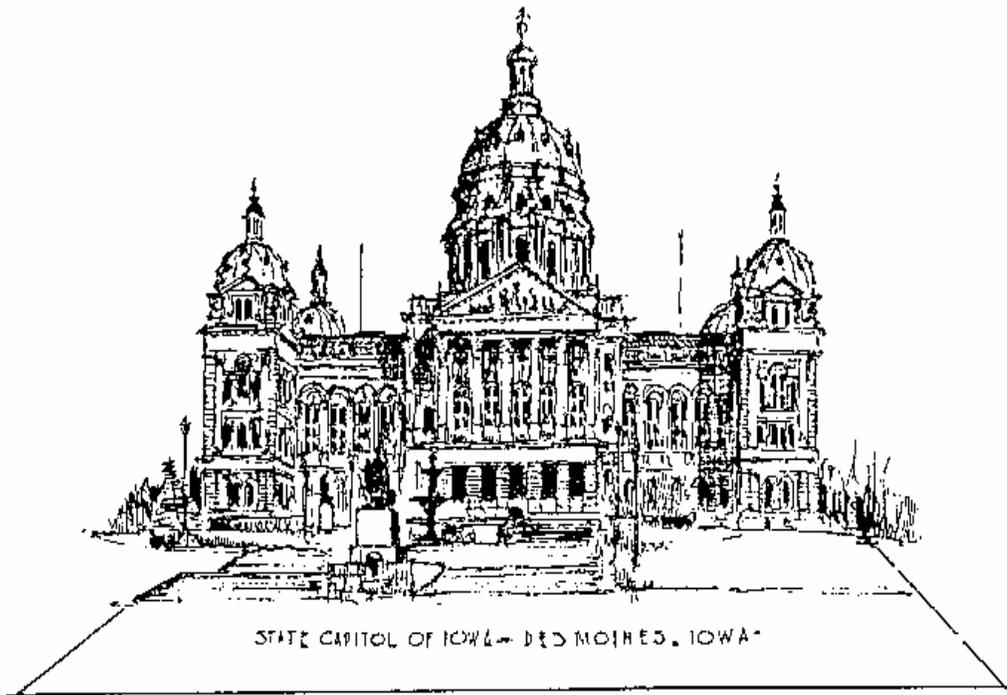

IOWA DEPARTMENT OF PUBLIC HEALTH

NUCLEAR MEDICINE TECHNOLOGIST TRAINING PROGRAM REGULATORY GUIDE



Iowa Department of Public Health
Bureau of Radiological Health
Radioactive Materials Section
Lucas State Office Building, 5th Floor
321 East 12th Street
Des Moines, Iowa 50319-0075

IDPH REGULATORY GUIDE FOR
NUCLEAR MEDICINE TECHNOLOGIST TRAINING

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IDPH REGULATORY GUIDE FOR NUCLEAR MEDICINE TECHNOLOGIST TRAINING

1. INTRODUCTION

1.1 PURPOSE

The Iowa Department of Public Health (IDPH) has established the minimum certification standards for nuclear medicine technologists. This regulatory guide should aid in making application for an approved training program. It will also assist in developing the curriculum, associated training, and testing materials for approved course of study.

1.2 APPLICABLE REGULATIONS

In addition to 641-42.1 (136C), other regulations pertaining to the technologist are found in Chapters 38, 40, 41 and 42 of the IDPH Radiation Machines and Radioactive Materials Rules. You can find the electronic version by going to www.idph.state.ia.us and click on "PROGRAMS". Click on the letter "P" and select Permits to Practice. The regulatory guides can also be accessed at that address.

2. CONTENT OF APPLICATION FOR TRAINING PROGRAM FOR TECHNOLOGISTS

This portion of the guide explains, item by item, the information requested on IDPH application form. (**See Appendix A.**) The appendices to this guide serve to provide additional information on specific subject areas. Model procedures that the applicant may adopt are provided. The applicant may use the model procedures as an outline to develop alternative procedures for review by the IDPH staff.

After review of this guide, if you have specific questions, you may contact:

The Iowa Department of Public Health
Lucas State Office Building, 5th Floor
321 East 12th Street
Des Moines, Iowa 50319-0075

Or you may call 515-281-0415.

Item 1. Institution's Name and Mailing Address

The applicant should be the corporation or institution applying for the training program. The address specified here should be the mailing address for correspondence.

Item 2. Person to Be Contacted About the Application

You should provide the name and telephone number of the individual who is familiar with the proposed technologist's training program and who can answer questions about the application. This individual (usually a supervisor) will serve as the contact point during the review of the application and during the period of the approved training program. Notify the IDPH if this individual changes.

