Accreditation Standards for Nuclear Medicine Technologist Education

Effective Date: TBD~~August 1, 2022~~

~~10/06/17 Glossary explanation of 'physics' was broadened~~
~~06/29/18 Editorial changes made for clarity and consistency of terminology~~
~~07/31/19 D3.2 average changed from five to three year period~~
~~11/26/19 Advanced placement statement added to C3~~
~~04/17/21 Standard D3.2 removed~~
~~05/28/21 Diagnostic CT content added~~
~~12/01/22 Removed mandatory arranged capacity at all PET/CT affiliates~~
~~05/12/23 Removed requirement for diagnostic CT certification exam data~~

Joint Review Committee on Educational Programs
In Nuclear Medicine Technology

JRCNMT Standards
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Terms in bold within the *Standards* are defined in the glossary at the end of this document.

Additional requirements for entry-level programs conferring a master's degree are in blue shaded text.

Requirements for programs that contain a complete diagnostic CT curriculum are in yellow shaded text.

Introduction

The Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT) is recognized by the Council for Higher Education Accreditation (CHEA) to accredit postsecondary nuclear medicine technology programs offering certificate, associate and baccalaureate degrees. Programs must be located in the territorial United States, its protectorates and possessions and may be offered in a traditional or distance education format.

This document was initially adopted in 1970; revised in 1976, 1984, 1991, 1997, 2003, 2010, 2017, ~~and~~ 2021 and 2024 with feedback from multiple communities of interest including practitioners, educators, employers, students, academic institution administrators, national associations and agencies, the public and the JRCNMT's collaborating agencies.

These *Standards* should be used for the development and self-evaluation of programs. They constitute the minimum requirements to which an accredited program is held responsible and they, along with JRCNMT policies and procedures, are the criteria which the JRCNMT utilizes to award or deny ~~program~~ accreditation. Programmatic accreditation is recognized as providing a basic assurance of the scope and quality of professional education.

Nuclear Medicine Technology

Nuclear medicine is the medical specialty that utilizes the nuclear properties of radioactive and stable nuclides for the diagnostic evaluation of the physiologic and/or anatomic conditions of the body and to provide therapy with radioactive sources. The nuclear medicine technologist is an allied health professional who, under the direction of an authorized user, is committed to applying the art and skill of diagnostic evaluation and therapeutics through the safe and effective use of radiopharmaceuticals and pharmaceuticals. The nuclear medicine technologist exhibits professionalism in the performance of duties, demonstrates an empathetic and instructional approach to patient care and maintains confidentiality of information as required. Responsibilities include, but are not limited to: ~~preparation, quality control testing and~~ administration of radioactive and non-radioactive compounds; execution of patient imaging procedures including computer processing and image enhancement; laboratory testing; patient interviews; instruction and preparation for administration of prescribed radioactive compounds for therapy; and equipment quality control~~; and radiation safety.~~ The nuclear medicine technologist applies knowledge of radiation physics and safety regulations to limit radiation exposure of the general public, patients, co-workers, and self to as low as reasonably achievable (ALARA).

Hybrid imaging, involving the acquisition of two types of imaging, with or without subsequent fusion into a single set of images, is common in nuclear medicine. Currently, the most common type of hybrid imaging involves traditional nuclear medicine single photon emission computed tomography (SPECT) or positron emission tomography (PET) and computed tomography (CT), an x-ray imaging modality. JRCNMT accreditation standards require both didactic and clinical education in hybrid imaging.

Some medical facilities expect nuclear medicine technologists to perform diagnostic CT procedures since the PET/CT and SPECT/CT equipment in the nuclear medicine department can be used in this manner. Performance of diagnostic CT procedures, which generally involve greater radiation exposure than CT performed for hybrid imaging and commonly utilize contrast material, requires specific didactic and clinical education beyond what is taught for hybrid imaging in nuclear medicine technology programs.

Some academic institutions offer a stand-alone diagnostic CT program for nuclear medicine and other medical imaging graduates after completion of their initial academic program. Other institutions, frequently those at the baccalaureate level, have embedded the didactic and clinical diagnostic CT curriculum within the nuclear medicine program.

In 2020 the JRCNMT determined that all nuclear medicine technology programs with an embedded diagnostic CT curriculum must have both the nuclear medicine and the diagnostic CT components evaluated during the accreditation review process. To facilitate this, these standards were amended in 2021 to include standards for

diagnostic CT education. The diagnostic CT standards are applicable to all nuclear medicine programs containing diagnostic CT curriculum that results in student eligibility for either national certification exam in CT upon program completion/graduation. Diagnostic CT programs that are not embedded within an accredited nuclear medicine technology program are not reviewed by the JRCNMT.

Program Accreditation

Accreditation of nuclear medicine technology programs is a voluntary process that includes an in-depth analysis of the program relative to the *Standards*. Published institutional and program mission statements are considered by the JRCNMT in its application and enforcement of the *Standards*. Accreditation decisions are based on JRCNMT Board review of information provided in the accreditation application and self-study report, the letter of site visit findings and any additional information requested from the program in writing or at the time of the site visit. New information submitted after the site visit will not be accepted or considered by the JRCNMT Board of Directors.

Standard A: Administration

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A1 Sponsorship

A1.1 The institution sponsoring a nuclear medicine technology program must be one of the following:

a. A ***post-secondary*** academic institution accredited by an institutional ~~regional or national~~ accreditor~~ing agency~~ recognized by the U.S. Department of Education (USDE) or the Council for Higher Education Accreditation (CHEA), and authorized under ~~applicable~~ state law or other acceptable authority to provide a post-secondary educational program that awards a minimum of a certificate upon completion of the program.

b. A hospital or medical center that is accredited by a health care accrediting agency or equivalent recognized by the U.S. Department of Health and Human Services, and authorized under applicable state law or other acceptable authority to provide healthcare, that awards a minimum of a certificate upon completion of the program.

~~c. A branch of the United States Armed Forces that awards a minimum of a certificate upon completion of the program.~~

A1.2 When multiple institutions collaboratively sponsor a program it shall be called a ***consortium***. ~~All~~ Each institution~~s~~ in the consortium must meet one of the criteria in Standard A1.1. The responsibilities of each member institution must be clearly documented in a formal contract or memorandum of understanding that delineates responsibility for all aspects of the program including student admission, instruction, student services, resources, reporting, governance and lines of authority.

