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Connecticut Department
of Public Health

Report to the General Assembly

An Act Concerning the Department of Public Health's Oversight Responsibilities relating to Scope of Practice Determinations:

Scope of Practice Review Committee Report on
Nuclear Medicine Technologists

Jewel Mullen, MD, MPH, MPA, Commissioner

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State of Connecticut

Department of Public Health

Report to the General Assembly

An Act Concerning the Department of Public Health's Oversight Responsibilities relating to Scope of Practice Determinations for Health Care Professions: Nuclear Medicine Technologists

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Executive Summary

In accordance with Public Act 11-209, the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) submitted a scope of practice request to the Department of Public Health for the establishment of a licensure program and scope of practice for nuclear medicine technologists who are practicing in the specialty area of nuclear medicine and molecular imaging in Connecticut. Connecticut nuclear medicine technologists anticipate adopting the established scope of practice and clinical performance standards recognized by the National Society of Nuclear Medicine and Molecular Imaging.

A scope of practice review committee was established to review and evaluate the request as well as subsequent written responses to the request and additional information that was gathered through the review process. Literature and other information reviewed and evaluated by the scope of practice review committee emphasized the need to ensure that individuals practicing as nuclear medicine technologists (1) have thorough, standardized education and training, (2) pass an entry level knowledge-based examination, and (3) maintain ongoing clinical competence.

The committee did not identify any public health and safety risks associated with implementing a licensure program and scope of practice for nuclear medicine technologists as proposed in this request. Evidence provided by the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) demonstrated that enactment of these changes will enhance the ability of nuclear medicine technologists to practice to the full extent of the profession's education and training. It is not anticipated that implementation of this proposal will impact access to care or costs to the health care system. Although licensing fees generate revenue for the State's General Fund, there would be a fiscal impact to the Department of Public Health associated with implementing a new licensing program for several hundred individuals. Statutory recognition is another option that would ensure that all nuclear medicine technologists have met the same minimum qualifications related to competence and that they are practicing safely in accordance with a recognized scope of practice, and would have no cost to the state.

Draft statutory language was not provided for review by scope of practice review committee members. Should the Public Health Committee decide to raise a bill related to this scope of practice request, the Department of Public Health along with the organizations that were represented on the scope of practice review committee (Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS), the Connecticut Hospital Association and the Radiological Society of Connecticut) respectfully request the opportunity to work with the Public Health Committee on statutory language.

Background

Public Act 11-209, An Act Concerning the Department of Public Health's Oversight Responsibilities Relating to Scope of Practice Determinations for Health Care Professions, established a process for the submission and review of requests from health care professions seeking to revise or establish a scope of practice prior to consideration by the General Assembly. Under the provisions of this act, persons or entities acting on behalf of a health care profession that may be directly impacted by a scope of practice request may submit a written impact statement to the Department of Public Health. The Commissioner of Public Health shall, within available appropriations, establish and appoint members to a scope of practice review committee for each timely scope of practice request received by the Department. Committees shall consist of the following members:

1. Two members recommended by the requestor to represent the health care profession making the scope of practice request;

2. Two members recommended by each person or entity that has submitted a written impact statement, to represent the health care profession(s) directly impacted by the scope of practice request; and

3. The Commissioner of Public Health or the commissioner's designee, who shall serve as an ex-officio, non-voting member of the committee.

Scope of practice review committees shall review and evaluate the scope of practice request, subsequent written responses to the request and any other information the committee deems relevant to the scope of practice request. Such review and evaluation shall include, but not be limited to, an assessment of any public health and safety risks that may be associated with the request, whether the request may enhance access to quality and affordable health care and whether the request enhances the ability of the profession to practice to the full extent of the profession's education and training. Upon concluding its review and evaluation of the scope of practice request, the committee shall provide its findings to the joint standing committee of the General Assembly having cognizance of matters relating to public health. The Department of Public Health (DPH) is responsible for receiving requests and for establishing and providing support to the review committees, within available appropriations.

Scope of Practice Request

The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) submitted a scope of practice request to establish a new licensure program and scope of practice for nuclear medical technologists in Connecticut.

Impact Statements and Responses to Impact Statements

Written impact statements in response to the scope of practice request submitted by the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) were received from the Radiological Society of Connecticut and the Connecticut Hospital Association. Neither organization offered specific comments regarding the request as part of their impact statements but did request the opportunity to participate in any discussions if a scope of practice committee was established. The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) submitted a written response to each of the impact statements submitted by the Radiological Society of Connecticut and the Connecticut Hospital Association, which were reviewed by the scope of practice review committee.

Scope of Practice Review Committee Membership

In accordance with the provisions of Public Act 11-209, a scope of practice review committee was established to review and evaluate the scope of practice request submitted by the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS). Membership on the scope of practice review committee included:

1. Two members recommended by the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) ;
2. Two members recommended by the Radiological Society of Connecticut;
3. Two members recommended by the Connecticut Hospital Association; and
4. The Commissioner's designee (chairperson and ex-officio, non-voting member).

Scope of Practice Review Committee Evaluation of Request

The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) scope of practice request included all of the required elements identified in PA 11-209 as outlined below.

Health & Safety Benefits

The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular

Imaging Technologists Section (SNMMI-TS) identified the following health and safety benefits associated with implementing the scope of practice request:

-*Establishing a system for regulatory oversight and defining a scope of practice*

There are currently no specific laws or regulations governing the practice of nuclear medicine technologists in Connecticut. The establishment of a scope of practice would provide the existing qualified nuclear medicine professional with a State of Connecticut guideline for the performance of medical imaging and provide for additional public protection by articulating a standard of care to be consistently provided by all nuclear medicine professionals. Although the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) indicated that lack of standards has the potential to have a detrimental effect on patient safety as well as a financial impact due to substandard and repeat procedures, no specific data was provided related to the cost of substandard or repeat procedures.

-*Mandating specific education, training and competency requirements*

There are currently no mandatory education, training or certification requirements for nuclear medicine technologists who perform diagnostic imaging in Connecticut, with the exception of the performance of bone densitometry which is listed as an exemption under the scope of practice law governing the practice of radiographers and radiologic technologists (Connecticut General Statutes, Chapter 376). Establishing minimum standards for education and training (both didactic and clinical) and ongoing continuing education requirements ensures that qualified, competent practitioners are providing safe, quality care to patients in Connecticut.

<u>Access to Healthcare/Economic Impact</u>

Although they are not licensed and there is no statutorily recognized scope of practice, nuclear medicine technologists are currently practicing in Connecticut. The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) did not provide any data to suggest that implementation of the proposed changes will have an impact on access to care or costs to the health care system. It is important to note that some of the functions currently being performed by nuclear medicine technologists (e.g., administration of adjunctive medications, etc.) fall outside of the tasks permitted by law to be performed by unlicensed medical personnel who do not otherwise have the statutory authority to engage in such activities. The potential impact on access to care that may result if this proposal is not enacted was not evaluated by the committee. However, it can be reasonably anticipated that there would likely be additional costs to the system if nuclear medicine technologists are not able to

continue to perform these activities and other licensed health care practitioners have to assist in performing the procedures (e.g., a nurse having to administer medications).

Laws Governing the Profession

The U.S. Nuclear Regulatory Commission inspects and oversees hospitals and other health care facilities and offices where nuclear medicine is practiced but does not have any specific credentialing requirements for ancillary or other staff who practice nuclear medicine technology and handle, prepare and/or utilize radiopharmaceuticals under the supervision of a nuclear pharmacist or physician. There are no Connecticut laws or regulations specifically governing the practice of nuclear medicine technologists.

Current Requirements for Education and Training and Applicable Certification Requirements

Although there are currently no statutory requirements for education, training and/or certification for nuclear medicine technologists who are practicing in Connecticut, most employers (i.e., hospitals and physician offices) hire certified nuclear medicine technologists who have met specific education, training and competency standards.

-Education/Training

Nuclear medicine technologists are educated in intensive programs accredited by the Joint Review Committee on Educational Programs in Nuclear Medical Technology (JRCNMT). The JRCNMT accredits post-secondary nuclear medicine technology programs offering certificate, associate and baccalaureate degrees. The average nuclear medicine technologist program curriculum runs approximately 24 months. Prerequisites typically include anatomy and physiology and general education coursework. Currently, there are more than 95 accredited programs in the United States. There are also a small number of non-accredited programs that lead to alternate routes for certification as a nuclear medicine technologist.

Education consists of classroom and clinical training in areas including but not limited to anatomy, pharmacology, nuclear medicine and radiation physics, radiation safety and protection, radiation biology, radionuclide therapy, radionuclide chemistry, positron emission tomography (PET), computerized tomography (CT) and medical law/ethics.

-Examination/Certification Requirements

Certification for nuclear medicine technologists is voluntary and available through the Nuclear Medicine Technology Certification Board (NMTCB) and the American Registry of Radiologic Technologists (ARRT). Based on the information reviewed by the committee, there appear to be no significant differences between the two credentials.

In order to obtain initial certification, both the NMTCB and the ARRT require candidates to complete basic education and training that meet identified competencies, meet specific standards related to ethics and successfully complete an extensive examination.

In order to renew certification, both the NMTCB and ARRT require registrants to complete continuing education.

Additional specialty level certification is also available through both organizations for nuclear medicine technologists who have further specialized knowledge in nuclear medicine in areas such as nuclear cardiology (NCT) and positron emission tomography (PET).

Additional Information Considered

-What is a nuclear medicine technologist?

Nuclear medicine is the medical specialty that utilizes radioactive materials in the diagnosis and therapy of various diseases. Nuclear medicine technologists are health care professionals who under the direction of a physician utilize radiopharmaceuticals, adjunctive medications and imaging modalities (with or without contrast) as part of diagnostic evaluation and therapy.

-Where do nuclear medicine technologists practice?

Hospitals, private physician offices (e.g., cardiology – gamma camera, nuclear stress test), some clinics and mobile units

-How many nuclear medicine technologists practice in Connecticut?

Approximately 300-400 nuclear medicine technologists are currently practicing in CT.

-How does a nuclear medicine technologist currently practice?

Nuclear medicine technologists practice under the supervision and direction of a physician. The practice of nuclear medicine technology includes the use of sealed and unsealed radioactive materials as well as pharmaceuticals and adjunctive medications. The responsibilities of a nuclear medicine technologist include, but are not limited to, patient care, quality control, diagnostic procedures and testing, administration of radiopharmaceuticals and adjunctive medication, radionuclide therapy and radiation safety:

Patient Care – Assessing and responding to a patient's needs before, during and after diagnostic imaging and therapeutic procedures. Includes tasks such as: monitoring intravenous lines (e.g., central lines and peripherally inserted central catheters (PICC)) and oxygen supply, and operation of equipment such as blood pressure cuffs, electrocardiogram (ECG) machines, pulse oximeters, intravenous pumps and oxygen regulators; insertion of

peripheral intravenous catheters; monitoring patients who are under minimum sedation; explaining procedures to patients; providing a safe and sanitary work environment; and recognizing and responding to emergency situations.

Quality Control – Evaluating and maintaining a quality control program for instrumentation and other equipment to ensure optimal performance and stability.

Diagnostic Procedures – Utilizing appropriate techniques, radiopharmaceuticals and adjunctive medications as part of standard protocols to ensure quality images and/or laboratory results. Includes tasks such as: preparing, evaluating and properly administering the appropriate radiopharmaceuticals and/or pharmaceuticals and contrast; selecting the appropriate imaging or data collection parameters, and establishing and/or properly maintaining venous access routes; administering radiopharmaceuticals and/or adjunctive medications through various routes, including but not limited to oral, intravesical, inhalation, intravenous, intramuscular, subcutaneous and intradermal under the direction of a physician; positioning the patient and obtaining images; assisting in stress testing procedures; and performing data collection, processing and analysis.

Radiopharmaceuticals – safe handling and storage of radioactive materials during the procurement, identification, calibration, preparation, quality control, dose calculation, dispensing documentation, administration and disposal.

Operation of Instrumentation – involves the use of imaging equipment: gamma camera systems, transmission imaging or diagnostic CT, PET imaging and bone density imaging; and non-imaging equipment: dose calibrators, survey instrumentation for exposure and contamination, probe and well instrumentation, and ancillary patient care equipment

Radionuclide Therapy – involves patient management, preparation and administration of therapeutic radiopharmaceuticals under the personal supervision of a physician. Includes tasks such as: assuring that the correct radiopharmaceutical and dosage is prepared; following the Nuclear Regulatory Commission's quality management program; and observing radiation safety procedures.