Item 3. Individual(s) To Be In the Training Program.

1. Provide the full name of each individual to be in training program.
2. Provide previous training/experience of the individual and any certification(s) the individual holds.

Item 4. Curriculum for the Training Program.

Describe the training program including didactic and clinical training. List the approximate hours involved, the text that will be used, testing and tracking methods.

For Nuclear Medicine, some training with a nuclear pharmacy should be considered.

Appendix D may be helpful in selecting textbooks for your program.

Appendices E through H may be used to develop the curriculum and track the student's clinical experience.

Item 5. Individuals Responsible for Training

Submit the name and credentials of those individuals who will be actively participating in the student's training (e.g., authorized users, RSO, medical physicist, technologists, physicians, etc.)

Item 6. Radiation Safety Officer's (RSO) Signature

The application for a nuclear medicine training program must be signed by the RSO.

Item 7. Administration Signature and Title

A member of the institution's administration must sign the application. Identify the title of the office held by the individual who signs the application.

The application must be dated.

Note: The applicant may not place into effect any portion of the training program until receiving written verification from the IDPH that the training program has been approved.

No changes to an approved program can be implemented without prior approval.

IDPH may review the program or conduct on-site inspections at any time.

Nuclear Medicine Technologist Training Guide

3.0 PROGRAM OVERSIGHT

Paragraph 641-42.2 (6) states, in part:

- a. Any individual wishing to train an individual as a nuclear medicine technologist must submit a training program to the agency for approval. The request must provide the following:
 - An outline of the didactic and clinical studies to meet the requirements of 42.3(1), 42.4(2), or 42.5(2).
 - Proof that the instructor meets the requirements of this chapter as a nuclear medicine technologist or as an Authorized User listed on an Iowa Radioactive Materials License.
 - A time schedule of the training program. The projected completion date of the clinical portion of the program or course of study shall be within a time period equal to or less than twice that required for the original program or course of study.
 - A description of the mechanism to be used to determine competency.
- b. Upon the completion of the training program, the following must be submitted to the agency:

A statement of competency from the trainer for each area completed.

A statement of permission to allow a representative of the agency to comprehensively evaluate whether the individual meets the training standard.”

DISCUSSION

Appendix B of the regulatory guide is a sample curriculum. You may want to incorporate into your training program. Appendix C of the regulatory guide is an outline of training topics that will assist you in your development of the didactic portion of the training program. You must develop the time frame for your individual program to correlate didactic and clinical training.

The training program will need to describe the process that will be used to determine the competency of the students. Competency can be evaluated by written and/or oral exams, simulation of procedures, or observations. The IDPH will review the entire training program plan prior to the start of the training program and may require an on-site interview. In addition, the approved program can be reviewed by the IDPH at anytime during the training period.

Appendix D may help you select textbooks for the didactic portion of the training.

Appendices E through H may be used in your training program to track the clinical portion of the student's training.

Appendix I may be submitted to the IDPH when the student has completed all aspects of the training program as a statement of competency from the trainer for each area completed by the individual student. Records of each student's progress through the training program and used to document competencies should be retained for three (3) years.

3.1 TRAINING REQUIREMENTS

Paragraph 641-42.4 (2) requires the following:

- a. *General nuclear medicine technologist.* Successful completion of a Joint Review Committee on Educational Programs in Nuclear Medicine approved course of study or equivalent designed to prepare the student to demonstrate competency in the following:
 - (1) Basic anatomy, physiology, and pathology.
 - (2) Intravenous injections and radiopharmaceutical chemistry.
 - (3) Radiation physics and mathematics.
 - (4) Nuclear instrumentation.
 - (5) Radiation biology.
 - (6) Radiation protection and radiation protection standards and codes.
 - (7) Laboratory procedures and techniques (in vivo and in vitro).
 - (8) Clinical application of radiopharmaceuticals used for diagnostic and therapeutic uses and duties performed by the technologist during sealed source procedures.
 - (9) Records and administrative procedures.
 - (10) Medical ethics.
 - (11) Patient care.
- b. *Limited nuclear medicine technologist.* Successful completion of a department–approved training program that prepares the student to demonstrate competency in a specified area. Each program shall include the items in 42.4(2)“a” that are specific to the limited area. Included are laboratory technologists who perform nuclear medicine procedures unless the material handled is regulated under 641—paragraph 39.4(22)“i”.