A1.3 Entry-level programs culminating in a master's degree must be sponsored by the educational institution that awards the graduate degree.

A2 Sponsor Responsibilities

A2.1 The sponsor must ~~be capable of~~ provid~~e~~~~ing~~ required prerequisite and co-requisite courses or have a process for evaluating and accepting transfer credit for these courses from other ~~regionally or nationally~~ accredited educational institutions.

A2.2 The sponsor must ~~be capable of~~ provid~~e~~~~ing~~ the professional didactic and laboratory instruction and is responsible for:

a. hiring faculty and staff;
b. supporting the program faculty in curriculum planning, selection of course content, and program ***assessment***;
c. supporting the program in maintaining compliance with JRCNMT Standards and policies;
d. receiving and processing applications for admission;
e. conferring the academic degree or ***credential*** which documents satisfactory completion of the educational program;
f. ensuring that all faculty and student policies are consistent with federal and state statutes, rules and regulations; ~~and~~
g. having a policy to creat~~e~~~~ing~~ and follow~~ing~~ a ***teach out plan*** for currently matriculated students in accordance with the institution's ~~regional or national~~ accreditor and federal law, in the event of program or institutional closure and/or loss of accreditation; and~~.~~
h. ensuring there is a contingency plan for the sudden departure or extended absence of the Program Director.

A2.3 The sponsor must offer a nuclear medicine technology program that is the equivalent of at least 12 months in length, inclusive of holidays and breaks between academic terms.

A2.~~3~~4 The sponsor must provide ~~the opportunity~~ time and financial support to the primary faculty of the program for ongoing professional development in both nuclear medicine technology and ***pedagogy***. ~~of the ***primary faculty*** of the program to ensure they are able to fulfill their instructional and administrative obligations.~~

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A3 Program Responsibilities

~~A3.1 The program must have a mission and student learning outcomes that are commensurate with the degree level offered and used to guide the development of the curriculum.~~

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A3.~~1~~2 The program shall be responsible for:

a. Maintaining and documenting effective supervision, coordination, and continuing communication with all clinical affiliates to ensure students receive equivalent and adequate clinical experiences to meet ***competencies*** defined by the program.

b. Maintaining and documenting effective coordination and continuing communication with ***academic affiliates*** to ensure students receive accurate and timely advisement prior to entering the nuclear medicine technology program, and/or upon transfer of professional coursework from the program to the academic affiliate for degree completion.

A3.2~~D3.3~~Programs must have an Advisory Committee that includes each AES, along with any other members the program chooses to appoint. On an annual basis, the program shall hold a meeting to, at a minimum:

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- ~~-~~apprise the Committee of program issues;
- review program effectiveness and student learning outcome assessment; and
- ~~and ask for~~ request feedback to improve the program's policies, procedures and curriculum.

Meetings must be live (in-person, conference call, webinar and/or other real-time, interactive medium) and minutes must be prepared.

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Programs with embedded diagnostic CT education must appoint all CT AES and at least one of its didactic CT instructors ~~a member~~ to the Advisory Committee to represent this area of clinical practice.

Programs offering a master's degree must appoint additional members to the Advisory Committee to represent the expanded professional curriculum.

A3.3~~C2~~ The program must provide a student handbook, clinical course syllabi, and student assessment tools ~~documents~~ to each AES at least annually and upon a change in AES. Orientation to the documents and expectations of clinical affiliates should be provided by the program.

A3.4 Administration of Clinical Affiliates

a. ~~A3.3~~The program must ensure there is a current, duly executed ***affiliation agreement*** between the sponsor and each clinical affiliate. An agreement must identify the roles and responsibilities of all parties; specifically address student supervision and student liability; and provide adequate notice of termination of the agreement. ~~to minimize the impact on the clinical education of enrolled and matriculated students.~~

b. Modifications to the program must be communicated to all clinical affiliates in a timely manner and in accordance with requirements in affiliation agreements.

c. When a clinical affiliate is utilized by more than one nuclear medicine technology program, each program and the clinical site must negotiate and sign and adhere to an ***affiliate sharing agreement.*** ~~then adhere to the terms of the agreement to ensure the maximum student capacity at the affiliate is not exceeded.~~

d. The PD and/or CC must perform and document a minimum of two in-person visits OR three visits, one of which must be in-person, ~~per year~~ annually to each clinical affiliate in use. ~~is expected.~~ All in-person visits must occur when a student is present.

For programs with embedded diagnostic CT education, the PD and/or CC must perform and document a minimum of two in-person visits OR three visits, one of which must be in-person, ~~per year~~ annually to each ~~clinical~~ CT affiliate in use.~~providing clinical education in diagnostic CT.~~ All in-person visits must occur when a student is present.

A3.~~5~~4 Administration of Academic Affiliates

The program must ensure there is a current, duly executed ***affiliation agreement*** between the sponsor and each academic affiliate. The agreement must identify the roles and responsibilities of all parties. It must delineate the credits the academic affiliate will award for completion of the nuclear medicine technology program, the degree to be awarded, and the process whereby the transfer of credits is accomplished.

~~A3.5 When a clinical affiliate is utilized by more than one nuclear medicine technology program, each program and the clinical site must negotiate and sign an ***affiliate sharing agreement*** then adhere to the terms of the agreement to ensure the maximum student capacity at the affiliate is not exceeded.~~

Standard B: Resources

Sponsor Resources

B1 The sponsor must provide sufficient resources to ensure achievement of the program's mission and student learning outcomes. Resources must include, but are not limited to:

a. faculty;
b. ~~clerical and~~ **administrative** ***support staff***;
c. finances;
d. offices, classroom and laboratory facilities;
e. library, technology and educational resources; and
f. clinical affiliates.

