PROMETRIC

Test Development Solutions

2023 CERTIFIED NUCLEAR MEDICINE TECHNOLOGIST (CNMT) - JOB ANALYSIS REPORT

Date:

November 13, 2023

Prepared by:

Colvin Franklin M.S.
Test Development Solutions

ACKNOWLEDGEMENTS

We would like to thank the many individuals who provided invaluable assistance throughout the conduct of the Nuclear Medicine Technology Certification Board (NMTCB) Job Analysis Study for the Certified Nuclear Medicine Technologist (CNMT) Examination.

Above all, we thank the many dedicated professionals who generously contributed their time and expertise. Over 3,000 individuals participated in different phases of the job analysis: including Task Force members, survey respondents, and Test Specifications members.

At NMTCB, Katie Neal, Executive Director, provided excellent support throughout the project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Page

LIST OF APPENDICES

EXECUTIVE SUMMARY

The Nuclear Medicine Technology Certification Board (NMTCB) requested a Job Analysis Study from Prometric for the Certified Nuclear Medicine Technologist (CNMT) Examination.

A job analysis study is designed to obtain descriptive information about the tasks performed on a job and the knowledge needed to adequately perform those tasks. The purpose of this job analysis study was to:

- Validate the tasks, knowledge, and skills important for nuclear medicine technologists; and,
- Revise the test specifications for the CNMT exam.

Conduct of the Job Analysis Study

The job analysis study consisted of several activities completed in collaboration with subject-matter experts. These activities included: the creation and refinement of task, knowledge, and skill statements; the development of a survey; the dissemination of that survey; the compilation of survey results; and ultimately the development of test specifications. The successful completion of the job analysis study was made possible by the in-depth information provided by industry professionals.

Survey Development

Survey research is an effective way to identify the tasks, knowledge, and skills important for nuclear medicine technologists. The task, knowledge, and skill statements were split into domains based on distinctions in the industry. The statements included on the survey were all grouped into five domains of practice. The items included in the survey were based on updated information from the previous job analysis study conducted in 2017.

Survey Content

The survey, disseminated in June 2023, consisted of five sections. Prometric and NMTCB worked together to distribute the survey to nuclear medicine technologists and other related professionals.

Survey Sections
Section 1: Background and General Information
Section 2: Tasks
Section 3: Knowledge and Skills
Section 4: Recommendations for Test Content
Section 5: Additional Feedback

Results

Survey Response

A total of 1,602 nuclear medicine technologists and related professionals submitted surveys sufficiently complete for data analysis. Based on the analysis of survey responses, a representative group completed the survey in appropriate numbers to meet the requirements for statistical analysis of the results. This is evidenced by the review of the responses for each of the background and general information questions, along with validation by a group of subject matter experts.

Survey Ratings

Participants were asked to rate the task, knowledge, and skill statements on their importance for an entry-level nuclear medicine technologist using a five-point scale (0 = Of no importance to 4 = Very Important). Some knowledge and skill statements were also rated based on their frequency used/performed (0 = Never to 5 = Daily).

Content Coverage

Evidence was provided for the comprehensiveness of the content coverage within the domains. If the task, knowledge, and skill statements within a domain are adequately defined, then it should be judged as being well covered. Respondents indicated the content within each task and knowledge and skill domain was well covered, thus supporting the comprehensiveness of the defined domains.

Test Specifications Development

In September 2023 a Test Specifications Committee was convened to review the results of the job analysis and to revise the test content outline that guides the CNMT exam.

Summary

This study used a multi-method approach to identify the tasks, knowledge, and skills that are important to the competent performance of a nuclear medicine technologist. The job analysis process allowed for input from a representative group of industry professionals and was conducted within the guidelines of professionally sound practice. The results of the job analysis can be used by NMTCB as a blueprint for the CNMT exam.

RESULTS AT A GLANCE

WHO COMPLETED THE SURVEY

A total of 1,602 responses were used in analysis. The majority of these respondents reported working as staff technologists.

TASK IMPORTANCE RATINGS

A total of 29 out of 29 task statements achieved high importance ratings for the overall group.

KNOWLEDGE & SKILL IMPORTANCE RATINGS

421 out of 444 knowledge and skill statements achieved high importance ratings for the overall group.

INTRODUCTION

"The Nuclear Medicine Technology Certification Board, Inc. (NMTCB) was founded in 1977 to establish and maintain a voluntary program for certification of nuclear medicine technologists by nuclear medicine technologists. The standards established by the NMTCB include educational requirements, practical experience, and successful completion of an appropriate competency-based examination. The NMTCB certifies individuals whom have developed the requisite body of knowledge to practice nuclear medicine technology, and registers those individuals who meet these criteria."[1]

This report describes the job analysis study for the NMTCB Certified Nuclear Medicine Technologist (CNMT) Examination including the:

- Rationale for conducting the job analysis study;
- Methods used to define tasks, knowledge, and skills;
- Types of data analyses conducted and their results; and
- Finalization of the test specifications.

Job Analysis Study and Adherence to Professional Standards

A job analysis study refers to procedures designed to obtain descriptive information about the tasks performed on a job and the knowledge, skills, or abilities requisite to the performance of those tasks. The specific type of information collected during a job analysis study is determined by the purpose for which the information will be used.

For the purpose of developing credentialing examinations, a job analysis study should identify tasks, knowledge, skills, or abilities relevant to the field being studied. For the CNMT exam, tasks, knowledge, and skills deemed important for nuclear medicine technologists were identified.

The use of a job analysis study (also known as practice analysis, role and function study, or role delineation) to define content domain(s) is a critical component in establishing content validity for a certification. Content validity refers to the extent to which the content covered by an examination is representative of the tasks, knowledge, skills, or abilities required for a job. This is demonstrated through verification activities performed by subject-matter experts.

A well-designed job analysis study should include participation from a representative group of subject-matter experts who reflect diversity within the profession. Here, diversity refers to both regional or job context factors and individual demographics, such as, gender and race/ethnicity. By including a large number of experts who represent diversity in relevant areas of expertise the content validation process is enhanced.

[1] https://nmtcb.org/about retrieved September 25, 2023

The Standards for Educational and Psychological Testing[2] (2014) (*The Standards)* is a comprehensive technical guide that provides criteria for the evaluation of tests, testing practices, and the effects of test use. It was developed jointly by the American Psychological Association (APA), the American Educational Research Association (AERA), and the National Council on Measurement in Education (NCME). The guidelines presented in *The Standards*, by professional consensus, have come to define the necessary components of quality testing. Consequently, a testing program that adheres to *The Standards* is more likely to be judged as valid and defensible than one that does not.

As stated in Standard 11.13,

> "The content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance of the content for credential-worthy performance in an occupation or profession. A rationale and evidence should be provided to support the claim that the knowledge or skills being assessed are required for credential-worthy performance in that occupation and are consistent with the purpose for which the credentialing program was instituted…Typically, some form of job or practice analysis provides the primary basis for defining the content domain…" (p.181-182)

The job analysis study for the CNMT exam was designed to follow the guidelines presented in *The Standards* and to adhere to accepted professional practice.

[2] American Educational Research Association, American Psychological Association, National Council on Measurement in Education. (2014). *The Standards for Educational and Psychological Testing*. Washington, DC: American Psychological Association.

METHOD

The job analysis study for the CNMT exam involved a multi-method approach that included meetings with subject-matter experts and a survey of the industry. This section of the report describes the activities conducted for the job analysis study.

STEPS OF THE JOB ANALYSIS STUDY

1. Conduct of a planning meeting
2. Development of the survey instrument
3. Dissemination of the survey
4. Analysis of the survey data
5. Development of the test specifications

First, experts identified the tasks, knowledge, and skills they believed were important to practice as a nuclear medicine technologist. Then, a survey was developed and disseminated to individuals within the field. The purpose of the survey was to obtain verification (or refutation) that the tasks, knowledge, and skills identified by the initial group of experts are important to the work of nuclear medicine technologists.

Survey research functions as a "check and balance" for the judgments of the experts and reduces the likelihood that unimportant areas will be considered in the development of the test specifications. The use of a survey is also an efficient and cost-effective method of obtaining input from large numbers of experts and makes it possible for analysis of ratings by appropriate subgroups of respondents.

The survey results provide information to guide the development of test specifications and content-valid examinations. It is critical that a certification examination covers the important knowledge and skills needed to perform job activities.

The steps of the job analysis study are described in detail below:

1. Completion of the Planning Meeting

In February 2023, NMTCB representatives and the Prometric staff responsible for the conduct of the job analysis began planning the study. The selection of the Task Force Committee members and Test Specifications Committee members, meeting dates and logistics, and survey delivery were topics of discussion.

2. Development of the Survey

Task Force Meeting

The Task Force Committee was comprised of a representative group of nuclear medicine technologists and related professionals. In total, the committee consisted of nine subject-matter experts. A list of the Task Force Committee members appears in Appendix A. The Task Force meeting was conducted on April 29th and 30th, 2023, in Atlanta, Georgia. The purpose of the meeting was to develop survey content. Prometric staff facilitated the meeting.

A pre-meeting document was provided to the Task Force. This document included the meeting agenda and expectations for the meeting. The pre-meeting document is also included in Appendix A.

Activities conducted during the meeting included reviewing and, as needed, revising the major domains, tasks, knowledge, and skills necessary for competent performance as a nuclear medicine technologist. The draft list of tasks, knowledge, and skills, presented to the Task Force, was developed from the results of the 2017 Job Analysis Study. Survey rating scales as well as background and general information questions were also presented, discussed, and revised as needed.

Survey Construction

Upon the completion of the Task Force Meeting, Prometric staff constructed a draft survey. The survey covered the following task and knowledge and skill domains:

I. Radiation Physics and Detection
II. Radiation Safety and Regulations
III. Pharmaceutical and Radiopharmaceutical Agents
IV. Instrument Operations and Quality Control
V. Clinical Procedures and Therapies

Survey Review by Task Force Committee

Each Task Force member received a copy of the draft survey for review. The purpose of the review was to provide the Committee with an opportunity to view their work and recommend any revisions.

Comments provided by the Task Force Committee for the online survey were compiled by Prometric staff and reviewed via web conference on May 25, 2023, with the Task Force members. Refinements recommended by the Task Force were incorporated into the survey in preparation for survey distribution.

Final Version of the Survey

The final version of the online survey consisted of five sections: Section 1: Background and General Information; Section 2: Tasks; Section 3: Knowledge and Skills; Section 4: Recommendations for Test Content; and, Section 5: Additional Feedback.

In Section 1: Background and General Information, survey participants responded to general and background information questions about themselves and their professional activities.

In Section 2: Tasks, survey participants rated each task using the importance scale shown below.

Importance: How important is this Task in relation to competent performance as an entry-level CNMT?
0 = Of no importance
1 = Of little importance
2 = Of moderate importance
3 = Important
4 = Very important

In Section 3: Knowledge and Skills, survey participants rated each knowledge and skill statement using the importance scale shown below.

Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?
0 = Of no importance
1 = Of little importance
2 = Of moderate importance
3 = Important
4 = Very important

For the knowledge and skills in section V.A. Perform nuclear medicine procedures, participants were also asked to rate each knowledge and skill using the following frequency scale.

Frequency: How often do you perform this Skill or use this Knowledge as a nuclear medicine technologist?
0 = Never
1 = Annually
2 = Quarterly
3 = Monthly
4 = Weekly
5 = Daily

Survey participants were asked to provide a rating measuring the representativeness of each task and knowledge and skill domain. Respondents made their judgments using a five-point rating scale (1 = Very Poorly; 2 = Poorly; 3 = Adequately; 4 = Well; 5 = Very Well). Respondents could note any topics that were not covered within a specific domain in an open response field.

In Section 4: Recommendations for Test Content, survey participants indicated the content weights that the knowledge and skill areas below should receive on the exam:

I. Radiation Physics and Detection
II. Radiation Safety and Regulations
III. Pharmaceutical and Radiopharmaceutical Agents
IV. Instrument Operations and Quality Control
V. Clinical Procedures and Therapies

This was accomplished by distributing 100 percentage points across the five knowledge and skill areas. These distributions represented the allocation of examination items survey participants believed should be devoted to each knowledge and skill area.

In Section 5: Additional Feedback, survey respondents were asked a series of questions around the eligibility qualifications and path to certification for the CNMT exam. They were also given the opportunity to answer the following open-ended questions: "What additional professional development and/or continuing education could you use to improve your performance in your current work role?" and "How do you expect your work role to change over the next 5 years? What tasks will be performed and what knowledge will be needed to meet changing practice demands?"

3. Dissemination of the Survey

On June 9, 2023, NMTCB and Prometric distributed the survey via direct email invitation and anonymous survey link.

Appendix B contains the online survey.

4. Analysis of the Survey Data

As previously noted, the purpose of the survey was to have a relatively large number of professionals validate the tasks, knowledge, and skills initially determined to be important to their work. This objective was accomplished through an analysis of the mean importance ratings for task, knowledge, and skill statements. The derivation of test specifications from those statements verified as important by the surveyed professionals provides a substantial evidential basis for the content validity of the CNMT exam.

Based on information obtained from the survey, data analyses by respondent subgroups (e.g., level of education) are possible when sample size permits. A subgroup category is required to have at least 30 respondents to be included in the mean analyses. This is a necessary condition to ensure the mean value based upon the sample of respondents is an accurate estimate of the corresponding population mean value.
The following quantitative data analyses were produced:

- Means, standard deviations, and frequency (percentage) distributions for task and content coverage ratings
- Means, standard deviations, and frequency (percentage) distributions for knowledge and skill statements and content coverage ratings
- Means and standard deviations for test content recommendations
- Index of agreement values for designated subgroups

Criterion for the Interpretation of Mean Importance Ratings

Since a major purpose of the survey was to ensure that only validated task, knowledge, and skill statements are included in the development of the test specifications, a criterion (cut point) for inclusion needed to be established.

A criterion used in similar studies is a mean importance rating that represents the midpoint between moderately important and important. For the importance rating scale used across many studies, the value of this criterion is 2.50.

This criterion is consistent with the intent of creating content validity. Therefore, for this job analysis, Prometric recommended the value of this criterion should be set at 2.50.

Definition of Pass, Borderline and Fail Categories for Task and Knowledge Importance Mean Ratings

	Means
Pass:	**At or above 2.50**
Borderline:	**2.40 to 2.49**
Fail:	**Less than 2.40**

Accordingly, the task, knowledge, and skill statements were each grouped into one of three categories: Pass, Borderline, or Fail as determined by their mean importance ratings.

- The Pass Category contains those statements whose mean ratings are at or above 2.50, and are eligible for inclusion in the development of test specifications.
- The Borderline Category contains those statements whose mean ratings are from 2.40 to 2.49. The Borderline Category is included to provide a point of discussion for the Task Force to determine if the statement(s) warrant(s) inclusion in the test specifications.
- The Fail Category contains those statements whose mean ratings are less than 2.40. It is recommended that statements in the Fail Category be excluded from consideration in the test specifications.

5. Development of the Test Specifications

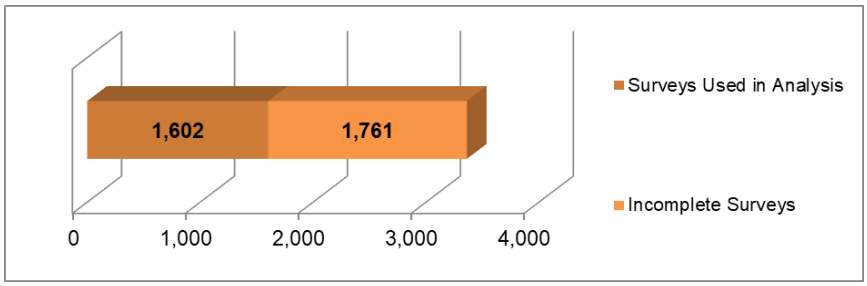
On September 10, 2023, Prometric staff facilitated a remote meeting to finalize new test specifications for the CNMT exam. The meeting focused on:

- Finalizing the task statements for inclusion based on the survey results;
- Finalizing the knowledge and skills that are important for inclusion based on the survey results; and,
- Establishing the test content weights for each area on the examination.

RESULTS

Survey Responses

A total of 3,363 surveys were submitted. Of these submissions 1,761 were excluded from analysis due to insufficient response. The remaining 1,602 submissions were determined to be complete enough (at least 55% of the questions answered) to be used in analysis.