3.2 SUGGESTED FORMAL DIDACTIC COURSEWORK

In addition to the classroom and testing that has been incorporated into your training program, your program should be supplemented with formal coursework. The coursework should be from an accredited college, university, accredited nuclear medicine program, or be approved continuing education credits recognized by the IDPH. The formal coursework should require satisfactory completion of a minimum of fifteen (15) contact hours of coursework in each of the following areas:

- Radiopharmacy;
- Nuclear medicine instrumentation; and
- Radiation safety.

3.3 STUDENT SUPERVISION

Paragraph 641-42.4(2)"d" states in part "that clinical experience must be **directly supervised** by a certified nuclear medicine technologist or by a physician who appears as an authorized user on an Iowa radioactive materials license. Quality assurance and quality control experience may be directly supervised by a pharmacist who appears as an authorized nuclear pharmacist on an Iowa radioactive materials license."

"Direct supervision" means guidance and instruction by a qualified individual who is physically present and watching the performance of the radiological operation or procedure and in such proximity that contact can be maintained and immediate assistance can be given as required.

3.4 FINAL TESTING OF STUDENT(S)

Paragraph 641-42.4 (3) states, in part:

- a. Any individual seeking certification as a general nuclear medicine technologist shall, in addition to the requirements of 42.4(2), successfully complete a written examination including the subject matter specified in 42.4(2)"a." The following organizations offer approved general examinations:
 - 1). American Registry of Radiologic Technologists.
 - 2). Nuclear Medicine Technology Certification Board.
- b. Any individual seeking certification as a limited nuclear medicine technologist shall, in addition to the requirements of 42.4(2)"b," successfully complete a written examination approved by the department which includes the subject matter specified in 42.4(2)"b."

The student will be required to take an examination prior to being issued a Permit To Practice by the IDPH.

APPENDIX A

APPLICATION FOR TECHNOLOGIST TRAINING PROGRAM

1. INSTITUTION NAME AND ADDRESS:
2. Person to be contacted about application: Name: _____ Phone: _____ Fax: _____
3. Individual(s) to be in training program (Indicate name, previous education and training/experience history).
4. Attach the curriculum that will be followed for training program (include didactic and clinical training).
5. Individuals responsible for training program. (Attach applicable credentials).
6. Radiation Safety Officer's Signature: _____ Date: _____
7. Administrator's Signature and title: _____ Date: _____ _____ Title

APPENDIX B

SAMPLE CURRICULUM

All student(s) shall be provided with a description of the training program, which includes course syllabi (didactic and clinical) with appropriate performance criteria for satisfactory completion.

I. Instructional Plan

The instructional plan must document learning experiences and curriculum sequencing to develop the necessary competencies for completion of the program. The curriculum shall include learning opportunities for students to develop personal and professional attributes and values relevant to practice.

A nuclear medicine technologist education program should foster:

1. Development of skills in problem-solving, critical-thinking, and decision-making, in oral and written communication; in human relations; in patient services; and some familiarity of applicable medical law and ethics;
2. A commitment to make a significant contribution to the healthcare team;
3. An appreciation and respect for cultural diversity;
4. A holistic caregiver's perspective;
5. Understanding of departmental organization and function in relation to the healthcare delivery system as a whole; and
6. Understanding of the value and responsibilities entailed in being a professional.

II. Education in health and basic sciences that will provide cognitive learning experiences as a foundation to understanding and performing clinical responsibilities.

III. Academic instruction for the professional nuclear medicine technology curriculum shall include as a minimum the following content areas:

1. Methods of patient care,
2. Radiation safety and protection,
3. Nuclear medicine physics and radiation physics,
4. Nuclear instrumentation,
5. Statistics,
6. Radionuclide chemistry and radiopharmacy,
7. Radiation biology,
8. Diagnostic nuclear medicine imaging and non-imaging in-vivo and in-vitro procedures,
9. Radionuclide therapy
10. Computer applications for nuclear medicine,
11. Immunology as related to nuclear medicine, and
12. Quality control and quality assurance.

- IV. Supervised clinical education, experience, and discussions shall include the following:
1. Patient care and patient record keeping;
 2. Radiation safety techniques that will minimize radiation exposure to the patient, public, fellow workers and self;
 3. Participation in a quality control program;
 4. Preparation, calculation, identification, administration, disposal of radiopharmaceuticals and performance of all radionuclide quality control procedures;
 5. Performance of an appropriate number and variety of procedures to achieve desired clinical competencies; and
 6. Clinical correlation of nuclear medicine procedures.

APPENDIX C

OUTLINE OF TRAINING TOPICS

After completing the program, each student should have attained a level of knowledge and skill to be capable of performing the following tasks.