Program Personnel

B2.1 Program Director

a. ~~Duties~~Responsibilities

The Program Director (PD) must hold a ***full-time*** appointment at the sponsoring institution and demonstrate ongoing participation in professional education in both nuclear medicine technology and ***pedagogy***. The PD must demonstrate effectiveness in:

i. program administration and assessment;~~,~~
ii. curriculum design;~~,~~
~~ii.~~iii. instruction;~~,~~
iv. student evaluation;~~, and~~
~~iii.~~v. academic advisement; and~~.~~
vi. ~~T~~the ~~PD must also demonstrate effectiveness in the~~ supervision and coordination of the clinical coordinator(s) and other faculty teaching in the program.

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There must be evidence that sufficient time is devoted to the program by the PD to demonstrate that all educational and administrative responsibilities are met.

b. Qualifications

The PD must be a nuclear medicine technologist knowledgeable of current nuclear medicine technology and pedagogy~~educational methodology~~. The PD must:

i. hold a master's degree from an ~~regionally or nationally~~ accredited academic institution;~~,~~
ii. hold certification and registration in nuclear medicine technology from a national certification board;~~,~~
iii. have a minimum of four years post-certification nuclear medicine technology experience;~~,~~ and
iv. have at least one year of experience teaching in the didactic and/or clinical setting ~~for~~ of an accredited nuclear medicine technology program.

B2.2 Clinical Coordinator

a. ~~Duties~~Responsibilities

The Clinical Coordinator (CC) must demonstrate effectiveness in the following aspects of clinical education:

i. organization;
ii. ongoing review and revision of clinical assignments;
iii. student education and assessment;
iv. planning for and development of clinical affiliates; and
v. the general effectiveness of the clinical education experience.

~~be responsible for all aspects of the clinical education portion of the program, including organization, ongoing review and revision, planning for and development of clinical affiliates, and the general effectiveness of the clinical education experience.~~

The PD may assume the responsibilities of the CC and programs may have multiple CCs.

A CC must demonstrate ongoing participation in professional education in both nuclear medicine technology and ***pedagogy***. There must be evidence that sufficient time is devoted to the program by the CC to meet ~~so that his or her~~ educational and administrative responsibilities ~~are met~~ and ensure students are supervised throughout the program's clinical education experiences.

b. Qualifications

The CC must be a nuclear medicine technologist knowledgeable of current nuclear medicine technology and pedagogy. The CC must:

- hold a bachelor's degree from a regionally or nationally accredited academic institution;~~,~~
- hold certification and registration in nuclear medicine technology from a national certification board~~,~~; and
- have a minimum of two years post-certification nuclear medicine technology experience.

B2.3 Instructional Faculty

a. Responsibilities~~Duties~~

Instructional faculty must demonstrate effectiveness in:

i. teaching courses;~~,~~
ii. supervising laboratory experiences;~~,~~

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~~i.~~iii. evaluating student achievement~~;~~ and
~~ii.~~iv. developing curriculum.

Faculty must also participate in program policy and procedure formulation and the assessment of program effectiveness.

b. Qualifications
Instructional faculty must be qualified by education, certification and/or experience to teach assigned courses at a level appropriate for nuclear medicine technology students.

Programs at the master's degree level must ensure that faculty teaching in graduate-level courses or mentoring graduate projects meet institutional graduate faculty policies.

Programs containing an embedded diagnostic CT program must ensure that at least one faculty member is credentialed in diagnostic CT.

B2.4 Administrative Support Staff
There must be sufficient ***administrative*** ~~***and clerical***~~ ***support staff*** to enable the program to meet~~s~~ accreditation standards.~~its published mission.~~

Clinical Affiliate Personnel

B3 Affiliate Education Supervisor

a. ~~Duties~~An ***affiliate education supervisor*** (AES) will be identified at each clinical affiliate.

b. Each AES must demonstrate effectiveness in the supervision, clinical education and evaluation of students. ~~assigned to his or her facility.~~

c. Qualifications
An AES must hold certification and registration in nuclear medicine technology from a national certification board or possess ***suitable equivalent qualifications*** relevant to the particular clinical area, and must have at least two years of post-certification clinical experience.

The AES in a radiopharmacy must possess a current pharmacy license from the state in which they ~~(s)he~~ practice~~s~~ and have two years of radiopharmacy experience. If the radiopharmacy is located within a clinical nuclear medicine department, the AES may be a certified, registered nuclear medicine technologist.

The AES in a recognized diagnostic CT rotation area or affiliate must hold current primary certification and registration in nuclear medicine technology or radiography from a national certification board and have at least two years of post-certification clinical experience in diagnostic CT. ~~Current certification and registration in CT is preferred.~~

Clinical Affiliate Resources

B4.1 The clinical component of the program shall provide an environment for supervised, ***competency-based*** clinical education and offer a sufficient and well-balanced variety of nuclear medicine procedures. ~~Nuclear medicine equipment that is accurately calibrated, in working order, and meeting applicable national and state standards must be available.~~ In the event that a single clinical affiliate is unable to provide all clinical education competencies, rotations through additional recognized clinical affiliates is required.

For programs with embedded diagnostic CT education, the clinical component must offer a sufficient and well-balanced variety of diagnostic CT examinations, occurring on stand-alone diagnostic CT scanners or

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hybrid PET/CT or SPECT/CT systems. CT equipment must be accurately calibrated, in working order, and meeting applicable national and state standards.

~~In the event that a single clinical affiliate is unable to provide all clinical education competencies, rotations through additional recognized clinical affiliates is required.~~

B4.2 Student capacity of a program is based on the ability of clinical affiliate resources to provide experiences that develop the clinical competence of all students.

a. ~~Facilities~~ Clinical affiliates providing narrowly-focused competencies, such as radiopharmacy and diagnostic CT, will be assigned an arranged capacity, which does not contribute to the program's total student capacity. ~~The capacity will be~~ Assignment of an arranged capacity to an affiliate is based upon staffing and the volume of procedures performed. A 1:1 student to staff ratio must be maintained.

b. Capacity at imaging affiliates providing a broad variety of competencies is determined based on staffing, number of imaging instruments, and the volume and variety of procedures performed. The lowest number computed for each of the criterion below determines an affiliate's capacity.