Radiation Safety – Involves practice techniques that will minimize radiation exposure to the patient, health care personnel and general public, through consistent use of protective devices, shields and monitors consistent with ALARA (as reasonably achievable) and establishing protocols for managing spills and unplanned releases of radiation.

-Are there are restrictions on nuclear medicine technologists who are currently practicing in Connecticut?

The radiographer/radiologic technologist statutes currently prohibit nuclear medicine technologists from performing CT scans. Nuclear medicine technologists are not requesting the authority to perform stand-alone CT scans through this scope of practice request; however, they are requesting authority to perform CT scans that are incidental to certain nuclear medicine procedures that are performed by nuclear medicine technologists.

Although there are no specific mandatory requirements for credentialing, all of the above listed procedures are currently being performed by unlicensed, unregulated nuclear medicine technologists in Connecticut.

Summary of Known Scope of Practice Changes

Although legislation has been proposed over last several years to establish a licensure program, no changes have previously been enacted and the request was not previously reviewed as part of the scope of practice review process. Proposed legislation to establish a new licensure program for nuclear medicine technologists was previously unsuccessful due to fiscal constraints.

Impact on Existing Relationships within the Health Care Delivery System

The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) identified that implementation of the scope of practice request would have minimal impact on existing relationships within the health care delivery system. The establishment of a scope of practice in Connecticut would provide the existing, qualified nuclear medicine professional with a guideline for the performance of their imaging services. It also provides the non-professional with a direction for becoming a properly qualified nuclear medicine technologist.

Regional and National Trends

Thirty-seven other states require a state license for nuclear medicine technologists to practice. Within New England, Rhode Island, Massachusetts, Maine and Vermont require licensing. In addition, both New York and New Jersey require licensure. The scope of practice being proposed in this request mirrors the scope of practice recognized by the National Society of Nuclear Medicine and Molecular Imaging.

Other Health Care Professions that may be Impacted by the Scope of Practice Request as Identified by the Requestor

The Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular

Imaging Technologists Section (SNMMI-TS) identified that the scope of practice for nuclear medicine technologists parallels that of the modalities involved in the field of radiology. Because of the similarity, they believe that the impact and effect on the other radiology modalities will be minimal. Although the Connecticut Society of Radiology Technologists (CSRT) did not submit an impact statement, the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) indicated that there has been communication and positive support from the CSRT for approval of a scope of practice and the licensing of nuclear medicine technologists and that they expressed an interest in discussing proposed statutory language.

Description of How the Request Relates to the Profession's Ability to Practice to the Full Extent of the Profession's Education and Training

Establishing a scope of practice will allow Connecticut nuclear medicine technologists to practice to the full extent of their education and training. It will provide the necessary validation of the education and training received by the qualified and certified technologist. It will also provide reassurance to the patient that the nuclear medicine technologist performing their study is well qualified and educated as required by the standards established by the State of Connecticut.

Findings/Conclusions

The scope of practice review committee reviewed and evaluated all of information provided in the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS)'s scope of practice request and the evidence they provided in support of the proposed changes, as well as additional information that was requested as a result of committee discussions. In reviewing and evaluating the information presented, the scope of practice committee focused on assessing any public health and safety risks associated with the request, whether the request may enhance access to quality and affordable health care and whether the request enhances the ability of the profession to practice to the full extent of the profession's education and training.

The literature and other information reviewed and evaluated by the scope of practice review committee emphasized the need to ensure that individuals practicing as nuclear medicine technologists (1) have thorough, standardized education and training, (2) pass an entry level knowledge-based examination, and (3) maintain ongoing clinical competence.

The committee did not identify any public health and safety risks associated with implementing a licensure program and scope of practice for nuclear medicine technologists as proposed in this request.

Evidence provided by the Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS) demonstrated that enactment of these changes will enhance the ability of nuclear medicine technologists to practice to the full extent of the profession's education and training. It is not anticipated that implementation of this proposal will impact access to care or costs to the health care system. It is important to note that some of the functions currently being performed by nuclear medicine technologists (e.g., administration of adjunctive medications, etc.) fall outside of the tasks permitted by law to be performed by unlicensed medical personnel who do not otherwise have the statutory authority to engage in such activities. The potential impact on access to care that may result if this proposal is not enacted was not evaluated by the committee. However, it can be reasonably anticipated that there would likely be additional costs to the system if nuclear medicine technologists are not able to continue to perform these activities and other licensed health care practitioners must assist in performing the procedures (e.g., a licensed nurse having to administer medications). Additionally, although licensing fees generate revenue for the State's General Fund, there would be a fiscal impact to the Department of Public Health associated with implementing a new licensing program for several hundred individuals. Statutory recognition is another option that would ensure that all nuclear medicine technologists have met the same minimum qualifications related to competence and that they are practicing safely in accordance with a recognized scope of practice, and would have no cost to the state.

Draft statutory language was not provided for review by scope of practice review committee members. Should the Public Health Committee decide to raise a bill related to this scope of practice request, the Department of Public Health along with the organizations that were represented on the scope of practice review committee (Connecticut Task Force for Licensure of Nuclear Medicine Technologists, members of the New England Chapter Technologists Section (NECTS) of the Society of Nuclear Medicine and Molecular Imaging Technologists Section (SNMMI-TS), the Connecticut Hospital Association and the Radiological Society of Connecticut) respectfully request the opportunity to work with the Public Health Committee on statutory language.

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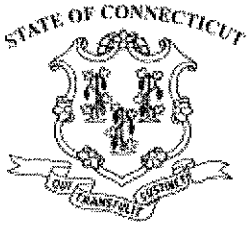

Substitute House Bill No. 6549

Public Act No. 11-209

AN ACT CONCERNING THE DEPARTMENT OF PUBLIC HEALTH'S OVERSIGHT RESPONSIBILITIES RELATING TO SCOPE OF PRACTICE DETERMINATIONS FOR HEALTH CARE PROFESSIONS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. (NEW) (*Effective July 1, 2011*) (a) Any person or entity, acting on behalf of a health care profession that seeks to establish a new scope of practice or change a profession's scope of practice, may submit a written scope of practice request to the Department of Public Health not later than August fifteenth of the year preceding the commencement of the next regular session of the General Assembly.

(b) (1) Any written scope of practice request submitted to the Department of Public Health pursuant to subsection (a) of this section shall include the following information:

(A) A plain language description of the request;

(B) Public health and safety benefits that the requestor believes will be achieved should the request be implemented and, if applicable, a description of any harm to public health and safety should the request not be implemented;

(C) The impact that the request will have on public access to health care;

(D) A brief summary of state or federal laws that govern the health care profession making the request;

(E) The state's current regulatory oversight of the health care profession making the request;

(F) All current education, training and examination requirements and any relevant certification requirements applicable to the health care profession making the request;

(G) A summary of known scope of practice changes either requested or enacted concerning the health care profession in the five-year period preceding the date of the request;

(H) The extent to which the request directly impacts existing relationships within the health care delivery system;

(I) The anticipated economic impact of the request on the health care delivery system;

(J) Regional and national trends concerning licensure of the health care profession making the request and a summary of relevant scope of practice provisions enacted in other states;

(K) Identification of any health care professions that can reasonably be anticipated to be directly impacted by the request, the nature of the impact and efforts made by the requestor to discuss the request with such health care professions; and

(L) A description of how the request relates to the health care profession's ability to practice to the full extent of the profession's education and training.

(2) In lieu of submitting a scope of practice request as described in subdivision (1) of this subsection, any person or entity acting on behalf of a health care profession may submit a request for an exemption from the processes described in this section and section 2 of this act. A request for exemption shall include a plain language description of the request and the reasons for the request for exemption, including, but not limited to: (A) Exigent circumstances which necessitate an immediate response to the scope of practice request, (B) the lack of any dispute concerning the scope of practice request, or (C) any outstanding issues among health care professions concerning the scope of practice request can easily be resolved. Such request for exemption shall be submitted to the Department of Public Health not later than August fifteenth of the year preceding the commencement of the next regular session of the General Assembly.

(c) In any year in which a scope of practice request is received pursuant to this section, not later than September fifteenth of the year preceding the commencement of the next regular session of the General Assembly, the Department of Public Health, within available appropriations, shall: (1) Provide written notification to the joint standing committee of the General Assembly having cognizance of matters relating to public health of any health care profession that has submitted a scope of practice request, including any request for exemption, to the department pursuant to this section; and (2) post any such request, including any request for exemption, and the name and address of the requestor on the department's web site.

(d) Any person or entity, acting on behalf of a health care profession that may be directly impacted by a scope of practice request submitted pursuant to this section, may submit to the department a written statement identifying the nature of the impact not later than October first of the year preceding the next regular session of the General Assembly. Any such person or entity directly impacted by a scope of practice request shall indicate the nature of the impact taking into consideration the criteria set forth in subsection (b) of this section and shall provide a copy of the written impact statement to the requestor. Not later than October fifteenth of such year, the requestor shall submit a written response to the department and any person or entity that has provided a written impact statement. The requestor's written response shall include, but not be limited to, a description of areas of agreement and disagreement between the respective health care professions.

Sec. 2. (NEW) (*Effective July 1, 2011*) (a) On or before November first of the year preceding the commencement of the next regular session of the General Assembly, the Commissioner of Public Health shall, within available appropriations allocated to the department, establish and appoint members to a scope of practice review committee for each timely scope of practice request submitted to the department pursuant to section 1 of this act. Committees established pursuant to this section shall consist of the following members: (1) Two members recommended by the requestor to represent the health care profession making the scope of practice request; (2) two members recommended by each person or entity that has submitted a written impact statement pursuant to subsection (d) of section 1 of this act, to represent the health care professions directly impacted by the scope of practice request; and (3) the Commissioner of Public Health or the commissioner's designee, who shall serve as an ex-officio, nonvoting member of the committee. The Commissioner of Public Health or the commissioner's designee shall serve as the chairperson of any such committee. The Commissioner of Public Health may appoint additional members to any committee established pursuant to this section to include representatives from health care professions having a proximate relationship to the underlying request if the commissioner or the commissioner's designee determines that such expansion would be beneficial to a resolution of the issues presented. Any member of such committee shall serve without compensation.

(b) Any committee established pursuant to this section shall review and evaluate the scope of practice request, subsequent written responses to the request and any other information the committee deems relevant to the scope of practice request. Such review and evaluation shall include, but not be limited to, an assessment of any public health and safety risks that may be associated with the request, whether the request may enhance access to quality and affordable health care and whether the request enhances the ability of the profession to practice to the full extent of the profession's education and training. The committee, when carrying out the duties prescribed in this section, may seek input on the scope of practice request from the Department of Public Health

and such other entities as the committee determines necessary in order to provide its written findings as described in subsection (c) of this section.

(c) The committee, upon concluding its review and evaluation of the scope of practice request, shall provide its findings to the joint standing committee of the General Assembly having cognizance of matters relating to public health. The committee shall provide the written findings to said joint standing committee not later than the February first following the date of the committee's establishment. The committee shall include with its written findings all materials that were presented to the committee for review and consideration during the review process. The committee shall terminate on the date that it submits its written findings to said joint standing committee.

Sec. 3. (NEW) (*Effective July 1, 2011*) On or before January 1, 2013, the Commissioner of Public Health shall evaluate the processes implemented pursuant to sections 1 and 2 of this act and report to the joint standing committee of the General Assembly having cognizance of matters relating to public health, in accordance with the provisions of section 11-4a of the general statutes, on the effectiveness of such processes in addressing scope of practice requests. Such report may also include recommendations from the committee concerning measures that could be implemented to improve the scope of practice review process.

Approved July 13, 2011

Nuclear Medical Technologists 2012 Scope of Practice Review Committee Participants

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Jennifer Lefkowski, Department of Public Health

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Karen Buckley-Bates, Connecticut Hospital Association
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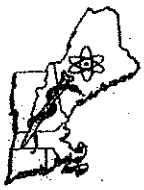
Andrew Lawson, MD, Radiological Society of Connecticut
Alan Kaye, MD, Radiological Society of Connecticut



New England Chapter
Technologist Section
Society of Nuclear Medicine and Molecular Imaging (SNMMI)

Aug. 6, 2012

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Re: Scope of Practice Determination for Connecticut Nuclear Medicine and Molecular Imaging Technologists and Licensure for the same.