- I. Patient Preparation:
 1. verifying patient identification, determining pregnancy status, and reviewing written orders for the procedure;
 2. obtaining a pertinent history and checking for contraindications;
 3. ensuring that informed consent has been obtained when necessary;
 4. explaining the procedure to the patient;
 5. checking patient clothing and linen for objects that may cause artifacts in the images or the proposed measurements; and
 6. waiting an appropriate length of time after the administration of a radiopharmaceutical to begin the procedure.

- II. Patient Care:
 1. acquiring adequate knowledge of the patient's medical history to understand and relate to the patient's illness and the pending diagnostic or therapeutic procedures;
 2. providing for proper comfort and care of the patient prior to, during and after a procedure;
 3. establishing and maintaining good communication with each patient (i.e., making introductions, explaining the procedures, answering questions);
 4. providing functionally safe and sanitary conditions for the patient in compliance with universal protection policies;
 5. recognizing and responding to an emergency condition; and
 - a. initiating a call for assistance;
 - b. monitoring and recording physiologic data (i.e., ECG, pulse rate, respiratory rate);
 - c. administering cardiopulmonary resuscitation when necessary; and
 - d. maintaining intravenous fluids, oxygen, and other life-support assistance until an emergency code team arrives.

- III. Administrative Procedures:
 1. maintaining an adequate volume of medical/surgical supplies, radiopharmaceuticals and film to ensure that a patient procedure can be performed whenever necessary;
 2. scheduling patient procedures;
 3. determining the appropriate sequence for executing multiple procedures;
 4. maintaining appropriate records of patient dosages, quality control procedures, patient reports, and other required records;
 5. revising and developing procedures for reporting or recording incidents required by regulatory agencies in collaboration with an authorized user;
 6. revising and developing policies and procedures in conjunction with administration; and
 7. participating in the quality assurance program.

- IV. Radiation Safety:
 1. using personnel monitoring devices (i.e., dosimeters, film badges, TLD's, etc.); and
 - a. reviewing monthly personnel exposure records in regard to maximum permissible dose limits;
 - b. taking appropriate measures to reduce exposure when necessary; and
 - c. notifying proper authorities of excessive exposure upon occurrence.

2. notifying appropriate authorities when changes occur in the radiation safety program;
3. assisting in the preparation of license amendments when necessary;
4. reviewing and complying with regulations;
5. maintaining required records;
6. posting appropriate signs in designated areas;
7. following regulations regarding receipt and disposition of all radionuclides;
8. carrying out a program to follow regulations regarding therapeutic dosages and follow-up procedures;
9. recommending purchase of protective equipment to meet regulations; and
10. packaging radioactive material according to regulations and keeping accurate records of transfer.

V. Radiation Protection Procedures:

1. selecting and using proper shielding to reduce radiation exposure;
2. using proper methods for storage and disposal of radioactive materials;
3. identifying and using proper procedures for those radionuclides that pose special hazards (i.e., Sr-89, I-131); and
4. performing a bioassay as per state regulations.

VI. Radiation surveys:

1. ensuring that instruments are calibrated at regular intervals or after a repair and as required by regulations;
2. setting frequency and locations for surveys and following schedules;
3. using appropriate survey meters for each type and level of activity;
4. following regulations regarding personnel surveys and reporting to the designated physician 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; and
8. recording data in standard format.

VII. Decontamination procedures:

1. wearing appropriate clothing and foot covering as necessary;
2. blocking access to a contaminated area and confining a spill;
3. removing contamination or reducing the activity to acceptable levels;
4. monitoring the area and personnel involved and repeating decontamination procedures until activity levels are acceptable;
5. closing off all areas of fixed contamination that are above acceptable levels;
6. identifying, storing, or disposing of contaminated material in accordance with regulations;
7. maintaining adequate records concerning cleanup;
8. notifying appropriate authority (i.e., Radiation Safety Officer) in the event of possible overexposure or other violations of regulations; and
9. assessing and managing patient contamination.

VIII. Radioactive Waste Disposal

IX. Participation in a facility's program to instruct other personnel about radiation hazards and principles of radiation safety.