- 1 full-time student per full-time, certified nuclear medicine technologist
- 1 student per imaging instrument
- 1 student per 1300 procedures performed annually

B5 Clinical education may only occur at facilities recognized by the JRCNMT through the affiliate application process initiated by the program.

Standard C: Curriculum

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C1 The program must create and follow a ~~m~~Master ~~e~~Educational ~~p~~Plan for program delivery. The ~~p~~Plan should contain sufficient detail to support program continuity when there are changes in faculty. The ~~p~~Plan should include, at a minimum, the following:

a. mission ~~and student learning outcomes~~ of the program and ~~a description of how they~~ it integrates with the mission and goals of the institution;
~~a.~~b. program-level student learning outcomes that identify the knowledge, skills and professional attributes students are expected to obtain;
~~b.~~c. curriculum sequence with rationale for course organization;
~~c.~~d. course syllabi that include, at a minimum:

- course title and number
- course description
- credit hours (or clock hours if program does not utilize credit hours)
- instructor(s)
- texts and other reading assignments
- outline/agenda of topics
- course-level learning ~~and/or performance~~ objectives/outcomes
- methods of student assessment and their weighting in course grade computation
- grading scale

e. explanation of how the didactic curriculum correlates with the clinical curriculum
f. program's required clinical competencies and the methods used to assess student attainment of them; and

~~d.~~g. clinical education schedule template and guidelines for making clinical assignments, which demonstrate that all students will have an equivalent clinical experience and the opportunity to meet required competencies.

~~e.a. explanation of how the didactic curriculum correlates with the clinical curriculum~~

~~f. tools used to assess student attainment of clinical competencies~~

~~C2 The program must provide a student handbook, clinical course syllabi, and student assessment documents to each AES. Orientation to the documents and expectations of clinical affiliates should be provided by the program.~~

C2~~3~~ General education and basic science coursework must be of adequate depth and scope, and ***appropriately sequenced***, to provide a foundation for the student learning outcomes of the professional program. Credit-bearing, college-level courses are required in:

a. chemistry with laboratory
b. human anatomy and physiology (two courses, each with a laboratory)
c. mathematics
d. ***physics***
e. written communication

~~Students may demonstrate competency in postsecondary coursework as permitted by institutional policy.~~

Programs at the master's degree level must require sufficient coursework to support the professional curriculum. A baccalaureate degree must be conferred during the program if it is not a requirement for admission.

C3~~4.1~~ The professional nuclear medicine technology curriculum shall include, as a minimum, the following didactic content areas:

a. patient care
b. cross-sectional anatomy
c. nuclear medicine statistics
d. nuclear medicine and radiation physics
e. radiation biology
f. radiation safety and protection
g. nuclear medicine instrumentation
h. ***quality control*** and ***quality assurance***
i. medical vocabulary
j. diagnostic nuclear medicine procedures
~~jk~~. ~~diagnostic~~ therapeutic nuclear medicine procedures
~~kl~~. CT instrumentation and procedures ~~therapeutic nuclear medicine procedures~~
~~lm~~. ~~PET/CT and SPECT/CT~~ hybrid imaging
~~mn~~. radiopharmacy and pharmacology
~~no~~. medical ethics and law
~~op~~. healthcare administration
~~pq~~. health sciences research methods
~~qr~~. ***medical informatics***
~~rs~~. ~~oral~~ ***clinical communications***
t. MRI safety

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Programs offering a master's degree must provide additional professional content in topics such as leadership, management, education, research and/or expanded clinical skills.

C4~~.2~~ Programs with embedded diagnostic CT education shall, in addition to the above nuclear medicine curriculum, include as a minimum, the following didactic content areas:

a. ~~computed tomography~~ CT physics
b. ~~computed tomography~~ CT instrumentation

c. diagnostic ~~computed tomography~~ CT procedures
d. contrast media contra-indications, administration, and adverse reactions
e. radiation safety specific to diagnostic ~~computed tomography~~ CT procedures
f. ~~computed tomography~~ CT dose measurement and dose reduction
g. ~~computed tomography~~ CT quality control

C5 The program shall include opportunities for students to develop personal and professional attributes and skills~~values~~ relevant to clinical practice. These ~~attributes~~ include:

a. problem-solving, critical-thinking and decision-making skills;
b. ~~participating as~~ being an effective member of an interprofessional healthcare team;
c. providing effective care to a diverse patient population;~~showing respect for diversity;~~ and
d. ~~demonstrating~~ responsibility and ethical principles.

Programs offering a master's degree must identify and provide mechanisms for students to develop additional personal and professional attributes beyond those listed above.

C6 ***Supervised***, competency-based clinical education shall include ~~the following~~:

a. patient care and patient recordkeeping in accordance with the Health Insurance Portability and Accountability Act (HIPAA);
b. radiation safety techniques that minimize radiation exposure;
c. participation in a quality control program;
d. ~~preparation,~~ calculation, identification, administration (where permitted), and disposal of radiopharmaceuticals; ~~and the performance of radionuclide quality control procedures;~~
e. preparation, calculation, identification, administration (where permitted), and disposal of adjunctive medications necessary to the performance of nuclear medicine procedures;
f. performance of an appropriate number and variety of diagnostic nuclear medicine procedures, including general imaging, nuclear cardiology and PET/CT, to achieve desired clinical competencies;
g. observation and assistance with an appropriate number and variety of therapeutic nuclear medicine procedures to achieve desired clinical competencies; and
h. interaction, in the didactic and/or clinical setting with ***licensed, independent practitioners*** ~~interpreting physicians~~ to develop an understanding of the clinical correlation of nuclear medicine procedures ~~with other diagnostic procedures~~.

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Programs with embedded diagnostic CT education must also include the following ***supervised***, competency-based clinical education:

i. contrast material selection, preparation, ~~contrast~~ dose calculation, contrast selection, and administration (where permitted); ~~of contrast media necessary to the performance of computed tomography procedures;~~
j. performance of an appropriate number and variety of diagnostic CT~~computed tomography~~ procedures to achieve desired clinical competencies; and
~~k.~~ interaction with licensed, independent practitioners ~~interpreting physicians~~ to develop an understanding of the interpretation and clinical correlation of diagnostic CT~~computed tomography~~ procedures. ~~with other diagnostic procedures~~

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Programs offering a master's degree with expanded clinical experiences must identify competencies unique to these experiences and provide supervised activities in which students may obtain the competencies.

