

Essentials and Guidelines

for an

Accredited Educational Program for the Nuclear Medicine Technologist

Essentials initially adopted in 1970; revised in 1976, 1984, 1991, 1997 and 2003

Adopted by the
AMERICAN COLLEGE OF RADIOLOGY
AMERICAN SOCIETY OF RADIOLOGIC TECHNOLOGISTS
SOCIETY OF NUCLEAR MEDICINE
SOCIETY OF NUCLEAR MEDICINE-TECHNOLOGIST SECTION

Program Review Committee
JOINT REVIEW COMMITTEE ON EDUCATIONAL PROGRAMS IN
NUCLEAR MEDICINE TECHNOLOGY

Essentials are the minimum standards of quality used in accrediting programs that prepare individuals to enter the Nuclear Medicine Technology profession. The extent to which a program complies with these standards determines its accreditation status. **Essentials** are printed in regular typeface.

The **Guidelines** provide examples intended to assist in interpreting the **Essentials**. **Guidelines** are printed in italic typeface.

OBJECTIVE:

The medical and health professions cooperate to establish, maintain and promote standards of quality for educational programs in nuclear medicine technology. These standards are to be used for the development and self-evaluation of educational programs.

The Review Committee, assisted by on-site review teams, evaluates a program's compliance with the **Essentials**. Educational programs that meet or exceed the minimum standards stated in the **Essentials** are granted an accreditation status by the **Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT)** providing public recognition of such achievement. Program accreditation is recognized as providing a basic assurance of the scope and quality of professional preparation. Lists of accredited programs are published for the information of prospective students, employers, and the public.

DESCRIPTION OF THE PROFESSION:

Nuclear medicine is the medical specialty that utilizes the nuclear properties of radioactive and stable nuclides to make diagnostic evaluations of the physiologic and/or anatomic conditions of the body and to provide therapy with unsealed radioactive sources. The Nuclear Medicine Technologist is an allied health professional who, under the direction of an authorized user, is committed to applying the art and skill of diagnostic evaluation and therapeutics through the safe and effective use of radionuclides. Responsibilities include, but are not limited to: preparation, quality control testing and administration of radioactive compounds; execution of patient imaging procedures including computer processing and image enhancement; laboratory testing; patient interviews; instruction and preparation for administration of prescribed radioactive compounds for therapy; quality control; and radiation safety. The nuclear medicine technologist exhibits professionalism in the performance of these duties, demonstrates an empathetic and instructional approach to patient care, and maintains confidentiality of information as required. He/she applies knowledge of radiation physics and safety regulations to limit radiation exposure of the general public, patients, fellow workers, and self to as low as reasonably achievable (ALARA). Professional growth and development is achieved through appropriate utilization of new technologies such as PET cross-sectional fusion technology and participation in medical and technical education and research to enhance the quality of patient care.

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REQUIREMENTS FOR ACCREDITATION

ESSENTIAL I SPONSORSHIP

The nuclear medicine technology program shall be conducted in an institution that has documented its commitment to quality, integrity and performance.

I.A

Sponsoring Institution

The sponsoring institution and affiliates must be able to provide resources needed to fulfill the mission and educational goals of the program and must be accredited by recognized regional, national and/or state agencies.

Educational programs shall be located in:

1. colleges and universities,
2. community and junior colleges,
3. nuclear medicine laboratories,
4. hospitals and medical centers,
5. medical schools,
6. postsecondary vocational technical schools and institutions, or
7. other institutions or consortia that meet comparable standards for education in nuclear medicine technology.

Guideline

The JRCNMT accredits individual programs sponsored by institutions. An institution inviting JRCNMT accreditation of a nuclear medicine technology program, including site visitation, must demonstrate that it is accredited by a nationally recognized education accrediting agency or be officially designated as having candidate status, or meet equivalent standards. Institutional accreditors include the regional associations; associations devoted to proprietary school evaluation; the Joint Commission on Accreditation of Healthcare Organizations (hospital accreditation programs); programs sponsored by Federal agencies, such as the military service and the Veteran's Administration; and bodies such as a state department of education that approves (institutionally accredits) adult vocational training centers at the postsecondary level.

Clinical education facilities that carry the same corporate name but have separate radioactive materials licenses, geographic locations and/or different CEO's, administrative structures and staff will be considered separate facilities. A single affiliation agreement may be submitted for a corporate entity, but this agreement must clearly define all participating institutions. Final decisions on institutional status will be made by the Executive Officers of the JRCNMT Board of Directors and will be based upon considerations dealing with student protection and education.

I.B

Affiliated Institution(s)

Affiliated institutions shall be located in geographic locations that allow the sponsoring institution to maintain direct supervision, coordination, and continuing communication to ensure that students enrolled receive uniform and adequate instruction and clinical experience. There shall be documented, ongoing communication between the institution and its affiliates for review of the program and its operation. Meetings shall be held at least semi-annually, one of which must be in the form of a formal meeting. Whenever an alternative to a formal meeting is employed, the methodology must be fully described and available for review. Meetings conducted by an alternative methodology must document how program goals and operations were reviewed and the interactive nature of the process. Each affiliated institution and the sponsoring institution shall appoint a representative from the nuclear medicine technology faculty to attend such meetings.