X. Nuclear Instrumentation - Quality Control:

1. assessing camera uniformity;
 - a. selecting a radionuclide source of appropriate type, size, (if necessary), quantity and energy;

- b. selecting an appropriate pulse height analyzer (PHA) photo-peak and window;
 - c. obtaining uniformity images using standardized imaging parameters;
 - d. evaluating the images qualitatively and, if possible, quantitatively in comparison to the manufacturer's specification;
 - e. identifying the source of any non-uniformity (i.e., checking collimator, PHA peak setting); and
 - f. initiating corrective action when necessary.
2. performing a detector spatial linearity evaluation;
 - a. selecting a radionuclide, a spatial linearity phantom and obtaining images;
 - b. identifying any non-linearity in the image and, where possible, determining the source; and
 - c. initiating corrective action when necessary.
 3. performing spatial resolution check;
 - a. selecting an appropriate radionuclide;
 - b. choosing a phantom that is compatible with the specified resolution of the camera;
 - c. analyzing the resulting images for degradation of resolution; and
 - d. initiating corrective action when necessary.
 4. conducting sensitivity check;
 - a. selecting a source with an appropriate level of activity and half-life; and
 - b. assuring identical geometry, source placement, and measurement parameters for repetitive checks.
 5. performing SPECT quality control procedures;
 - a. obtaining a high-count uniformity flood;
 - b. obtaining a center of rotation correction;
 - c. evaluating energy corrections and spatial coordinates;
 - d. verifying multi-head detector alignment;
 - e. evaluating reconstruction results of a phantom acquisition; and
 - f. initiating corrective action when necessary.
 6. checking computer parameter settings and data interface;
 - a. assuring camera and computer register same frame rate at max frame rate;
 - b. verifying that the camera and computer have the same image orientation;
 - c. obtaining a dead-time measurement on the computer; and
 - d. verifying accuracy of ECG gating.
 7. checking the analog and/or digital recording device(s);
 - a. performing a lens focus check (i.e., CRT);
 - b. checking and adjusting imaging device for contrast and brightness (i.e., densitometry);
 - c. assessing integrity of imaging device; and
 - d. maintaining cleanliness of all equipment (i.e., lens, fan covers).
 8. maintaining the required records for the quality control program.
- XI. Evaluation of NaI(Tl) scintillation probes and well counters:
1. calibrating a spectrometer with a long half-life radionuclide source;
 2. determining energy resolution;
 3. performing constancy measurements and determining proper operation;
 4. conducting sensitivity measurements at appropriate energies;
 5. checking background and determining the cause for levels greater than established normal levels;
 6. performing a chi-square test and interpreting results; and
 7. maintaining required records for quality control programs.

- XII. Survey meter operations:
1. ensuring calibration is completed by an approved agent;
 2. performing a reference check-source test and comparing with previous results; and
 3. maintaining required records for quality control program.
- XIII. Dose calibrator:
1. performing a constancy test and determining proper operation;
 2. performing accuracy measurements with a National Institute of Standards and Technology (NIST) source;
 3. ascertaining linearity over the entire range of radionuclide activity to be measured; and
 4. testing for significant geometric variation in activity measured as a function of sample volume or configuration and determining correction factors.
- XIV. Operates and maintains film processors:
1. monitoring and recording sensitometry and temperature of water and dryer daily; and
 2. maintaining required records for quality control program.
- XV. Purchase of radiopharmaceutical products and adjunct supplies:
1. anticipating and procuring a sufficient supply of radioactive drugs for an appropriate time period in accordance with anticipated need and license possession limits;
 2. storing drugs and supplies in a manner consistent with labeled product safeguards and with radiation safety considerations;
 3. performing and documenting radiation wipe tests upon receipt of radioactive materials;
 4. recording receipt of radioactive materials; and
 5. following Department of Transportation (DOT) and radiation safety guidelines in the transport, receipt and shipment of radioactivity.
- XVI. Prepares and verifies quality of radiopharmaceuticals:
1. employing aseptic technique for manipulation of injectable products;
 2. assembling and maintaining radionuclide generators;
 3. eluting radionuclide generators according to manufacturer's specification;
 4. verifying radionuclide purity of generator elutes;
 5. selecting and preparing radiopharmaceuticals in accordance with manufacturer's specification;
 6. calculating and measuring activity of the radionuclide with a dose calibrator;
 7. confirming the quality of a radiopharmaceutical in accordance with accepted techniques and official guidelines;
 8. preparing labeled blood cells (i.e., In-111 WBC) in accordance with established protocols; and
 9. recording use and/or disposition of all radioactive materials.
- XVII Identification and labeling of all radiopharmaceuticals:
1. labeling the container with the radiopharmaceutical, hour, date, expiration time, and radiation symbol;
 2. recording radiopharmaceutical and medication information on a patient's administration form and preparation records; and
 3. labeling and segregating radioactive waste and recording this information.

XVIII. Prepares individual dosages:

1. applying radioactive decay calculations to determine required volume or unit form necessary to deliver the prescribed radioactive dosage;
2. selecting and preparing prescribed dosages and entering this information on a patient's administration form and other records;
3. labeling the dosage for administration; and
4. checking the dosage activity prior to administration in a dose calibrator and comparing this measurement against the identification label of the dose's immediate container.