Dear Ms. Filippone

Pursuant to Public Act 11-209, we formally submit this written request for the establishment of licensure and Scope of Practice for the Nuclear Medicine Technologists practicing Nuclear Medicine and Molecular Imaging in the State of Connecticut. Included with this request are the established Scope of Practice and the adopted Clinical Performance Standards both from the National Society of Nuclear Medicine and Molecular Imaging. The Connecticut Nuclear Medicine technologists will also be adopting these same documents as their governing standards for practice.

Sincerely,

Task Force for Connecticut Licensure

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Scope of Practice Request for Nuclear Medicine Technologists in Connecticut

The following numbered items respond to the requests made in PA 11-209

1. The request is for legislation of technologists in the field of Nuclear Medicine. This request includes minimum standards for education, both didactic and clinical, continued education and national certification requirements.

2. With the granting of this legislation, minimum standards of qualifications and patient care will protect the public by establishing a standard of care to be provided by Connecticut's Nuclear Medicine professionals. Lack of these standards could have a detrimental effect on patient safety and a financial impact due to substandard and repeat procedures.

3. There would be a minimal impact due to the fact that many of the professional practicing in Connecticut will have met the criteria required to perform Nuclear Medicine procedures. The impact would be on those who have not met the didactic and clinical requirements or the certifications necessary to be a Nuclear Medicine Technologist.

4. There are no Connecticut laws governing the practice of Nuclear Medicine and Molecular Imaging. There are 37 states that do regulate and license Nuclear Medicine Technologists.

5. There is no Connecticut regulatory oversight for Nuclear Medicine Technologists practicing in this state.

6. There are no Connecticut state education, training or certification requirements for Nuclear Medicine Technologists performing diagnostic imaging with the exception of bone densitometry as listed in the regulation, Chapter 376, governing Radiographers and Radiation Therapists. There are certifications required by the Nuclear Medicine credentialing organizations, the Nuclear Medicine Technology Certification Board (NMTCB) and the American Registry of Radiologic Technologists (ARRT).

7. There is no known Scope of Practice for Nuclear Medicine Technologists listed with the State of Connecticut.

8. This Scope of Practice for Nuclear Medicine Technologists would have a minimal direct impact on any existing relationships within the health care delivery system. The establishment of the Scope of Practice would provide the existing, qualified Nuclear Medicine professional with a State of Connecticut guideline for the performance of their medical imaging services. It also provides the non-professional with a direction for becoming a properly qualified Nuclear Medicine technologist.

9. There would be minimal to no economic impact on the healthcare delivery system. There would be an increase in the education requirements for new imaging systems, which most technologists would welcome.

10. As stated in response number 4, there are 37 states nationally that require a state license for Nuclear Medicine Technologists to perform their duties. Within the New England states, Rhode Island, Massachusetts, Maine and Vermont each require licensing. Regionally both New York and New Jersey require Nuclear Medicine Technologists be licensed. Their Scope of Practice documents mirror that of the national Society of Nuclear Medicine and Molecular Imaging, which has been provided along with this request.

11. This Scope of Practice parallels those of the sister modalities involved in the field of Radiology. Because of this similarity, the impact and effect on the other Radiology modalities would be minimal. There has been communication and positive support from the Connecticut Society of Radiology Technologists for the approval of this Scope of Practice and the licensing of Connecticut's Nuclear Medicine Technologists.

12. This Scope of Practice will enhance the Connecticut Nuclear Medicine Technologists in the performance of their duties and their service to the patient. It will provide the necessary validation of the education and training received by the qualified and certified technologist. It will also provide to the patient the reassurance they need in knowing that the Nuclear Medicine Technologist performing their study is qualified and educated as defined by the State of Connecticut.

Society of Nuclear Medicine and Molecular Imaging (SNMMI)
Technologist Section
Scope of Practice for Nuclear Medicine Technologists
Revised 2011

This document is not intended to modify or alter existing tort law; rather it should serve as a concise outline of nuclear medicine technology skills and responsibilities.

NUCLEAR MEDICINE TECHNOLOGY

Nuclear medicine, which includes molecular imaging, is the medical specialty that utilizes sealed and unsealed radioactive materials in the diagnosis and therapy of various diseases. This practice also includes the utilization of pharmaceuticals (used as adjunctive medications) and other imaging modalities with or without contrast to enhance the evaluation of physiologic processes at a molecular level. 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 their profession to optimize diagnostic evaluation and therapy through the safe and effective use of radiopharmaceuticals and adjunctive medications.

The practice of nuclear medicine technology requires multidisciplinary skills that are needed to use rapidly evolving instrumentation, radiopharmaceuticals, adjunctive medications and techniques. The responsibilities of the nuclear medicine technologist include, but are not limited to, patient care, quality control, diagnostic procedures, radiopharmaceutical and adjunctive medication, preparation and administration, in vitro diagnostic testing, radionuclide therapy, and radiation safety. The nuclear medicine technologist can also participate in research.

In order to perform these tasks, the nuclear medicine technologist must successfully complete didactic and clinical education. Education includes, but is not limited to, methods of patient care, immunology, cross sectional anatomy, pharmacology, nuclear medicine and radiation physics, radiation biology, radiation safety and protection, nuclear medicine instrumentation, quality control and quality assurance, computer applications for nuclear medicine, general diagnostic nuclear medicine procedures, radionuclide therapy, positron emission tomography (PET), computed tomography (CT), radionuclide chemistry, radiopharmacy, medical ethics and law, healthcare administration, health sciences and research methods, and medical informatics.

Graduates of accredited programs are eligible to sit for certification examinations offered by the Nuclear Medicine Technology Certification Board and the American Registry of Radiologic Technologists. The spectrum of the nuclear medicine technologist's responsibilities varies widely across the country and may exceed basic skills outlined in the technologist's initial education and certification. Practice components presented in this document provide a basis for establishing the areas of

knowledge and performance for the nuclear medicine technologist. It is assumed that for all activities included in this scope of practice, the nuclear medicine technologist has received the proper education and is in compliance with all federal, state and institutional guidelines including proper documentation of initial and continued competency in those practices and activities. Continuing education is a necessary component in maintaining the skills required to perform all duties and tasks of the nuclear medicine technologist in this ever-evolving field.

THE SCOPE OF PRACTICE

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

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

- **Quality Control:** Requires the evaluation and maintenance of a quality control program for all instrumentation to ensure optimal performance and stability.

- **Diagnostic Procedures:** Requires the utilization of appropriate techniques, radiopharmaceuticals and adjunctive medications as part of a standard protocol to ensure quality diagnostic images and/or laboratory results.

- **Radiopharmaceuticals:** Involves the safe handling and storage of radioactive materials during the procurement, identification, calibration, preparation, quality control, dose calculation, dispensing documentation, administration and disposal.

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

- **In Vitro Diagnostic Testing:** Involves the acquisition of biological specimens with or without oral, intramuscular, intravenous, inhaled or other administration of radiopharmaceuticals and adjunctive medications for the assessment of physiologic function.

- **Operation of Instrumentation:** Involves the operation of:

• Imaging instrumentation:
o Gamma camera systems with or without sealed sources of radioactive materials or x-ray tubes for attenuation correction, transmission imaging or diagnostic CT (when appropriately educated, trained and/or credentialed).
o PET imaging systems with or without sealed sources of radioactive materials or x-ray tubes for attenuation correction, transmission imaging or diagnostic CT (when appropriately trained and/or credentialed)
o Bone density imaging systems with x-ray tubes.

• Non-imaging instrumentation:
o Dose calibrators
o Survey instrumentation for exposure and contamination
o Probe and well instrumentation
o Ancillary patient care equipment as authorized by institutional policies.

• **Radionuclide Therapy:** Involves patient management, preparation and administration of therapeutic radiopharmaceuticals, under the personal supervision of the Authorized User

• **Radiation Safety:** Involves practicing techniques that will minimize radiation exposure to the patient, health care personnel and general public, through consistent use of protective devices, shields, and monitors consistent with ALARA (as low as reasonably achievable) and establishing protocols for managing spills and unplanned releases of radiation.

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CONNECTICUT HOSPITAL ASSOCIATION

MEMORANDUM

TO: Jennifer L. Filippone, Chief
Practitioner Licensing and Investigation Section

FROM: James Iacobellis, Senior Vice President, Government and Regulatory Affairs

DATE: September 28, 2012

SUBJECT: Impact Statement – Scope of Practice Request – Connecticut Nuclear Medicine Technologists

CHA, a trade association representing Connecticut's 29 acute care hospitals, submits this impact statement, in accordance with Chapter 368a of the Connecticut General Statutes, in response to the scope of practice change requested by Connecticut Nuclear Medicine Technologists. The New England Chapter of the Society of Nuclear Medicine and Molecular Imaging is requesting to establish a new scope of practice and licensure category for Nuclear Medicine Technologists.

Nuclear medicine is practiced at Connecticut hospitals. Connecticut hospitals employ or utilize a significant number of licensed healthcare professionals involved in the area of nuclear medicine including physicians, advanced practice registered nurses, physician assistants, and radiologic technologists. It is unclear from the language submitted how the new licensure program and scope of practice would impact the existing scope of practice for other professions. Thus, the establishment of this new licensure category may impact the delivery of care to hospital patients or change hospital policy and procedures.

If the Department appoints a Scope of Practice Review Committee, CHA respectfully requests an appointment to the Committee.

JDI:kbb
By e-mail

RSC RADIOLOGICAL SOCIETY OF CONNECTICUT, INC.
A CHAPTER OF THE AMERICAN COLLEGE OF RADIOLOGY

53 Russ Street, 2nd Floor
Hartford, CT 06106

October 1, 2012

Ms. Jennifer L. Filippone
Chief, Practitioner Licensing and
Investigations Section
Department of Public Health
410 Capitol Avenue, MS #12MQA
P.O. Box 340308
Hartford, CT 06134

Dear Ms. Filippone:

The Radiological Society of Connecticut (RSC) submits this impact statement with regard to a Scope of Practice proposal submitted by the Society of Nuclear Medicine and Molecular Imaging. As you know, the proposal in question would create a new licensure for this profession and details the responsibilities they would undertake.

It has been our understanding that this committee process is to review scope changes for professions that are already licensed and operating in the State of Connecticut. This proposal would essentially create a new profession, something that needs to have the rigorous review of the appropriate legislative committees in the Connecticut General Assembly. We believe this proposal is, therefore, premature.

RSC would ask that if a scope of practice review committee is established, that the RSC be permitted to participate in its deliberations. Thank you.

Sincerely,

Gary Dee, M.D.
RSC President

CC: Tony Sicignano
Past President, N.E. Chapter
Society of Nuclear Medicine and Molecular Imaging

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

§ 35.11 License required.

(a) A person may manufacture, produce, acquire, receive, possess, prepare, use, or transfer byproduct material for medical use only in accordance with a specific license issued by the Commission or an Agreement State, or as allowed in paragraph (b) or (c) of this section.

(b) A specific license is not needed for an individual who—

(1) Receives, possesses, uses, or transfers byproduct material in accordance with the regulations in this chapter under the supervision of an authorized user as provided in § 35.27, unless prohibited by license condition; or

(2) Prepares unsealed byproduct material for medical use in accordance with the regulations in this chapter under the supervision of an authorized nuclear pharmacist or authorized user as provided in § 35.27, unless prohibited by license condition.

(c)(1) A Government agency or a Federally recognized Indian Tribe, that possesses and uses accelerator-produced radioactive material or discrete sources of radium-226 for which a specific medical use license is required in paragraph (a) of this section, may continue to use such materials for medical uses until the date of the NRC's final licensing determination, provided that the person submits a medical use license application on or before December 1, 2008.

(2) Except as provided in paragraph (c)(1) of this section, all other persons, who possess and use accelerator-produced radioactive material or discrete sources of radium-226 for which a specific medical use license is required in paragraph (a) of this section, may continue to use this type of material for medical uses permitted under this part until the date of the NRC's final licensing determination, provided that the person submits a medical use license application within 12 months from the waiver expiration date of August 7, 2009 or within 12 months from the date of an earlier termination of the waiver as noticed by the NRC, whichever date is earlier.

[72 FR 55930 Oct. 1, 2007]

Page Last Reviewed/Updated Tuesday, December 18, 2012

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

§ 35.27 Supervision.

