Practice Analysis and Content Specifications

For Nuclear Medicine Technology

Final Report

For New Documents Implemented January 2017

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CHAPTER 1

PROJECT BACKGROUND AND INTRODUCTION

The ARRT establishes the job relatedness of an examination via a practice analysis (also called a job analysis). Practice analyses document the role to be credentialed and the topics to be covered by the examination used in the credentialing decision as well as the degree of emphasis that each topic receives. The rationale for practice analyses is outlined in *The Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, National Council on Measurement in Education, 2014) and in the National Commission for Certifying Agencies (NCCA) *Standards for the Accreditation of Certification Programs* (NCCA, 2014). Legislative activity and legal precedence also stress the importance of practice analysis in the development and validation of certification exams. The ARRT conducts a practice analysis for each discipline every five years. Such updates are important for professions that continually evolve, due to advances in technology, because they help assure that the content specifications and other certification requirements reflect current practice.

This report describes the practice analysis for Nuclear Medicine Technology conducted between the dates of November 2014 and January 2016. The purpose of the overall project was to identify tasks currently required of the typical nuclear medicine technologist and determine the knowledge and cognitive skills required to effectively perform those tasks.

Projects such as this require a coordination of numerous activities. During the project a number of committee meetings were held, a survey was developed and administered, the survey data was analyzed, and decisions were made regarding revisions to the exam content and eligibility requirements. The project was completed when the ARRT Board of Trustees approved the changes to the exam content and eligibility requirements in July 2016. The first exam under the new content and eligibility requirements was administered in January 2017.

CHAPTER 2

TASK INVENTORY SURVEY

Development of Task Inventory Survey

The task inventory survey was developed between September 2014 and January 2015 by the Practice Analysis Committee with facilitation from ARRT staff. The Practice Analysis Committee held its first meeting November 2014. Part of the meeting was devoted to the development of a task inventory survey. The survey consisted of tasks thought to define Nuclear Medicine Technology. A brief description of the survey is provided below.

Format of Survey

The existing Task List in 2014 consisted of 119 tasks. The committee began developing a survey by starting with that list and then added tasks that they thought may be emerging in the field; they also added some tasks to clarify or add detail to existing tasks. The final task analysis survey consisted of 118 tasks, with an additional 23 tasks listed on an *Omitted Task List*. The omitted list consisted of tasks that the committee was certain that nearly 100% of the survey population was performing on a regular basis, and for which there would be no benefit in collecting data. These tasks will be included on the final task list but will not be on the survey. For each task, the survey asked: *If you are personally responsible for performing this task, how often do you perform it?* The possible responses were: NR – not responsible; Y – yearly; Q – quarterly; M – monthly; W – weekly; and, D – daily.

Another part of the survey consisted of 68 questions concerning pharmaceuticals and radiopharmaceuticals, and the final section of the survey included 10 questions about equipment, work environment, and demographics.

Survey Sample

The original sample was drawn from registered technologists in the ARRT database. The focus of the survey was on the job duties of staff nuclear medicine technologists at entry level. For the purpose of primary exam practice analysis, the ARRT defines an entry-level technologist as a staff technologist with one to three years of experience. With a goal of sending this survey to 1,000 entry-level nuclear medicine technologists, we began by looking at the population of nuclear medicine technologists working full-time, with a job title of staff technologist, and with one to three years of experience. Because there were not enough in this group to fill out the survey sample, it was decided for this survey to select 60% of the sample from the group with one to five years of experience, and to select the remaining 40% from the groups with less than one year of experience and the group with six to ten years of experience.

Once the sample was determined, the task inventory survey was mailed in January 2015. The initial mailing was followed up by a reminder postcard approximately three weeks after the initial mailing. A total of 252 surveys were returned. The returned surveys were first screened to exclude those that it was thought did not seriously fill out the survey (e.g., partial surveys, same response to all questions), and the remainder were then

filtered to only include staff technologists working in NMT more than 32 hours per week - this reduced the sample to 238. Finally, the sample was filtered to only include those with 1 to 5 years of experience, and this group totaled 82; this was our target group. We often base decisions primarily on the responses of the target group, but because of the small size of the target group for this survey we will use the data from the total group, along with the target group responses in making any decisions.

Data Analysis

The primary variable of interest was the percent that were responsible for performing a task. We also analyzed the frequency responses for tasks, noting the added importance of tasks that are performed more frequently than those infrequently performed.