XIX. Diagnostic imaging procedures:

1. selecting imaging parameters;
 - a. selecting and preparing the instrument for the procedure;
 - b. selecting appropriate parameters for digital and/or analog acquisition; and
 - c. recognizing artifacts that are due to instrumentation malfunction and initiating appropriate action.
2. administering radiopharmaceuticals and/or pharmaceuticals using universal precaution techniques as authorized by the institution
 - a. verifying patient identity prior to the administration of medication or radiopharmaceuticals;
 - b. determining route of administration according to established protocol (i.e., subcutaneous, intramuscular, intravenous, aerosol, or oral);
 - c. establishing and/or verifying venipuncture access using aseptic techniques;
 - d. using and maintaining established venous access routes (i.e., heparin infusion, IMED);
 - e. establishing patterned breathing when introducing radiopharmaceuticals by inhalation;
 - f. administering oral radiopharmaceuticals;
 - g. documenting medication and/or radiopharmaceutical administrations on a patient's permanent record; and
 - h. preparing, determining dosage, and administering non-radioactive pharmaceuticals under medical direction.
3. positioning the patient and obtaining images;
 - a. recording image data according to established protocols and acquiring additional views when needed to optimize information content;
 - b. placing the patient in correct position using supportive materials and immobilizers as necessary;
 - c. exercising independent judgment in positioning a patient or detector unit to best demonstrate pathology;
 - d. indicating appropriate anatomic landmarks for each view of the procedure; and
 - e. reviewing images to assure that correct information is supplied.
4. assisting the physician in cardiac stress testing when performed in conjunction with nuclear medicine procedures;
 - a. preparing patient's skin and placing ECG leads appropriately;
 - b. recognizing and being responsive to any changes that may occur on either a resting or stress ECG; and
 - c. recognizing the parameters that should terminate a cardiac stress study.
5. performing data collection, processing and analysis;
 - a. regions of interest (ROI's) with reproducible results and correctly applying performing data collection, processing and analysis in accordance with established protocols;
 - b. exercising independent judgment in selecting appropriate images for processing;
 - c. selecting appropriate filter, filter parameters, and attenuation correction when reconstructing SPECT images;
 - d. defining regions background subtraction;

- e. performing time activity curve generation and additional manipulation (i.e., $T_{1/2}$);
- f. labeling processed images to reflect anatomical position, ROI's, etc.; and
- g. archiving and retrieving data from storage media.

XX. Non- imaging *in-vivo* and/or radio-assay studies:

1. operating laboratory equipment;
 - a. checking accuracy, precision, and operation of pipetting device; and
 - b. determining hematocrit using appropriate equipment.
2. preparing dosage according to standards;
 - a. quantifying dosage by:
 - 1) determining decay factor and calculating remaining activity;
 - 2) determining volume necessary to deliver activity for the prescribed dosage;
 - 3) drawing dosage into syringe using appropriate techniques and materials;
 - 4) dispensing appropriate quantity of liquid or capsules for the prescribed dosage; and
 - 5) confirming calculated activity by using a dose calibrator.
 - b. preparing standard by:
 - 1) choosing appropriate volumetric or gravimetric techniques to dilute standard;
 - 2) adding radioactive material identical to that given the patient quantity sufficient (q.s.) to appropriate volume; and
 - 3) diluting capsule in appropriate solvent, if necessary, for preparing a standard.
3. collecting proper specimen for procedures using universal precaution techniques;
 - a. collecting blood samples by:
 - 1) selecting proper supplies (i.e., needles, syringes, evacuated tubes, anticoagulants, etc.);
 - 2) labeling patient information on collection containers;
 - 3) performing venipunctures at appropriate time intervals using aseptic technique;
 - 4) adding hemolyzing compounds to samples when necessary;
 - 5) centrifuging blood and separating blood components, as required; and
 - 6) storing aliquot of serum, plasma, or whole blood according to protocol.
 - b. collecting and processing urine samples for radiometric assays by:
 - 1) instructing patient and nursing staff as to correct method and time of urine collection;
 - 2) aliquoting urine sample and measuring total urine volume;
 - 3) measuring specific gravity of urine, if required;
 - 4) recognizing and documenting all technical circumstances which would produce invalid results; and
 - 5) labeling patient information on collection containers.
4. performing calculations;
 - a. subtracting room or patient background from appropriate samples;
 - b. applying appropriate formulas, including conversion and dilution factors;
 - c. calculating results according to procedure used; and
 - d. reporting both patient values and normal range of specific procedures used.
5. managing bio-hazardous waste using disposal methods adopted as facility policy.