Guideline *In programs in which the education is provided by two or more institutions, responsibilities of each institution for program administration, instruction, and supervision must be clearly documented as a formal affiliation agreement or memorandum of understanding. Each written agreement or memorandum of understanding, signed by the appropriate executive officers, should address the following items:*

1. reason for the agreement,
2. responsibilities of the academic facility,
3. responsibilities of the clinical facility,
4. joint responsibilities,
5. periodic review of the affiliation agreement,
6. supervisory responsibilities for the students,
7. student professional liability coverage,
8. student health and safety policies, and,
9. termination clause providing for program completion by enrolled students

I.B.1 **Academic Affiliates**

The program has the responsibility for ensuring that prerequisites are met. Where academic affiliates provide the prerequisites and/or award credit for the professional curriculum the responsibilities shall be clearly described in written agreements.

I.B.2 **Clinical Affiliates**

The clinical component of the program shall provide an environment for supervised competency-based clinical education and experience and offer a sufficient and well-balanced variety of nuclear medicine procedures, examinations and equipment. Modern nuclear medicine equipment, accurately calibrated, in working order and meeting applicable national and state standards must be available for the full range of diagnostic and therapeutic procedures as outlined in the curriculum. Clinical education sites must document satisfactory participation in extramural quality assurance programs appropriate to the practice. In the event that an institution is unable to provide the total clinical education experiences needed, arrangements with additional clinical facilities shall be made to complete the prescribed curriculum.

I.B.3 **Clinical Affiliates - Categories:**

1. Major Affiliate - A participating institution that provides a required portion of the clinical education experience outlined in the **Essentials**. The length of time assigned to the clinical affiliate must be sufficient for completion of the essential education assigned to this institution.
2. Minor Affiliate - A participating institution that provides clinical education experiences not essential to fulfill but which enhance the curriculum requirements of the **Essentials**. A student would be assigned to a minor affiliate for not more than ten business days.

Guideline *The JRCNMT does not encourage clinical affiliations with more than one sponsor. Where such arrangements exist, it is the responsibility of the sponsor to clearly identify the status of available clinical education positions to all applicants. The sponsor and affiliate must ensure that the approved student capacity is not exceeded and that the education for students is integrated to provide the required competencies.*

I.C **Accreditation**

Accreditation is granted to the sponsoring institution that assumes primary responsibility for curriculum planning and selection of course content; coordinates classroom teaching and supervised clinical education; appoints faculty to the program; receives and processes applications for admission; and grants the certificate or degree documenting completion of the program. The sponsoring institution shall be responsible for providing assurance that the activities assigned to students in the clinical setting are educational.

ESSENTIAL II RESOURCES

The program's human, physical, financial and learning resources must be sufficient to support the educational goals and number of students admitted into the program. The instructor/student ratio shall be adequate to provide the student a learning environment in which to achieve the stated goals.

II.A Human Resources

Sponsor

The sponsoring institution must have a qualified program director, clinical coordinator, and a medical director for the nuclear medicine technology program. Primary responsibilities shall include program development, organization, administration, evaluation and revision. The program director may assume the responsibilities of the clinical coordinator position.

Affiliate

In addition to the program personnel, each medical clinical affiliate must have an affiliate medical director and affiliate clinical coordinator responsible for the clinical education of the student. Radiopharmacy affiliates must have an affiliate clinical coordinator responsible for the student's clinical education. In accordance with institutional policies and practices, these officials shall possess the qualifications and assume the responsibilities described.

Changes in any of these positions shall be communicated to the JRCNMT. If a position becomes vacant and is not filled within 60 days, or the incumbent is absent or unable to serve for 60 days, the program shall send the JRCNMT a description of the actions taken to maintain the continuity and effectiveness of the program.

II.A.1 Program Director

II.A.1.a Responsibilities

The director of the educational program shall be responsible for the organization, administration, periodic review, planning, development, and general effectiveness of the program. The director shall have input into budget preparation and provide supervision and coordination to the clinical coordinator(s). The program director may assign a clinical coordinator to supervise and coordinate the clinical phases of the program.

Guideline

*Regular visits to the affiliates by the program director or clinical coordinator must be scheduled and a record of these visits maintained. Visits to clinical affiliates shall be made by the program director or a designee with administrative responsibility and authority. The purpose of these visits is to establish that the clinical affiliate provides students with education that meets the requirements of the **Essentials**. Such reviews of the affiliate institution's program must be conducted on site at the affiliate institution. Visits by the affiliate clinical coordinator to the sponsor do not fulfill the intent of these reviews. An adequate record of such an on-site visit is a brief, dated note that describes what was seen and what accomplishments or problems the clinical affiliate might be encountering. It should also include any steps that were taken to resolve problems that might have been identified during prior visits. Visits should be at least quarterly and more often if needed.*

II.A.1.b Qualifications

The program director must be a nuclear medicine technologist or a nuclear medicine physician, knowledgeable about nuclear medicine technology and education methodology. The program director must be qualified in nuclear medicine and certified by a nationally recognized certifying board, or possess suitable equivalent qualifications, and possess one of the following:

1. a baccalaureate degree in nuclear medicine technology or a related field with a minimum of two years of post-graduate professional experience, or
2. an associate degree related to nuclear medicine technology with a minimum of four years of post-graduate professional experience.