Based on the analysis of survey responses, a representative group of nuclear medicine technologists and related professionals completed the survey in sufficient numbers to meet the requirements to conduct statistical analysis. This was evidenced by the distribution of responses for each of the background information questions and was confirmed through discussion with the Test Specifications Committee.

Demographic Characteristics of Survey Respondents

The profile of survey respondents is below. All responses to the background and general information section of the survey are provided in Appendix C. Write-in responses to "Other, please specify" options are also provided in Appendix C. The results in the figures below reflect the sample size used for analysis of 1,602.

Demographic Figures

Figure 1. *Demographic Question 1. What was your pathway to becoming a credentialed Nuclear Medicine Technologist?*

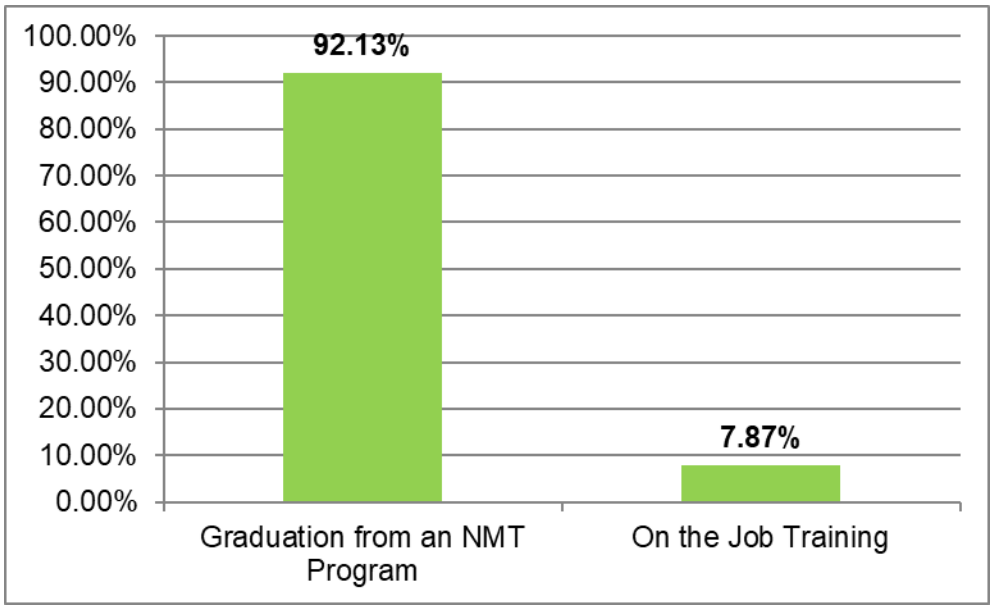


Figure 2. *Demographic Question 2. What was awarded to you upon graduating from a Nuclear Medicine Technology program?*

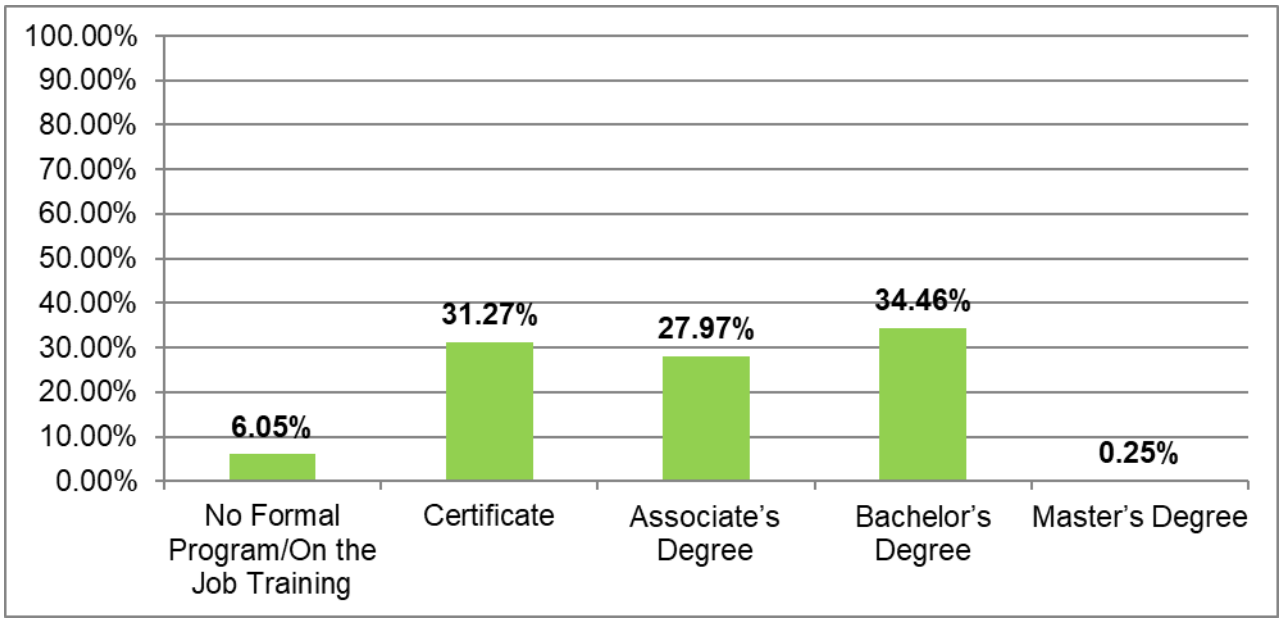


Figure 3. *Demographic Question 3. What is your highest level of education?*

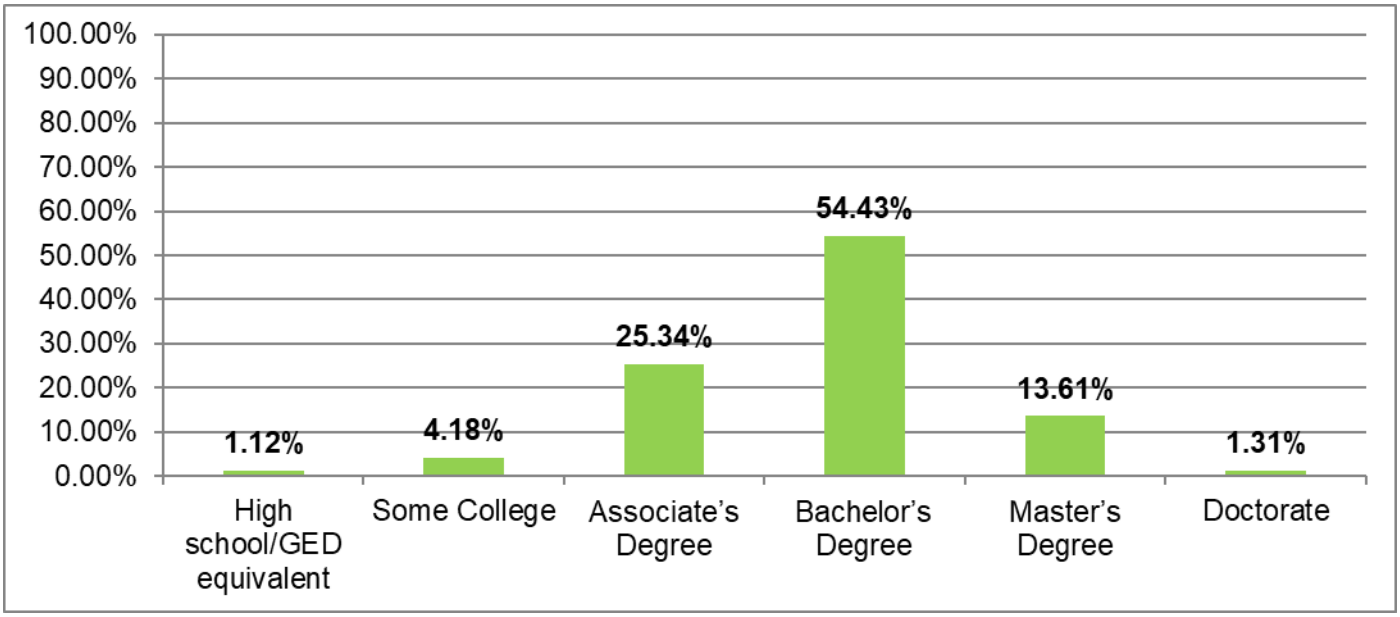


Figure 4. *Demographic Question 4. How many years have you been practicing as a credentialed Nuclear Medicine Technologist?*

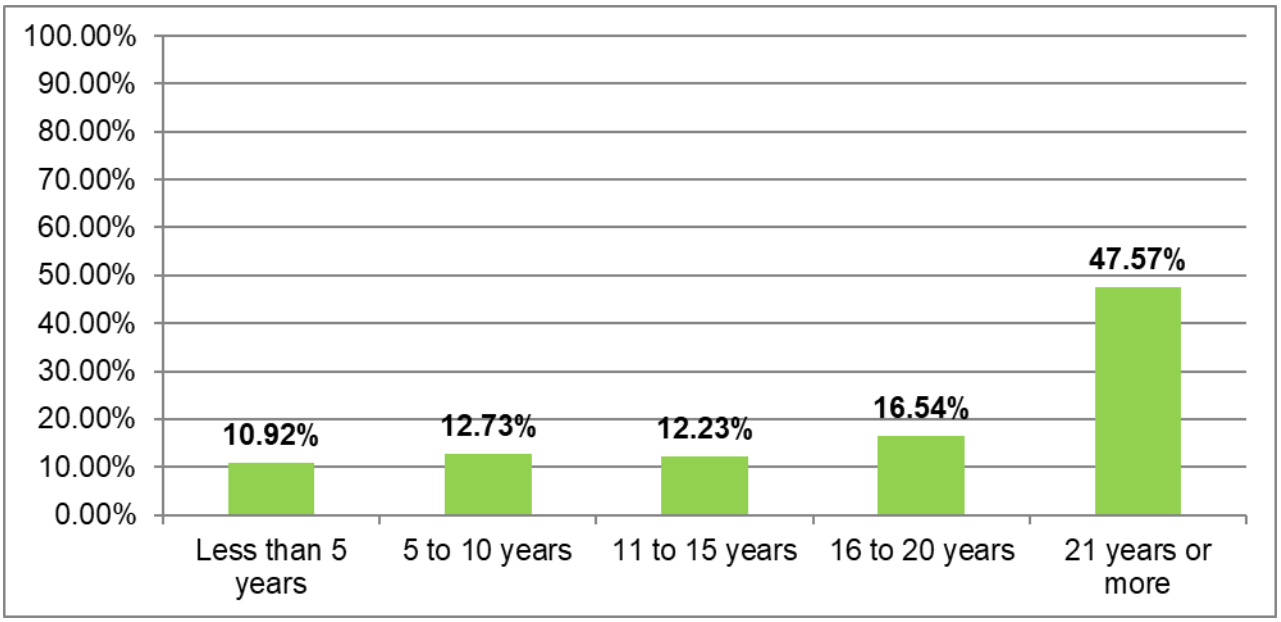


Figure 5. *Demographic Question 6. In what capacity are you employed as a Nuclear Medicine Technologist?*

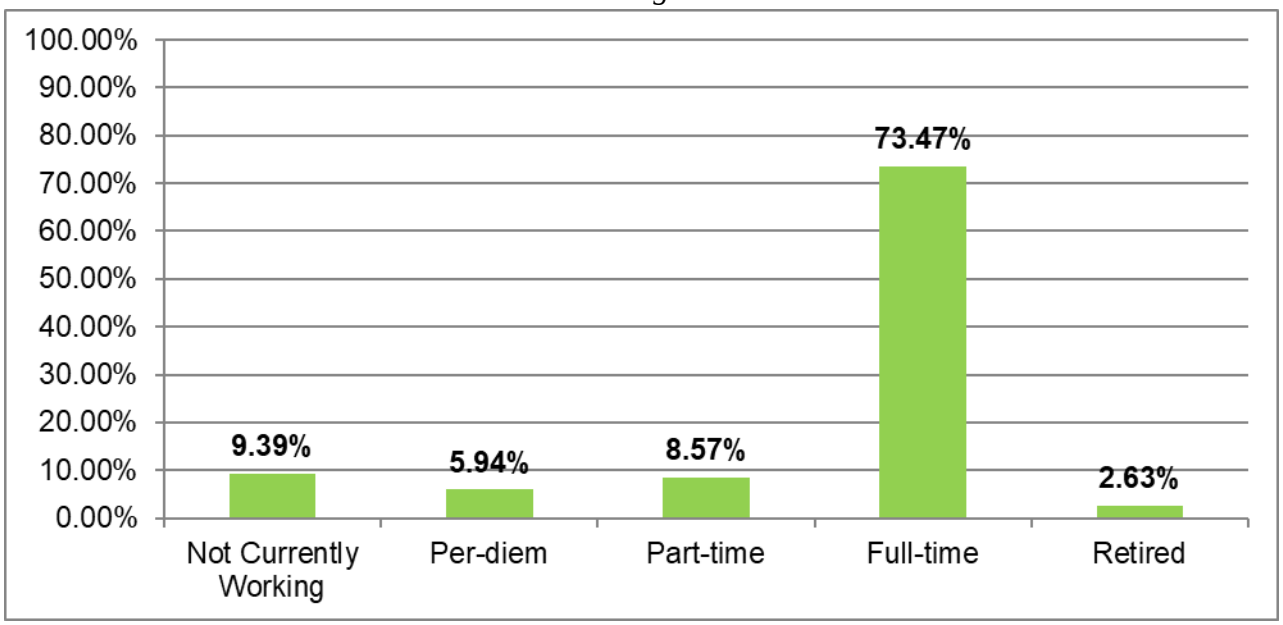


Figure 6. *Demographic Question 7. Which of the following BEST describes your PRIMARY practice setting?*

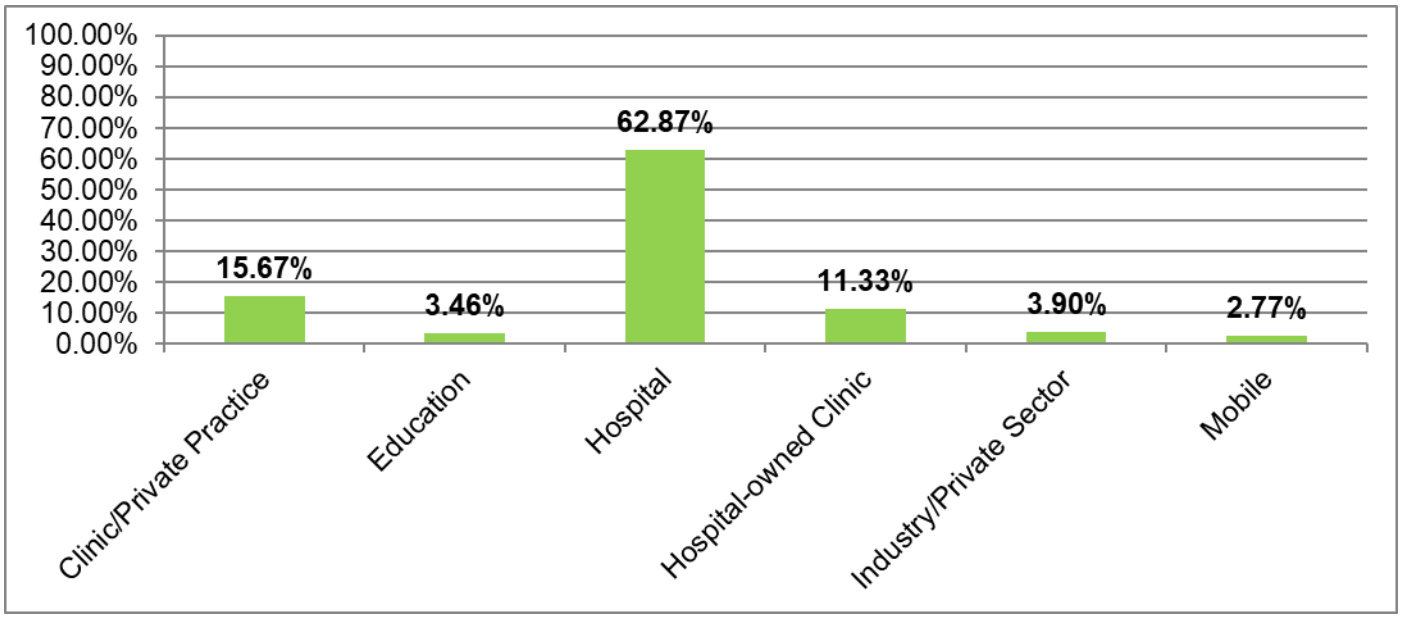


Figure 7. *Demographic Question 8. Which of the following BEST describes the PRIMARY focus of your practice?*