XXI. Radionuclide therapy:

1. assuring the correct radiopharmaceutical and dosage are prepared;
2. having the authorized user and the technologist verify the dosage;
3. assuring the patient is correctly identified by the technologist and authorized user according to the Quality Management Program in effect at the particular institution;
4. preparing and/or coordinating environmental preparations (i.e., decontamination supplies);

5. observing prescribed radiation safety procedures during the preparation and the administration of such treatment;
6. assisting the authorized user in supplying proper patient care instructions to hospital staff, patient, and/or caregivers;
7. conducting and documenting radiation surveys of designated patient areas, when indicated; and
8. supplying hospital staff, patient, and/or caregivers with proper instructions on handling and disposal of all contaminated supplies when necessary.

XXII. Maintains appropriate records.

APPENDIX D

TEXTBOOKS FOR DIDACTIC NUCLEAR MEDICINE TRAINING

The following list is not all-inclusive. However, it does indicate some of the more commonly used and available textbooks covering the subject matter.

Ethical and Legal Issues for Imaging Professionals, Towsley-Cook, Young

Principles and Practices of Nuclear Medicine, Early, Sodee

Essentials of Nuclear Medicine Imaging, Mettler, Guiberteau

Nuclear Medicine Technology and Techniques, Bernier, Christian, Langan

Physics and Radiobiology of Nuclear Medicine, Saha

Practical Nuclear Medicine, Sharp, Gemmell, Smith

APPENDIX E

GENERAL LIST OF PATIENT PROCEDURES – NUCLEAR MEDICINE

(To be covered for didactic and clinical training. Note: This may be partial listing.)

1. Perfusion Lung Scan
2. Ventilation Lung Scan
3. Bone Scan
 - a. whole body
 - b. 3-phase
 - c. SPECT
4. Hepatobiliary Scan
5. Liver/Spleen Imaging
 - a. Static
 - b. Static with vascular flow
 - c. SPECT
6. Cardiac
 - a. First Pass
 - b. Ventriculogram
 - c. Shunt studies
 - d. Infarct Scan
 - e. Perfusion Studies (Tl-201 & Tc-99^m)
 - (1) exercise/resting
 - (2) pharmacologic stress/resting
7. GI Bleed Scan
8. Meckels' Diverticulum Imaging
9. Gastric Emptying Study
10. Gastroesophageal reflux study
11. Abscess or Tumor Imaging with or without SPECT
 - a. Gallium
 - b. Labeled white blood cell (Indium-111)
12. Thyroid
 - a. Uptake
 - b. Scan
13. Parathyroid Scan
14. Thyroid Cancer Metastatic Imaging
15. Cerebral spinal Fluid Imaging
16. Brain Imaging
17. Schillings Test
18. Blood Volume Test
19. Thyroid Therapy
20. Therapy (Any)

GENERAL QUALITY CONTROL PROCEDURES LIST

(To be covered for didactic and clinical training. Note: This may be partial listing.)

1. Gamma Camera
 - a. Uniformity – Intrinsic or Extrinsic flood
 - b. Spatial Resolution
 - c. Image Linearity
2. Receiving/Shipping Radioactive Material
 - a. Survey
 - b. Wipe Test
 - c. Label
3. Dose Calibrator
 - a. Constancy
 - b. Linearity
 - c. Accuracy
 - d. Geometry
4. Nuclear Medicine Suite
 - a. Room Survey
 - b. Room Wipe Test

APPENDIX F

IMAGING PROCEDURE EVALUATION FORM

(This form can be used for each type of imaging procedure that the student is comfortable with accomplishing on their own while being evaluated)

(Fill-in blank) _____ Imaging

Performance Objective: Given a patient and the necessary equipment, the student will demonstrate the ability to:

Procedure Preparation

- | | | |
|---|------------------------------|-----------------------------|
| -patient dose, syringes and needles available | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -emesis basins, washcloths and tissues available | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -laundry stocked in the room and the bathroom | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -room and table ready for patient | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -necessary supplies available | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -camera set properly | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -emergency equipment available for use if necessary | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 1. O ₂ tubing and mask and/or nasal cannula | | |
| 2. Suction tubing | | |
| 3. Blood pressure cuff and stethoscope | | |
| 4. Emergency drug box available | | |
| 5. Know availability of nearest crash cart and procedure for calling a code | | |
| 6. Common emergency drugs on hand | | |