The program director must demonstrate effectiveness in instruction, curriculum design, program planning, evaluation and counseling.

- II.A.2**
II.A.2.a **Clinical Coordinator**
Responsibilities
The clinical coordinator shall perform duties as assigned by the program director e.g., provide supervision, administration, and coordination of the instructional faculty in the clinical phase of the educational program.
- II.A.2.b** **Qualifications**
The clinical coordinator shall be a nuclear medicine technologist certified by a nationally recognized certifying board and have a minimum of two years of post-certification experience in nuclear medicine technology or possess suitable equivalent qualifications.
- II.A.3**
II.A.3.a **Medical Director**
Responsibilities
The medical director of the program shall provide competent medical guidance to ensure that the medical components of the curriculum meet current acceptable standards. The medical director coordinates with the program director to assure physician interaction with students and physician review and input into the curriculum.
- II.A.3.b** **Qualifications**
The medical director must be a physician certified in the use of radionuclides and be either a diplomate of an American Board of Medical Specialties (ABMS) approved certifying board in Nuclear Medicine or Radiology, or possess suitable equivalent qualifications.
- II.A.4**
II.A.4.a **Affiliate Clinical Coordinator**
Responsibilities
The affiliate clinical coordinator shall be responsible for the clinical education, supervision and evaluation of students assigned to the clinical affiliate.
- II.A.4.b** **Qualifications**
The affiliate clinical coordinator must be certified by a nationally recognized certifying board in nuclear medicine technology or possess suitable equivalent qualifications.
- Clinical coordinators in radiopharmacies must possess a professional license from the appropriate state board or possess suitable equivalent qualifications.
- II.A.5**
II.A.5.a **Affiliate Medical Director**
Responsibilities
The affiliate medical director shall provide input into the clinically related activities of the student and shall participate in on-site clinical instruction.
- II.A.5.b** **Qualifications**
The affiliate medical director must be a physician certified in the use of radionuclides and be either a diplomate of an American Board of Medical Specialties (ABMS) approved certifying board in Nuclear Medicine or Radiology, or possess suitable equivalent qualifications.
- II.A.6**
II.A.6.a **Faculty and/or Instructional Staff**
Responsibilities
The faculty shall participate in teaching courses, supervising laboratory learning experiences, evaluating student achievement, developing curriculum, formulating policies and procedures, and evaluating program effectiveness.

- II.A.6.b** **Qualifications**
Faculty designated by the program must be qualified, by education, certification, and experience, to teach assigned courses at the appropriate nuclear medicine technology educational level.
- II.A.6.c** **Professional Development**
The program shall document ongoing professional development of all program faculty, academic and clinical, to assure that the faculty are able to fulfill their instructional responsibilities.
- II.B** **Physical Resources**
Classrooms, laboratories, administrative offices, and other facilities shall be adequate to achieve the educational objectives, ensure safety, and provide barrier-free access for students, faculty, and staff.
- II.C** **Financial Resources**
Financial resources for continued operation of the educational program shall be ensured by an adequate, institutionally approved budget or by a statement of continued financial support from an executive officer of the sponsoring institution.
- II.D** **Learning Resources**
- II.D.1** **Library**
An accessible library collection or information resource containing professional books published within the last five years, current periodicals, and other reference materials related to all subject areas of the curriculum shall be provided to foster an atmosphere of inquiry, study and learning.
- II.D.2** **Instructional Aids**
Clinical subjects, computer hardware and software, specimens, records and related reference materials, and audiovisual resources shall be available in sufficient number and quality to enhance student learning.

ESSENTIAL III STUDENTS

The program shall address the needs of students by providing information related to the program, admission policies and procedures, student rights and responsibilities, evaluation criteria, health, and guidance services.

- III.A** **Program Description**
Students shall be provided with a clear description of the program and its content in the form of current publications that must include:
- | | |
|--|--|
| 1. admission criteria, both academic and non-academic, | 6. a description of tuition and fees with refund policies, |
| 2. program goals and course objectives, | 7. rules and regulations including causes for dismissal and appeal procedures, and |
| 3. a list of course descriptions, | 8. program calendar which specifies the length of the program. |
| 4. supervised clinical education assignments, | |
| 5. a list of professional competencies to be obtained, | |
- III.B** **Admission Policies and Procedures**
Admission of students, including advanced placement, shall be made in accordance with defined and published practices of the institution. Specific academic and technical standards required for admission to the program shall be defined, published, and accessible to prospective students and the public.

III.B.1

Admission Requirements

Applicants must have completed high school or the equivalent. Applicants may have prior qualifications in a clinically related allied health profession with a minimum of two years education in an accredited educational program that includes the identified postsecondary education.

III.B.2

Student Capacity

The number of students admitted must be based on the capacity of the clinical facilities to accommodate students. Resources must be adequate to support the number of students admitted to the program. The instructor/student ratio shall be adequate to achieve the stated objectives of the curriculum.