(a) A licensee that permits the receipt, possession, use, or transfer of byproduct material by an individual under the supervision of an authorized user, as allowed by § 35.11(b)(1), shall--

(1) In addition to the requirements in § 19.12 of this chapter, instruct the supervised individual in the licensee's written radiation protection procedures, written directive procedures, regulations of this chapter, and license conditions with respect to the use of byproduct material; and

(2) Require the supervised individual to follow the instructions of the supervising authorized user for medical uses of byproduct material, written radiation protection procedures established by the licensee, written directive procedures, regulations of this chapter, and license conditions with respect to the medical use of byproduct material.

(b) A licensee that permits the preparation of byproduct material for medical use by an individual under the supervision of an authorized nuclear pharmacist or physician who is an authorized user, as allowed by § 35.11(b)(2), shall--

(1) In addition to the requirements in § 19.12 of this chapter, instruct the supervised individual in the preparation of byproduct material for medical use, as appropriate to that individual's involvement with byproduct material; and

(2) Require the supervised individual to follow the instructions of the supervising authorized user or authorized nuclear pharmacist regarding the preparation of byproduct material for medical use, written radiation protection procedures established by the licensee, the regulations of this chapter, and license conditions.

(c) A licensee that permits supervised activities under paragraphs (a) and (b) of this section is responsible for the acts and omissions of the supervised individual.

Page Last Reviewed/Updated Tuesday, December 18, 2012

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

§ 19.12 Instruction to workers.

(a) All individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 100 mrem (1 mSv) shall be--

(1) Kept informed of the storage, transfer, or use of radiation and/or radioactive material;

(2) Instructed in the health protection problems associated with exposure to radiation and/or radioactive material, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed;

(3) Instructed in, and required to observe, to the extent within the workers control, the applicable provisions of Commission regulations and licenses for the protection of personnel from exposure to radiation and/or radioactive material;

(4) Instructed of their responsibility to report promptly to the licensee any condition which may lead to or cause a violation of Commission regulations and licenses or unnecessary exposure to radiation and/or radioactive material;

(5) Instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and/or radioactive material; and

(6) Advised as to the radiation exposure reports which workers may request pursuant to § 19.13.

(b) In determining those individuals subject to the requirements of paragraph (a) of this section, licensees must take into consideration assigned activities during normal and abnormal situations involving exposure to radiation and/or radioactive material which can reasonably be expected to occur during the life of a licensed facility. The extent of these instructions must be commensurate with potential radiological health protection problems present in the work place.

[60 FR 36043, July 13, 1995]

Page Last Reviewed/Updated Tuesday, December 18, 2012

Clinical Performance Standards FOR THE NUCLEAR MEDICINE TECHNOLOGIST (Revision 2011)

The Clinical Performance Standards for the Nuclear Medicine Technologist were initially developed by the Socio Economic Affairs Committee and approved in 1994 periodically revised as the profession and educational requirements evolved. Over this past year, the SNMTS Scope of Practice Task Force has worked to revise the SNMTS Scope of Practice to serve more as an overview of responsibilities, allowing the Clinical Performance Standards (previously the Performance and Responsibility Guidelines) to serve as the task list for nuclear medicine technologists.

The spectrum of nuclear medicine technology skills and responsibilities varies widely across the country. The broad descriptions of this document will provide a basis for determining the areas of knowledge and of performance for the nuclear medicine technologist. The documents used in the revision and development of these guidelines were the Society of Nuclear Medicine Technologist Section (SNMTS) Performance and Responsibility Standards for the Nuclear Medicine Technologist (2003); Nuclear Medicine Technology Certification Board (NMTCB) Report: Components of Preparedness (2009); NMTCB, SNMTS Scope of Practice (2009); Nuclear Medicine Technology Entry-Level Curriculum Guide, 4th Edition; and the Accreditation Standards for Nuclear Medicine Technologist Education (2011). These guidelines should be considered a helpful checklist of those skills necessary to perform a variety of nuclear medicine procedures. Although the editors tried to be complete, nuclear medicine technology is a dynamic and evolving field; therefore, any list is likely to be partially obsolete as soon as it is issued. In addition, this document is not designed to be a "how to" description for any of the listed activities, nor is it intended to be used to represent entry level competencies, but rather the spectrum of NMT general responsibilities. It is not intended to modify or alter existing tort law.

Nuclear medicine, which includes molecular imaging, is the medical specialty that utilizes sealed and unsealed radioactive materials in the diagnosis and therapy of various diseases. This practice also includes the utilization of pharmaceuticals (used as adjunctive medications) and other imaging modalities with or without contrast to enhance the evaluation of physiologic processes at a molecular level. 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 their profession to optimize diagnostic evaluation and therapy through the safe and effective use of radiopharmaceuticals and adjunctive medications.

Nuclear Medicine Technology

The practice of nuclear medicine technology requires multidisciplinary skills that are needed to use rapidly evolving instrumentation, radiopharmaceuticals, adjunctive medications and techniques. The responsibilities of the nuclear medicine technologist include, but are not limited to, patient care, quality control, diagnostic procedures, radiopharmaceutical and adjunctive medication, preparation and administration, in vitro diagnostic testing, radionuclide therapy, and radiation safety. The nuclear medicine technologist can also participate in research.

In order to perform these responsibilities, the nuclear medicine technologist must successfully complete didactic and clinical training. Recommended course work includes, but is not limited to: anatomy, physiology, pathophysiology, pharmacology, chemistry, physics, mathematics, computer applications, biomedical sciences, ethics, and radiation health and safety. Direct patient contact hours are obtained by training in a clinical education setting and are a necessary component in maintaining the skills required to perform the duties and tasks of the nuclear medicine technologist.

Formal education programs in nuclear medicine technology are accredited by the Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT). Graduates of accredited programs are eligible to take the certification examination offered by the Nuclear Medicine Technologist Certification Board (NMTCB) and/or American Registry of Radiologic Technologists (ARRT).

The scope of performance in nuclear medicine technology includes, but is not limited to, the following areas and responsibilities:

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

In Vitro Diagnostic Testing:
Involves the acquisition of biological specimens with or without oral, intramuscular, intravenous, inhaled or other administration of radiopharmaceuticals and adjunctive medications for the assessment of physiologic function.

Instrumentation: Involves the operation of imaging instrumentation:

A. Gamma camera systems with or without sealed sources of radioactive materials or x-ray tubes for attenuation correction, transmission imaging or diagnostic CT (when appropriately educated, trained and/or credentialed).
B. PET imaging systems with or without sealed sources of radioactive materials or x-ray tubes for attenuation correction, transmission imaging or diagnostic CT (when appropriately trained and/or credentialed)
C. Bone density imaging systems with x-ray tubes
    1. Non-imaging instrumentation:
D. Dose calibrators
E. Survey instrumentation for exposure and contamination
F. Probe and well instrumentation
G. Ancillary patient care equipment as authorized by institutional policies.

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

Diagnostic Procedures:
Requires the utilization of appropriate techniques, radiopharmaceuticals and adjunctive medications as part of a standard protocol to ensure quality diagnostic images and/or laboratory results.

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

Radiopharmaceuticals:
Involves the safe handling and storage of radioactive materials during the procurement, identification, calibration, preparation, quality control, dose calculation, dispensing documentation, administration and disposal.

Radionuclide therapy:
Involves patient management, preparation and administration of therapeutic radiopharmaceuticals, under the personal supervision of the Authorized User.

Radiation safety:
Involves practicing techniques that will minimize radiation exposure to the patient, health care personnel and general public, through consistent use of protective devices, shields, dose reduction, and monitors consistent with ALARA (as low as reasonably achievable) and establishing protocols for managing spills and unplanned releases of radiation.

I. Patient Care

A. A nuclear medicine technologist provides patient care by:

1. providing for proper comfort and care to the patient prior to, during and after a procedure, including but not limited to the monitoring of intravenous lines (i.e.., central lines, peripherally inserted central catheters (PICC), oxygen supplies, drains; and operation of blood pressure cuffs, electrocardiogram (ECG) machines, pulse oximeters, glucometer intravenous pumps and oxygen delivery regulators.

2. insertion of peripheral intravenous catheters

3. monitoring patients who are under minimal sedation (in those facilities that approve such practice with subsequent documentation of competency of all monitoring staff in accordance with the American Society of Anesthesiology's [ASA] guidelines for conscious sedation).

3. establishing and maintaining proper communication with patients (i.e.,

proper introduction, appropriate explanation of procedure, etc.)

4. behaving in a professional manner in consideration and observation of patients' rights resulting in the provision of the highest quality patient care possible.

5. providing a safe and sanitary working environment for patients and the general public, using proper infection control practices in compliance with accepted precaution policies

6. Recognizing and responding to an emergency situation at a level commensurate with one's training and competency including cardiopulmonary resuscitation (CPR) ; the use of automatic external defibrillators (AED), if applicable, advanced cardiac life support (ACLS), advanced pediatric life support (PALS).

B. A nuclear medicine technologist prepares the patient by:

1. review the indication for the study for appropriateness and consulting with the authorized user and/or referring physician whenever necessary to ensure that the proper study is performed.

2. verifying patient identification, date of last menstrual period, pregnancy/breastfeeding status and written orders for the procedure.

3. obtaining a pertinent medical history including medications and allergies and confirming the patient's candidacy for the procedure.

4. assuring that any pre-procedural preparation has been completed (e.g., fasting, hydration, thyroid blocking, voiding, bowel cleansing, suspension of interfering medications.

5. assuring that informed consent has been obtained, as prescribed by the institution, whenever necessary.

6. properly explaining the procedure to the patient and/or family and, where appropriate, to the parent and/or legal guardian, and when necessary, obtain the assistance of an interpreter or translator This includes, but is not limited to, patient involvement, length of study, radiation safety issues, and post-procedure instructions.

7. Collecting and performing pertinent laboratory procedures

8. In vitro diagnostic testing laboratory analyses, including urine pregnancy testing and fasting blood sugar. Additionally, in vitro diagnostic testing laboratory procedures include, but are not limited to, secretions, saliva,

breath, blood, and stool, to measure biodistribution of radiopharmaceuticals.

C. A nuclear medicine technologist performs administrative procedures by:

1. maintaining an adequate volume of medical/surgical supplies, radiopharmaceuticals, storage media, and other items required to perform procedures in a timely manner.

2. scheduling patient procedures appropriate to the indication and in the proper sequence.

3. maintaining appropriate records of administered radioactivity, quality control procedures, patient reports, and other required records.

4. Developing and revising, when necessary, policies and procedures in accordance with applicable regulations.

5. Actively participating in total quality management/continuous quality improvement programs (i.e., age-specific competencies, patient education, and patient restraint and immobilization).

II. Instrumentation/Quality Control

A. A nuclear medicine technologist evaluates the performance of instrumentation by:

1. obtaining uniformity images on scintillation detectors.

a) selecting a radionuclide source of appropriate type, size, 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/or quantitatively in comparison to the manufacturer's specifications and the performance requirements based on the studies for which unit is used;

e) identifying the source of any nonuniformity (e.g., checking collimator, PHA peak setting);

f) initiating corrective action when necessary; and

g) maintaining required records for the quality control program.

2. performing a detector linearity evaluation on scintillation detectors.

a) selecting a radionuclide, a linearity phantom and obtaining images;

b) identifying any nonlinear distortion in the image;

c) determining the source of nonlinearity. (e.g., detector-source geometry);

d) initiating corrective action when necessary; and

e) maintaining required records for the quality control program.

3. performing spatial resolution checks on scintillation detectors.

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;

d) initiating corrective action when necessary; and

e) maintaining required records for the quality control program.

4. conducting sensitivity checks on scintillation detectors.

a) selecting a source with an appropriate level of activity and half-life;

b) assuring identical geometry, source placement and measurement parameters for repetitive checks;

c) evaluating results;

d) initiating corrective action when necessary; and

e) maintaining required records for the quality control program.

5. performing single photon emission computed tomography (SPECT) quality control procedures.

   a) obtaining a high count uniformity flood;

   b) verifying center of rotation correction;

   c) verifying energy correction and spatial coordinates;

   d) verifying multi-head detector alignment;

   e) evaluating reconstruction results of phantom acquisition;

   f) analyzing the results for degradation;

   g) initiating corrective action when necessary; and

   h) maintaining required records for the quality control program.