C7 An accredited nuclear medicine technology program includes didactic, laboratory, and clinical education experiences that develop student competence in the items included on the *Competency List* in the appendix. The program must confirm student competence on each item prior to graduation.

Programs with embedded diagnostic CT education shall include didactic and clinical education experiences that develop student competence in the items included on the *Diagnostic CT Competency List* in the appendix. The program must confirm student competence on each item prior to graduation.

Standard D: Assessment

Assessment of Program-Level Student Learning Outcomes (SLOs)

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D1 The program must have a mission and student learning outcomes that are commensurate with the degree level offered and used to guide the development of the curriculum.

D2 A program must identify student learning outcomes that clearly state the knowledge, skills and/or attitudes students are expected to obtain at the course and program level. Assessment measures must be established by the program for each learning outcome.

Programs with embedded diagnostic CT education must identify program and course level student learning outcomes and associated assessment measures that address this component of the curriculum.

Programs offering a master's degree must identify additional learning outcomes and associated assessment measures that address the additional curriculum associated with the graduate degree.

Assessment of Program Effectiveness

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D3 Measurement of a program's effectiveness is based on the extent to which it achieves its mission and student learning outcomes. Assessment of program effectiveness must, at a minimum, document the regular collection and analysis of the following quantitative and qualitative data. Justifiable benchmarks for each quantitative assessment parameter should be established by the program, with the exception of the national certification exam benchmark, which is established by the JRCNMT.

a. graduation rate
b. graduate performance on the national certification examinations in nuclear medicine technology
c. job placement of graduates
d. faculty retention
e. student assessments of individual didactic courses, clinical experiences, and faculty
f. AES assessment of student performance
g. graduate assessment of program effectiveness
h. employer assessment of graduate preparedness to enter the workforce
~~a.~~i. Advisory Committee feedback (refer to A2.3)
j. affiliate visit notes from the PD and/or CC

~~The program must demonstrate a systematic and sustained assessment process that is used to enhance student learning outcomes and program effectiveness.~~

Assessment of Student~~s Learning Outcomes~~

~~D2.1 A program must identify student learning outcomes that clearly state the knowledge, skills and/or attitudes students are expected to obtain at the course and program level. Assessment measures must be established by the program for each learning outcome.~~

~~Programs with embedded diagnostic CT education must identify program and course level student learning outcomes and associated assessment measures that address this component of the curriculum.~~

~~Programs offering a master's degree must identify additional learning outcomes and associated assessment measures that address the additional curriculum associated with the graduate degree.~~

D~~4~~2.2 Clinical and didactic evaluation of students shall be based on the learning outcomes and competencies identified in course syllabi.

D~~5~~2.3 Programs must implement a student assessment process in didactic and clinical courses that utilizes ***formative*** and ***summative assessment*** techniques to provide students and program officials with timely indication of student progress and academic standing while remediation is still possible. In addition to measuring student progress, the assessment system also serves as a reliable indicator of the effectiveness of course design and instruction.

~~**Assessment of Program Effectiveness**~~

~~D3.1 Assessment of program effectiveness must, at a minimum, document the regular collection and analysis of the following quantitative and qualitative data. Justifiable benchmarks for each quantitative assessment parameter should be established by the program, with the exception of the national certification exam benchmark, which is identified by the JRCNMT.~~

~~b. graduation rate~~
~~c. graduate performance on the national certification examinations in nuclear medicine technology~~
~~d. job placement of graduates~~
~~e. faculty retention~~
~~f. student assessments of individual didactic courses, clinical experiences, and faculty~~
~~g. AES assessment of student performance~~
~~h. graduate assessment of program effectiveness~~
~~i. employer assessment of graduate preparedness to enter the workforce~~
~~j. Advisory Committee feedback (refer to D3.3)~~
~~k. affiliate visit notes from the PD and/or CC; a minimum of two visits per year to each clinical affiliate in use is expected.~~

~~For programs with embedded diagnostic CT education, the PD and/or CC must perform and document two visits per year to each clinical affiliate providing clinical education in diagnostic CT.~~

~~a.~~

~~D3.2 *Standard eliminated April 2021*~~

~~D3.3 Programs must have an Advisory Committee that includes each AES, along with any other members the program chooses to appoint. On an annual basis, the program shall hold a meeting to apprise the Committee of program issues and ask for feedback to improve the program's policies, procedures and curriculum. Meetings must be live (in-person, conference call, webinar and/or other real-time, interactive medium) and minutes must be prepared.~~

~~Programs with embedded diagnostic CT education must appoint a member to the Advisory Committee to represent this area of clinical practice.~~

~~Programs offering a master's degree must appoint additional members to the Advisory Committee to represent the expanded professional curriculum.~~

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Application of Assessment

D6 ~~The~~ A program must demonstrate a systematic and sustained assessment process that is used to enhance student learning ~~outcomes~~ and program effectiveness. The assessment process must be regularly evaluated and updated as needed to ensure continued program improvement.

D7~~3.4~~ The results of ongoing assessment must be appropriately reflected in the curriculum and other dimensions of the program. In particular, the program must systematically document the application of assessment results in the process of program improvement.

Standard E: Operational Policies

Fair Practices

E1.1 Published information, including academic catalogs, web pages, brochures and advertising must accurately reflect the program offered.

E1.2 The program must create and adhere to personnel and student policies that are congruent with institutional policies and consistent with federal and state statutes, rules, and regulations.

E1.3 The admission process, including ***credit for prior learning*** ~~advanced placement~~, must be conducted in accordance with clearly defined and published practices of the sponsoring institution and program.