Normally, a task must be performed by at least ***40% of the target group*** for it to be included on the task list. The 40% criterion is used because it is consistent with ARRT's goal of assessing tasks typically performed in practice. However, exceptions can be allowed for tasks that are performed by a smaller portion of the target group if the task is deemed highly critical, or if it is thought to be an emerging task that experts agree will soon be performed by greater than 40%.

When tasks are near the 40% threshold it is common to incorporate additional data into the discussion. The demographic variables allowed us to break responses down by work environment and years of experience, and that data was employed when appropriate.

CHAPTER 3

CONTENT SPECIFICATIONS AND CLINICAL REQUIREMENTS

Revision of the Task Inventory

The Practice Analysis Committee met in June 2015 to review the practice analysis survey data and determine whether any tasks should be dropped from, added to, or changed in the final task inventory. The content of the NMT Task List is a direct result of the responses to the Practice Analysis Survey. The normal criterion used by the ARRT is that at least 40% of the target group must be responsible for performing a task for it to appear on the final task list. If a task falls below this threshold, a compelling argument must be made for it to be included. Most of the decisions of whether or not to include a survey task on the final list were relatively easy, because most tasks were either clearly above or clearly below the cut-off percentage. Decisions made by the Advisory Committee follow.

The following new tasks represent content that is currently on the content specifications, but were added to better describe the tasks associated with those content areas:

- *Maintain confidentiality of patient information.* Rationale: The committee believes that almost all nuclear medicine technologists perform this task so this task was added but not surveyed.
- *Use sterile or aseptic techniques.* (96.3%) Rationale: The percentage of respondents indicating they are responsible for the task is above the 40% threshold.
- *Take appropriate measures to minimize radiation exposure to patient (i.e., Image Wisely®, Image Gently®).* (97.5%) Rationale: The percentage of respondents indicating they are responsible for the task is above the 40% threshold.
- *Perform CT scanner quality control.* (49.4%) Rationale: *PET or PET/CT scanner quality control* was previously one task and it was decided to separate PET and CT scanner quality control. The percentage of respondents indicating they are responsible for the task is above the 40% threshold.
- *Prepare radioactive aerosol systems in accordance with regulations*. (45.0%) Rationale: The percentage of respondents indicating they are responsible for the task is above the 40% threshold.

The following tasks surveyed at less than 40% but were kept on the task inventory.

- *Prepare radioactive gas delivery systems in accordance with regulations.* (37.8%) Although 37.8% of respondents indicated they are responsible for this task, 47.5% perform ventilation-gas procedures and 40% use Xe-133 gas. Since these tasks are all linked together and the response was close to 40%, it was decided to leave this task on the task inventory.
- *Perform geometry test on a dose calibrator*. (29.1%) Rationale: The committee believes this surveyed low because it is only done occasionally, but it is a critical QC test to know how to perform when necessary.

The four tasks that follow were already on the task list as being performed with SPECT. Additional tasks were added to the survey to determine how many performed the task with SPECT/CT. It was decided in all cases to not add separate tasks with SPECT/CT to the task list, but to modify the existing task so it included being done with SPECT or SPECT/CT.

Set-up equipment and position patient to obtain the following diagnostic procedures:

- *Brain: SPECT or SPECT/CT* 47.6% of respondents perform brain SPECT and 28.4% perform SPECT/CT. The committee believes the use of SPECT/CT will increase as more SPECT/CT scanners are installed.
- *Renal SPECT or SPECT/CT* 24.7% of respondents perform SPECT and 18.3% perform SPECT/CT. The committee believes that this will increase in the near future because DMSA is more available.
- *Liver/Spleen SPECT or SPECT/CT* 60.8% of respondents perform liver/spleen SPECT and 25.3% perform SPECT/CT. The committee believes the use of SPECT/CT will increase as more SPECT/CT scanners are installed.
- *Tumor SPECT or SPECT/CT* 56.8% of respondents perform tumor SPECT and 36.7% perform SPECT/CT. The committee believes the use of SPECT/CT will increase as more SPECT/CT scanners are installed.

The following two tasks were on the existing task survey, but they were broken apart for the current survey to assess the importance of each. It was decided that the tasks still warranted being on the task list, but they should remain as one combined task.

Set-up equipment and position patient to obtain the following diagnostic procedures:

- *Brain: PET or PET/CT* 25.6% of respondents perform brain PET and 29.6% perform PET/CT. The committee believes that this will increase in the near future.
- *Cardiac PET or PET/CT* 17.5% of respondents perform cardiac PET and 22.8% perform cardiac PET/CT. The committee believes that this will increase in the near future.