6. performing and evaluating quality control procedures for positron emission tomography (PET) and computed tomography (CT) imaging systems.

   a) evaluating the performance of PET and hybrid PET/CT systems:

      (i) with an intimate knowledge of PET detectors, types of crystals (e.g., BGO, LSO, GSO, NaI), transmission sources of various configurations, retractable rod sources/septa, ring planes, and methods of coincidence detection.

      (ii) identifying system-specific quality control requirements by following recommended initial acceptance, daily, weekly, monthly, quarterly, and annual quality control procedures to evaluate allowable parameter ranges for:

         a) photon detection/discrimination
         b) spatial resolution
         c) scatter reaction
         d) count loss
         e) random measurement
         f) sensitivity
         g) deadtime loss and random count correction accuracy

(iii) recognizing image artifacts requiring imaging system correction and performing corrections and quality assuranance as directed by institutional and manufacturer recommendations.

a) sinogram acquisition and evaluation
b) well counter SUV calibration;
c) PET/CT system alignment calibration;
d) CT system quality assurance;
e) glucometer quality assurance using high and low standards;

f) rubidium generator quality assurance to include dose calibrator/generator calibration and parent/daughter breakthrough is this in the correct location??

(iv) assisting with the development of 2D and 3D tomographic normalization algorithms used for image acquisition, recontruction, and display.

(v) demonstrating knowledge and technical skills in computed tomography (CT) when used to perform PET/CT examinations.
a) x-ray production
b) radiographic techniques
c) scanning parameters (MA, kVp, pitch, and helical scanning)

7. verifying computer parameter settings and data interface.

a) assuring that the camera detector and computer register the same count rate at the maximum frame rate;

b) verifying that the camera detector and computer have the same image orientation;

c) obtaining a dead time measurement on the computer;

d) verifying accuracy of ECG gating;

e) performing pixel calibration; and

d) operating PET computer hardware, processing software and basic Windows and Unix platforms.

8. ensures the proper performance of imaging systems,

storage media, and radiation detection and counting devices, including but not limited to scintillation cameras, dose calibrators, survey instruments, scintillation probes and well counters, and data processing and image production devices.

9. Maintaining and operating auxiliary equipment used in nuclear medicine procedures

10. A nuclear medicine technologist actively participates in total quality management/continuous quality improvement programs by:

    a) identifying indicators to be analyzed;

    b) gathering and presenting data in appropriate formats; and

    c) analyzing data and recommending changes.

B. A nuclear medicine technologist evaluates the performance of NaI (TI) scintillation probes, well counters and other laboratory equipment by:

1. calibrating a spectrometer with a calibrated, long half-life radionuclide source.

2. determining energy resolution.

3. conducting sensitivity measurements at appropriate energies.

4. checking background and determining the cause for levels greater than established normal levels.

5. conducting a chi-square test.

6. maintaining required records for quality control programs.

C. A nuclear medicine technologist operates survey meters by:

1. ensuring that calibration is completed with an approved source.

2. performing a check-source test and comparing with previous results.

3. maintaining required records for quality control program.

D. A nuclear medicine technologist evaluates the operation of a dose calibrator by:

1. determining precision (constancy).

2. determining accuracy.

3. ascertaining linearity over the entire range of radionuclide activity to be measured and determining correction factors when necessary.

4. testing for significant geometric variation in activity measured as a function of sample volume or configuration and determining correction factors when necessary.

5. maintaining required records for the quality control program.

E. A nuclear medicine technologist operates and maintains image processors by:

1. verifying the calibration of the instrument.

2. ensuring that materials required for image processing are at acceptable levels.

3. maintaining required records for quality control program.

III. Diagnostic Procedures and Adjunctive Medications

A. A nuclear medicine technologist performs imaging procedures by:

1. determining imaging parameters.

a) preparing, evaluating and properly administering the appropriate radiopharmaceuticals and/or pharmaceuticals and contrast (under the direction of an authorized user)

b) selecting the appropriate imaging or data collection parameters; and

c) establishing and/or properly maintain venous access routes of various configurations (in accordance with hospital policies and procedures)

2. administrating radiopharmaceuticals and/or pharmaceuticals through various routes, including but not limited to oral, intravesical, inhalation, intravenous, intramuscular, subcutaneous, and intradermal (under the direction of an authorized user).

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, etc.);

c) establishing and/or verifying venipuncture access using aseptic technique;

d) using and maintaining established venous access routes (e.g., heparin infusion, IMED);

e) establishing patient patterned breathing when introducing radiopharmaceuticals (e.g., inhalants or aerosols);

f) NMT also performs med reconciliation according to the procedure manual to assure no drug interaction with patient's current meds

g) administering oral radiopharmaceuticals;

h) Preparing and administering adjunctive pharmacologic agents including oral and IV contrast agents

i) properly documenting medications and/or radiopharmaceutical administrations on the patient medical record

3. Positioning the patient and obtaining images.

a) waiting an appropriate length of time following the administration of a radiopharmaceutical to begin the imaging procedure;

b) acquiring imaging views according to established protocols and acquiring additional views to optimize information content;

c) properly positioning the patient using supportive materials and immobilizers, as necessary;

d) exercising independent judgment in positioning a patient or detector unit to best demonstrate pathology and to adapt to the patient's limitations;

e) indicating appropriate anatomic landmarks for each view of the procedure; and

f) reviewing images to ensure that required information has been acquired, processed properly and is of the highest quality.

4. assisting in exercise and pharmacologic cardiac stress testing procedures

a) preparing patients for placement of ECG electrodes;

b) recognizing and responding to any ECG changes;

c) recognizing the parameters that indicate termination of cardiac stress study; and

d) recognizing ECG patterns that are appropriate for image gating.

e) determine whether the appropriate test has been ordered based on the ECG rhythm

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 filters, frequency cutoff, attenuation and motion correction when reconstructing SPECT images;

d) defining regions of interest (ROI's) with reproducible results and correctly applying background subtraction;

e) performing computer data manipulations as required by standard nuclear medicine procedures, e.g., activity curve generation, quantitation, SPECT slice production;

f) labeling processed images (e.g., anatomical positioning, ROI's, date, etc.);

g) processing PET data to produce parametric images; and

h) archiving and retrieving data from storage media.

B. A nuclear medicine technologist performs non-imaging in vivo and/or radioassay studies by:

1. operating laboratory equipment including well counters, probes, and other detection devices to measure the biodistribution of radiopharmaceuticals.

a) confirming accuracy, precision, and operation of pipetting device; and

b) using microhematocrit centrifuge and determining hematocrit.

b) recognizing and responding to any ECG changes;

c) recognizing the parameters that indicate termination of cardiac stress study; and

d) recognizing ECG patterns that are appropriate for image gating.

e) determine whether the appropriate test has been ordered based on the ECG rhythm

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 filters, frequency cutoff, attenuation and motion correction when reconstructing SPECT images;

d) defining regions of interest (ROI's) with reproducible results and correctly applying background subtraction;

e) performing computer data manipulations as required by standard nuclear medicine procedures, e.g., activity curve generation, quantitation, SPECT slice production;

f) labeling processed images (e.g., anatomical positioning, ROI's, date, etc.);

g) processing PET data to produce parametric images; and

h) archiving and retrieving data from storage media.

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1. operating laboratory equipment including well counters, probes, and other detection devices to measure the biodistribution of radiopharmaceuticals.

a) confirming accuracy, precision, and operation of pipetting device; and

b) using microhematocrit centrifuge and determining hematocrit.

2. preparing doses and guidelines.

   a) quantitating dose

      (i) determining decay factor and calculating remaining activity;

      (ii) determining volume necessary to deliver activity for the prescribed dose;

      (iii) drawing dose into syringe using appropriate techniques and materials;

      (iv) dispensing appropriate quantity of liquid or capsules, as necessary, for the prescribed dose;

      (v) confirming calculated activity by using a dose calibrator.

   b) preparing standard solutions.

      (i) choosing appropriate volumetric or gravimetric techniques to dilute standard;

      (ii) adding radioactive material identical to that given the patient quantity sufficient (qs) to appropriate volume; and

      (iii) dissolving capsule in appropriate solvent, if necessary, for preparing a standard

3. collecting appropriate specimen for procedures using standard precaution techniques by:

   a) collecting blood samples.

      (i) selecting proper supplies (e.g., needles, syringes, evacuated tubes, anticoagulants, etc.);

      (ii) Correctly identify patient and labeling patient demographics on collection containers;

      (iii) performing venipuncture at appropriate time intervals using aseptic technique;

      (iv) adding hemolyzing compounds or anticoagulants to samples when necessary;

(v) centrifuging blood and separating blood components, as required; and

(vi) storing aliquots of serum, plasma, or whole blood according to protocol.

b) collecting urine samples by:

(i) instructing patient and nursing staff regarding the correct method and time of urine collection;

(ii) aliquoting urine sample and measuring total urine volume;

(iii) measuring specific gravity of urine, if required; and

(iv) recognizing and documenting all technical circumstances which would produce invalid results.

4. gathering, validating and documenting data.

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;

d) plotting graph, if necessary, and determining half time by extrapolating to zero time;

e) reporting both patient calculated values and normal range of specific procedures used; and

f) evaluating results for potential error.

5. managing bio-hazardous, chemical and radioactive waste in accordance with applicable regulations and specific facility policy.

IV. Radiopharmaceuticals

A. A nuclear medicine technologist displays:

1. thorough knowledge of molecular level physiological functions that relate to glucose metabolism, blood flow, brain oxygen utilization, perfusion, and receptor-ligand binding rates.

642 2. thorough knowledge of physiological and processes that relate to organ
643 system function and anatomy and their radiopharmaceutical demonstration
644 of normal and pathologic states.
645
646 B. A nuclear medicine technologist procures and maintains radiopharmaceutical
647 products and adjunct supplies by:
648
649 1. anticipating and procuring a sufficient supply of radiopharmaceuticals for
650 an appropriate time period in accordance with anticipated need and license
651 possession limits.
652
653 2. storing pharmaceuticals, radiopharmaceuticals and supplies in a manner
654 consistent with labeled product safeguards and with radiation safety
655 considerations.
656
657 3. performing and documenting radiation survey and wipe tests upon receipt
658 of radioactive materials.
659
660 4. recording receipt of radioactive materials in a permanent record.
661
662 5. following Department of Transportation (DOT) and radiation safety
663 guidelines in the transport, receipt and shipment of radioactivity.
664
665 C. A nuclear medicine technologist properly prepares and administers diagnostic
666 radiopharmaceuticals under the direction of an authorized user in accordance with
667 all federal, state and institutional gudielines by:
668
669 1. employing aseptic technique for manipulation of injectable products.
670
671 2. assembling and maintaining radionuclide generators.
672
673 3. eluting radionuclide generators according to manufacturer's specification.
674
675 4. verifying radionuclide purity of generator eluates.
676
677 5. selecting and preparing radiopharmaceuticals in accordance with
678 manufacturer's specifications.
679
680 6. measuring and calculating activity of the radionuclide with a dose
681 calibrator.
682
683 7. confirming the quality of a radiopharmaceutical in accordance with
684 accepted techniques and official guidelines (e.g., radiochemical purity,
685 physical appearance).
686
687 8. preparing blood or blood products for labeling and/or labeled blood cells,

e.g., ^{111}Indium WBC in accordance with established protocols.

9. recording use and/or disposition of all radioactive materials in a permanent record.

D. A nuclear medicine technologist is responsible for the identification and labeling of all radiopharmaceutical preparations by:

1. labeling vials and syringes as required by regulation.

2. recording radiopharmaceutical and medication information on a patient's administration form and permanent preparation records.

3. labeling and segregating radioactive waste and recording this information in a permanent record.

E. A nuclear medicine technologist prepares individual dosages under the direction of an authorized user or Radiation Safety Officer by:

1. applying radioactive decay calculations to determine required volume or unit form necessary to deliver the prescribed radioactive dose.

2. selecting and preparing prescribed dosages and entering this information on a patient's administration form and other permanent records.

3. labeling the dose for administration.

4. checking the dose activity prior to administration in a dose calibrator and comparing this measurement against the identification label of the dose's immediate container.

V. Radionuclide Therapy

A. Nuclear medicine technologist properly prepares and administers therapeutic radionuclides, radiopharmaceuticals, and pharmaceutical agents by oral and/or intravenous routes when these agents are part of a standard procedure that is required for treatment under the direction of an authorized user in accordance with federal, state, and institutional regulations by:

1. assuring that the correct radiopharmaceutical and dosage is prepared.