E1.4 The following must be accurately stated, published, and available to students:

a. required academic and technical performance standards for admission;
~~a.~~b. policies on transfer of credit and credit for professional certification and prior work experience;
~~b.~~c. institutional academic calendar;
~~c.~~d. estimates of tuition, fees, and other costs related to the program;
e. policies and procedures for refund of tuition and fees;
f. list of clinical affiliates and processes for assigning students to them;
g. policies and procedures for student withdrawal, leave of absence, probation, suspension, and dismissal;
~~d.~~h. student appeal and grievance procedures to permit neutral evaluation and ensure due process;
~~e. required academic and technical performance standards for admission~~
~~f.~~i. all graduation requirements, including academic credits necessary for program completion
~~g.~~a. ~~policies and procedures for student withdrawal, leave of absence, probation, suspension, and dismissal~~
~~student appeal and grievance procedures to permit neutral evaluation and ensure due process~~
~~h.~~j. identification of which national certification exams(s) in nuclear medicine technology graduates are eligible to take after successful completion of the program; and
~~i.~~k. disclosure that eligibility to take either national certification exam in CT requires certification in nuclear medicine technology, radiography or radiation therapy first.

~~E1.5 Faculty grievances must be handled in accordance with clearly defined and published practices of the sponsor that are readily available to faculty.~~

E1.5 Programs must ensure that faculty adhere to published institutional policy on clock to credit hour conversions when scheduling course sessions.

E1.6 Programs offering courses by distance education must have processes through which they can establish that a student who registers in such a course is the same student who participates in, completes and receives academic credit for the course. ~~Student identity may be verified by methods including, but not~~

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~~limited to, secure log-in methodologies or proctored examinations.~~ These processes must protect student identity and students must be informed of associated costs.

E1.7~~6~~ Unique c~~C~~linical assignments for individual students outside the normally scheduled clinical experience (e.g., overnight, evenings, weekends, and holidays) shall be justified by documenting their purpose. The justification must be documented ~~must be~~ and signed by the student, the AES and a representative of the program. Specific learning outcomes and assessments must be developed for these unique clinical experiences. ~~to address the uniqueness of these clinical experiences.~~This standard is not applicable to early morning radiopharmacy experiences or second shift diagnostic CT experiences, in which all students participate.

E1.8~~7~~ The program must have a policy stating that a student may not earn class credit and/or competencies for hours in which they are an employee of a healthcare facility.~~Policies ad processes by which students may work in the nuclear medicine department (and/or the diagnostic CT department if the program has embedded diagnostic CT education) while enrolled in the program must be published and made known to all concerned. Students may not assume the responsibility or take the place of qualified staff. Class credit cannot be awarded for clinical hours in which the student is an employee of the facility.~~

~~E1.8 Programs offering courses by distance education must have processes through which they can establish that a student who registers in such a course is the same student who participates in, completes and receives academic credit for the course. Student identity may be verified by methods including, but not limited to, secure log-in methodologies or proctored examinations. These processes must protect student identity and students must be informed of associated costs.~~

E1.9 The program is responsible for accurately stating and annually publishing data reflecting student achievement and program performance for public review. At a minimum this includes providing a link on the program's main web page to the Graduate Achievement Report posted on the JRCNMT website.

Record-Keeping

E2.1 Individual grades and credits for courses shall be recorded on a transcript and permanently maintained by the sponsoring institution.

E2.2 Student records shall be maintained for admission, assessment, counseling/advisement, dosimeter reading results and disciplinary actions. Records should be maintained in compliance with federal, state and institutional regulations and should remain on file for a minimum of seven years (one accreditation cycle). Programs must determine if the sponsoring institution or its accreditor have policies requiring maintenance for more than seven years.

Health and Radiation Safety

E3.1 All students shall be informed of and have access to the student health care services provided by the sponsoring institution.

E3.2 The health and safety of patients, students, and faculty must be adequately safeguarded.

E3.3 Students must be appropriately ***supervised*** at all times during their clinical education. Students may not substitute for clinical staff.

E3.4 The program must maintain compliance with federal and state radiation protection regulations. Radiation exposure records shall be reviewed with each student at regular intervals (not less than quarterly).

Documentation of these reviews, including a dated acknowledgement by the student, must be maintained.

E3.~~5~~4 The program must ensure that all students, regardless of location, have equitable and timely access to faculty and student support services for assistance with academic matters and personal issues.

Appendix 1: Glossary

Terms throughout the Standards that are in ***bold italics*** are defined below. Where terms are not defined, their definitions are at the discretion of the JRCNMT.

Term	Definition
Academic Affiliate	A regionally-accredited, post-secondary educational institution recognized by the JRCNMT to provide, through a contractual agreement with the program sponsor, academic credits for nuclear medicine coursework that will lead to a degree.
Administrative Support Staff	Support staff in areas such as admissions, academic assessment, information technology, student advisement and clerical support.
Affiliation Agreement	A formal written document between a program sponsor and another institution that agrees to provide educational experiences or academic credits to students.
Affiliate Education Supervisor (AES)	The person recognized at each clinical affiliate to oversee and participate in the education occurring there. This person is also named to the program's Advisory Committee.
Affiliate Sharing Agreement	A formal document, signed by the program directors and AES, describing how the approved student capacity at the affiliate will be distributed amongst the programs sharing the facility for clinical education.
Appropriately Sequenced	General education and basic science courses must occur prior to related professional courses in the curriculum. Examples include chemistry prior to radiopharmacy, physics prior to nuclear/radiation physics, anatomy and physiology prior to procedures courses.
Arranged Capacity	Student capacity at a clinical affiliate that does not contribute to the program's total clinical capacity due to the limited nature of education provided by the affiliate. Examples include, but are not limited to, radiopharmacies, diagnostic CT rotations and pediatric nuclear medicine facilities. ~~and affiliates that only offer PET/CT.~~
Assessment	The systematic collection, review and application of information to improve student learning, educational quality and program effectiveness.
Clinical Communications	The written, verbal and non-verbal transmission of information associated with effective, patient-centered healthcare delivery. Clinical communication routinely occurs between healthcare providers and between a healthcare provider and a patient and caregivers.
Competencies	The measurable set of knowledge; clinical and interpersonal skills; professionalism; and critical thinking skills expected of program graduates.
Competency-Based	Learner-centered education in which the focus is on the development and demonstration of proficiency in performing specific tasks.
Consortium	A legally binding, contractual partnership between two or more institutions, for the purpose of offering a nuclear medicine technology educational program.
Credential	Confirmation of program completion using a certificate or diploma, rather than an academic degree.
Credit for Prior Learning	Awarding college credit for satisfactory completion of an AP, CLEP or other recognized form of credit by examination, advanced standing or other extra-institutional learning experiences. Such practices must follow published institutional policy.
Effectiveness	Meeting expectations or producing the identified outcomes.