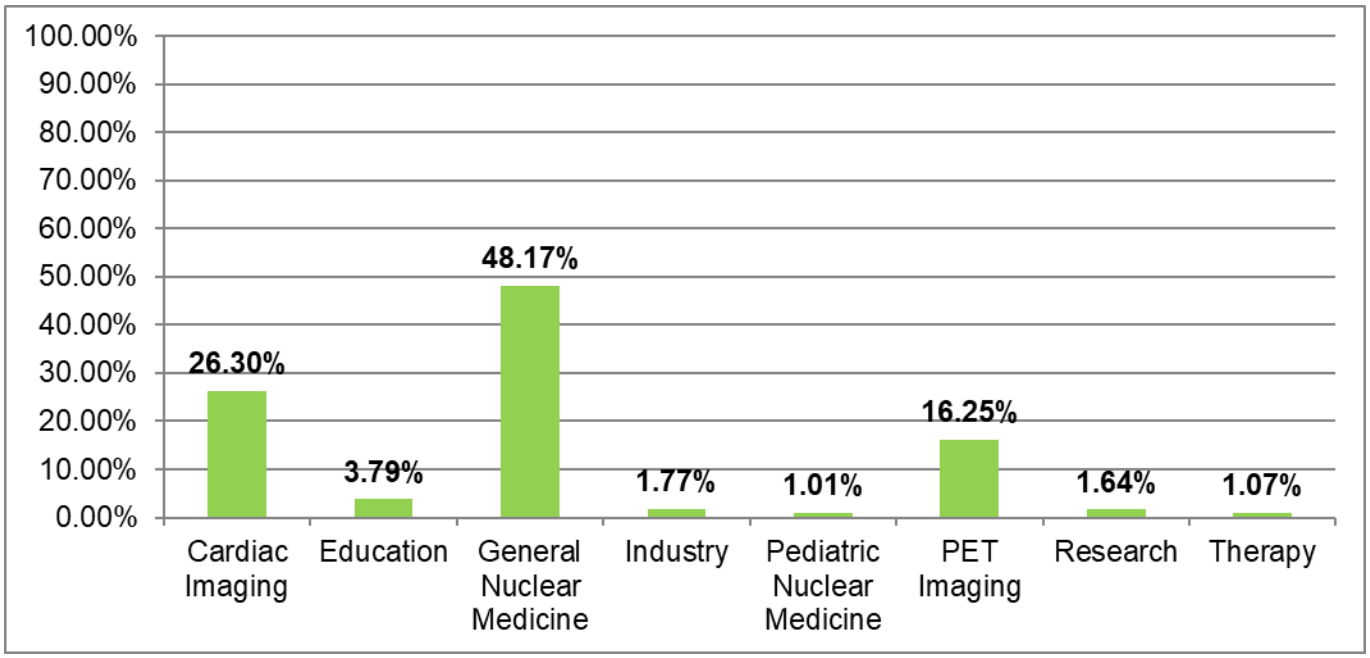


Figure 8. *Demographic Question 9. Select the category that BEST describes your PRIMARY position?*

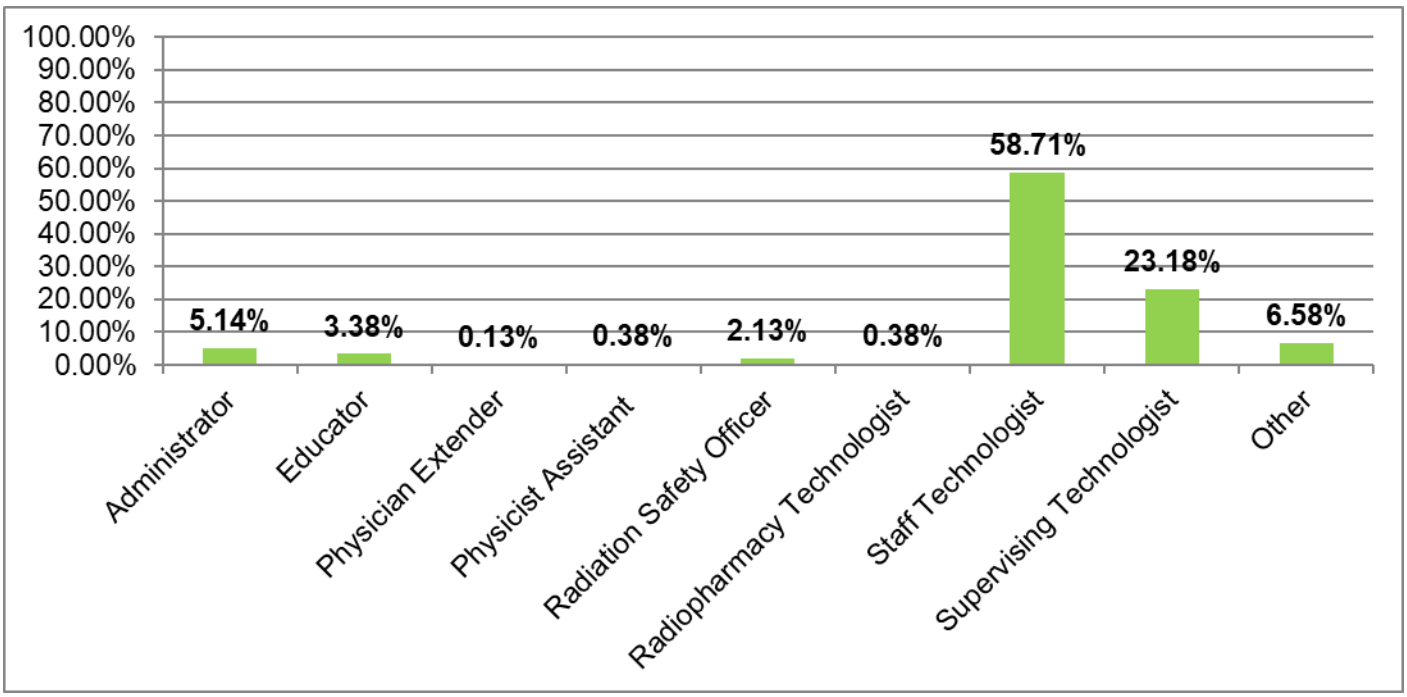


Figure 9. *Demographic Question 11a. Where is your primary practice located?*

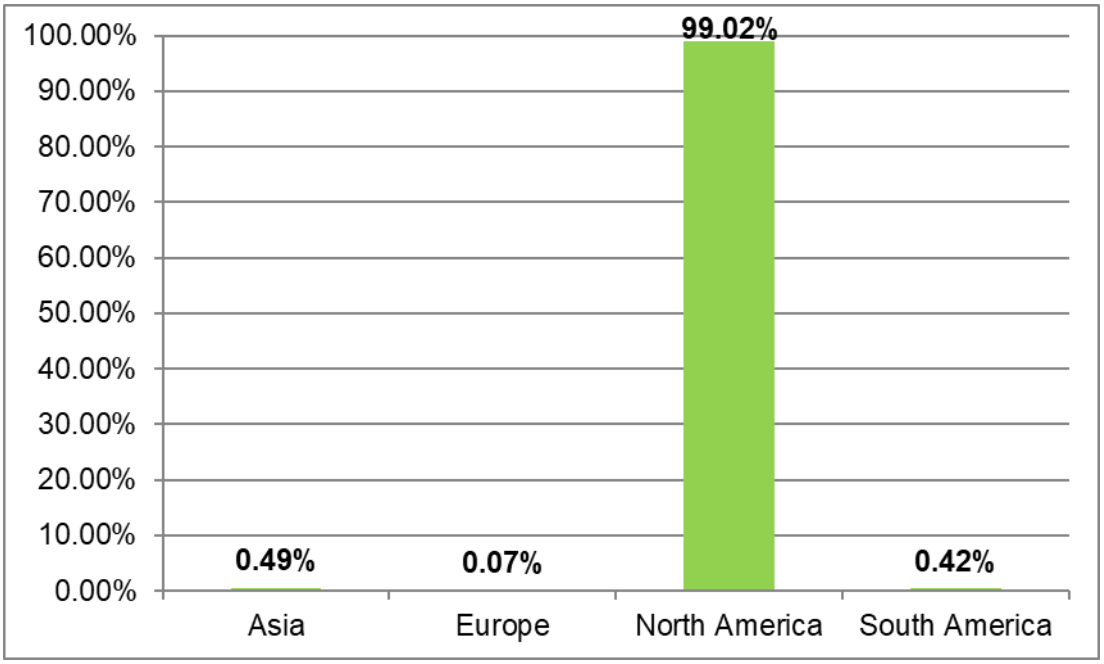


Figure 10. *Demographic Question 11b. In which state, province, or territory is your primary practice?*

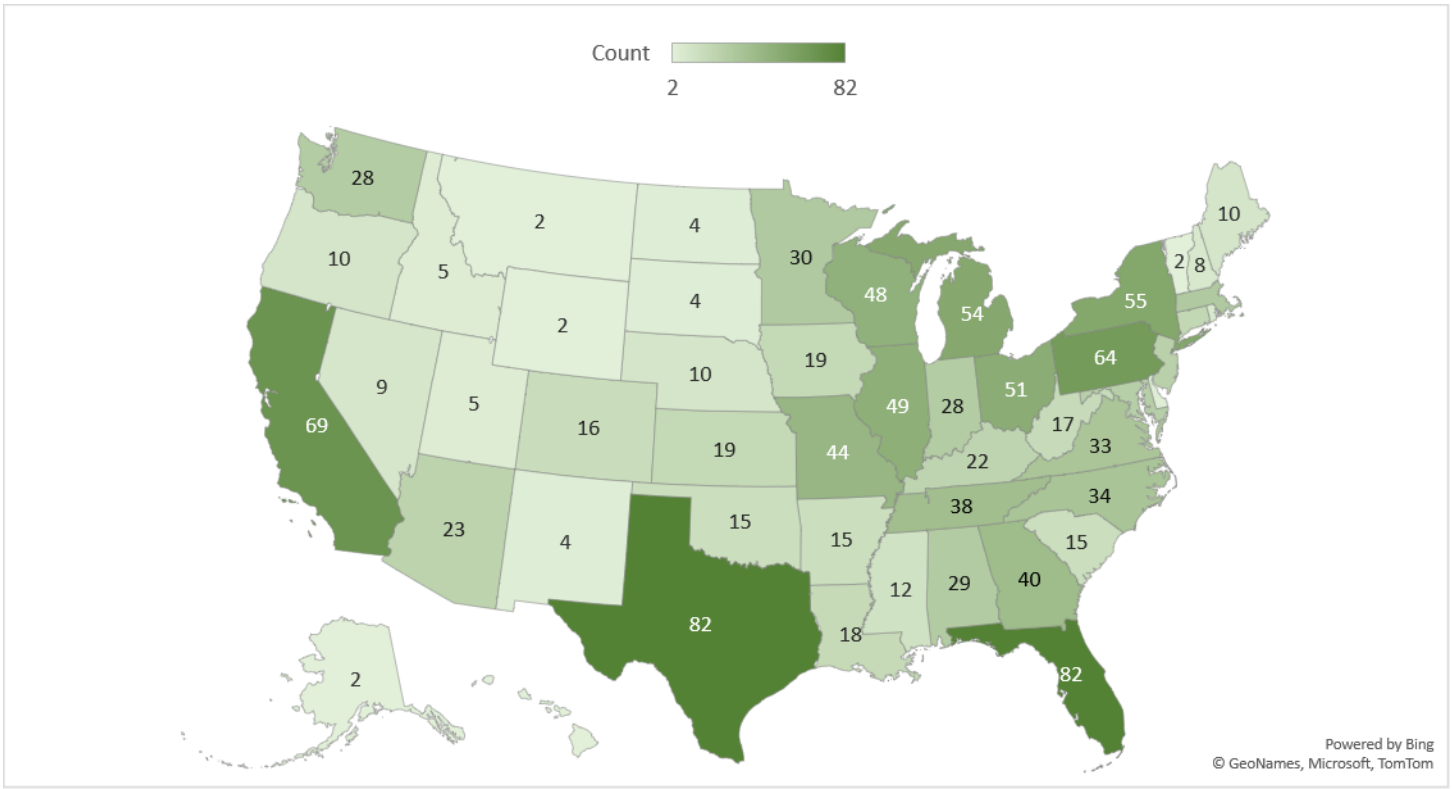


Figure 11. *Demographic Question 10. Which of the following BEST describes your geographic region of practice?*

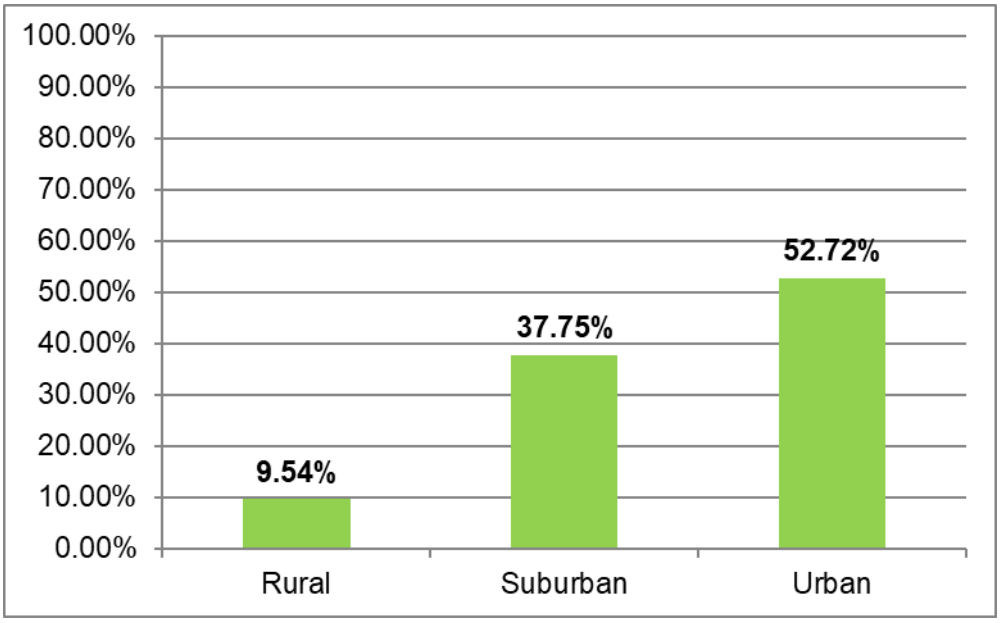


Figure 12. *Demographic Question 12. Which of the following describes your age?*

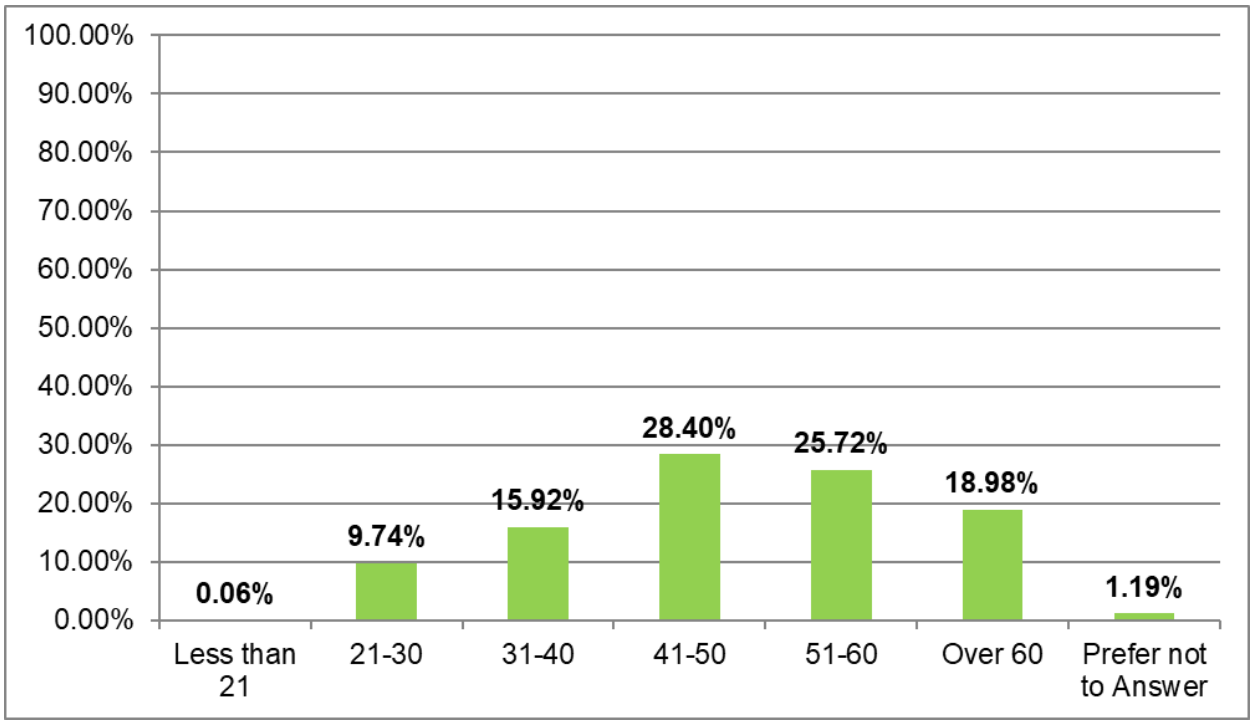


Figure 13. *Demographic Question 13. Which of the following describes your gender?*