2. following the NRC mandated quality management program in effect at the facility in regard to patient identification and the use of therapeutic radionuclides.

3. observing prescribed radiation safety procedures during the preparation and the administration of such treatment.

4. assisting the authorized user in supplying proper patient care instructions to hospital staff, patient, and/or caregivers.

5. conducting and documenting radiation surveys of designated patient areas, when indicated.

6. Instruct the patient, family and staff in radiation safety precautions after the administration of therapeutic radiopharmaceuticals.

7. coordinating/scheduling pre/post treatment blood draws and/or imaging.

VI. Radiation Safety

A. A nuclear medicine technologist performs all procedures utilizing ionizing radiation safely and effectively, applying federal, state, and institutional regulations, including, but not limited to:

1. notifying appropriate authority when changes occur in the radiation safety program.

2. assisting in the preparation of license amendments, when necessary.

3. keeping up to date on regulatory changes and by complying with all applicable regulations.

4. maintaining required records.

5. posting appropriate signs in designated areas.

6. following regulations regarding receipt, disposal and usage of all radioactive materials.

7. carrying out a program to follow regulations regarding therapeutic procedures and follow-up.

8. recommending purchase of protection equipment to meet regulations.

9. packaging radioactive material according to regulations and keeping accurate records of transfer.

B. A nuclear medicine technologist follows appropriate radiation protection procedures by:

1. using personnel monitoring devices (dosimeters, film badges, thermoluminescent dosimeters, etc.).

   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. selecting and using proper syringe shields and other shielding configurations to reduce radiation exposure to patients, personnel and the general public.

3. identifying specific radionuclides emissions and energies per radiopharmaceutical (gamma, beta, positron) and using proper shielding and disposal procedures in compliance with NRC regulations to maximize patient, technologist, and public protection.

4. performing technologist bioassays as per state and/or federal regulations.

5. working in a safe, but timely manner in order to decrease radiation exposure in consideration of ALARA programs.

6. reviewing personal monitoring device readings to determine if radiation exposure can be further reduced.

7. working in a manner that minimizes potential contamination of patients, technologists, the public, and work areas.

C. A nuclear medicine technologist performs radioactivity contamination monitoring by:

1. ensuring that instruments are calibrated at regular intervals, or after repairs according to 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 authorized user or Radiation Safety Officer.

5. performing constancy checks on survey meters.

826
827 6. performing wipe tests where applicable.
828
829 7. performing leak tests on sealed sources, when so authorized.
830
831 8. recording data in required format (e.g., dpm instead of cpm).
832
833 9. evaluating results of wipe tests and area surveys to determine if action
834 is required.
835
836 10. notifying the Radiation Safety Officer when actions are
837 required.
838
839 D. A nuclear medicine technologist performs decontamination procedures by:
840
841 1. wearing personal protective equipment as necessary.
842
843 2. restricting access to affected area and confining a spill.
844
845 3. removing contamination and monitoring the area and personnel and
846 repeating decontamination procedure until activity levels are acceptable.
847
848 5. closing off all areas of fixed contamination that are above acceptable
849 levels, and posting appropriate signs.
850
851 6. identifying, storing, or disposing of contaminated material in accordance
852 with regulations.
853
854 7. maintaining adequate records concerning decontamination.
855
856 8. notifying appropriate authority (e.g., Radiation Safety Officer) in the event
857 of possible overexposure or other violations of regulations.
858
859 E. A nuclear medicine technologist disposes of radioactive waste in accordance with
860 federal, state and institutional regulations by:
861
862 1. maintaining appropriate records.
863
864 2. disposal according to license specifications.
865
866 3. maintaining long- and short-term storage areas according to
867 regulation.
868
869 F. A nuclear medicine technologist participates in programs designed to instruct
870 other personnel about radiation hazards and principles of radiation safety by:
871

1. using the following teaching concepts

   a) types of ionizing radiation;

   b) the biological effects of ionizing radiation;

   c) limits of dose, exposure, and radiation effect;

   d) concepts of low-level radiation and health; and

   e) concept of risk versus benefit.

2. providing instruction on appropriate radiation safety measures.

3. providing instruction on proper emergency procedures to be followed until radiation safety personnel arrive at the site of accident or spill.

4. modeling proper radiation safety techniques and shielding in the course of daily duties.

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NMTCB ELIGIBILITY REQUIREMENTS

Effective January 1, 2007, all eligibility standards required to sit for the entry-level examination must be completed within the 5 year period immediately prior to the candidate's application. A candidate must show documented evidence of having completed ONE of the following in the previous five years:

I. Completion of a NMTCB recognized nuclear medicine technology program

II. Completion of a certificate, associate degree or baccalaureate degree in nuclear medicine technology program from a regionally accredited academic institution.* Regionally accredited college and university programs must have structured clinical training sufficient to provide clinical competency in radiation safety, instrumentation, clinical procedures, and radiopharmacy. This should require approximately 1000 hours of clinical training supervised by program faculty. **Please note that beginning January 1, 2016, only graduates of programmatically accredited nuclear medicine education programs will be considered eligible to sit for the NMTCB examination. The NMTCB currently recognizes the following programmatic accreditation organizations:**

- Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT)
- Canadian Association of Medical Radiation Technologists (CAMRT)
- Australian and New Zealand Society of Nuclear Medicine (ANZSNM)

- Alternate Eligibility and Non-USA trained candidates (Must meet requirements listed under section A, B, and C below). **Attention: All eligibility requirements must be completed and the application and fee must be received in the NMTCB office by December 31, 2015 in order to be considered for approval to sit for the NMTCB exam through Alternate Eligibility.**

A. Education Requirement (Completion of one of the following)

1. A baccalaureate or associate degree in one of the physical or biological sciences
2. A baccalaureate or associate degree in other disciplines with successful completion of courses in the following areas: college algebra, physics, chemistry, human anatomy, and physiology

In lieu of a baccalaureate or associate degree, the NMTCB will accept the following:

3. Active national certification as a registered medical technologist (MT)
4. Active national certification as a registered radiographer (RT)

5. Active license as a registered nurse (RN)
6. Active national certification as a registered diagnostic medical sonographer (RDMS)
7. Active national certification as a radiation therapist (RTT)
8. Active certification as a CAMRT nuclear medicine technologist

B. Clinical Experience

Within the 5 year period immediately prior to the candidate's application, four years full-time (or 8000 hours) of clinical experience in nuclear medicine technology under the supervision of a physician (MD/DO) board certified in nuclear radiology (ABR) or nuclear medicine (ABNM) or isotopic pathology (ABP) or an authorized physician user of radioactive materials with special competency in nuclear medicine.

C. Didactic Coursework Requirement

Within the 5 year period immediately prior to the candidate's application, 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. Only coursework from an accredited college or university, accredited nuclear medicine program or approved continuing education credits recognized by NMTCB, such as SNMMITS VOICE Credits or ASRT Evidence of Continuing Education (ECE), will be accepted. See Didactic Coursework

- Graduation from a nuclear medicine technology or related program in another country. These individuals should contact the NMTCB office for eligibility requirements. Required documentation will include but not be limited to a complete program description with course descriptions, contact hours, and documentation of clinical experience. Proof of graduation must also be a part of the documentation.
- CNMTs requesting reexamination for competency.

NOTE: Candidates who believe they have equivalent qualifications may petition the Credentials Committee for consideration. Documentation is required.
*Schools, colleges, or universities accredited by one of the six regional accrediting bodies:

- Middle States Association of Colleges and Schools

- North Central Association of Colleges and Schools
- New England Association of Schools and Colleges
- Northwest Association of Schools and Colleges
- Southern Association of Colleges and Schools
- Western Association of Schools and Colleges

If your alternate eligibility is based on academic coursework and/or a degree from a foreign university, your official transcripts, grades, and other records must first be evaluated to include both an equivalency evaluation and subject breakdown by one of the NMTCB approved credential evaluation services. Two of these Evaluation Agencies are listed below:

The International Education Research Foundation
Credentials Evaluation Service
P.O. Box 3665
Culver City, CA 90231-3655
(310) 258-9451

World Education Services, Inc.
P.O. Box 745
Old Chelsea Station
New York, NY 10113-0745
(212) 966-6311

This evaluation must be completed and submitted directly to the NMTCB by one of the approved credential evaluation services. The NMTCB does not pay fees associated with transcript evaluation.

American Registry of Radiologic Technologists (ARRT)

Nuclear Medicine Technology Certification

Certification is the initial recognition of an individual who satisfies certain standards within a profession. Employers, state licensing agencies, and federal regulators look at the ARRT credential as an indication that a person has met a recognized national standard for medical imaging, interventional procedures, and radiation therapy professionals.

As outlined in ARRT's "Equation for Excellence," candidates for ARRT's Nuclear Medicine Technology certification must meet basic education, ethics, and examination requirements to become eligible. The following sections outline the eligibility requirements for all three areas. Note that there is no such thing as "registry-eligible" as far as the ARRT is concerned. Additional eligibility details can be found in the Nuclear Medicine Technology Certification Handbook. The 2013 handbook is now available.

Education Requirements for Nuclear Medicine Technology Certification

Nuclear Medicine Technology certification candidates must have — within the past five years* — successfully completed a Nuclear Medicine Technology educational program that is accredited by a mechanism acceptable to the ARRT**. Beginning on January 1, 2015, all candidates for certification in Nuclear Medicine Technology must have earned an academic degree before becoming certified.

As part of their education, candidates must also demonstrate competency in didactic coursework and an ARRT-specified list of clinical procedures by completing the Nuclear Medicine Technology Didactic and Clinical Competency Requirements. NOTE: Candidates who complete their educational program during 2011 or 2012 may use either the version with the 2008 effective date or the version with the 2011 effective date. Candidates graduating after December 2012 must use the version with the 2011 effective date.

* Candidates graduating from an educational program beginning January 1, 2013, will have three years to establish eligibility for ARRT certification, as opposed to the five years that is available to those who complete their program by December 31, 2012.

** ARRT generally recognizes only accreditation agencies that are recognized by CHEA and/or USDE. Currently, that includes only regional and programmatic accrediting agencies listed here. The ARRT Board in July 2011 instituted a moratorium on recognizing new accreditation agencies while it is re-evaluating its recognition standards.

Learn more about ARRT's education requirements.

Ethics Requirements for Nuclear Medicine Technology Certification

Every candidate for certification must, according to ARRT governing documents, "be a person of good moral character and must not have engaged in conduct that is inconsistent with the ARRT

Rules of Ethics," and they must "agree to comply with the *ARRT Rules and Regulations* and the *ARRT Standards of Ethics*." ARRT investigates all potential violations in order to determine eligibility.

Issues addressed by the Rules of Ethics include convictions, criminal procedures, or military court martials as described below:

- Felony;
- Misdemeanor;
- Criminal procedures resulting in a plea of guilty or nolo contendere (no contest), a verdict of guilty, withheld or deferred adjudication, suspended or stay of sentence, or pre-trial diversion.

Juvenile convictions processed in juvenile court and minor traffic citations not involving drugs or alcohol do *not* need to be reported.

Additionally, candidates for certification are required to disclose whether they have ever had any license, registration, or certification subjected to discipline by a regulatory authority or certification board (other than ARRT), as well as any honor code violations that may have occurred while they attended school.

Candidates may complete a pre-application to determine their ethics eligibility prior to enrolling in or during their educational program.

Read all about ARRT's ethics requirements.

Examination Requirements for Nuclear Medicine Technology Certification

After having met the education and ethics requirements, candidates for Nuclear Medicine Technology certification must pass ARRT's Nuclear Medicine Technology examination, which assesses the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of staff technologists practicing at entry-level within the discipline. Applications for the exam are found in the certification handbooks which candidates receive from their educational program. When completing their applications, candidates should keep a few things in mind:

- Candidates for primary certification may mail their application up to three months prior to their anticipated graduation date.
- All photos, signatures, and dates of signatures on an application form must occur within the six months before the date the application is received at the ARRT office.
- Be sure to include the correct application fee.

The Nuclear Medicine Technology Content Specifications provide an outline of the topics covered in the exam. Since ARRT uses many references to build its exams, it does not provide specific lists of study materials or textbooks, nor does it recommend or endorse any review programs, mock registries, or study guides.