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Formative Assessment	Monitoring learning and skill development during a clinical rotation or course so adjustments can be made to lessons and/or instructional techniques to improve learning outcomes by the end of the rotation or course.
Full-Time	The JRCNMT will defer to the published definition of 'full-time' utilized by the Program Director's employer.
Licensed, Independent Practitioner	An individual permitted by law and by the licensed medical facility to provide care and services, without direction or supervision, within the scope of the individual's license and consistent with individually granted clinical privileges.
Medical Informatics	Structure, function and implementation of PACS, teleradiology, electronic medical records, and other digital systems used in the healthcare setting to manage, store and transmit information.
Pedagogy	The methods and practice of teaching, including teaching methods, learning activities and assessment.
Physics	A college-level course in physics or graduation from an accredited radiography program.
Post-secondary Education	Education offered by institutions after the completion of high school.
Primary Faculty	Employees of the program sponsor filling the positions of Program Director and Clinical Coordinator.
Quality Assurance	A structured program designed to maintain and improve all aspects of clinical practice. A quality control program is part of the broader quality assurance program.
Quality Control	A program of technical procedures routinely performed to ensure that equipment meets established performance standards and radiopharmaceuticals demonstrate accepted properties.
Suitable Equivalent Qualifications	Current registration, certification or state license related to the area of practice, such as computed tomography, nursing, or radiation physicist.
Summative Assessment	Measuring the knowledge and proficiency obtained by a student at the end of a clinical rotation or course.
Supervised (pertaining to clinical education)	Direct supervision of students is required at clinical affiliates until competence is demonstrated, after which time supervision may be indirect. Direct supervision requires the clinical instructor to be physically present with the student. Indirect supervision requires the clinical instructor to be within the facility and immediately available to provide direct supervision.
Teach Out Plan	A plan created by the sponsoring institution and program describing how current students in the program will complete their education or be assisted in transferring to another accredited program. The plan is developed when closure or loss of accreditation is forthcoming for the institution or program.

Appendix 2
Nuclear Medicine Technology Competency List

A. Professionalism

A nuclear medicine technology graduate must:

1. Practice in accordance with ethical standards, legal statutes and published standards of practice.
2. Demonstrate professionalism befitting a health care provider.
3. Collaborate as a member of an interprofessional team.
4. Display respect for diversity.
5. Apply problem-solving, critical-thinking and decision-making strategies.
6. Evaluate published research studies and apply appropriate principles to improve evidence-based practice.

B. Patient Care

A nuclear medicine technology graduate must:

1. Practice universal precautions.
2. Practice aseptic technique, inclusive of adhering to U.S. Pharmacopeia (USP) standards.
3. Assess patient status and vital signs.
4. Establish, verify and maintain vascular access.
5. Provide appropriate patient comfort, monitoring, and care before, during and after procedures.
6. Recognize and respond appropriately to unexpected and emergency situations.

C. Radiation Safety

A nuclear medicine technology graduate must:

1. Maintain compliance with institutional radioactive materials license under supervision of an authorized user or radiation safety officer.
2. Maintain compliance with local, state and federal radiation safety regulations.
3. Practice ALARA principles thereby limiting the radiation exposure of the patient, public, fellow workers, and self.
4. Perform and document radiation surveys and when necessary, take appropriate action.
5. Respond appropriately to a radioactive spill.
6. Perform decontamination procedures in accordance with the radiation safety program.
7. Participate in appropriate in-service programs to educate other personnel regarding radiation and principles of radiation protection.
8. Prepare to participate in the management of radiation disasters.

D. Instrumentation and Quality Control

A nuclear medicine technology graduate must:

1. Identify the function and application of the following instruments:
    a) Dose calibrators
    b) GM survey meters
    c) NaI(Tl) counting and/or uptake systems
    d) Imaging systems including:
        i. Planar
        ii. SPECT
        iii. PET
        iv. CT component of hybrid imaging
        v. Fusion or hybrid imaging system

2. Perform the appropriate quality control for the instruments listed in D1.
3. Document performance and results of all quality control testing according to quality control program procedures.
4. Analyze QC results and take appropriate corrective action(s) when necessary.
5. View, process and archive acquired data on picture archival communicating systems (PACS).
6. Utilize radiology and hospital information systems, managing patient information in these systems according to facility policies, state and federal statues and accreditation standards.

E. Radiopharmaceuticals and Pharmaceuticals

A nuclear medicine technology graduate must:

1. Procure appropriate radiopharmaceuticals for the day's schedule in accordance with license possession limits.
2. Store radiopharmaceuticals consistent with established safeguards and institutional radiation safety guidelines.
3. Follow Department of Transportation (DOT) and institutional radiation safety guidelines in the transport, receipt and shipment of radioactive materials.
4. Prepare and label applicable radiopharmaceuticals in accordance with institutional protocols.
5. Apply radioactive decay calculations as appropriate to determine required volume and activity.
6. Verify physician order, procedure, time, patient, radiopharmaceutical or adjunctive pharmaceutical, dosage, and route for administration.
7. Apply weight and age-based calculations as appropriate to verify the prescribed dosage of radiopharmaceuticals or pharmaceuticals.
8. Dispense and administer radiopharmaceuticals and/or adjunctive pharmaceuticals under the direction of an authorized user.
9. Document radiopharmaceutical and/or adjunctive pharmaceutical administration in accordance with institutional policies.
10. Follow institutional protocols for blood withdrawal and radioactive labeling.
11. Evaluate patients for contraindications, precautions, physiological response and side effects of radiopharmaceuticals and adjunctive pharmaceuticals.
12. Manage the disposal of radioactive materials.