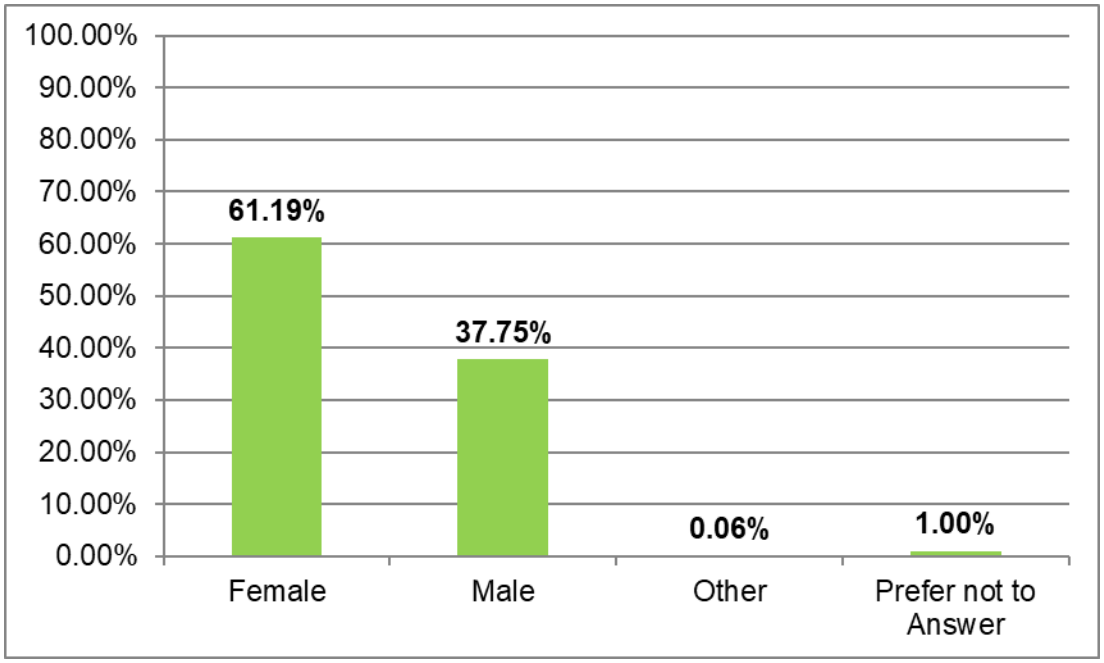
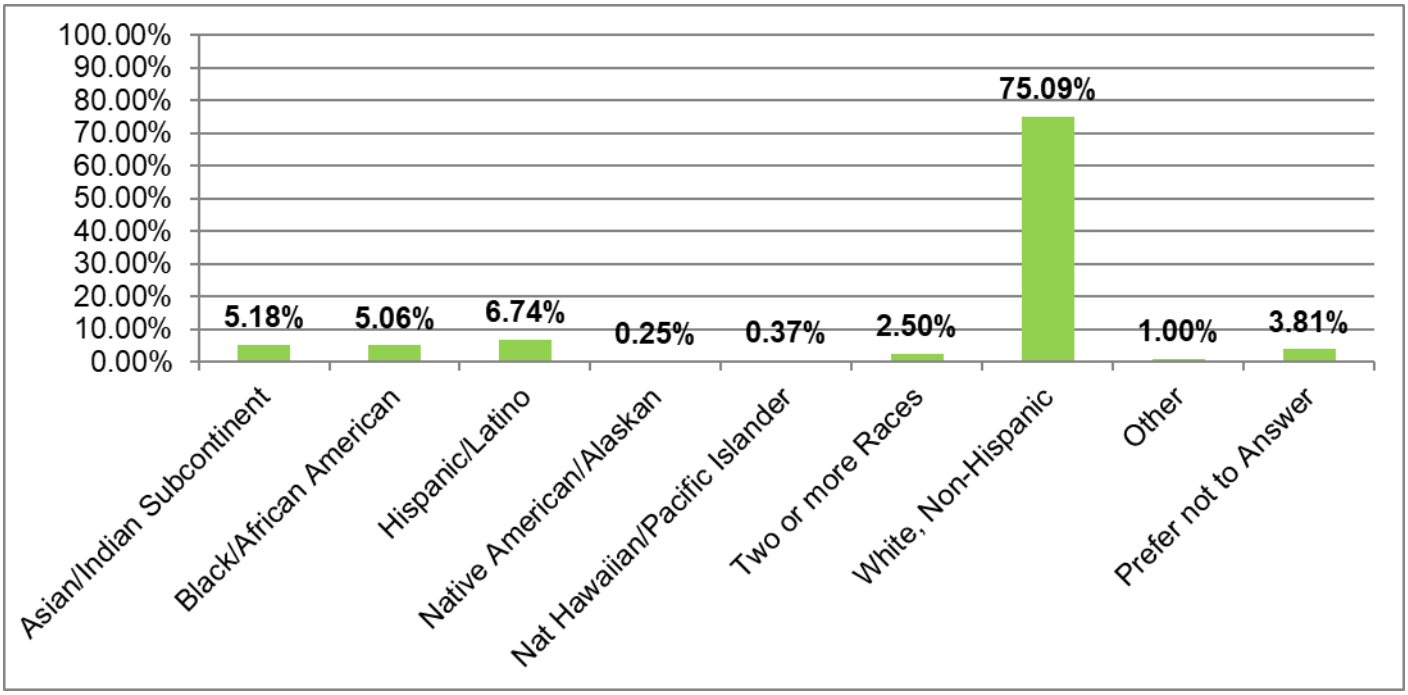


Figure 14. *Demographic Question 14. Which of the following BEST describes your race/ethnicity?*



Task, Knowledge, and Skill Overall Ratings

The following provides a summary of survey respondents' ratings of the task, knowledge, and skill statements. The survey respondents passed 450 of the 473 task, knowledge, and skill statements.

Tasks

Means and standard deviations for the tasks included on the survey are in Appendix D. All 29 (100%) of the 29 tasks achieved high importance means. Table 1 shows the delineation of tasks in Pass, Borderline, and Fail categories by domain.

Table 1. *Tasks by Pass, Borderline, and Fail categories*

Domains	Number of Task Statements	Pass (Mean 2.50 or Above)	Borderline (Mean 2.40 to 2.49)	Fail (Mean Less than 2.40)
I. Radiation Physics and Detection	1	1	0	0
II. Radiation Safety and Regulations	5	5	0	0
III. Pharmaceutical and Radiopharmaceutical Agents	7	7	0	0
IV. Instrument Operations and Quality Control	3	3	0	0
V. Clinical Procedures and Therapies	13	13	0	0
Total	**29**	**29**	**0**	**0**
Percentage		**100.00%**	**0.00%**	**0.00%**

Knowledge & Skills

Analysis of the knowledge and skill statements included on the survey are in Appendix E. A total of 421 (94.82%) of the 444 knowledge and skill statements achieved high importance means. Table 2 shows the knowledge and skill statements placed in Pass, Borderline, and Fail categories.

Table 2. *Knowledge & Skill Importance by Pass, Borderline, and Fail categories*

Domains	Number of Task Statements	Pass (Mean 2.50 or Above)	Borderline (Mean 2.40 to 2.49)	Fail (Mean Less than 2.40)
I. Radiation Physics and Detection	20	20	0	0
II. Radiation Safety and Regulations	62	62	0	0
III. Pharmaceutical and Radiopharmaceutical Agents	119	115	3	1
IV. Instrument Operations and Quality Control	51	50	0	1
V. Clinical Procedures and Therapies	192	174	5	13
Total	**444**	**421**	**8**	**15**
Percentage		**94.82%**	**1.80%**	**3.38%**

Subgroup Analysis of Task, Knowledge, and Skill Ratings

The index of agreement (IOA) is a measure of the extent to which subgroups of respondents agree on which tasks, knowledge, and skills are important. Using the mean importance ratings for tasks, knowledge, and skills, indices of agreement were computed:

- If the individual subgroup means are above the critical importance value (mean ratings at or above 2.50), then they agree that the content is important.
- If the individual subgroup means are below the critical importance value (mean ratings less than 2.50), then the subgroups agree that the content is considered less important.
- By contrast, if one subgroup's (for example, female) mean ratings are above the critical importance value and another subgroup's (for example, male) means are below the critical importance value then the subgroups are in disagreement as to whether the content is important.

The index of agreement provides a method of computing the similarity in judgments between groups and is tailored to the purpose of a job analysis study. As one of the major purposes of this job analysis study is to identify appropriate test content, the agreement index provides a statistical method to address this question at the subgroup level. Furthermore, the agreement index requires only 30 respondents per subgroup for computation, thus allowing for numerous comparisons to be made.

An illustrative example for two groups on a survey with 100 knowledge areas shows how to compute the index. If two groups passed the same 96 knowledge areas and failed the same 2 knowledge areas (out of the 100 total knowledge areas in the survey), the consistency index would be computed as *Agreement = (96 + 2)/100 = 0.98*. Values of 0.80 or less show less than optimal agreement and therefore additional mean analyses are required.

The index of agreement coefficients for tasks, knowledge, and skills are in Appendix F. Agreement coefficients were produced on the following background questions:

- *What was your pathway to becoming a credentialed Nuclear Medicine Technologist?*
- *What was awarded to you upon graduating from a Nuclear Medicine Technology program?*
- *What is your highest level of education?*
- *How many years have you been practicing as a credentialed Nuclear Medicine Technologist?*
- *In what capacity are you employed as a Nuclear Medicine Technologist?*
- *Which of the following BEST describes your PRIMARY practice setting?*
- *Which of the following BEST describes the PRIMARY focus of your practice?*
- *Select the category that BEST describes your PRIMARY position?*
- *Which of the following BEST describes your geographic region of practice?*
- *In which state, province, or territory is your primary practice?*

The computed agreement coefficients for tasks ranged from 0.97 to 1.00. For knowledge and skill statements the agreement coefficients ranged from 0.84 to 0.99. Since all items had an agreement coefficient greater than 0.80, no additional mean analysis was required.

Content Coverage Ratings

The survey participants indicated how well the statements within each of the task and knowledge and skill domains covered important aspects of that area. These responses provide an indication of the comprehensiveness of the survey content.

The five-point rating scale included 1=Very Poorly, 2=Poorly, 3=Adequately, 4=Well, and 5=Very Well. The means and standard deviations for the task, knowledge, and skill ratings are provided in Appendix G. For the task domains, the means ranged from 4.20 to 4.44 and for the knowledge and skill domains means ranged from 4.28 to 4.44. These means provide evidence that tasks, knowledge, and skills were "well" covered on the survey.

Survey respondents could write in tasks or knowledge and skills that they believed should be included in the listing of important task, knowledge, and skills. See Appendix H for the content coverage write-in comments. The Test Specifications Committee reviewed the comments to determine whether there were important statements not covered on the survey that should be included in the test specifications.

Test Content Recommendations

In survey Section 4: Recommendations for Test Content, participants were asked to assign a percentage weight to each knowledge and skill domain. The sum of percentage weights was required to equal 100. This information guided the Test Specifications Committee in making decisions about how much emphasis the domains should receive on the test content outline. The mean weights across all survey respondents are in Table 3.

Table 3. *Survey Respondents' Test Content Recommendations by Mean Percentages and Standard Deviations*

Domain	Mean (%)	SD (%)
I. Radiation Physics and Detection	14.1%	5.46%
II. Radiation Safety and Regulations	16.9%	6.04%
III. Pharmaceutical and Radiopharmaceutical Agents	21.6%	6.64%
IV. Instrument Operations and Quality Control	17.9%	5.82%
V. Clinical Procedures and Therapies	29.5%	12.24%

Write-In Comments

Many survey respondents provided responses to the open-ended questions in Section 5: Comments about expected changes in their job role over the next few years. See Appendix I for these comments.

DEVELOPMENT OF TEST SPECIFICATIONS FOR THE CNMT EXAM

The test specification meeting for the CNMT exam occurred September 10, 2023, via web conference. The steps involved in the development of test specifications included the following:

- Presentation of the job analysis project and results to the Test Specifications Committee;
- Identification of the task, knowledge, and skill statements to be included on the CNMT test specifications; and,
- Development of the test content weights for the exam.

Presentation of the Job Analysis Project and Results to the Test Specifications Committee

The first activity involved in the test specifications development was to provide the Test Specifications Committee an overview of the job analysis activities that were conducted. This was followed by a presentation of the results of the study.

Identification of the Task, Knowledge, and Skill Statements to be Included on the CNMT Exam

The Test Specifications Committee reviewed the task, knowledge, and skills results to make final recommendations about the areas that should be included on the exam.

The survey results served as the primary source of information used by the Test Specification Committee members to make test content decisions. Recommendations were based on the following criteria:

- Mean task, knowledge, and skill ratings for all respondents;
- Frequency distribution of ratings for all respondents; and,
- Appropriateness of the content for the examination.

Appendix J outlines the task, knowledge, and skill approval decisions.

Tasks Recommended for Inclusion

- A total of 29 of the 29 tasks achieved mean ratings at or above 2.50 (Pass category) and all were included on the test specifications. None of the statements required modification from the survey.

Knowledge and Skills Recommended for Inclusion

- A total of 421 of the 444 knowledge and skill statements achieved mean ratings at or above 2.50 (Pass category) and 417 of these statements were included on the test specifications.
- Eight of the 444 knowledge and skill statements achieved mean ratings at or between 2.40 and 2.49 (Borderline category). Five of the eight statements were included on the test specifications.
- A total of 15 of the 444 knowledge and skill statements achieved mean ratings below 2.40 (Fail category). Two of the 15 statements were included on the test specifications as examples for statements in the Pass category.

The final version of the task, knowledge, and skill statements can be found in Appendix J.

Development of Test Content Weights

The Test Specifications Committee participated in an exercise that required each member to assign a percentage weight to each of the knowledge and skill domains. Weights were then entered into a spreadsheet and shown to the committee. The committee members were able to compare the test content weights derived from the survey responses, the current exam weights, and their own independent estimates. This resulted in a productive discussion among the committee members regarding the optimal percentages for the exam.

Table 4 shows the test specifications recommendation including the agreed upon percentages.

Table 4. *CNMT Test Content Weights Recommended by the Test Specifications Committee*

Knowledge and Skill Domains	No. of Statements	% Weight
I. Radiation Physics and Detection	21	7%
II. Radiation Safety and Regulations	67	13%
III. Pharmaceutical and Radiopharmaceutical Agents	121	25%
IV. Instrument Operations and Quality Control	53	15%
V. Clinical Procedures and Therapies	189	40%

NMTCB Update

At the conclusion of the Job Analysis process, NMTCB met to review and approve the preliminary test specifications for the updated CNMT exam. During this meeting NMTCB approved the new test specifications with two minor edits. NMTCB added the knowledge of "temperature requirements" as it relates to the storage of radiopharmaceutical kits and removed the specific knowledge of "brachytherapy" as it relates to radionuclide therapy from the test specifications. NMTCB believes these two updates will create test specifications that better reflect industry practice.

The final CNMT test specifications are located in Appendix K.

SUMMARY AND CONCLUSIONS

The job analysis study for NMTCB identified tasks, knowledge, and skills that are important to the work performed by nuclear medicine technologists. Furthermore, the data collected can be used to guide the development of the test specifications used for the CNMT exam.