Individuals who are determined eligible by ARRT will receive, via the USPS, a Candidate Status Report (CSR) that details eligibility status and provides information on scheduling an exam appointment within the 90-day window. The CSR also addresses how to change an exam window or appointment, and how to prove identity at the test center.

Find out more about ARRT's exams, including details about exam format and exam length, test centers, and how to request testing accommodations.

Candidates are allowed three attempts to pass an exam, and they must complete the three attempts within a three-year period that begins with the initial ARRT examination window start date.

Beyond Certification

ARRT offers an easy way to publicly recognize a technologist's accomplishments and promote a facility's commitment to quality — a news release template that can be accessed easily, customized personally, and distributed locally. Find out how easy it is to announce a newly earned certification.

Once you become certified, the Registered Technologist (R.T.) credential is maintained through ongoing registration. R.T.s must agree to comply with the *ARRT Rules and Regulations* and *ARRT Standards of Ethics* each year, as well as meet the *Continuing Education Requirements for Renewal of Registration* every two years.

Learn more about what happens after certification.

CONTENT SPECIFICATIONS FOR THE EXAMINATION IN NUCLEAR MEDICINE TECHNOLOGY

Publication Date: July 2010
Implementation Date: January 2011

The purpose of the ARRT Examination in Nuclear Medicine Technology is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the staff technologist at entry into the profession. To identify the knowledge and skills covered by the examination, the ARRT periodically conducts practice analysis studies involving a nationwide sample of staff technologists[1]. The results of the most recent practice analysis are reflected in this document. The complete task inventory, which serves as the basis for these content specifications, is available from our website *www.arrt.org*.

The table below presents the five major content categories, along with the number and percentage of test questions appearing in each category. The remaining pages provide a detailed listing of topics addressed within each major content category. A list of commonly used pharmaceuticals that may be tested on the examination can be found in Attachment A. However, other pharmaceuticals may appear as practice changes.

This document is not intended to serve as a curriculum guide. Although certification programs and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address subject matter not included in these content specifications.

	CONTENT CATEGORY	PERCENT OF TEST	NUMBER OF QUESTIONS [2]
A.	Radiation Protection	10%	20
B.	Radionuclides and Radiopharmaceuticals	11%	22
C.	Instrumentation and Quality Control	20%	40
D.	Diagnostic and Therapeutic Procedures	50%	100
E.	Patient Care and Education	9%	18
		100%	200

1. A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.

2. Each exam includes an additional 20 unscored (pilot) questions. On the pages that follow, the approximate number of test questions allocated to each content category appears in parentheses.

A. RADIATION PROTECTION (20)

1. Patient and Personnel Protection (10)

A. Biological Effects of Radiation

1. cellular biology
2. effects of radiation on cells
   a. direct and indirect action
   b. radiolysis of water
   c. LET and RBE
3. stochastic and deterministic effects
4. acute effects of total body radiation
   a. radiation sickness
   b. hemopoietic syndrome
   c. gastrointestinal syndrome
   d. central nervous system syndrome
5. long term effects of radiation
   a. somatic
   b. genetic
6. relative tissue and organ sensitivity (e.g., law of Bergonié and Tribondeau)
7. effects of radiation on embryo/fetus

B. Basic Concepts of Radiation Protection

1. units of radiation exposure
2. principles of time, distance, and shielding
3. personnel protection equipment (e.g., gloves, lab coats)
4. personnel monitoring devices
   a. types
   b. use, care, and placement
5. ALARA
6. release of patients

C. NRC Regulations for Radiation Exposure

1. occupational
2. public
3. pregnancy or nursing
4. internal dosimetry and bioassays
5. personnel exposure records

D. Medical and Recordable Events

1. definition
2. NRC regulations for reporting and notification

2. Area/Facilities Monitoring (5)

A. Basic Concepts

1. units of measurement
2. exposure rates
3. definition of contaminated area

B. Survey Equipment and Techniques

1. well counters
2. survey meters
3. wipe test technique

C. NRC Regulations

1. frequency of surveys and wipes
2. classification of areas
   a. work
   b. treatment
   c. storage
3. posting of signs (e.g., types, locations)
4. documentation of survey and wipes results
   a. interpretation
   b. reporting (corrective action)
   c. record retention

D. Radioactive Spills

1. major spills
2. minor spills
3. processes for decontamination
4. reporting procedures

3. Radioactive Materials (5)

A. Inspection of Incoming and Outgoing Materials

1. shipping labels
2. measurement of exposure rate
3. measurement of surface contamination
4. removable contamination limits/trigger levels

B. Storage

1. radiopharmaceuticals
2. sealed sources
3. consequences of improper storage

C. Disposal of Radioactive Waste

1. release to environment
2. decay in storage
3. transfer to authorized recipient

B. RADIONUCLIDES AND RADIOPHARMACEUTICALS (22)

1. Physical Properties of Radioactive Materials (4)

A. Decay of Radioactivity
   1. atomic structure
   2. decay modes (e.g., alpha, beta, positron, etc.)
   3. decay rate
   4. half-life
   5. parent-daughter relationship

B. Interaction of Radiation with Matter
   1. coherent (i.e., Rayleigh scattering)
   2. photoelectric effect
   3. Compton scattering
   4. pair production and annihilation
   5. internal conversion
   6. Auger electron
   7. bremsstrahlung

C. Physical Form (e.g., gas, solution, capsule)

D. Production of Radionuclides
   1. methods
      a. reactor
      b. accelerator
      c. generator
   2. purity
      a. radionuclide
      b. chemical

2. Radiopharmaceutical Characteristics (5)

A. Method of Localization
   1. capillary blockade
   2. active transport
   3. phagocytosis
   4. diffusion
   5. compartmentalization
   6. chemisorption
   7. receptor binding
   8. antigen antibody
   9. filtration

B. Half-Life
   1. physical
   2. biological
   3. effective

C. Biodistribution
   1. pharmacokinetics
   2. critical organs
   3. target organs

3. Preparation and Administration (13)

A. Kit Preparation
   1. labeling process
      a. principles
         1. oxidation/reduction
         2. pH
         3. time for reaction
         4. temperature
      b. compounding techniques
         1. venting
         2. heating
         3. mixing
      c. factors that affect labeling quality
   2. shelf life and storage
   3. quality control
      a. radiochemical purity
      b. particle size

B. Calculation of Radiopharmaceutical and Pharmaceutical Dosage
   1. units
      a. conversions
      b. calculations
   2. volume determination
      a. formula
      b. decay tables
      c. concentration
      d. activity

C. Pharmaceutical and Radiopharmaceutical Administration
   1. preparation
      a. syringe, shielding, and needle selection
      b. administration techniques
         1. routes
         2. aseptic
      c. uniform distribution (e.g., mixing, agitation)
   2. complications and reactions
   3. documentation

D. Radiopharmaceutical Label
   1. date and time
   2. lot number and expiration date
   3. concentration
   4. volume
   5. activity

C. INSTRUMENTATION AND QUALITY CONTROL (40)

1. Survey Meter (2)

A. Operating Principles

1. Geiger Mueller
2. ionization chambers (cutie pies)

B. Quality Control

1. frequency and types of checks
2. interpretation and record keeping

2. Dose Calibrator (2)

A. Operating Principles

B. Quality Control

1. types of checks
   a. accuracy
   b. constancy
   c. linearity (activity)
   d. geometry
2. frequency of checks
3. source selection
   a. activity
   b. energy
4. interpretation and record keeping

3. Scintillation Detector System (2)

A. Operating Principles

1. well counter
2. uptake probe

B. Quality Control

1. radionuclide source
   a. energies
   b. type of source
2. parameters
   a. energy resolution
   b. efficiency
   c. high voltage calibration
   d. resolving time
   e. sensitivity
   f. energy linearity
3. interpretation and record keeping

4. Gamma Camera (10)

A. Operating Principles

B. Quality Control

1. frequency and types of checks
2. performance characteristics
   a. flood field uniformity
   b. spatial linearity
   c. spatial resolution
   d. detector sensitivity
   e. energy resolution (e.g., FWHM)
   f. extrinsic versus intrinsic methods
   g. center of rotation
   h. SPECT phantom measurements
3. interpretation and record keeping

5. PET/CT Scanner (8)

A. PET Operating Principles

B. PET Quality Control

1. frequency and types of checks
2. characterization and correction calibration
   a. energy window calibration
   b. gain setting
   c. coincidence timing calibration
   d. blank scan
   e. normalization calibration
   f. absolute activity (well counter) calibration
3. interpretation and record keeping

C. CT Operating Principles

D. CT Quality Control

1. tube warm-up
2. CT number (water phantom)
3. noise and uniformity

6. Gas and Aerosol Delivery Systems (2)

A. Operating Principles

B. Exhaust System (e.g., negative pressure, gas traps)

C. Interpretation and Record Keeping

(Section C continues on the following page)

C. INSTRUMENTATION AND QUALITY CONTROL (cont.)

7. Image Acquisition (10)

A. Detector System

1. count or time mode
2. detector orientation
3. photopeak energy setting and window width
4. multi-energy acquisition

B. Collimator Selection

1. parameters (e.g., energy, resolution)
2. types (e.g., parallel hole, pinhole)

C. Dynamic/Static Acquisition

1. matrix selection
2. framing (e.g., number and length)
3. gating

D. SPECT Acquisition

1. angular sampling (e.g., 180° versus 360°)
2. matrix selection
3. attenuation correction
4. duration of acquisition
5. mode of acquisition (e.g., continuous, step and shoot, gated)

E. CT Acquisition

1. kVp
2. mA

8. Data Processing (4)

A. Quantitative Analysis (e.g., region of interest selection, ejection fraction, time activity curves)

B. SPECT Reconstruction

1. orientation
2. filter parameters
3. attenuation correction
4. gated images
5. motion correction

C. Image Management

1. archiving
2. PACS
3. RIS

D. DIAGNOSTIC AND THERAPEUTIC PROCEDURES (100)

1. Positioning (5)

A. Patient/Detector Orientation

B. Anatomical Landmarks

C. Immobilization Techniques

1. physical devices
2. sedation
3. effects (e.g., restriction of circulation, attenuation, patient motion)

2. Factors Affecting Image Quality (5)

A. Equipment

B. Patient

C. Radiopharmaceutical

3. Specific Procedures (90)

TYPE OF STUDY	APPROX. # QUESTIONS
A. Abscess/Infection/Inflammation	4
B. Bone 1. limited 2. 3-phase 3. whole body 4. SPECT	9
C. Central Nervous System 1. brain death 2. brain SPECT 3. brain PET or PET/CT 4. cisternography/CSF leak	2
D. Cardiac 1. gated blood pool 2. myocardial perfusion 3. PET or PET/CT	24
E. Endocrine 1. thyroid uptake/imaging 2. parathyroid 3. neuroendocrine 4. adrenal imaging	7
F. Gastrointestinal 1. gastric emptying/reflux 2. Meckel's diverticulum 3. GI bleed 4. hepatobiliary 5. RBC hemangioma 6. liver/spleen	13

FOCUS OF QUESTIONS

Questions about a specific study or procedure may address any of the following factors:

A. Instrumentation
- detector system
- data acquisition
- data analysis
- ancillary equipment

B. Radiopharmaceuticals
- selection
- dosage
- administration
- biodistribution

C. Patient Preparation, Monitoring, and Education
- indications and contraindications
- pregnancy, nursing
- dietary restrictions
- adverse reactions
- medications
- age specific considerations

D. Imaging Techniques
- views
- patient-detector orientation
- fusion imaging

E. Anatomy and Pathophysiology
- general anatomy
- cross-sectional anatomy

(Section D continues on the following page)

E. PATIENT CARE AND EDUCATION (18)

1. Ethical and Legal Aspects (5)

A. Patient's Rights

1. informed consent (e.g., written, oral, implied)
2. confidentiality (HIPAA)
3. additional rights (e.g., Patient's Bill of Rights)
   a. privacy
   b. extent of care (e.g., DNR)
   c. access to information
   d. living will; health care proxy
   e. research participation
4. patient safety standards (e.g., patient identification)

B. Legal Issues

1. examination requisition
2. common terminology (e.g., battery, negligence, malpractice)
3. legal doctrines (e.g., *respondeat superior*, *res ipsa loquitur*)

C. ARRT Standards of Ethics

2. Interpersonal Communication (3)

A. Modes of Communication

1. verbal/written
2. nonverbal (e.g., eye contact, touching)