The following two tasks did not meet the 40% criterion but were deemed to involve extremely critical knowledge for patient safety, and so they remained on the task list.

Administer or assist with the administration of the following therapeutic procedures:

- *Palliation of Bone Pain* (25.9%) A new radiopharmaceutical, *Xofigo*®, is being used. The committee believes this task will become more commonly performed with this availability of this radiopharmaceutical, and it is critical for entry level nuclear medicine technologists to understand the use of the radiopharmaceutical and how this task is performed.
- *Non-Hodgkin Lymphoma* (11.1%) The committee believes it is critical for entry level nuclear medicine technologist to understand how this task is performed. The responses to this task are significantly below

the normal inclusion criteria, but the committee felt strongly that the task should be included. The current NMT Exam Committee was also asked for an opinion on this task, and they were in agreement with the PA committee, that this task should be included despite the low survey numbers.

The following tasks represent new content added to the task inventory:

- *Check pertinent lab values (e.g., TSH, bilirubin, ß-HCG, creatinine) before imaging*. (89.9%) Rationale: The percentage of respondents indicating they are responsible for the task is above the 40% threshold.

Set-up equipment and position patient to obtain the following diagnostic procedures:

- *Bone SPECT or SPECT/CT* (83.8% of respondents perform SPECT and 43.9% perform SPECT/CT) Rationale: Bone SPECT/CT was added because the percentage of respondents indicating they are responsible is above the 40% threshold.
- *Bone PET or PET/CT* (31.6%) Rationale: This task was not on the survey, but was added because of the response to *F-18 sodium fluoride* in the radiopharmaceutical section. The percentage of respondents indicating that they use this radiopharmaceutical has risen from 24% in 2009 to 31.6% in this survey. The committee believes this number will continue to increase as reimbursement becomes easier.
- *Damaged RBC Spleen* (53.1%) Rationale: The percentage of respondents indicating they are responsible for the task is above the 40% threshold.
- *Parathyroid SPECT or SPECT/CT* (45.7%) Rationale: The percentage of respondents indicating they are responsible for the task is above the 40% threshold.
- *Radionuclide Cystogram* (36.3%) Rationale: The percentage of respondents indicating they are responsible for this task has been rising for the last 6 years. 25% performed it in 2009 and 31% performed it in 2012. The committee believes that this number will continue to rise because of its low radiation dose.

Administer or assist with the administration of the following therapeutic procedures:

- *Selective Internal Radiation Therapy (SIRT) with Hepatic Artery Perfusion Study (HAPS)*. Rationale: This task was not on the survey; it was added because it is the task involved in using *Y-90 microspheres* (28.7%), which appeared in the radiopharmaceutical section. The use of this therapeutic radiopharmaceutical has been rising for the past 6 years. 17% used it in 2009 and 22% used it in 2012. The committee believes its use will continue to rise, and it is critical that entry level nuclear medicine technologists understand its use.

Additional tasks were reworded to better define the task and reflect current practice. In particular, in the tumor section it was decided to list the procedures by how they are done (e.g., planar, SPECT or SPECT/CT) and list the radiopharmaceuticals used for the procedures in Appendix A of the content specifications. So rather than listing a task as *Gallium,* the task is listed by the imaging method (e.g., *Tumor SPECT*), and *Gallium* is included on the

pharmaceutical list. The final task list was approved by the ARRT Board in July 2015 and can be found at: Task Inventories | ARRT - The American Registry of Radiologic Technologists.

Content Specifications

Revising the content specifications is based on changes to the final task inventory, comments from the professional community, and judgment of the Practice Analysis Committee. A final draft of the content specifications was completed after the task inventory had been finalized and approved. For every activity in the task inventory, the Practice Analysis Committee was asked to consider the knowledge and skill required to successfully perform that task and verify that the topic was addressed in the content specifications. Similarly, topics that could not be linked to practice were not included on the final content specifications.