The task, knowledge, and skill statements were developed through an iterative process involving the combined efforts of NMTCB, subject-matter experts, and Prometric staff. These statements were assembled into a survey and disseminated to individuals in the nuclear medicine field for verification/refutation. Survey participants were asked to rate the importance of task, knowledge, and skill statements.

The result of the study supports the following:

- Task, knowledge, and skill statements that were verified as important through the survey provide a foundation of empirically derived information from which to develop test specifications for the CNMT exam.

- Evidence was provided in this study that the comprehensiveness of the content within the task and knowledge and skill domains was "well" covered.

- Both the process utilized, and survey results support the development of content-valid test specifications.

In summary, the job analysis study used a multi-method approach to identify the tasks, knowledge, and skills that are important to the work performed by nuclear medicine technologists. The results of the study were used to develop the test specifications for NMTCB's CNMT exam.

PREPARING FOR YOUR PARTICIPATION IN THE

CERTIFIED NUCLEAR MEDICINE TECHNOLOGIST (CNMT) - JOB TASK ANALYSIS:

TASK FORCE MEETING

APRIL 29-30, 2023

PREPARED BY:

PROMETRIC

INTRODUCTION

The Nuclear Medicine Technology Certification Board (NMTCB) has commissioned a Job Analysis for their Certified Nuclear Medicine Technologist (CNMT) examination from Prometric.

A job analysis is designed to obtain descriptive information about the tasks performed for a particular job and the knowledge needed to support their performance. The purpose of this job analysis is to:

- Review and revise the list of the tasks and knowledge related to work performed by nuclear medicine technologists; and,
- Update the test specifications for the CNMT examination.

PARTICIPATION IN THE TASK FORCE MEETING

During the meeting, we will define the major content areas (domains) along with the major tasks performed and the knowledge needed for competent performance. The information produced in this meeting will be incorporated into a survey distributed to individuals working as nuclear medicine technologists.

Your role—along with the other task force members— is to actively provide information during the meeting based on your professional expertise about the work performed by nuclear medicine technologists.

On behalf of NMTCB, we welcome you as a key contributor to this important project by serving on the Task Force Committee!

PREPARING FOR THE TASK FORCE MEETING

This document provides information to prepare you for participation in the Task Force meeting, including:

- The meeting schedule and agenda
- An overview of the job analysis process
- A summary of how tasks and knowledge statements are developed

Colvin Franklin, M.S., Assessment Design Specialist will serve as the Prometric meeting facilitator.

ABOUT THE MEETING

MEETING LOCATION (APRIL 29-30)

Presidential Room
Embassy Suites by Hilton Atlanta Airport
4700 Southport Road
Atlanta, GA 30337

AGENDA

- Welcome and introductions
- Overview of the Job Task Analysis process
- Review of task/knowledge domains and statements
- Selection of survey rating scales
- Creation of survey background information questions
- Discussion about post-Task Force Meeting activities and assignments including:
  - Survey pilot nominations and pilot administration
  - Conference calls

APRIL 29TH 8:00 AM-5:00PM

WELCOME & INTRODUCTIONS	8:00 AM
OVERVIEW OF JOB ANALYSIS PROCESS	8:30 AM
REVIEW OF TASKS/KNOWLEDGE	9:00 AM
BREAK	10:30 AM
CONTINUE REVIEW OF TASKS/KNOWLEDGE	10:45 AM
LUNCH	12:00 PM
CONTINUE REVIEW OF TASKS/KNOWLEDGE	1:00 PM
BREAK	3:00 PM
CONTINUE REVIEW OF TASKS/KNOWLEDGE	3:15 PM
END OF MEETING #1	5:00 PM

APRIL 30TH 8:00 AM-12:00 PM

FINALIZE TASKS/KNOWLEDGE	8:00 AM
SELECT RATING SCALES	9:00 AM
BREAK	10:00 AM
CHOSE BIOGRAPHICAL QUESTIONS	10:15 AM
END OF MEETING #2	12:00 PM

JOB TASK ANALYSIS DEFINED

A job task analysis (also known as a practice analysis, role and function study, body of knowledge study, or role delineation) refers to procedures designed to obtain descriptive information about the tasks performed on a job and the important knowledge/skills needed to competently perform those activities. The specific type of job information collected is determined by the purpose for which the information will be used. For purposes of updating the CNMT examination, the study should identify important tasks and knowledge necessary for competent performance as a nuclear medicine technologist.

In addition, a well-designed job analysis should reflect the diversity within the job. Diversity refers to both regional or job context factors (e.g., geographic region, practice setting) and individual factors (e.g., professional experience, education).

By asking people of diverse backgrounds to rate the importance of tasks and knowledge, fairness is built into the CNMT examination from the start. If diverse people perceive the job in similar ways, then that perception can be applied in support of including that content in the examination.

ADHERENCE TO THE STANDARDS FOR EDUCATIONAL AND PSYCHOLOGICAL TESTING

The job analyses conducted by Prometric are designed to adhere to professional practice guidelines presented in *The Standards for Educational and Psychological Testing* (2014) *(The Standards).*

The Standards is a comprehensive technical guide that provides criteria for the evaluation of tests, testing practices, and the effects of test use. It was developed jointly by the American Psychological Association (APA), the American Educational Research Association (AERA), and the National Council on Measurement in Education (NCME). The guidelines presented in *The Standards* have, by professional consensus, come to define the necessary components of quality testing. Consequently, a testing program that adheres to *The Standards* is more likely to be judged valid and defensible than one that does not.

The Standards emphasize the concept of content validity and the need to conduct a job analysis to assure that the knowledge assessed in credentialing initiatives are in fact limited to those important for competent performance. As noted in Standard 14.14, "The content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance of the content for credential-worthy performance in an occupation or profession. A rationale should be provided to support a claim that the knowledge or skills being assessed are required for credential-worthy performance in an occupation and are consistent with the purpose for which the licensing or certification program was instituted" (p. 161).

OBJECTIVES OF THE JOB TASK ANALYSIS

The objectives of the study are two-fold: (1) to construct, with subject-matter experts, a comprehensive delineation of tasks and knowledge related to important work activities, and (2) to obtain, using survey methodology, the independent judgments of a national sample of professionals to verify (or refute) the importance of the tasks and knowledge.

The verification/refutation component plays a critical part in ensuring that the content area (in whole or in part) is judged relevant to work in the profession being examined. The verified list of important tasks and knowledge can be used in the development of test specifications for licensure and certification examinations.

THE TASK FORCE MEETING: DELINEATION OF DOMAINS, TASKS, AND KNOWLEDGE

The major aim of conducting a job analysis is to develop a concise and logical compilation of what professionals do in specific terms that can be readily communicated and understood. The delineation procedure involves a number of steps including the identification of (1) domains, (2) tasks, and (3) knowledge underlying the performance of the tasks.

1. Domains: These are also known as topic areas, content areas, or dimensions and represent the:
    a. professional responsibilities; and,
    b. knowledge needed to perform one's professional responsibilities.

    These may be characterized as major headings in an outline format and may include a brief behavioral description of the domain.

2. Tasks: When all domains have been identified, each domain will be described in terms of the tasks performed to fulfill important job responsibilities. The tasks identified in the job analysis must cover all aspects of the work that are relevant to the objectives of the study.

3. Knowledge: After the domains and tasks have been compiled, the knowledge associated with the performance of activities are identified.

EXAMPLE: DOMAINS (CONTENT AREAS)

Below is an example of the aforementioned hierarchy. A full version of the current Test Specifications is located here.

NMTCB Nuclear Medicine Technologist Certification Board Examination Content Outline

I. Domain I: Radiation Physics and Detection

A. Physical properties
1. Radioactive materials
   a. Modes of decay
      i. Gamma emitters
      ii. Beta emitters
      iii. Alpha emitters
      iv. Positron emitters
2. X-ray production
   a. Bremsstrahlung
   b. Characteristic x-ray

B. Measurement of radioactivity and decay calculations
C. Interactions of radiation with matter
D. Radiation detector types and basic principles
E. Counting statistics

II. Domain II: Radiation Safety and Regulations

A. Biological effects of radiation exposure
B. Protection techniques and calculations
1. Time
2. Distance (inverse square law)
3. Shielding (shielding equations)

C. Monitoring protocols and requirements (e.g., timing and frequency)
1. Radiation surveys (area monitoring) including:
   a. Survey meters and well counters
   b. Choice of radiation detection devices (e.g., Geiger Counters, sodium iodide detectors)
   c. Frequency and limits of wipe surveys
2. Personal monitoring devices
3. Personal protective equipment (e.g., lab coat, gloves, syringe shields)
4. Effective dose equivalent limits for:
   a. Radiation workers

WRITING TASKS

Tasks are distinct, identifiable, specific job-related activities performed by professionals in the field that are necessary for competent performance. Tasks should begin with action verbs such as:

Administer	Calculate	Counsel	Document	Identify	Interview	Negotiate	Read	Revise
Analyze	Compute	Describe	Establish	Instruct	Maintain	Obtain	Recommend	Schedule
Assess	Conduct	Design	Evaluate	Integrate	Measure	Perform	Report	Supervise
Audit	Consult	Discuss	Formulate	Interpret	Monitor	Plan	Review	Write

A few examples of some *commonly misused* verbs are:

Assist	Consider	Determine	Help	Know	Participate	Process	Understand

Since tasks vary in complexity, the writer should expect to have statements of varying length and complexity. The following are examples of appropriately written tasks:

- Schedule patient studies to accommodate sequencing of multiple procedures and special orders
- Perform post-procedure assessment
- Label blood components with radiopharmaceutical according to protocol

WRITING KNOWLEDGE STATEMENTS

The development of knowledge requires inferring behaviors from the tasks. In the writing of these statements, conciseness with specificity is the goal. Adjectives modifying the level or extent of the knowledge (e.g., some, thorough, clearly, effectively) should *not* be used. Doing so introduces a qualifier that is not necessary or appropriate for the job analysis process.

REVIEWING THE TASKS AND KNOWLEDGE

The following questions will be used to review the draft listing of tasks and knowledge after it has been created:

Clarity: Are the domains succinct? Are the tasks and knowledge clearly worded?
Relevance: Are the tasks and knowledge relevant to the work performed by nuclear medicine technologists?
Redundancy: Are the tasks and knowledge unique and discrete?
Omissions: Have any important tasks or knowledge been omitted?
Comprehensiveness: Are the domains, tasks, and knowledge comprehensive and representative?

PREPARING FOR YOUR PARTICIPATION IN THE

CERTIFIED NUCLEAR MEDICINE TECHNOLOGIST (CNMT) - JOB TASK ANALYSIS:

TEST SPECIFICATIONS MEETING

SEPTEMBER 10, 2023

PREPARED BY:

PROMETRIC

INTRODUCTION

The Nuclear Medicine Technology Certification Board (NMTCB) has commissioned a Job Analysis for their Certified Nuclear Medicine Technologist (CNMT) examination from Prometric.

A job analysis is designed to obtain descriptive information about the tasks performed for a particular job and the knowledge needed to support their performance. The purpose of this job analysis is to:

- Review and revise the list of the tasks and knowledge related to work performed by nuclear medicine technologists; and,
- Update the test specifications for the CNMT examination.

PARTICIPATION IN THE TEST SPECIFICATIONS MEETING

The purpose of the Test Specifications Meeting is to review the results of the Job Analysis Survey that was disseminated from June to August and develop test specifications.

Your role—along with the other Test Specifications Committee members— is to actively provide information during the meeting based on your professional expertise about the work performed by individuals working as nuclear medicine technologists.

On behalf of NMTCB, we welcome you as a key contributor to this important project by serving on the Test Specifications Committee!

PREPARING FOR THE TASK FORCE MEETING

This document provides information to prepare you for participation in the Test Specifications Meeting, including

- the meeting schedule and an agenda
- an overview of the job analysis process
- an overview of the test specifications development process
- sample of the job analysis survey
- sample of the test specifications

Colvin Franklin, M.S., Assessment Design Specialist will serve as the Prometric meeting facilitator.

ABOUT THE MEETING

MEETING LOCATION (SEPTEMBER 10TH)

Microsoft Teams

Sunday, September 10th Meeting Link

AGENDA

- Welcome and introductions
- Overview of the conduct of the Job Analysis Study
- Review of the results of the Job Analysis Study
- Development of Test Specifications
    - Recommendations regarding test content (tasks and knowledge)
    - Recommendations regarding test content weights

SEPTEMBER 10TH 12:00 PM-4:00PM ET

WELCOME & INTRODUCTIONS ..... 12:00 PM
OVERVIEW OF JOB ANALYSIS PROCESS ..... 12:15 PM
REVIEW OF SURVEY DATA ..... 12:45 PM
TEST CONTENT RECOMMENDATIONS ..... 1:30 PM
BREAK ..... 2:00 PM
FINALIZE TEST CONTENT RECOMMENDATIONS ..... 2:15 PM
TEST WEIGHT RECOMMENDATIONS ..... 3:00 PM
FINALIZE TEST SPECIFICATIONS ..... 3:45 PM
END OF MEETING ..... 4:00 PM

JOB TASK ANALYSIS DEFINED

A job task analysis (also known as a practice analysis, role and function study, body of knowledge study, or role delineation) refers to procedures designed to obtain descriptive information about the tasks performed on a job and the important knowledge/skills needed to competently perform those activities. The specific type of job information collected is determined by the purpose for which the information will be used. For purposes of updating the CNMT examination, the study should identify important tasks and knowledge necessary for competent performance as a nuclear medicine technologist.

In addition, a well-designed job analysis should reflect the diversity within the job. Diversity refers to both regional or job context factors (e.g., geographic region, practice setting) and individual factors (e.g., professional experience, education).

By asking people of diverse backgrounds to rate the importance of tasks and knowledge, fairness is built into the CNMT examination from the start. If diverse people perceive the job in similar ways, then that perception can be applied in support of including that content in the examination.

ADHERENCE TO THE STANDARDS FOR EDUCATIONAL AND PSYCHOLOGICAL TESTING

The job analyses conducted by Prometric are designed to adhere to professional practice guidelines presented in *The Standards for Educational and Psychological Testing* (2014) *(The Standards).*

The Standards is a comprehensive technical guide that provides criteria for the evaluation of tests, testing practices, and the effects of test use. It was developed jointly by the American Psychological Association (APA), the American Educational Research Association (AERA), and the National Council on Measurement in Education (NCME). The guidelines presented in *The Standards* have, by professional consensus, come to define the necessary components of quality testing. Consequently, a testing program that adheres to *The Standards* is more likely to be judged valid and defensible than one that does not.

The Standards emphasize the concept of content validity and the need to conduct a job analysis to assure that the knowledge assessed in credentialing initiatives are in fact limited to those important for competent performance. As noted in Standard 14.14, "The content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance of the content for credential-worthy performance in an occupation or profession. A rationale should be provided to support a claim that the knowledge or skills being assessed are required for credential-worthy performance in an occupation and are consistent with the purpose for which the licensing or certification program was instituted" (p. 161).

OBJECTIVES OF THE JOB TASK ANALYSIS

The objectives of the study are two-fold: (1) to construct, with subject-matter experts, a comprehensive delineation of tasks and knowledge related to important work activities, and (2) to obtain, using survey methodology, the independent judgments of a national sample of professionals to verify (or refute) the importance of the tasks and knowledge.

The verification/refutation component plays a critical part in ensuring that the content area (in whole or in part) is judged relevant to work in the profession being examined. The verified list of important tasks and knowledge can be used in the development of test specifications for licensure and certification examinations.

CONDUCT OF THE TEST SPECIFICATIONS MEETING

STEP 1: REVIEW THE RESULTS OF THE JOB ANALYSIS SURVEY

The results of the Job Analysis survey will be presented to the Test Specifications Committee (background and general information questions; tasks and knowledge ratings for importance).

The survey results represent the independent judgments of nuclear medicine technologists. Participants verified (or refuted) the importance of each task and knowledge statement.

Criteria that will be used to aid the Test Specifications Committee in making informed recommendations are comprised of the survey responses for each task and knowledge statement (e.g., importance means, standard deviations, frequency distribution of responses).

STEP 2: RECOMMENDATIONS FOR TEST CONTENT (TASKS AND KNOWLEDGE STATEMENTS)

- Review of means, standard, deviations, and frequency percentages for task importance ratings
- Review of task content coverage comments
- Review of means, standard, deviations, and frequency percentages for knowledge importance ratings
- Review of knowledge content coverage comments

STEP 3: RECOMMENDATIONS REGARDING TEST CONTENT WEIGHTS

The Test Specifications Committee will recommend the content weighting (percentage of items).