Guideline

Student capacity in each clinical facility is calculated according to the following criteria:

- 1 full-time student for each imaging instrument which completes procedures on 5 or more patients per day, plus
1 full-time student for in-vitro procedures, providing an adequate number and variety are performed daily, plus
1 full-time student for a radiopharmacy where adequate numbers and varieties of radiopharmaceuticals are prepared.*
- Student capacity may not exceed more than 1 full-time student per full-time certified nuclear medicine technologist, pharmacist, chemist, or person possessing suitable equivalent qualifications.*

On occasion the on-site capacity may be larger or smaller than that calculated above. The final number recommended for on-site student capacity must clearly assure that space, personnel, equipment, and procedure load will enable each student's experience to satisfy the program objectives for clinical education.

III.C

Student Rights and Responsibilities

III.C.1

Dismissal

A clear statement detailing causes for student dismissal must be published and available to the student.

III.C.2

Appeal Procedures

A description of appeal procedures shall be distributed to students at the start of the program. These procedures shall include provisions for academic and non-academic types of grievances and a mechanism for neutral evaluation that ensures due process and fair disposition. Rules and regulations governing acceptable conduct must be clearly defined and published.

III.D

Evaluation Criteria

Written criteria for successful completion of each segment of the curriculum and for graduation shall be given in advance to each student. The evaluation system shall be related to the objectives and competencies described in the curriculum for both academic and supervised clinical education components. The evaluation system shall be employed frequently enough to provide students and program officials with timely indications of the student's progress and academic standing and to serve as a reliable indicator of the effectiveness of course design and instruction.

III.E

Health

There shall be a procedure for determining whether the applicant's or student's health will permit achievement of the written essential standards of the program. Students shall be informed of and have access to the usual student health care services of the institution. The health and safety of students, faculty, and patients associated with educational activities shall be adequately safeguarded. Emergency medical care shall be available for students while in attendance.

The program will maintain compliance with federal and state health and radiation protection regulations. Radiation exposure records shall be discussed with the students at regular intervals (not less than quarterly). Documentation of these reviews shall be maintained.

III.F

Guidance

Guidance shall be available to assist students in understanding and observing program policies and practices and in handling professional career issues and personal problems that may interfere with progress in the program.

ESSENTIAL IV CURRICULUM

Curriculum content shall provide the student with a comprehensive body of knowledge and the necessary skills expected of a competent program graduate.

IV.A

Description of the Program

All faculty, instructors and students shall be provided with a clear description of the program and its content, which includes written course syllabi (academic and clinical) with appropriate learning objectives and performance criteria for satisfactory achievement. This description must be consistent with the mission of the program and appropriate for the degree or certificate awarded. The degree or certificate must be conferred on the basis of assessed and documented educational achievement and must conform to commonly accepted standards for the certificate or degree involved. The sponsoring institution may present required educational experiences through time frames and methodologies appropriate to its mission and objectives.

IV.B

Instructional Plan

The master instructional plan must describe learning experiences, curriculum sequencing, and integration of clinical assignments to develop the necessary competencies for graduation. The curriculum shall include:

IV.B.1

Learning opportunities for students to develop personal and professional attributes and values relevant to practice.

Guideline

A nuclear medicine technologist education program should foster:

- 1. the development of skills in problem-solving, critical-thinking, and decision-making; in oral and written communication; in human relations; 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. an understanding of departmental organization and function in relation to the healthcare delivery system as a whole; and*
- 6. an understanding of the value and responsibilities entailed in being a professional.*

IV.B.2 Education in health and basic sciences that will provide cognitive learning experiences as a foundation to understanding and performing clinical responsibilities.

IV.B.2.a Postsecondary education in human anatomy and physiology, physics, algebra, medical terminology, computer applications, oral and written communications, and general chemistry shall have been completed or be provided as part of the education program. Students may demonstrate competency in postsecondary requisites as appropriate by institutional policy. Institutions such as accredited junior colleges, universities, postsecondary technical institutes and hospital programs may be used to provide education in these requisites prior to or concurrent with specific courses in nuclear medicine.

IV.B.3 Academic instruction for the professional nuclear medicine technology curriculum shall include as a minimum the following content areas:

1. methods of patient care,
2. statistics,
3. nuclear medicine physics and radiation physics,
4. radiation biology,
5. radiation safety and protection,
6. radionuclide chemistry and radiopharmacy,
7. nuclear instrumentation,
8. positron emission tomography (PET),
9. computer applications for nuclear medicine,
10. diagnostic nuclear medicine imaging and non-imaging in vivo and in vitro procedures,
11. immunology as related to nuclear medicine,
12. radionuclide therapy, and
13. quality control and quality assurance.

IV.B.4 Supervised clinical education, experience and discussions shall include the following:

1. patient care and patient recordkeeping,
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 (where permitted), and disposal of radiopharmaceuticals and the 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.