B. Challenges in Communication

1. patient characteristics
2. explanation of medical terms
3. strategies to improve understanding
4. language barrier
5. cultural differences

C. Patient Education

1. explanation of current procedure
2. respond to inquiries about other health care related services (e.g., CT, MRI, mammography, sonography, radiography, bone densitometry, clergy, social services, and rehabilitation)

3. Infection Control (6)

A. Terminology and Basic Concepts

1. asepsis
   a. medical
   b. surgical
   c. sterile technique
2. pathogens
   a. fomites, vehicles, vectors
   b. nosocomial infections

B. Cycle of Infection

1. pathogen
2. source or reservoir of infection
3. susceptible host
4. method of transmission
   a. contact (direct, indirect)
   b. droplet
   c. airborne/suspended
   d. common vehicle
   e. vector-borne

C. Standard Precautions

1. handwashing
2. gloves, gowns
3. masks
4. medical asepsis (e.g., equipment disinfection)

D. Additional or Transmission-Based Precautions (e.g., hepatitis B, HIV, rubella, tuberculosis)

1. airborne (e.g., respiratory protection, negative ventilation)
2. droplet (e.g., particulate mask, restricted patient placement)
3. contact (e.g., gloves, gown, restricted patient placement)

E. Disposal of Contaminated Materials

1. linens
2. needles
3. patient supplies (e.g., tubes, emesis basin)

(Section E continues on the following page)

D. DIAGNOSTIC AND THERAPEUTIC PROCEDURES (cont.)

3. Specific Procedures (cont.)

TYPE OF STUDY	APPROX. # QUESTIONS	FOCUS OF QUESTIONS
G. Genitourinary 1. renal function 2. renal perfusion 3. renal morphology	6	*Questions about a specific study or procedure may address any of the following factors:* A. Instrumentation • detector system • data acquisition • data analysis • ancillary equipment B. Radiopharmaceuticals • selection • dosage • administration • biodistribution C. Patient Preparation, Monitoring, and Education • indications and contraindications • pregnancy, nursing • dietary restrictions • adverse reactions • medications • age specific considerations D. Imaging Techniques • views • patient-detector orientation • fusion imaging E. Anatomy and Pathophysiology • general anatomy • cross-sectional anatomy
H. Lung 1. perfusion 2. ventilation – gas and aerosol 3. quantitative	5	
I. Lymphoscintigraphy 1. breast 2. melanoma	4	
J. Tumor 1. gallium 2. I-131 whole body 3. sestamibi 4. PET or PET/CT 5. peptide receptor imaging	11	
K. Shunt Studies	1	
L. Therapy 1. procedures a. palliative bone b. thyroid ablation c. hyperthyroidism d. non-Hodgkin's lymphoma 2. regulations	4	

E. PATIENT CARE AND EDUCATION (cont.)

4. Physical Assistance and Transfer (2)

A. Patient Transfer and Movement

1. body mechanics (balance, alignment, movement)
2. patient transfer

B. Assisting Patients with Medical Equipment

1. infusion catheters and pumps
2. oxygen delivery systems
3. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)

C. Routine Monitoring

1. equipment (e.g., stethoscope, sphygmomanometer)
2. vital signs (e.g., blood pressure, pulse, respiration, temperature)
3. physical signs and symptoms (e.g., motor control, severity of injury)
4. documentation

5. Medical Emergencies (2)

A. Allergic Reactions (e.g., pharmaceuticals, latex)

B. Cardiac or Respiratory Arrest (e.g., CPR)

C. Physical Injury or Trauma

D. Other Medical Disorders (e.g., seizures, diabetic reaction)

Attachment A

NUCLEAR MEDICINE PHARMACEUTICALS*

RADIOPHARMACEUTICALS

1. Tc-99m sodium pertechnetate
2. Tc-99m HDP
3. Tc-99m MDP
4. Tc-99m sestamibi
5. Tc-99m tetrofosmin
6. Tc-99m labeled RBCs
7. Tc-99m DTPA
8. Tc-99m DMSA
9. Tc-99m MAG3
10. Tc-99m HMPAO (Ceretec)
11. Tc-99m ECD (Neurolite)
12. Tc-99m HMPAO (Ceretec) tagged WBCs
13. Tc-99m MAA
14. Tc-99m sulfur colloid
15. Tc-99m disofenin and mebrofenin
16. In-111 DTPA
17. In-111 oxine labeled WBCs
18. In-111 pentetreotide (OctreoScan)
19. In-111 ibritumomab tiuxetan (Zevalin)
20. Tl-201 thallous chloride
21. Xe-133 gas
22. I-123 sodium iodide
23. I-131 sodium iodide
24. I-131/I-123 MIBG
25. Ga-67 gallium citrate
26. F-18 fluorodeoxyglucose (FDG)

INTERVENTIONAL PHARMACEUTICALS

27. Adenosine
28. Aminophylline
29. Dipyridamole

* This is a list of commonly used pharmaceuticals that may appear on the exam. However, other pharmaceuticals may appear as practice changes.

INTERVENTIONAL PHARMACEUTICALS (cont.)

30. Dobutamine
31. Captopril
32. Enalapril
33. Furosemide (Lasix)
34. Cholecystokinin (CCK, Sincalide)
35. Morphine
36. Regadenoson
37. Lugol's solution
38. Heparin

THERAPEUTIC RADIOPHARMACEUTICALS

39. I-131 tositumomab (Bexxar)
40. Y-90 ibritumomab tiuxetan (Zevalin)
41. Sr-89 chloride (Metastron)
42. Sm-153 EDTMP (Quadramet)
43. I-131 MIBG
44. I-131 sodium iodide

NUCLEAR MEDICINE TECHNOLOGY DIDACTIC AND CLINICAL COMPETENCY REQUIREMENTS

Eligibility Requirements Effective January 2011*

Candidates for certification are required to meet the Professional Requirements specified in Article II of the *ARRT Rules and Regulations*. This document identifies the minimum didactic and clinical competency requirements for certification referenced in the *Rules and Regulations*. Candidates who complete a formal educational program accredited by a mechanism acceptable to the ARRT will have obtained education and experience beyond the requirements specified here.

Didactic Requirements

Candidates must successfully complete coursework addressing the topics listed in the *ARRT Content Specifications for the Examination in Nuclear Medicine Technology*. These topics are presented in a format suitable for instructional planning in the *SNM Curriculum Guide for Educational Programs in Nuclear Medicine Technology* (2002).

Clinical Requirements

As part of their educational program, candidates must demonstrate competence in the clinical activities identified in this document. Demonstration of clinical competence means that the program director or designee has observed the candidate performing the procedure, and that the candidate performed the procedure independently, consistently, and effectively. Candidates must demonstrate competence in:

- Four patient care activities.
- Five quality control procedures.
- Twenty-five diagnostic and therapeutic procedures.

Documentation

The following pages identify specific clinical competency requirements. Candidates may wish to use these pages, or their equivalent, to record completion of the requirements. The pages do NOT need to be sent to the ARRT.

To document that the didactic and clinical requirements have been satisfied, candidates must have the program director (and authorized faculty member if required) sign the ENDORSEMENT SECTION of the **Application for Certification** included in the *Certification Handbook*.

* *Note: Candidates who complete their educational program during 2011 or 2012 may use either the previous requirements (effective 2005) or the current requirements (effective 2011). Candidates who graduate after December 31, 2012 may no longer use the previous requirements.*

Nuclear Medicine Technology
Clinical Competency Requirements

The clinical competency requirements include the patient care activities, quality control procedures, and diagnostic and therapeutic procedures identified below. Demonstration of competence should include variations in patient characteristics (e.g., age, gender, medical condition).

1. General Patient Care

Requirement: Candidates must demonstrate competence in all four patient care activities listed below. The activities should be performed on patients; however, simulation is acceptable (see endnote) if state or institutional regulations prohibit candidates from performing the procedures on patients.

Patient Care Activity	Date Completed	Competence Verified By
CPR		
Vital Signs (BP, pulse, respiration)		
Venipuncture		
ECG (lead placement; recognition of common dysrhythmias)		

2. Quality Control Procedures

Requirement: Candidates must demonstrate competence in all five quality control activities listed below.

Quality Control Procedure	Date Completed	Competence Verified By
Gamma Camera or SPECT (uniformity, resolution, center of rotation)		
Dose Calibrator (constancy, linearity)		
Well Counter/Uptake Probe (energy calibration)		
Survey Meter (daily check)		
PET or PET/CT (daily check)		

Nuclear Medicine Technology
Clinical Competency Requirements (cont.)

3. Diagnostic and Therapeutic Procedures

Requirement: Candidates must demonstrate competence in 25 different nuclear medicine procedures. Candidates should demonstrate the following skills when performing the procedures: evaluation of requisition; patient instructions, preparation, and care; selection, handling, and administration of radiopharmaceutical; equipment configuration and patient positioning; radiation safety; and image processing and evaluation. All procedures must be performed on patients, with the exception of thyroid therapy which may be simulated (see endnote).

The 25 procedures to be performed are selected from the categories (cardiovascular, endocrine, etc.) listed in the table below. Candidates must select 18 of the 25 procedures from the categories as specified in the table. The remaining 7 procedures may be chosen from any category. The table indicates the procedures in each category, and specifies the minimum number of procedures that must be performed in each category.

Category*	**# Procedures in Category**	**# That Must Be Performed**	
Abscess and Infection (elective)	2	0	
Skeletal	3	2	
Cardiovascular	3	2	
Endocrine/Exocrine	4	2	
Gastrointestinal	6	3	
Genitourinary	2	1	
Respiratory	3	2	
Tumor	4	2	
SPECT	6	3	
Therapeutic Procedures	4	1	
Central Nervous System (elective)	5	0	
Subtotal		**18**	
		+ 7	electives from any category
Total	**42**	**25**	

Example: Assume a candidate demonstrates competence in the 3 cardiovascular procedures (*myocardial perfusion*, *gated blood pool*, and *PET or PET/CT*). This means that the candidate has fulfilled the cardiovascular requirement of 2 procedures, and has also completed 1 elective.

* Note: The specific nuclear medicine procedures within each category are identified on the following two pages.

Nuclear Medicine Technology
Clinical Competency Requirements (cont.)

Nuclear Medicine Procedure (# of required procedures appears in parentheses)	**Date Completed**	**Competence Verified By**
Abscess and Infection (0 - procedures are elective)		
Gallium		
WBC Imaging		
Skeletal (2)		
Limited		
Three-Phase		
Whole Body		
Cardiovascular (2)		
Gated Blood Pool Studies		
Myocardial Perfusion		
PET or PET/CT		
Endocrine/Exocrine (2)		
Thyroid Uptake		
Thyroid Scan		
Thyroid Metastatic Survey		
Parathyroid		
Gastrointestinal (3)		
Hepatobiliary		
Gastroesophageal Reflux		
Gastric Emptying		
GI Bleeding		
Meckel's Diverticulum		
Liver		
Genitourinary (1)		
Renal: Dynamic Perfusion		
Renal: Cortical Imaging		
Respiratory (2)		
Perfusion		
Ventilation (gas or aerosol)		
Quantitative		

Nuclear Medicine Technology
Clinical Competency Requirements (cont.)

Nuclear Medicine Procedure (# of required procedures appears in parentheses)	**Date Completed**	**Competence Verified By**
Tumor (2)		
Gallium		
Peptide Receptor		
Lymphoscintigraphy (breast or melanoma)		
PET or PET/CT		
SPECT (3)		
Bone		
Brain		
Liver		
Tumor		
Cardiac		
Renal		
Therapeutic Procedures (1) (all may be simulated)		
Thyroid: Ablation		
Thyroid: Hyperthyroidism		
Palliative Bone		
Non-Hodgkin's Lymphoma		
Central Nervous System (0 - procedures are elective)		
Brain: Planar		
Brain: Dynamic		
Brain: PET or PET/CT		
Cisternography: Routine		
Cisternography: CSF leak		

Note: The ARRT requirements specify that certain clinical procedures may be simulated. Simulations must meet the following criteria: (a) the student is required to competently demonstrate skills as similar as circumstances permit to the cognitive, psychomotor, and affective skills required in the clinical setting; (b) the program director is confident that the skills required to competently perform the simulated task will generalize or transfer to the clinical setting. Examples of acceptable simulation include: demonstrating CPR on a mannequin; performing venipuncture by demonstrating aseptic technique on another person, but then inserting the needle into an artificial forearm or grapefruit.