The Committee members will be led through an activity where they assign a percentage weight to each knowledge domain/subdomain for these examinations. After reviewing the data, the Committee will determine the optimal percentage weights for each domain.

The approved test content weights for each part will be used to guide examination development activities including item writing and examination assembly.

JOB ANALYSIS SURVEY SAMPLE

Below is a sample portion of the job analysis survey.

Domain 1. Radiation Physics and Detection

A. Understand the fundamentals of radiation physics and detection

How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Physical properties	○	○	○	○	○
1a. Radioactive materials	○	○	○	○	○
1a. Radioactive materials: Isotopes and their properties (e.g., half-life, energy)	○	○	○	○	○
1a. Radioactive materials: Modes of decay	○	○	○	○	○
1a. Radioactive materials: Modes of decay: gamma emitters	○	○	○	○	○
1a. Radioactive materials: Modes of decay: beta emitters	○	○	○	○	○
1a. Radioactive materials: Modes of decay: Alpha emitters	○	○	○	○	○

TEST SPECIFICATIONS EXAMPLE

Below is an example of a section of the current CNMT test specifications.

NMTCB Nuclear Medicine Technologist Certification Board Examination Content Outline

I. Domain I: Radiation Physics and Detection

- **A. Physical properties**
  - 1. Radioactive materials
    - a. Modes of decay
      - i. Gamma emitters
      - ii. Beta emitters
      - iii. Alpha emitters
      - iv. Positron emitters
  - 2. X-ray production
    - a. Bremsstrahlung
    - b. Characteristic x-ray
- **B. Measurement of radioactivity and decay calculations**
- **C. Interactions of radiation with matter**
- **D. Radiation detector types and basic principles**
- **E. Counting statistics**

II. Domain II: Radiation Safety and Regulations

- **A. Biological effects of radiation exposure**
- **B. Protection techniques and calculations**
  - 1. Time
  - 2. Distance (inverse square law)
  - 3. Shielding (shielding equations)
- **C. Monitoring protocols and requirements (e.g., timing and frequency)**
  - 1. Radiation surveys (area monitoring) including:
    - a. Survey meters and well counters
    - b. Choice of radiation detection devices (e.g., Geiger Counters, sodium iodide detectors)
    - c. Frequency and limits of wipe surveys
  - 2. Personal monitoring devices
  - 3. Personal protective equipment (e.g., lab coat, gloves, syringe shields)
  - 4. Effective dose equivalent limits for:
    - a. Radiation workers
    - b. Pregnant radiation workers
    - c. General public
- **D. Practice and adhere to ALARA**
- **E. Nuclear Regulatory Commission (NRC)**
  - 1. Posting warning and informational signs delineating restricted and unrestricted areas

Instructions Page

Nuclear Medicine Technology Certification Board (NMTCB)
Certified Nuclear Medicine Technologist (CNMT)
Job Analysis Survey

ABOUT THE SURVEY

SURVEY FORMAT

This survey can be completed in approximately 30 minutes. Most questions take just seconds to answer. A progress bar is provided at the bottom of each page to indicate the percentage of the survey you have completed. The survey consists of the following sections:

Section 1: Background & General Information
Section 2: Tasks
Section 3: Knowledge and Skills
Section 4: Domain Weighting
Section 5: Additional Feedback

Each time you select the "Next" button, your answers will be recorded and you will be transferred automatically to the next set of items. Upon completion of the entire survey, select the "Submit" button on the last page.

HOW TO EXIT AN INCOMPLETE SURVEY AND CONTINUE LATER

If you cannot finish the entire survey in one sitting, you can exit the survey by closing your web browser. To re-access the survey please use the original survey URL (link). Your responses are automatically recorded as you navigate to the next page. Ensure you complete all questions on the current page and select the "Next" button, before exiting the survey.

TECHNICAL ASSISTANCE

If you encounter any technical difficulties with completing the survey online or have questions regarding the survey content, you may contact us. Please be sure to identify the survey you are taking (CNMT Job Analysis Survey). Email: colvin.franklin@prometric.com. You will receive a response within 24 hours or less, Monday through Friday.

Section 1: Opening Questions

SECTION 1: BACKGROUND AND GENERAL INFORMATION

The information that you provide in this section is completely confidential and will be used for research purposes only. Please answer the following questions by selecting the response that most closely describes you or your professional activities, or type in your answer as appropriate.

1. What was your pathway to becoming a credentialed Nuclear Medicine Technologist?

- ○ Graduation from an NMT Program
- ○ On the Job Training
- ○ Not Currently Credentialed/Licensed

2. What was awarded to you upon graduating from a Nuclear Medicine Technology program?

- ○ Certificate
- ○ Associate's Degree
- ○ Bachelor's Degree
- ○ Master's Degree
- ○ Did not Complete a Formal Program/Completed on the Job Training

3. What is your highest level of education?

- ○ High school/GED equivalent
- ○ Some College
- ○ Associate's Degree
- ○ Bachelor's Degree
- ○ Master's Degree
- ○ Doctorate (MD, PhD, EdD, DO)

4. How many years have you been practicing as a credentialed Nuclear Medicine Technologist?

- ○ Less than 5 years
- ○ 5 to 10 years
- ○ 11 to 15 years
- ○ 16 to 20 years
- ○ 21 years or more

5. What credentials do you currently hold? *(Select all that apply)*

- ☐ ARDMS - Diagnostic Cardiac Sonography - RDCS
- ☐ ARDMS - Diagnostic Medical Sonography - RDMS
- ☐ ARDMS - Vascular Sonography - RVT
- ☐ ARMRIT - Magnetic Resonance - ARMRIT
- ☐ ARRT - Bone Densitometry - RT(BD)

- [ ] ARRT - Breast Sonography - RT(BS)
- [ ] ARRT - Cardiac-Interventional Radiography - RT(CI)
- [ ] ARRT - Cardiovascular-Interventional Radiography - RT(CV)
- [ ] ARRT - Computed Tomography - RT(CT)
- [ ] ARRT - Magnetic Resonance Imaging - RT(MR)
- [ ] ARRT - Mammography - RT(M)
- [ ] ARRT - Nuclear Medicine Technology - RT(N)
- [ ] ARRT - Quality Management - RT(QM)
- [ ] ARRT - Radiation Therapy - RT(T)
- [ ] ARRT - Radiography - RT(R)
- [ ] ARRT - Sonography - RT(S)
- [ ] ARRT - Vascular Sonography - RT(VS)
- [ ] ARRT - Vascular-Interventional Radiography - RT(VI)
- [ ] CAMRT - Magnetic Resonance - RTMR
- [ ] CAMRT - Nuclear Medicine Technology - RTNM
- [ ] CAMRT - Radiation Therapy - RTT
- [ ] CAMRT - Radiological Technology - RTR
- [ ] MDCB - Medical Dosimetrist - CMD
- [ ] NMTCB - Certified Nuclear Medicine Technologist - CNMT
- [ ] NMTCB - Computed Tomography Technologist - NMTCB(CT)
- [ ] NMTCB - Nuclear Cardiology Technologist - NCT
- [ ] NMTCB - Nuclear Medicine Advanced Associate - NMAA
- [ ] NMTCB - PET Technologist - PET
- [ ] NMTCB - Radiation Safety - NMTCB(RS)
- [ ] _____ Other, Please Specify

6. In what capacity are you employed as a Nuclear Medicine Technologist?

- ○ Per-diem
- ○ Part-time
- ○ Full-time
- ○ Retired
- ○ I am not Currently Working as a Nuclear Medicine Technologist

7. Which of the following BEST describes your PRIMARY practice setting?
(Please choose the option that most closely reflects your current location)

- ○ Clinic/Private Practice
- ○ Education
- ○ Hospital
- ○ Hospital-owned Clinic
- ○ Industry/Private Sector
- ○ Mobile

8. Which of the following BEST describes the PRIMARY focus of your practice?
(Please choose the option that most closely reflects your current focus)

- ○ Cardiac Imaging
- ○ Education
- ○ General Nuclear Medicine
- ○ Industry
- ○ Pediatric Nuclear Medicine
- ○ PET Imaging
- ○ Research
- ○ Therapy

9. Select the category that BEST describes your PRIMARY position?

- ○ Administrator
- ○ Educator
- ○ Physician Extender (e.g., NMAA, RA, PA)
- ○ Physicist Assistant
- ○ Radiation Safety Officer
- ○ Radiopharmacy Technologist
- ○ Staff Technologist
- ○ Supervising Technologist
- ○ [ ] Other, Please Specify

10. Which of the following BEST describes your geographic region of practice?

- ○ Rural (Less than 10,000 People), Sparsely Populated Areas Further Outside the City (e.g., countryside, farmlands)
- ○ Suburban (Between 10,000 and 100,000 People), Less Densely Populated Areas, Typically Bordering the City
- ○ Urban (Greater than 100,000 People), Highly Dense Population within City Limits

11a. Where is your primary practice located?

[▾]

11b. In which state, province, or territory is your primary practice?

12. Which of the following describes your age?

- ○ Less than 21
- ○ 21-30
- ○ 31-40
- ○ 41-50
- ○ 51-60
- ○ Over 60
- ○ Prefer not to Answer

13. Which of the following describes your gender?

- ○ Female
- ○ Male
- ○ Other
- ○ Prefer not to Answer

14. Which of the following BEST describes your race/ethnicity?

- ○ Asian/Indian Subcontinent
- ○ Black/African American
- ○ Hispanic/Latino
- ○ Native American/Alaskan
- ○ Native Hawaiian/Pacific Islander
- ○ White, Non-Hispanic
- ○ Two or more Races
- ○ Other
- ○ Prefer not to Answer

Section 2: Task Statements

SECTION 2: Tasks

The purpose of this section is to rate the importance of tasks (job activities) performed by a Nuclear Medicine Technologist. After you rate the tasks from each of the following domains you will have the opportunity to provide feedback on additional knowledge and skills related to these tasks.

Domains Covered

Domain 1. Radiation Physics and Detection
Domain 2. Radiation Safety and Regulations
Domain 3. Pharmaceutical and Radiopharmaceutical Agents
Domain 4. Instrument Operations and Quality Control
Domain 5. Clinical Procedures and Therapies

The rating scale you will use is:

Importance: How important is this Task in relation to competent performance as an entry-level CNMT?
0 = Of no importance
1 = Of little importance
2 = Of moderate importance
3 = Important
4 = Very important

Domain 1. Radiation Physics and Detection

	How important is this Task in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
A. Understand the fundamentals of radiation physics and detection	○	○	○	○	○

How well does the Domain 1 task cover important aspects of Radiation Physics and Detection?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important tasks, if any, are not covered?

Domain 2. Radiation Safety and Regulations

	How important is this Task in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
A. Identify biological effects of radiation exposure	○	○	○	○	○
B. Recognize protection techniques and calculations	○	○	○	○	○
C. Perform survey protocols and requirements (e.g., timing and frequency)	○	○	○	○	○
D. Comply with Nuclear Regulatory Commission (NRC) Regulations	○	○	○	○	○
E. Comply with Other Regulations and Guidelines	○	○	○	○	○

How well do the tasks in Domain 2 cover important aspects of Radiation Safety and Regulations?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important tasks, if any, are not covered?

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

How important is this Task in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
A. Elute radionuclide generator, perform, and evaluate quality control tests	○	○	○	○	○
B. Prepare radiopharmaceutical kits, perform quality control, and evaluate results	○	○	○	○	○
C. Understand the characteristics (i.e., mechanism of localization), indications, contraindications, and administration of diagnostic radiopharmaceuticals	○	○	○	○	○
D. Understand the characteristics (i.e., mechanism of localization), indications, contraindications, and administration of therapeutic radiopharmaceuticals	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
E. Understand the indications, contraindications, and administration of interventional and adjunct pharmaceutical agents used in conjunction with nuclear medicine procedures	○	○	○	○	○
F. Radiolabel blood components with radiopharmaceutical according to protocol	○	○	○	○	○
G. Administer radiopharmaceuticals and non-radioactive agents	○	○	○	○	○

How well do the tasks in Domain 3 cover important aspects of Pharmaceutical and Radiopharmaceutical Agents?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important tasks, if any, are not covered?

Domain 4. Instrument Operations and Quality Control

	How important is this Task in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
A. Operate Non-imaging equipment and components	○	○	○	○	○
B. Operate Imaging equipment and components	○	○	○	○	○
C. Operate Auxiliary equipment	○	○	○	○	○

How well do the tasks in Domain 4 cover important aspects of Instrument Operations and Quality Control?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important tasks, if any, are not covered?

Domain 5. Clinical Procedures and Therapies

How important is this Task in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
A. Perform nuclear medicine procedures	○	○	○	○	○
B. Schedule patient studies	○	○	○	○	○
C. Procure supply of radiopharmaceuticals	○	○	○	○	○
D. Educate patient, family, and personnel	○	○	○	○	○
E. Obtain patient information and provide patient care	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
F. Select and administer prescribed radiopharmaceuticals	○	○	○	○	○
G. Prepare equipment and perform examinations	○	○	○	○	○
H. Evaluate image quality	○	○	○	○	○
I. Perform image processing	○	○	○	○	○
J. Prepare/perform stress testing	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
K. Obtain samples and/or data for non-imaging studies	○	○	○	○	○
L. Evaluate the results of non-imaging studies	○	○	○	○	○
M. Administer radiopharmaceutical therapies	○	○	○	○	○

How well do the tasks in Domain 5 cover important aspects of Clinical Procedures and Therapies?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important tasks, if any, are not covered?

Section 3: Knowledge Statements

SECTION 3: Knowledge and Skills

The purpose of this section is to rate the importance of knowledge and skills needed to work as a Nuclear Medicine Technologist.

Domains Covered

Domain 1. Radiation Physics and Detection
Domain 2. Radiation Safety and Regulations
Domain 3. Pharmaceutical and Radiopharmaceutical Agents
Domain 4. Instrument Operations and Quality Control
Domain 5. Clinical Procedures and Therapies

The rating scale(s) you will use are:

Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?
0 = Of not importance
1 = Of little importance
2 = Of moderate importance
3 = Important
4 = Very important

Frequency: How often do you perform this Skill or use this Knowledge as a nuclear medicine technologist? (Section 5A only)
0 = Never
1 = Annually
2 = Quarterly

3 = Monthly
4 = Weekly
5 = Daily

Domain 1. Radiation Physics and Detection

A. Understand the fundamentals of radiation physics and detection

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Physical properties	○	○	○	○	○
1a. Radioactive materials	○	○	○	○	○
1a. Radioactive materials: Isotopes and their properties (e.g., half-life, energy)	○	○	○	○	○
1a. Radioactive materials: Modes of decay	○	○	○	○	○
1a. Radioactive materials: Modes of decay: gamma emitters	○	○	○	○	○
1a. Radioactive materials: Modes of decay: beta emitters	○	○	○	○	○
1a. Radioactive materials: Modes of decay: Alpha emitters	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1a. Radioactive materials: Modes of decay: Positron emitters	○	○	○	○	○
1b. X-ray production	○	○	○	○	○
1b. X-ray production: Bremsstrahlung	○	○	○	○	○
1b. X-ray production: Characteristic x-ray	○	○	○	○	○
2. Decay calculations and Counting statistics	○	○	○	○	○
3. Interactions of radiation with matter	○	○	○	○	○
3a. Compton scatter	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3b. Photoelectric effect	○	○	○	○	○
4. Radiation detector types and basic principles	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
4a. NaI well	○	○	○	○	○
4b. Ion chamber	○	○	○	○	○
4c. Solid state detector	○	○	○	○	○
4d. GM meter	○	○	○	○	○

How well do the knowledge and skills in Domain 1 cover important aspects of Radiation Physics and Detection?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important knowledge and skills, if any, are not covered?