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

I. Patient Care

A. A nuclear medicine technologist provides patient care by:

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 before, during and after a procedure including, but not limited to, the monitoring of intravenous lines, oxygen supplies, drains and the status of patients who are under sedation;
3. recognizing surgical and disease factors that may create artifacts or variants on all nuclear medicine images including PET images, and thus require modifications in the data acquisition or data processing protocol;
4. establishing and maintaining good communication with each patient (e.g., making introductions, explaining the procedures, answering questions);
5. providing functionally safe and sanitary conditions for the patient in compliance with standard precaution policies;

6. *recognizing and responding to an emergency condition by:*
 - a. *initiating a call for assistance,*
 - b. *monitoring and recording physiologic data (e.g., 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.*
- B. *A nuclear medicine technologist prepares the patient for an examination by:*
1. *reviewing written orders for the procedure, verifying patient identification and determining pregnancy status as well as breast feeding status, if applicable;*
 2. *obtaining a pertinent history and checking for contraindications;*
 3. *measuring peripheral blood glucose level prior to PET imaging;*
 4. *ensuring that informed consent has been obtained when necessary;*
 5. *explaining the procedure to the patient or family and, where applicable, to the parents or legal guardian including, but not limited to, the procedure, patient involvement, length of study, and basic radiation safety;*
 6. *ensuring that any preprocedural preparation has been completed including, but not limited to, fasting, hydration, taking of thyroid blocking compounds, voiding, bowel cleansing, and suspension of interfering medications;*
 7. *waiting an appropriate length of time after the administration of a radiopharmaceutical to begin the procedure;*
 8. *checking patient clothing and linen for objects that may cause artifacts in the images or the proposed measurements.*
- C. *A nuclear medicine technologist performs administrative procedures by:*
1. *maintaining an appropriate inventory of medical/surgical supplies, radiopharmaceuticals, storage media, and other items 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 administered radioactivity quality control procedures, patient reports, and other required records;*
 5. *revising, developing, or collaborating on procedures for reporting or recording incidents required by regulatory agencies;*
 6. *revising and developing policies and procedures in accordance with applicable regulations and administrative requirements;*
 7. *participating in the quality control program.*

II. Radiation Safety

- A. *A nuclear medicine technologist, under supervision of an authorized user or radiation safety officer, maintains compliance with local, state and federal regulations in radiation safety practices by:*
1. *using personnel monitoring devices (e.g., dosimeters, film badges, TLD's, etc.):*
 - a. *reviewing on at least a quarterly basis personnel exposure records in regard to maximum permissible dose limits,*
 - b. *taking appropriate measures to follow the ALARA principle, 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. *maintaining required records;*
 5. *posting appropriate signs in designated areas;*
 6. *following federal, state and institutional regulations regarding receipt and disposition of all radionuclides;*

7. *carrying out a program to follow regulations regarding therapeutic dosages and follow-up procedures;*
 8. *recommending purchase of protective equipment to meet regulations;*
 9. *packaging radioactive material according to regulations and keeping accurate records of transfer.*
- B. *A nuclear medicine technologist follows appropriate protection procedures thereby limiting the radiation exposure of the patient, public, fellow workers, and self to as low a level as reasonably achievable (ALARA) by:*
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 (e.g., Sr-89, I-131, 511 keV radiotracers);*
 4. *performing a bioassay as per state and/or federal regulations;*
 5. *using appropriate modifications of radiation protection techniques when dealing with 511 keV PET radiotracers.*
- C. *A nuclear medicine technologist performs radiation surveys by:*
1. *ensuring that instruments are calibrated at regular intervals, 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;*
 8. *recording data in standard format.*
- D. *A nuclear medicine technologist performs decontamination procedures by:*
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;*
 9. *performing appropriate follow-up monitoring after any necessary decontamination procedures.*
- E. *A nuclear medicine technologist disposes of radioactive waste and maintains appropriate records according to license conditions.*
- F. *A nuclear medicine technologist participates in a hospital's in-service education program to instruct other personnel regarding radiation and principles of radiation protection.*

III Nuclear Instrumentation - Quality Control

- A. A nuclear medicine technologist evaluates the performance of scintillation cameras by:
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) photopeak 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 nonlinearity in the image and, where possible, determining the source,
 - c. initiating corrective action when necessary.
 3. performing spatial resolution checks;
 - 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 checks;
 - 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 and data interface settings and verifying accuracy of ECG gating and quality of ECG tracing;
 7. assessing and, when appropriate, maintaining imaging or data recording device(s);
 8. maintaining the required records for the quality control program.
- B. A nuclear medicine technologist evaluates the performance of a PET or PET/CT scanner by:
1. assessing detector array uniformity;
 2. acquiring applicable calibration data prior to clinical imaging (as applicable: blank scan, normalization, coincidence timing, well counter, etc.);
 3. testing transmission imaging systems;
 4. checking alignment of emission and transmission images.
- C. A nuclear medicine technologist evaluates the performance of NaI (Tl) scintillation probes and well counters by:
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;*
 7. *maintaining required records for quality control programs.*
- D. *A nuclear medicine technologist operates survey meters by:*
1. *ensuring calibration is completed by an approved agent;*
 2. *performing a reference check-source test and comparing with previous results;*
 3. *maintaining required records for quality control program.*
- E. *A nuclear medicine technologist evaluates the operation of a dose calibrator by:*
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;*
 4. *testing for significant geometric variation in activity measured as a function of sample volume or configuration and determining correction factors.*
- F. *A nuclear medicine technologist operates and maintains film processors by:*
1. *monitoring and recording sensitometry and temperature of water and dryer daily;*
 2. *maintaining required records for quality control program.*