Procedure Performance

- | | | |
|---|------------------------------|-----------------------------|
| -patient dressed properly for exam | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -checks orders | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -explains procedure to patient | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -assists patient onto table or to injection area | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -takes patient history and records it for physician | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -gives clear and concise patient instructions | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -positions equipment | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -starts acquisition properly | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -watches patient closely after injection | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -assists patient to bathroom as necessary | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -works with speed and efficiency | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -is aware of and practices good radiation habits | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Exam Completion

- | | | |
|--|------------------------------|-----------------------------|
| -critiques final examination | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -checks study with Physician as necessary | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -produces diagnostic study | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -writes injection amount and Physician's name on requisition | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -places completed exam in proper area | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -documents amount of dose injected and time of injection | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -returns patient to indicated area (their room, ER, OPT, etc.) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -removes soiled linen | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -replaces supplies as necessary | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -maintains a clean and neat working area | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| -makes sure all information is correctly recorded | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Comments: _____

The evaluator's signature verifies that the procedure was completed satisfactorily.

Evaluator's Signature: _____ Date: _____

APPENDIX G

DOSE CALIBRATOR CONSTANCY PROCEDURE EVALUATION

Performance objective: Given the necessary equipment and supplies, the student will demonstrate the ability to:

PERFORMS DOSE CALIBRATOR CONSTANCY CHECK

- | | | |
|--|------------------------------|-----------------------------|
| 1. Completes the quality performance procedure in a timely fashion | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Knows where to locate sealed sources | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Properly changes dose calibrator settings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Accurately measures sealed sources | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Accurately records readings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 6. Knows action limits | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

COMMENTS: _____

The evaluator's signature verifies that the procedure was completed satisfactorily.

Signature: _____ Date: _____

DOSE CALIBRATOR LINEARITY PROCEDURE EVALUATION

Performance objective: Given the necessary equipment and supplies, the student will demonstrate the ability to:

PERFORMS DOSE CALIBRATOR LINEARITY CHECK

- | | | |
|--|------------------------------|-----------------------------|
| 1. Completes the quality performance procedure in a timely fashion | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Knows where to locate equipment/materials needed | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Properly changes dose calibrator settings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Accurately measures material over entire range of activity | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Accurately records readings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 6. Knows action limits | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

COMMENTS: _____

The evaluator's signature verifies that the procedure was completed satisfactorily.

Signature: _____ Date: _____

DOSE CALIBRATOR ACCURACY PROCEDURE EVALUATION

Performance objective: Given the necessary equipment and supplies , the student will demonstrate the ability to:

- | | | |
|--|------------------------------|-----------------------------|
| A. PERFORMS DOSE CALIBRATOR ACCURACY CHECK | | |
| 1. Completes the quality performance procedure in a timely fashion | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Knows where to locate sealed sources | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Properly changes dose calibrator settings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Accurately measures sealed sources | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Accurately records readings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 6. Knows action limits | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

COMMENTS: _____

The evaluator's signature verifies that the procedure was completed satisfactorily.

Signature: _____ Date: _____

DOSE CALIBRATOR GEOMETRY PROCEDURE EVALUATION

Performance objective: Given the necessary equipment and supplies, the student will demonstrate the ability to:

- | | | |
|--|------------------------------|-----------------------------|
| A. PERFORMS DOSE CALIBRATOR GEOMETRY CHECK | | |
| 1. Completes the quality performance procedure in a timely fashion | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Knows how to measure volume and volume configuration correctly | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Properly changes dose calibrator settings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Accurately measures material | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Accurately records readings | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 6. Knows action limits | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

COMMENTS: _____

The evaluator's signature verifies that the procedure was completed satisfactorily.

Signature: _____ Date: _____

APPENDIX I

COMPETENCY CERTIFICATION for NUCLEAR MEDICINE TECHNOLOGIST

TOPIC	DATE	SIGNATURE
Basic anatomy, physiology, and pathology.		
Intravenous injections and radiopharmaceutical chemistry.		
Radiation physics and mathematics.		
Nuclear instrumentation.		
Radiation biology.		
Radiation protection and radiation protection standards and codes.		
Laboratory procedures and techniques (in vivo and in vitro).		
Clinical application of radiopharmaceuticals used for diagnostic and therapeutic procedures.		
Records and administrative procedures.		
Medical ethics.		
Patient care.		
Computer applications		
Immunology as related to nuclear medicine		
Quality control and quality assurance		

STUDENT NAME	SOCIAL SECURITY NUMBER
INSTITUTION NAME	

<u>REVISION</u>	<u>SECTION</u>	<u>DESCRIPTION</u>
07/01/05	ALL	Changed address for the Bureau of Radiological Health