Domain 2. Radiation Safety and Regulations

A. Identify biological effects of radiation exposure

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Stochastic/ Deterministic (e.g., due to amount, radiation burns)	○	○	○	○	○
2. Non-stochastic/non-deterministic (e.g., cancer)	○	○	○	○	○
3. Exposure	○	○	○	○	○
3a. Patient (e.g., imaging, treatment, diagnostic)	○	○	○	○	○
3b. Technologist (e.g., imaging, treatment, diagnostic)	○	○	○	○	○
4. Short-term vs Long-term effects of radiation	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
5. Radiosensitivity (e.g., effects on the cell)	○	○	○	○	○

Domain 2. Radiation Safety and Regulations

B. Recognize protection techniques and calculations

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. ALARA	○	○	○	○	○
1a. Time	○	○	○	○	○
1b. Distance (inverse square law)	○	○	○	○	○
1c. Shielding (shielding equations)	○	○	○	○	○

Domain 2. Radiation Safety and Regulations

C. Perform survey protocols and requirements

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Radiation surveys (area monitoring) including:	○	○	○	○	○
1a. Survey meters and well counters	○	○	○	○	○
1b. Choice of radiation detection devices (e.g., Geiger Counters, sodium iodide detectors)	○	○	○	○	○
1c. Frequency of surveys	○	○	○	○	○
1d. Trigger limits of surveys	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2. Personal monitoring devices	○	○	○	○	○
2a. Types (e.g., ring badge vs collar badge)	○	○	○	○	○
2b. Dosimeter report	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2c. Declaration of pregnancy	○	○	○	○	○
3. Personal protective equipment (e.g., lab coat, gloves, syringe shields)	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
4. Effective dose equivalent limits for:	○	○	○	○	○
4a. Radiation workers	○	○	○	○	○
4b. Pregnant radiation workers	○	○	○	○	○
4c. General public	○	○	○	○	○

Domain 2. Radiation Safety and Regulations

D. Comply with Nuclear Regulatory Commission (NRC) Regulations

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Posted warnings and informational signs delineating restricted and unrestricted areas	○	○	○	○	○
2. Surveying and inventorying radioactive materials	○	○	○	○	○
3. Adverse event response	○	○	○	○	○
3a. Trigger levels and monitoring methods	○	○	○	○	○
3b. Radiation exposure	○	○	○	○	○
3c. Radiation spills (e.g., major vs minor)	○	○	○	○	○
3d. Protection during adverse events	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3e. Personnel, patient and/or public decontamination	○	○	○	○	○
3f. Area/equipment decontamination	○	○	○	○	○
3g. Recordable and reportable events	○	○	○	○	○
4. Adherence to radioactive waste storage requirements	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
5. Radioactive material disposal (e.g., liquids, solids, gasses, contaminated materials)	○	○	○	○	○
6. Record maintenance	○	○	○	○	○
6a. Receipt, storage, and disposal of radioactive materials	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
6b. Radiation monitoring and reporting	○	○	○	○	○
6c. Equipment calibration and maintenance	○	○	○	○	○
6d. Staff, patient, occupational and public exposure	○	○	○	○	○
6e. Nuclear medicine diagnostic and therapeutic procedures	○	○	○	○	○
6f. Leak test	○	○	○	○	○
7. Written directives	○	○	○	○	○
8. Shipping and Packaging Regulations	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
8a. Department of Transportation (DOT)	○	○	○	○	○
8b. Types of shielding containers	○	○	○	○	○
8c. Label requirements (e.g., transportation index, name, concentration, expiration date/time, total activity, assay date/time, limits)	○	○	○	○	○
8d. Types of packages (e.g., exempt, non-exempt)	○	○	○	○	○
8e. Package monitoring/receiving/returning	○	○	○	○	○

Domain 2. Radiation Safety and Regulations

E. Comply with Other Regulations and Guidelines

How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Environmental Protection Agency (EPA)	○	○	○	○	○
2. Occupational Safety and Health Administration (OSHA)	○	○	○	○	○
3. Health and Human Services (HHS)/Health Insurance Portability and Accountability Act (HIPAA)	○	○	○	○	○
3a. Protecting patient rights and privacy	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3b. Maintaining patient records	○	○	○	○	○
3c. Releasing information to authorized parties	○	○	○	○	○
4. Food and Drug Administration (FDA)	○	○	○	○	○
5. United States Pharmacopeia (USP)	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
5a. USP<797>	○	○	○	○	○
5b. USP<825>	○	○	○	○	○
6. Institutional and Departmental Accreditation Organizations	○	○	○	○	○

How well do the knowledge and skills in Domain 2 cover important aspects of Radiation Safety and Regulations?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important knowledge and skills, if any, are not covered?

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

A. Elute radionuclide generator, perform, and evaluate quality control tests

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Types of generators (e.g., 99Mo/99mTc, 82Sr/82Rb)	○	○	○	○	○
1a. Transient and secular	○	○	○	○	○
1b. Eluate	○	○	○	○	○
1c. Generator yield – volume and activity	○	○	○	○	○
1d. Quality control procedures	○	○	○	○	○
1d. Quality control procedures: Radionuclidic 99Mo/99mTc (e.g., 99Mo breakthrough)	○	○	○	○	○
1d. Quality control procedures: Chemical (e.g., Al+3 breakthrough)	○	○	○	○	○
2. Dose calibrator operation / units of radioactivity	○	○	○	○	○

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

B. Prepare radiopharmaceutical kits, perform quality control, and evaluate results

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Radiopharmaceutical kits	○	○	○	○	○
1a. Preparation techniques	○	○	○	○	○
1b. Activity and volume limitations	○	○	○	○	○
1c. Activity calculations	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1d. Particle size and number (e.g., MAA kit)	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2. Radiopharmaceutical quality control	○	○	○	○	○
2a. Visual inspection - color and clarity	○	○	○	○	○
2b. Radiochemical purity (e.g., ITLC)	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3. Labeling kits	○	○	○	○	○
4. Storage of kits before and after reconstitution	○	○	○	○	○
4a. Expiration	○	○	○	○	○

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

C. Understand the characteristics, indications, contraindications, and administration of diagnostic radiopharmaceuticals

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Tc-99m labeled radiopharmaceuticals	○	○	○	○	○
1a. Tc-99m sodium pertechnetate	○	○	○	○	○
1b. Tc-99m oxidronate/HDP	○	○	○	○	○
1c. Tc-99m medronate/MDP	○	○	○	○	○
1d. Tc-99m pentetate/DTPA	○	○	○	○	○
1e. Tc-99m macroaggregated albumin/MAA	○	○	○	○	○
1f. Tc-99m sulfur colloid (e.g., filtered, unfiltered)	○	○	○	○	○
1g. Tc-99m mebrofenin (Choletec®)	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1h. Tc-99m mertiatide/MAG3	○	○	○	○	○
1i. Tc-99m pyrophosphate/PYP	○	○	○	○	○

How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1j. Tc-99m sestamibi/MIBI (Cardiolite®)	○	○	○	○	○
1k. Tc-99m tetrofosmin (Myoview®)	○	○	○	○	○
1l. Tc-99m succimer/DMSA (Nephroscan®)	○	○	○	○	○
1m. Tc-99m exametazime/HMPAO (Ceretec®)	○	○	○	○	○
1n. Tc-99m bicisate/ECD (Neurolite®)	○	○	○	○	○
1o. Tc-99m labeled RBCs (UltraTag®)	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1p. Tc-99m HMPAO tagged WBCs	○	○	○	○	○
1q. Tc-99m tilmanocept (Lymphoseek®)	○	○	○	○	○
2. Iodine labeled radiopharmaceuticals	○	○	○	○	○
2a. I-123 sodium iodide	○	○	○	○	○
2b. I-131 sodium iodide	○	○	○	○	○
2c. I-123 Iobenguane (MIBG) (AdreView®)	○	○	○	○	○
2d. I-131 Iobenguane (MIBG) (Azedra®)	○	○	○	○	○
2e. I-123 Ioflupane (DaTscan®)	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2f. I-131 Human Serum Albumin (HSA) (Megatope®)	○	○	○	○	○
2g. I-125 Human Serum Albumin (HSA) (Jeanatope®)	○	○	○	○	○
3. Indium labeled radiopharmaceuticals	○	○	○	○	○
3a. In-111 chloride	○	○	○	○	○
3b. In-111 oxine labeled WBCs	○	○	○	○	○
3c. In-111 pentetate (DTPA®)	○	○	○	○	○
3d. In-111 pentetreotide (Octreoscan®)	○	○	○	○	○
4. Miscellaneous diagnostic radiopharmaceuticals	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
4a. C-14 urea	○	○	○	○	○
4b. Ga-67 gallium citrate	○	○	○	○	○
4c. Tl-201 thallous chloride	○	○	○	○	○
4d. Xe-133 gas	○	○	○	○	○
5. Positron Emission Tomography	○	○	○	○	○
5a. C-11 Choline	○	○	○	○	○
5b. Cu-64 Dotatate (Detectnet®)	○	○	○	○	○
5c. F-18 FDG	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
5d. F-18 Florbetaben (Neuraceq®)	○	○	○	○	○
5e. F-18 Florbetapir (Amyvid®)	○	○	○	○	○
5f. F-18 Flutemetamol (Vizamyl®)	○	○	○	○	○
5g. F-18 Sodium Fluoride (NaF)	○	○	○	○	○
5h. F-18 Fluciclovine (Axumin®)	○	○	○	○	○
5i. F-18 Flortaucipir (Tauvid®)	○	○	○	○	○
5j. F-18 Piflufolastat (Pylarify®)	○	○	○	○	○
5k. F-18 Fluorodopa	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
5l. F-18 Fluoroestradiol (Cerianna®)	○	○	○	○	○
5m. Ga-68 Dotatate (Netspot®)	○	○	○	○	○
5n. Ga-68 Dotatoc	○	○	○	○	○
5o. Ga-68 Gozetotide (Illuccix®, Locametz®)	○	○	○	○	○
5p. N-13 ammonia	○	○	○	○	○
5q. Rb-82 chloride (Rubyfill®, Cardiogen®)	○	○	○	○	○

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

D. Understand the characteristics, indications, contraindications, and administration of therapeutic radiopharmaceuticals

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. I-131 Iobenguane (mIBG®, Azedra®)	○	○	○	○	○
2. I-125 Seeds	○	○	○	○	○
3. I-131 sodium iodide	○	○	○	○	○
4. Lu-177 Lutetium dotatate (Lutathera®)	○	○	○	○	○
5. Lu-177 Vipivotide tetraxetan (Pluvicto®)	○	○	○	○	○
6. Ra-223 Radium dichloride (Xofigo®)	○	○	○	○	○
7. Sr-89 chloride (Metastron®)	○	○	○	○	○
8. Y-90 ibritumomab tiuxetan (Zevalin®)	○	○	○	○	○
9. Y-90 microspheres (SIR-Spheres®, TheraSphere®)	○	○	○	○	○

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

E. Understand the indications, contraindications, and administration of interventional and adjunct pharmaceutical agents used in conjunction with nuclear medicine procedures

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. dipyridamole (Persantine®)	○	○	○	○	○
2. adenosine	○	○	○	○	○
3. dobutamine	○	○	○	○	○
4. aminophylline	○	○	○	○	○
5. regadenoson (Lexiscan®)	○	○	○	○	○
6. captopril	○	○	○	○	○
7. enaloprilat	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
8. furosemide (Lasix®)	○	○	○	○	○
9. insulin	○	○	○	○	○
10. acetazolamide (Diamox®)	○	○	○	○	○
11. cholecystokinin/ sincalide/CCK	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
12. morphine	○	○	○	○	○
13. cimetidine/famotidine	○	○	○	○	○
14. ACD solution	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
15. heparin	○	○	○	○	○
16. contrast media (oral and IV)	○	○	○	○	○
17. Lugol's solution/SSKI	○	○	○	○	○
18. Thyroid Stimulating Hormone (TSH)	○	○	○	○	○
19. Lidocaine	○	○	○	○	○
20. Lidocaine (EMLA) cream	○	○	○	○	○
21. atropine	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
22. recombinant human TSH (Thyrogen®)	○	○	○	○	○
23. amino acids (e.g., lys-arg)	○	○	○	○	○
24. zofran/emend	○	○	○	○	○
25. beta blockers (e.g., Metoprolol®)	○	○	○	○	○
26. Boost®/Ensure®	○	○	○	○	○

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

F. Label blood components with radiopharmaceutical according to protocol

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Labeling procedures	○	○	○	○	○
1a. Required lab equipment and supplies	○	○	○	○	○
1b. Anticoagulants and other additives	○	○	○	○	○
1c. Chemical reactions	○	○	○	○	○
1d. Cell washing	○	○	○	○	○
1e. Required radiopharmaceuticals	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1f. Method (e.g., invivo, invitro)	○	○	○	○	○
2. Calculation of labeling efficiency and administered dosage	○	○	○	○	○
3. Reinjection patient and sample verification	○	○	○	○	○

Domain 3. Pharmaceutical and Radiopharmaceutical Agents

G. Administer radiopharmaceuticals and non-radioactive agents

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Administration routes (e.g., IV, oral, intrathecal)	○	○	○	○	○
2. Administration techniques (e.g., bolus, infusion, aseptic)	○	○	○	○	○

How well do the knowledge and skills in Domain 3 cover important aspects of Pharmaceutical and Radiopharmaceutical Agents?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important knowledge and skills, if any, are not covered?

Domain 4. Instrument Operations and Quality Control

A. Operate Non-imaging equipment and components

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Quality control and calibration for well counters and probes	○	○	○	○	○
1a. Quality control and calibration for the sodium iodide scintillation detector	○	○	○	○	○
1b. gamma ray spectra and pulse height analysis	○	○	○	○	○
1c. Formulas (e.g., energy resolution, sensitivity, Chi-square statistics)	○	○	○	○	○
2. Operational status of survey meter	○	○	○	○	○
2a. Survey meter operations and components	○	○	○	○	○
2b. Survey meter quality control and calibration	○	○	○	○	○
3. Dose calibrator constancy, accuracy, linearity, and geometry tests	○	○	○	○	○

Domain 4. Instrument Operations and Quality Control

B. Operate Imaging equipment and components

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Gamma Camera quality control	○	○	○	○	○
1a. Uniformity	○	○	○	○	○
1b. Spatial resolution and linearity	○	○	○	○	○
1c. Visual image quality	○	○	○	○	○
1d. Phantoms	○	○	○	○	○
1e. Artifacts	○	○	○	○	○
1f. System sensitivity	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1g. Pulse height analysis	○	○	○	○	○
2. SPECT and SPECT/CT imaging system	○	○	○	○	○
2a. Attenuation correction	○	○	○	○	○

How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2b. SPECT camera quality control					
2b. SPECT camera quality control: Center of rotation					
2b. SPECT camera quality control: Field uniformity requirements					
2b. SPECT camera quality control: Pixel calibration					
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2b. SPECT camera quality control: 3-D uniformity and resolution (e.g., Jaczak phantom)					
2b. SPECT camera quality control: Artifacts					
3. PET and PET/CT imaging systems					
3a. Application of attenuation corrections					
3b. PET quality control (e.g., daily blank scan, normalization scan, 2-D/3- D well counter, artifacts)					
4. CT imaging systems					
4a. Co-registration of images					
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
4b. CT quality control (e.g., contrast and spatial resolution, noise, uniformity, artifacts)					
4c. Safety alerts (e.g., pre-scan notification)					
5. Computer equipment (e.g., monitors, matrix sizes, printers)					
6. Networking and information systems (e.g., PACS and RIS)					
7. PET MR					

Domain 4. Instrument Operations and Quality Control

C. Operate Auxiliary equipment

How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Laboratory equipment (e.g., pipette, fume hoods)	○	○	○	○	○
2. Patient care equipment	○	○	○	○	○
2a. Intravenous infusion pump	○	○	○	○	○
2b. ECG monitor	○	○	○	○	○
2c. Pulse oximeter	○	○	○	○	○
2d. Defibrillator	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
2e. Glucose meter	○	○	○	○	○
2f. Blood pressure equipment	○	○	○	○	○
2g. Oxygen delivery equipment	○	○	○	○	○
2h. Patient lifts	○	○	○	○	○
2i. Lateral transfer equipment	○	○	○	○	○
3. Non-imaging equipment	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3a. Xenon delivery system and trap	○	○	○	○	○
3b. Aerosol delivery system	○	○	○	○	○
3c. Treadmill	○	○	○	○	○
3d. Liquid scintillation counter	○	○	○	○	○
3e. Rb delivery system (CardioGen®)	○	○	○	○	○

How well do the knowledge and skills in Domain 4 cover important aspects of Instrument Operations and Quality Control?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important knowledge and skills, if any, are not covered?