IV. Radiopharmaceuticals

- A. *A nuclear medicine technologist initiates purchases of radiopharmaceutical products and adjunct supplies by:*
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 and surveys upon receipt of radioactive materials;*
 4. *recording receipt of radioactive materials;*
 5. *following Department of Transportation (DOT) and radiation safety guidelines in the transport, receipt and shipment of radioactivity.*
- B. *A nuclear medicine technologist prepares and verifies quality of radiopharmaceuticals under the direction of an authorized user by:*
1. *employing aseptic technique for manipulation of injectable products;*
 2. *eluting radionuclide generators according to manufacturer's specification;*
 3. *verifying radionuclide purity of generator eluates;*
 4. *selecting and preparing radiopharmaceuticals in accordance with manufacturer's specification;*
 5. *calculating and measuring activity of the radionuclide with a dose calibrator;*
 6. *confirming the quality of a radiopharmaceutical in accordance with accepted techniques and official guidelines;*
 7. *preparing labeled blood cells in accordance with established protocols;*
 8. *recording use and/or disposition of all radioactive materials.*

- C. *A nuclear medicine technologist is responsible for the identification and labeling of all radiopharmaceutical preparations by:*
 - 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;*
 - 3. *labeling and segregating radioactive waste and recording this information.*

- D. *A nuclear medicine technologist prepares individual dosages under the direction of an authorized user by:*
 - 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;*
 - 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.*

V. Diagnostic Procedures

- A. *A nuclear medicine technologist performs imaging procedures by:*
 - 1. *selecting imaging parameters;*
 - a. *selecting and preparing the instrument for the procedure,*
 - b. *selecting appropriate parameters for image data acquisition, and*
 - c. *recognizing artifacts on static, dynamic, gated, SPECT and PET images that are due to instrumentation malfunction and initiating appropriate action.*
 - 2. *administering radiopharmaceuticals and/or pharmaceuticals using standard 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 (e.g., subcutaneous, intramuscular, intravenous, inhalant, oral and intravesical),*
 - c. *establishing and/or verifying venipuncture access using aseptic techniques,*
 - d. *using and maintaining established venous access routes (e.g. 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, as appropriate, and*
 - h. *preparing, determining dosage, and administering non-radioactive pharmaceuticals under medical direction, where permitted.*
 - 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 or practitioner 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. *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. *applying corrections to PET images for attenuation, random events, scatters, etc.*
 - e. *defining regions of interest (ROI's) with reproducible results and correctly applying background subtraction,*
 - f. *performing time activity curve generation and additional manipulation (e.g T1/2),*
 - g. *labeling processed images to reflect anatomical position, ROI's, etc.,*
 - h. *archiving and retrieving data from storage media, and*
 - i. *performing image fusion of PET and SPECT with CT and MRI, when available.*
- B. A nuclear medicine technologist performs non-imaging in-vivo studies by:**
1. *operating laboratory equipment and checking accuracy, precision, and operation of pipetting devices;*
 2. *preparing dosage according to standards;*
 - a. *quantitating 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,*
 - 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 q.s. (quantity sufficient) to appropriate volume, and*
 - 3) *diluting capsule in appropriate solvent, if necessary, for preparing a standard.*
 3. *collecting the appropriate specimens for procedures using standard precautions;*
 - a. *collecting blood samples by,*
 - 1) *selecting proper supplies (e.g., 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 by,*
 - 1) *instructing patient and nursing staff as to correct method and time of urine collection,*
 - 2) *preparing aliquots of 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, chemical, and radioactive waste in accordance with applicable regulations and specific facility policies.*

VI. Radionuclide Therapy

- A. *The nuclear medicine technologist assists an authorized user in the preparation and application of therapeutic radionuclides by:*
 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.*

ESSENTIAL V OPERATIONAL POLICIES
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Each program is responsible for ensuring integrity in all operations dealing with students, staff, patients, and the public.

V.A Fair Practices

- V.A.1** Announcements and advertising must accurately reflect the program offered.
- V.A.2** Student and faculty recruitment and student admission and faculty employment practices shall be non-discriminatory with respect to race, color, creed, sex, age, disability conditions (handicaps) and national origin.
- V.A.3** Academic credit and costs to the student shall be accurately stated, published and made known to all applicants.
- V.A.4** The program or sponsoring institution shall have a defined and published policy and procedure for processing student and faculty grievances.
- V.A.5** Assignments during hours other than the normally scheduled clinical experience (i.e., evenings, weekends, and holidays) shall be justified. Specific objectives and evaluations must be developed to address the uniqueness of these learning experiences.
- V.A.6** Policies and processes for student withdrawal and for refunds of tuition and fees shall be published and made known to all applicants.

V.A.7 Policies and processes by which students may perform service work while enrolled in the program must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. Students may not take the responsibility or the place of qualified staff. However, after demonstrating proficiency, students may be permitted to undertake certain defined activities with appropriate supervision and direction outside assigned program hours. Class credit shall not be awarded for such activities.

V.A.8 The health and safety of patients, students and faculty must not be jeopardized in any way by activities of the students.