F. Diagnostic Procedures

A nuclear medicine technology graduate must:

1. Identify indications for performing imaging and physiologic quantitation.
2. Identify the chemical and brand names of the radiopharmaceutical(s) for a specific procedure.
3. Identify the acceptable dose ranges for the radiopharmaceutical(s).
4. Identify the route of administration for the radiopharmaceutical(s).
5. Explain the appropriate methods to administer the radiopharmaceutical(s).
6. Describe the normal bio-distribution of the radiopharmaceutical including route of excretion and organ receiving highest radioactive dose.
7. Schedule a procedure, keeping in mind appropriate sequence when multiple procedures have been ordered.
8. Review and evaluate patient medical history in preparation for the nuclear medicine procedure.
9. Verify the written order for the procedure and evaluate procedure appropriateness.
10. Verify the patient's identity prior to radiopharmaceutical or adjunctive pharmaceutical administration.
11. Identify any contraindications including pregnancy and/or lactation status, prior to the procedure.
12. Verify patient's physiological preparation (e.g. NPO status).
13. Explain the impact of patient preparation on the procedure, imaging and quantitative data.
14. Explain the procedure, patient involvement, length of study and radiation safety to the patient and family.

15. Verify informed consent, if appropriate.
16. Select and organize the supplies necessary to perform the procedure.
17. Select appropriate instrument and parameters for the procedure.
18. Administer the radiopharmaceutical and/or adjunctive pharmaceutical in accordance with institutional guidelines.
19. Document the radiopharmaceutical and/or adjunctive pharmaceutical in accordance with institutional guidelines.
20. Position the patient appropriately for the procedure.
21. Assist the healthcare provider in nuclear cardiac stress testing performed in conjunction with nuclear medicine procedures.
22. Acquire appropriate imaging view(s) and/or non-imaging data for complete procedure.
23. Annotate and/or process imaging or non-imaging data for physician interpretation.
24. Review acquired images and processed data critically in order to assure diagnostic quality.
25. Analyze normal and abnormal bio-distribution of the radiopharmaceutical in nuclear medicine images and correlate with physiology and /or pathology.
26. Recognize image or patient artifacts and take appropriate action.

G. Radionuclide Therapy

A nuclear medicine technology graduate must:

1. Assist an authorized user with the therapy procedure including preparation, documentation, patient care and radiation safety.
2. Identify any contraindications to the therapy including pregnancy and/or lactation status, prior to the procedure.
3. Verify the patient's physiological preparation.
4. Verify completion of informed consent, written directive, radiation safety instructions, and patient and family education.
5. Verify and document patient identity, radiopharmaceutical, route of administration and dosage for the therapy.
6. Assist the authorized user in room preparation, instructing hospital staff, patient and/or caregivers in appropriate patient care and radiation safety precautions.
7. Practice prescribed radiation safety procedures during the preparation and the administration of therapy.
8. Conduct and document radiation surveys of designated patient areas and/or the patient, when indicated.
9. Assure appropriate post therapy monitoring, documentation and follow up is performed.

Appendix 3
Diagnostic CT Competency List

The following competency list applies to nuclear medicine programs with an embedded diagnostic computed tomography program - and is in addition to the nuclear medicine competency list in Appendix 2.

A. Patient Care

A computed tomography technology graduate must:

1. Identify contraindications to contrast media.
2. Evaluate vascular access for compatibility for IV contrast media injection.
3. Monitor patient for, and respond to, reactions to contrast media.

B. Radiation Safety

A computed tomography technology graduate must:

1. Control access to the CT examination room during radiation exposure.
2. Ensure appropriate radiation protection of patient, family, and caregivers during procedure.
3. Practice ALARA principles thereby limiting the radiation exposure of the patient, public, fellow workers, and self.
4. Document CT dose report in accordance with institutional guidelines.
5. Recognize and respond to a dose alert or dose notification.

C. Instrumentation and Quality Control

A computed tomography technology graduate must:

1. Perform shutdown, power off, and restart of CT scanner.
2. Perform tube warm-up.
3. Perform the appropriate scanner quality control
4. Document performance and results of all quality control testing according to quality control program procedures.
5. Analyze QC results and take appropriate corrective action(s) when necessary.

D. Diagnostic Imaging

A computed tomography technology graduate must:

1. Identify indications for CT imaging.
2. Instruct patient and family regarding preparation for CT imaging.
3. Identify the contrast media for a specific procedure.
4. Identify acceptable dose ranges for contrast media.
5. Identify the route of administration for contrast media.
6. Select appropriate flow rate for contrast media delivery according to imaging protocols.
7. Review and evaluate patient medical history in preparation for CT imaging.
8. Verify the written order and evaluate imaging appropriateness.
9. Verify the patient's identity prior to CT imaging.
10. Identify any contraindications including pregnancy and/or contrast allergy prior to CT imaging.
11. Explain the impact of patient preparation on the CT imaging.
12. Explain the imaging and patient involvement to the patient and family.
13. Position the patient appropriately for the procedure.
14. Ensure that artifact-producing objects have been removed from patient.
15. Select appropriate parameters (e.g. protocol and/or kV and/or mA) for the procedure.
16. Utilize iterative reconstruction and other approved techniques to reduce dose.
17. Prescribe the appropriate field of view and coverage for the procedure.
18. Administer contrast media in accordance with institutional guidelines.
19. Document the contrast media in accordance with institutional guidelines.

20. Utilize bolus tracking for contrast media administration to ensure peak enhancement.
21. Utilize physiologic gating to optimize image quality
22. Perform retrospective reconstruction of CT images for physician interpretation.
23. Review acquired and processed images to assure diagnostic quality.
24. Recognize image or patient artifacts and take appropriate action.
25. Apply hardware suppression to reduce metal artifact.

E. Interventional Procedures

1. Select and organize the supplies necessary to perform the procedure.
2. Control access to the scan room during the procedure.
3. Assist with the procedure including preparation, documentation, and patient care.
4. Identify any contraindications prior to the procedure.
5. Verify the patient's physiological preparation.
6. Verify completion of informed consent.
7. Verify and document patient identity.
8. Localize region of interest for the procedure.
9. Practice ALARA principles thereby limiting the radiation exposure of patients, fellow workers, and self.
10. Assure appropriate post-procedure monitoring and documentation is performed.
11. Assures proper disinfection, cleaning, and maintenance of the sterile field.