Domain 5. Clinical Procedures and Therapies

A. Perform nuclear medicine procedures

	Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?					Frequency: How use this kno	
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
1. Pulmonary	○	○	○	○	○	○	○
1a. Radioaerosol ventilation	○	○	○	○	○	○	○
1b. Gas ventilation	○	○	○	○	○	○	○
1c. Perfusion	○	○	○	○	○	○	○
1c. Perfusion: SPECT	○	○	○	○	○	○	○
1c. Perfusion: SPECT/CT	○	○	○	○	○	○	○
1d. Perfusion/Ventilation quantitation	○	○	○	○	○	○	○
2. Bone/Musculoskeletal scans	○	○	○	○	○	○	○
2a. Limited	○	○	○	○	○	○	○
2b. Whole-body	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
2c. 3-phase	○	○	○	○	○	○	○
2d. 4-phase	○	○	○	○	○	○	○
2e. SPECT	○	○	○	○	○	○	○
2f. SPECT/CT	○	○	○	○	○	○	○
2g. NaF PET	○	○	○	○	○	○	○
3. Oncology	○	○	○	○	○	○	○
3a. Ga-67 tumor imaging, planar and/or SPECT	○	○	○	○	○	○	○
3b. SPECT/CT	○	○	○	○	○	○	○
3c. Monoclonal antibody imaging	○	○	○	○	○	○	○
3d. Peptide imaging	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
3e. Molecular breast imaging	○	○	○	○	○	○	○
3f. Lymphoscintigraphy/sentinel lymph node localization	○	○	○	○	○	○	○
3g. Tumor imaging, PET	○	○	○	○	○	○	○
3g. Tumor imaging, PET: Melanoma (e.g., whole body)	○	○	○	○	○	○	○

	Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?					Frequency: How use this kno	
3g. Tumor imaging, PET: PSMA							
3g. Tumor imaging, PET: Neuroendocrine							
3g. Tumor imaging, PET: Neurology	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
3g. Tumor imaging, PET: General (e.g., skull-base to mid-thigh)							
3h. Neuroendocrine tumor imaging							
4. Infection							
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
4a. Ga-67 infection imaging							
4b. Tagged WBC imaging							
5. Renal/Genitourinary							
5a. Cystogram, direct							
5b. Effective renal plasma flow (ERPF)							
5c. Glomerular filtration rate (GFR) imaging							
5d. Glomerular filtration rate (GFR) non-imaging							
5e. Renal anatomy, planar, SPECT (e.g., DMSA)							
5f. Renal flow							
5g. Renogram (Lasix®)							
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
5h. Renogram with ACE inhibitors							
6. Endocrine							
6a. Adrenal imaging							
6b. Parathyroid imaging, planar and SPECT							
6c. SPECT/CT							
6d. Thyroid imaging							
6e. Thyroid uptake							
6f. Whole body survey for thyroid metastases							
7. Hematopoietic							
7a. Bone marrow imaging							
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
7b. Platelet survival study							
7c. Blood volume analysis							
8. Cardiovascular							
8a. Myocardial perfusion, planar							
8b. Myocardial perfusion (gated and non-gated)							

	Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?					Frequency: How use this kno	
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
8b. Myocardial perfusion: SPECT (e.g., supine, prone)	○	○	○	○	○	○	○
8b. Myocardial perfusion: SPECT/CT	○	○	○	○	○	○	○
8b. Myocardial perfusion: CT attenuation	○	○	○	○	○	○	○
8b. Myocardial perfusion: PET	○	○	○	○	○	○	○
8c. Cardiac sarcoidosis	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
8c. Cardiac sarcoidosis: Ga-67	○	○	○	○	○	○	○
8c. Cardiac sarcoidosis: PET	○	○	○	○	○	○	○
8d. First pass for EF and wall motion	○	○	○	○	○	○	○
8e. Gated cardiac blood pool, rest	○	○	○	○	○	○	○
8f. Gated cardiac blood pool, stress	○	○	○	○	○	○	○
8g. Gated cardiac blood pool, SPECT	○	○	○	○	○	○	○
8h. Cardiac shunt	○	○	○	○	○	○	○
8i. Cardiac Amyloidosis (PYP)	○	○	○	○	○	○	○
8j. MIBG	○	○	○	○	○	○	○
8k. Myocardial viability	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
8k. Myocardial viability: Thallium	○	○	○	○	○	○	○
8k. Myocardial viability: FDG'	○	○	○	○	○	○	○
8l. Upper venograms (99mTc-DTPA)	○	○	○	○	○	○	○
8m. Lower venograms (99mTc-MAA)	○	○	○	○	○	○	○
9. Gastrointestinal	○	○	○	○	○	○	○
9a. Gastric emptying (liquid/solid)	○	○	○	○	○	○	○
9b. Gastroesophageal reflux	○	○	○	○	○	○	○
9c. Gastrointestinal bleeding	○	○	○	○	○	○	○
9d. Hemangioma	○	○	○	○	○	○	○
9e. Hepatobiliary with and without GBEF	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually

	Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?					Frequency: How use this kno	
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
9f. Peritoneal venous shunt patency	○	○	○	○	○	○	○
9g. Liver-lung shunt mapping (arterial)	○	○	○	○	○	○	○
9h. Liver-spleen imaging, planar and SPECT	○	○	○	○	○	○	○
9i. SPECT/CT	○	○	○	○	○	○	○
9j. Meckel's diverticulum	○	○	○	○	○	○	○
9k. Denatured RBC	○	○	○	○	○	○	○
9l. Colonic transit	○	○	○	○	○	○	○
9m. Salivary gland	○	○	○	○	○	○	○
9n. Salivagram	○	○	○	○	○	○	○
10. Central Nervous System	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
10a. Brain flow, brain death	○	○	○	○	○	○	○
10b. Brain imaging, planar and SPECT	○	○	○	○	○	○	○
10b. Brain imaging, planar and SPECT: Brain perfusion SPECT (Acetazolamide)	○	○	○	○	○	○	○
10b. Brain imaging, planar and SPECT: Viability SPECT	○	○	○	○	○	○	○
10b. Brain imaging, planar and SPECT: Tumor SPECT	○	○	○	○	○	○	○
10c. SPECT/CT	○	○	○	○	○	○	○
10d. Dopamine transporter DaTscan®	○	○	○	○	○	○	○
10e. Cisternogram	○	○	○	○	○	○	○
10f. CSF leak	○	○	○	○	○	○	○
10g. CSF shunt patency	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
10h. Amyloid	○	○	○	○	○	○	○
10i. Ictal and interictal	○	○	○	○	○	○	○
10i. Ictal and interictal: SPECT/planar	○	○	○	○	○	○	○
10i. Ictal and interictal: PET	○	○	○	○	○	○	○
10j. Lacrimal duct imaging	○	○	○	○	○	○	○
11. Radionuclide Therapy	○	○	○	○	○	○	○
11a. I-131 iobenguane (Mibg®, Azedra®)	○	○	○	○	○	○	○
11b. I-131 sodium iodide for ablation	○	○	○	○	○	○	○
11c. I-131 sodium iodide for hyperthyroid	○	○	○	○	○	○	○

	Importance: How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?					Frequency: How use this kno	
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
11d. Lu-177 Dotatate (Lutathera®)	○	○	○	○	○	○	○
11e. Lu-177 PSMA (Pluvicto®)	○	○	○	○	○	○	○
11f. Ra-223 Dichloride (Xofigo®)	○	○	○	○	○	○	○
11g. Sr-89 Cholride (Metastron®)	○	○	○	○	○	○	○
11h. Y-90 Ibritumomab tiuxetan (Zevalin®)	○	○	○	○	○	○	○
11i. Brachytherapy	○	○	○	○	○	○	○
11i. Brachytherapy: Y-90 labeled microspheres	○	○	○	○	○	○	○
11i. Brachytherapy: I-125 Seeds	○	○	○	○	○	○	○
12. CT Imaging Procedures	○	○	○	○	○	○	○
12a. Attenuation correction	○	○	○	○	○	○	○
12b. Anatomical localization	○	○	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very important	0 = Never	1 = Annually
12c. Diagnostic vs non-diagnostic	○	○	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

B. Schedule patient studies

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Camera duration	○	○	○	○	○
2. Multiple radionuclide procedures for a single patient	○	○	○	○	○
3. Same-day multiple modality procedures for a single patient	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

C. Procure supply of radiopharmaceuticals

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. License parameters and limits (i.e., Institutional)	○	○	○	○	○
2. Reconciliation of schedule with radiopharmaceutical/adjunct pharmaceutical procurement	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

D. Educate patient, family, and personnel

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. procedures	○	○	○	○	○
2. precautions	○	○	○	○	○
3. Restrictions	○	○	○	○	○
4. Release criteria (e.g., inpatient, travel, therapy)	○	○	○	○	○
5. Consent (e.g., written and verbal)	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

E. Obtain patient information and provide patient care

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Patient information and privacy (e.g., Healthcare Insurance Portability and Accountability Act (HIPAA))	○	○	○	○	○
2. Basic patient care (e.g., vital signs, basic first aid, infection control)	○	○	○	○	○
3. Patient transferring techniques	○	○	○	○	○
4. Patient support devices (e.g., Foley catheter and drainage bag)	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
5. Patient identification (e.g., armband, verbal, scan)	○	○	○	○	○
6. Orders for study	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
7. Pre-examination screening	○	○	○	○	○
7a. Patient preparations and contraindications	○	○	○	○	○
7b. Medical history	○	○	○	○	○
7c. Current medications	○	○	○	○	○
7d. Allergic and adverse reaction history	○	○	○	○	○
7e. Review relevant lab values	○	○	○	○	○

	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
8. Informed consent	○	○	○	○	○
9. Disposal of supplies and biohazardous material	○	○	○	○	○
10. Emergency procedures (e.g., fainting, seizure, cardiopulmonary arrest)	○	○	○	○	○
11. Post-procedure assessment	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

F. Select and administer prescribed radiopharmaceuticals

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Patient/ radiopharmaceutical reconciliation	○	○	○	○	○
2. Calculation of appropriate volume to deliver prescribed dosage when needed	○	○	○	○	○

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3. Radiopharmaceutical administration using appropriate route and technique	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

G. Prepare equipment and perform examinations

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Patient positioning (e.g., anatomical markers, immobilization techniques)	○	○	○	○	○
2. Imaging parameters for data acquisition	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

H. Evaluate image quality

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Normal and abnormal scan patterns	○	○	○	○	○
2. Artifacts and causes	○	○	○	○	○
3. Co-registration of images (SPECT/CT and PET/CT)	○	○	○	○	○
4. Study repetition and additional views	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

I. Perform image processing

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Data storage, transfer, and retrieval	○	○	○	○	○
2. Image formation (e.g., static, dynamic, gating, list mode)	○	○	○	○	○
3. Image reconstruction (e.g., SPECT, PET/CT)	○	○	○	○	○
4. Image enhancement (e.g., filters, matrix, intensity)	○	○	○	○	○
5. Quantitative analysis	○	○	○	○	○
5a. Regions of interest and quantification	○	○	○	○	○
5b. Curve generation and analysis	○	○	○	○	○
5c. Image normalization and subtraction	○	○	○	○	○
6. Display formatting (image size, number of images, intensity adjustments)	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

J. Prepare/perform stress testing

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Basic electrocardiography (ECG) (e.g., cardiac monitoring)	○	○	○	○	○
1a. Cardiac conduction system	○	○	○	○	○
1b. Components of a normal ECG wave form	○	○	○	○	○
1c. Recognizing and responding to changes on a resting or stress ECG	○	○	○	○	○
2. ECG lead placements	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
3. Treadmill stress techniques (e.g., Bruce and modified Bruce) and bicycle stress techniques	○	○	○	○	○
3a. Contraindications	○	○	○	○	○
3b. Duration/termination parameters	○	○	○	○	○
4. Pharmacological stress protocols	○	○	○	○	○
4a. Contraindications	○	○	○	○	○
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
4b. Timing of pharmacological stress agent	○	○	○	○	○
4c. Timing of radiopharmaceutical injection	○	○	○	○	○
4d. Duration/termination parameters	○	○	○	○	○
4e. Drug side-effects and appropriate treatment	○	○	○	○	○
4f. Reversal agents and techniques	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

K. Obtain samples and/or data for non-imaging studies

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Data specimen collection techniques, including timing, methods, containers, and storage	○	○	○	○	○
2. Background correction	○	○	○	○	○
3. External counting techniques	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

L. Evaluate the results of non-imaging studies

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Error analysis	○	○	○	○	○
2. Calculations	○	○	○	○	○

Domain 5. Clinical Procedures and Therapies

M. Administer radiopharmaceutical therapies

	How important is this Knowledge or Skill in relation to competent performance as an entry-level CNMT?				
	0 = Of no importance	1 = Of little importance	2 = Of moderate importance	3 = Important	4 = Very Important
1. Isolation room requirements	○	○	○	○	○
2. Surveys	○	○	○	○	○
3. Inpatient vs outpatient	○	○	○	○	○
4. Storage and waste disposal	○	○	○	○	○
5. Documentation and record keeping	○	○	○	○	○
6. Post-therapy scanning	○	○	○	○	○
7. Dosimetry	○	○	○	○	○

How well do the knowledge and skills in Domain 5 cover important aspects of Clinical Procedures and Therapies?

- ○ 0 = Very Poorly
- ○ 1 = Poorly
- ○ 2 = Adequately
- ○ 3 = Well
- ○ 4 = Very Well

What important knowledge and skills, if any, are not covered?

Section 4: Domain Weighting

SECTION 4: RECOMMENDATION FOR TEST CONTENT

Listed below are the 5 domains that are covered on the CNMT exam.

What percentage of the test content should be assigned to each domain?

Please use only whole numbers (such as: 12, 20, 35, 47). If you think an area should not be represented, type 0 in the space provided.

The total of all domains must equal 100%.

Domain 1. Radiation Physics and Detection	0 %
Domain 2. Radiation Safety and Regulations	0 %
Domain 3. Pharmaceutical and Radiopharmaceutical Agents	0 %
Domain 4. Instrument Operations and Quality Control	0 %
Domain 5. Clinical Procedures and Therapies	0 %
Total	0 %

Section 5: Additional Feedback

SECTION 5: Additional Feedback

The following questions relate to the eligibility requirements for the CNMT exam. Feedback is optional.

1. Do you think that your nuclear medicine technology education program adequately prepared you for the full breadth of practice in nuclear medicine technology?

- ○ Yes
- ○ No
- ○ I Did Not Attend a Formal NMT Training Program

2. Do you believe the NMTCB's nuclear medicine technology certification exam (CNMT) assessed your knowledge and skills adequately?

- ○ Yes
- ○ No
- ○ N/A, I Did Not Sit for the NMTCB's CNMT Exam

Comments:

3. If you took the ARRT's nuclear medicine technology examination, do you feel that the RT (N) certification exam assessed your knowledge and skills adequately?

- ○ Yes
- ○ No
- ○ N/A, I Did Not Sit for ARRT's RT(N) Exam

Comments:

4a. Was your NMT education program accredited?

- ○ Yes, my Program was Accredited
- ○ No, it was Not Accredited
- ○ I Do Not Know if it was Accredited
- ○ I Did Not Attend a Formal NMT Program

4b. What type of accreditation did your program have?

- ○ ANZSNM
- ○ Armed Forces Military Training Command
- ○ CAMRT
- ○ JRCNMT
- ○ Regionally Accredited Only
- ○ Do Not Know

5. The current CNMT exam eligibility requirements require an applicant to complete an accredited nuclear medicine technology program recognized by NMTCB. Are NMTCB's exam eligibility requirements appropriate?

- ◯ Appropriate / Adequate for Entry Level
- ◯ Too Stringent / Too Hard
- ◯ Insufficient / Not Enough

Comments:

6. If a nuclear medicine technologist is trained internationally, should they be allowed to take the NMTCB entry level CNMT certification exam?

- ◯ Yes
- ◯ No

Comments:

7. Employers prefer a technologist who holds:

- ◯ CNMT
- ◯ RT (N)
- ◯ Employers have No Preference

8. Compared to when you entered the field, NMT program graduates today are:

- ◯ Better Prepared
- ◯ Same Level of Preparation
- ◯ Less Prepared
- ◯ Do Not Know

Comments:

The following questions are open-ended and contain a text box for you to enter your comments. Comments are optional.

1. What additional professional development and/or continuing education could you use to improve your performance in your current work role?

2. How do you expect your work role to change over the next 5 years? What tasks will be performed and what knowledge will be needed to meet changing practice demands?

Block 7

Thank you for taking part in this survey!