V.B **Student Records**
Student records shall be maintained for admission, evaluation, and counseling or advising sessions. Individual grades and credits for courses shall be recorded and permanently maintained by the sponsoring institution. The program shall maintain the student records for a reasonable period of time (e.g., 10 years) and shall conform to applicable federal and/or state regulations. Ideally, the student files should be maintained permanently.

ESSENTIAL VI PROGRAM EVALUATION

There shall be a systematic periodic evaluation review of the program's mission and objectives and the overall effectiveness of the nuclear medicine technology program.

VI.A **Effectiveness**
VI.A.1 The extent to which the sponsoring institution and affiliates fulfill their responsibilities related to the mission and educational goals of the program must be assessed.

Guideline *The following indicators may help assess the success of the program in relation to its mission and educational goals.*

1. *adequacy and effectiveness of resource,*
2. *student achievement,*
3. *student evaluation of academic and clinical faculty,*
4. *appropriateness of curricula designs, and*
5. *compliance with operational policies.*

VI.B **Outcomes**
Programs shall routinely collect sufficient qualitative and quantitative information regarding the post-graduation activities of its graduates to demonstrate an ongoing evaluation of outcomes consistent with the graduate competencies.

Guideline *Within one year following graduation, the program should obtain and analyze written data from the graduates and employers addressing employment settings, type and scope of practice, salary, job satisfaction, education and skills adequately or inadequately addressed in the educational program, interviews with program graduates and employers of graduates, and evaluation of student performance on national certifying examinations and other recognized standardized tests.*

VI.C **Results of Ongoing Program Evaluation**
The results of ongoing evaluation must be appropriately reflected in the curriculum and other dimensions of the program. In particular, the program must systematically use the information obtained in its evaluation to foster student achievement with respect to the certificate or degree offered.

ESSENTIAL VII SPONSORING INSTITUTION, PROGRAM, and JRCNMT RESPONSIBILITIES

The institution, the program and the JRCNMT all have certain administrative responsibilities in relation to the accreditation process. Fulfillment of these responsibilities provides assurance that accreditation of a program is conducted and maintained in an appropriate manner.

VII.A Program and Sponsoring Institution Responsibilities

VII.A.1 Applying for Accreditation

The accreditation review process conducted by the JRCNMT can be initiated only at the written request of the chief executive officer or an officially designated representative of the sponsoring institution.

This process is initiated by requesting an application form from:

Joint Review Committee on Educational Programs in Nuclear Medicine Technology

2000 W. Danforth Rd., Ste 130 #203 Edmond OK 73003

Tel: (405) 285-0546

Fax: (405) 285-0579

Email: jrcnmt@coxinet.net

The accreditation review process includes submission of the Application for Accreditation, completion and submission of a Self-Study Report, payment of appropriate fees, and agreement to an on-site evaluation.

An institution sponsoring a program may voluntarily withdraw from the JRCNMT accreditation process at any time.

VII.A.2 Administrative Requirements for Maintaining Accreditation

VII.A.2.a The program must submit a Self-Study Report or a required Progress Report within a reasonable period of time, as determined by the JRCNMT.

VII.A.2.b The program must agree to a site visit date near the end of the period for which accreditation was awarded.

VII.A.2.c The program must inform the JRCNMT within 60 days of changes, absence or inability to serve of required program personnel.

VII.A.2.d The program must submit an application for all clinical affiliates.
A program may not have a separate clinical facility which is not recognized by the JRCNMT when that affiliate has students who receive benefits due to the accredited status of the program or students who are recruited using the name or accredited status of the program. An Application for Clinical Affiliate(s) must be received 60 days prior to the assignment of students.

VII.A.2.e The sponsoring institution must inform the JRCNMT of its intent to transfer program sponsorship in accord with JRCNMT policy.

VII.A.2.f The program and the sponsoring institution must pay the JRCNMT fees within a reasonable period of time, as determined by the JRCNMT.

Failure to meet these administrative requirements for maintaining accreditation may lead to Administrative Probation and ultimately to withdrawal of accreditation.

VII.B
VII.B.1

JRCNMT Responsibilities
Administering the Accreditation Review Process

At the written request of the chief executive officer or other officially designated representative, the JRCNMT assesses an applicant program's relative compliance with the **Essentials**.

The accreditation review process includes the submission of the Application for Accreditation, the Self-Study Report, payment of appropriate fees, and an on-site evaluation of the program. If the performance of a site visit team is deemed unacceptable, the institution may request a second site visit.

Before the JRCNMT determines an accreditation action, the sponsoring institution is given an opportunity to comment in writing on the report of the site visit team and to correct factual errors.

Before awarding Probationary Accreditation, the JRCNMT provides the sponsoring institution with an opportunity to respond in writing to the cited deficiencies in the program's compliance with the **Essentials**. The JRCNMT's reconsideration of Probationary Accreditation is made on the basis of conditions existing when the JRCNMT arrived at its accreditation decision.

JRCNMT awards of Probationary Accreditation are final and not subject to further appeal.