In addition to content based changes, all ARRT exams are transitioning to a universal structure. The four main content areas for all exams going forward will be: *Patient Care; Safety; Image Production;* and *Procedures.* There are challenges presented for all exams moving to this structure, and for the Nuclear Medicine Technology exam the most interesting challenges concerned where to put the *Radionuclides and Radiopharmaceutical* section, and what content should be included in the *Safety* section. The structural changes did not cause any alterations to the *Patient Care* section, and the *Radiation Physics, Radiobiology, and Regulations* section was largely unchanged, but retitled *Safety*. Most of the *Procedures* section remained in place, but *Radionuclides and Radiopharmaceuticals* was added as a subcategory in this section. The remainder of the *Procedures* section was grouped together into four sections, each of which will be components to be assessed on the CQR SSA. The *Cardiac Procedures* section was the only procedures subsection large enough to stand alone as one section. *GU and GI procedures* were combined into another section, and *Endocrine and Oncologic procedures* became another section. The remaining procedures (Abscess/Infection/Inflammation, Bone, CNS, and Lung) were grouped into another section titled *Other Imaging Procedures*. After the structural changes were agreed upon, specific modifications based on changes made to the Task List were discussed and made.

The infection control area was changed so that it will more closely reflect the recommendations of the CDC (Centers for Disease Control). Content was added to the *Procedures* section for the new tasks: *Damaged RBC spleen*, *radionuclide cystogram*, and *selective internal radiation therapy with hepatic artery perfusion study (HAPS)*. Although it appeared that there were many changes to the Task List, the majority only involved rewriting and reorganizing tasks, and so they did not have a substantial effect on the new content specifications.

The Practice Analysis committee produced a draft of the content specifications in April 2015. This draft was mailed to educators and was also placed on the ARRT website, and comments were requested from all interested parties. Comments were received from 19 individuals or groups, primarily from educators. Most of the comments had to do with either the inclusion or exclusion of a particular procedure or radiopharmaceutical, and the Practice Analysis Committee discussed each comment individually. Since the inclusion of tasks is primarily data dependent, the committee referred back to the survey data during this discussion to justify any decisions. There wasn't a common theme to the comments, but many relatively minor topics were brought up that the committee

thought were worthy of consideration. A number of small changes were made to the specifications based on the discussion prompted by these public comments.

The Board of Trustees approved the final content specifications and structured education documents implemented January 2017. The updated content specifications can be found at: Examination Content Specifications | ARRT - The American Registry of Radiologic Technologists.

Clinical Requirements

The purpose of the clinical competency requirements is to verify that individuals certified by the ARRT have demonstrated competence performing the clinical activities fundamental to a particular discipline. Competent performance of these fundamental activities, in conjunction with mastery of the cognitive knowledge and skills covered by the certification examination, provides the basis for the acquisition of the full range of procedures typically required in a variety of settings. Demonstration of clinical competence means that the candidate has performed the procedure independently, consistently, and effectively during the course of his or her formal education. Thus, when establishing the clinical competency requirements, the Practice Analysis Committee focused on those procedures in the task inventory typically performed by most entry-level technologists. The committee added a few more options to the procedures list and made minor modifications as to how the numbers of procedures were distributed among categories, but overall there were not many changes to the clinical requirements. The Board of Trustees approved the final clinical requirements document implemented January 2017. The clinical requirements can be found at: Clinical Competency Requirements | ARRT - The American Registry of Radiologic Technologists

CHAPTER 4

EXAM PASSING STANDARD

Many factors go into deciding when to readdress the passing standard for an exam. When conducting a practice analysis study, the degree to which the content is changed is the primary factor that goes into making the decision. Exam standards are most commonly set by a standard setting study and it is normal to periodically consider whether or not the passing standard is operating as intended or if a new standard setting study should be performed. The most recent study for Nuclear Medicine Technology was performed in 2000, and the question has been brought up during each practice analysis study since as to whether or not a new study needs to be performed.

Since 2010 the overall pass rate is about 90%, and since 2001 it has averaged between 91% and 92%. When considering the amount of education and clinical training that each candidate attains, the committee thought that the current pass rate was appropriate and reasonable. About 10 years ago we would occasionally receive comments about this exam being too easy, but over the last several years the pass rate has decreased a few percent and there hasn't been any recent feedback regarding the standard being either too lenient or too stringent. Considering all of these factors the committee concluded that the current standard is serving the exam well and should remain in place for the present time.

CHAPTER 5

CONCLUSION

Numerous individuals contributed to this project, as committee members, document reviewers, or as survey respondents. Periodic practice analysis is a necessary step in the life cycle of an exam program to insure that the content of the exam and the eligibility requirements remain relevant with current practice. This study noted a number of significant changes to the field of Nuclear Medicine Technology, and thanks to the efforts of all involved it assures that the ARRT Nuclear Medicine Technology exam program will continue to be an excellent assessment of technologists wishing to demonstrate their qualifications by seeking certification and registration.