VII.B.2

Withholding or Withdrawing Accreditation

Before determining that accreditation be withheld or withdrawn, the Review Committee provides the sponsoring institution with an opportunity to request reconsideration. JRCNMT decisions to withhold or withdraw accreditation may be appealed. A copy of the **JRCNMT Appeals Procedures** is enclosed with the letter notifying the sponsoring institution of one of these actions. When accreditation is withheld or withdrawn, the sponsoring institution's chief executive officer is provided with a clear statement of each deficiency and is informed that the institution may apply for accreditation whenever the program is believed to be in compliance with the **Essentials**.

In the event of program closure, the JRCNMT regards as graduates of an accredited program only those students who meet the criteria listed below for the two categories of program closure:

Voluntary Closure – The JRCNMT regards as graduates only those students who have successfully completed the program prior to the effective date of closure.

Involuntary Closure – The JRCNMT regards as graduates of the program only those students who have already successfully completed 75% of the published curriculum as of the date of involuntary withdrawal and then successfully complete the remaining 25% of the curriculum in the scheduled time frame.

VII.B.3

Inactive Programs

The sponsoring institution may request inactive status for a program that does not enroll students for up to two years. The program and its sponsoring institution must continue to pay required annual fees. Should a program be inactive for two years and not reactivated, it will be considered discontinued and accreditation will be withdrawn.

CAREERS

Inquiries regarding career information may be addressed to:

AMERICAN SOCIETY OF RADIOLOGIC TECHNOLOGISTS
15000 Central Ave. SE
Albuquerque NM 87123

SOCIETY OF NUCLEAR MEDICINE
1850 Samuel Morse Drive
Reston VA 22090

SOCIETY OF NUCLEAR MEDICINE-TECHNOLOGIST SECTION
1850 Samuel Morse Drive
Reston VA 22090

GLOSSARY

Academic Component: Defined in **Essentials**, Page 2.

Accreditation: The voluntary process by which a private, non-governmental body evaluates an educational institution or program of study and formally recognizes it as having met certain predetermined criteria or standards. The process involves initial and periodic self-study and evaluation by peers. Accreditation implies stimulation toward quality improvement beyond the minimum standards specified by the accrediting body.

Accrediting Agency: (See “Accrediting Body”)

Accrediting Body: A voluntary, non-governmental association established to administer accrediting procedures. A recognized accrediting body is one that is formally acknowledged by a non-governmental agency having met published provisions and procedures for recognition. A listed accrediting body is one that is officially listed by the Secretary of the United States Department of Education having met the governmental criteria for recognition established by the Higher Education Amendment Act.

Affiliation Agreement: A formal written understanding between the institution sponsoring the program and another independent institution or facility that agrees to provide educational experiences or credits for students.

Affiliate Institution: An independent institution or facility that has formally agreed to provide certain educational experiences for students not provided by the sponsoring institution.

Affiliate Medical Director: Defined in **Essentials**, page 4.

Certificate Program: A systematic grouping of educational experiences that provide the required professional curriculum for a credential after the completion of requisite postsecondary courses.

Clinical Component: Defined in **Essentials**, page 2.

Competency-Based Education: Courses, curricula or programs based on the achievement of identified knowledge and skills, or on demonstrated outcomes.

Course Objectives: Statement of anticipated results to be achieved by students in a particular course of study.

Degree Program: A systematic, usually sequential, grouping of courses that provide the requirements for a degree.

Educational Goals: The statement in which the program or institution clearly identifies its objectives such as the intellectual and affective development of the student, study of values and attitudes, and much else.

Essentials: Defined in **Essentials**, Title Page.

Extramural Quality Assurance Programs: Participation in or review by a recognized independent organization’s quality assurance program to document quality of procedures performed.

Faculty: Instructional faculty whose assignment is class or course instruction.

Goals: The purpose toward which an objective is directed.

Guidelines: Statements that explain how the requirements may be interpreted to allow for flexibility yet remain within the framework of the **Essentials**.

Holistic Caregiver: A member of a health care team that is focused on the patient’s total care rather than an isolated portion thereof.

Learning Environment: A place, surroundings or circumstances where knowledge, understanding or skills are studied or observed such as classrooms, laboratories, clinical practice settings or places for field study.

Medical Director: Defined in **Essentials**, page 4.

Mission Statement: The statement in which an institution describes its particular philosophic stance and serves as a guide for educational planning.

Objectives: A statement of a desired or planned achievement.

Performance Criteria: A description of the way assignments are to be completed and the skill level that must be achieved to demonstrate success.

Postsecondary Education: Education offered by institutions after the completion of secondary or high school education.

Program Director: Defined in *Essentials*, page 3.

Program Goals: Statement(s) of purpose or intent toward which program effort is directed.

Quality Assurance: An organized activity or program directed at maintaining and improving all aspects of care rendered to patients. This is an all encompassing activity or program including quality control that extends to administrative, educational, and preventive maintenance methods. Continuing evaluation of the adequacy and effectiveness of the overall program is included.

Quality Control: An organized program with a series of distinct technical procedures performed on a routine basis to assure equipment, pharmaceuticals and laboratory tests meet pre-established guidelines.

Resources: The total means available to achieve the educational goals and support the number of students in the program.

Sponsoring Institution: Defined in *Essentials*, Page 1.

