Practice Analysis and Content Specifications

for Computed Tomography

Final Report

For New Documents Implemented July 2017

The American Registry of Radiologic Technologists
1255 Northland Drive
St. Paul, MN 55120

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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 Computed Tomography (CT) conducted between the dates of January 2015 and July 2017. The purpose of the overall project was to identify tasks currently required of the typical 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 January 2017. The first exam under the new content and eligibility requirements was administered in July 2017.

CHAPTER 2

TASK INVENTORY SURVEY

Development of Task Inventory Survey

The task inventory survey was developed between July 2015 and July 2016 by the Practice Analysis Committee with facilitation from ARRT staff. The Practice Analysis Committee held its first meeting August 2015. Part of the meeting was devoted to the development of a task inventory survey. The survey consisted of tasks thought to define CT. A brief description of the survey is provided below.

Format of Survey. The survey consisted of a one page cover letter, a page with directions on how to use the frequency responsibility scale to rate job tasks, the job tasks that needed to be rated, and a section with demographic and work experience questions.

Section 1. The first major section of the survey consisted of 123 job tasks that were to be rated using the frequency responsibility scale. The first 41 job tasks focused on non-procedure related tasks and the remaining 82 job tasks focused on imaging procedures. The frequency responsibility scale had six scale points (not responsible, yearly, quarterly, monthly, weekly, and daily) and respondents were instructed to use this scale to rate each task.

Section 2. The second major section of the survey consisted of 15 demographic and work experience questions. These included questions on the respondents' work place, experience, job duties, and demographic characteristics as well as how long it took them to complete the survey.

Survey Sample

Evaluation of Original Sample. The original sample was drawn from registered technologists in the ARRT database. The criteria used to construct a population of individuals from which to sample included being certified and registered in CT, working full-time in CT, having less than 10 years of experience, having a job title classified as a staff position, and not being sampled in the most recent practice analysis survey. Ultimately, 19,174 technologists were identified by ARRT staff that satisfied the above criteria. From the population of technologists a stratified random sample of 5,400 was drawn such that 3,600 people had 1 to 5 years of experience and 1,800 people had 6 to 10 years of experience. The survey sample was stratified based on years of experience with a majority of people having 1 to 5 years of experience because the CT examination is an entry-level exam and people with less experience represent the people typically working at entry level. The sample was further divided into eight different survey conditions to evaluate whether certain factors may impact response rates. The factors investigated included receiving enhanced mailing materials with simplified and engaging language or not, receiving a Starbuck gift card or not, and receiving the opportunity to be entered in prize drawing when returning the survey or not. These three factors were full crossed to produce the eight different survey conditions.

Once the sample was determined, the task inventory survey was mailed in October 2015. The initial mailing was followed up by a reminder post card. Survey respondents could complete the survey by returning the mailed survey or by filling it out online. A total of 1,892 surveys were returned by November 2015 (allowing 6 weeks for completion), for a response rate of 35.0%. Statistical analyses of the eight survey conditions found no statistically significant differences between the baseline condition (no enhanced mailing, no Starbucks gift card, and

no Prize drawing) and any other conditions. Some important differences were found based on gender and age, where females and older respondents were more likely to return the survey. Responses from those returning the survey were screened to assure that the surveys were correctly filled out, the responses were realistic, and the responses were from the intended population. After the complete screening process, a total of 1,637 surveys were retained for an effective response rate of 30.3%.

Data Analysis

Data were analyzed using a few different strategies. First, the percentage of people reporting that they were responsible (e.g., provided a response of yearly, quarterly, monthly, daily, or weekly) for each task was determined. ARRT's typical guideline for a task to be included in the task inventory is that at least 40% of people report responsibility for the task. Results suggested that out of the 123 job tasks that were surveyed, 110 of the tasks were above the 40% threshold. Next, the percentage of people reporting daily or weekly performance of each of the job tasks was examined. Results suggested that 97 out of the 123 job tasks had over 20% of people reporting daily or weekly performance. It is important to examine daily or weekly performance in conjunction with percentage responsible because tasks with a high daily or weekly performance and low percentage responsible or tasks with high percentage responsible and low daily or weekly performance may require special consideration. Of the 110 tasks above the 40% responsibility threshold only eight had less than 20% daily or weekly performance. Of the 13 tasks that were below the 40% responsibility threshold there were two tasks with greater than 20% daily or weekly performance. Several of these tasks were the focus of discussion when making final decisions on whether to include the tasks in the final task inventory.

Additional analyses were performed to examine whether there may be important differences in task responsibility based on years of experience or size of the facility. Results suggested that there were not significant differences based on years of experience. There were 16 tasks that showed significant differences based on the size of the facility. The 16 tasks with differences were all related to different imaging procedures. All 16 procedures were above the 40% threshold. These procedures tended to be less commonly performed at facilities with less than 100 beds. It appears that some procedures are much more common at larger facilities. These results were discussed with the Practice Analysis Committee and they confirmed that certain procedures were less common in smaller facilities. However, the committee felt that these tasks were an important part of the job duties of an entry-level technologist working in CT and recommended that these tasks by retained on the final task inventory.

CHAPTER 3

CONTENT SPECIFICATIONS AND CLINICAL REQUIREMENTS

Revision of the Task Inventory

The Practice Analysis Committee met in February 2016 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 clinical tasks that were deleted from or added to the task inventory are listed here.

The following task surveyed at less than 40% responsible, but was kept on the task inventory because the committee believes that this task represents entry-level knowledge that is critical for patient safety:

- Monitor patient's vital signs.

The following tasks represent new content and were added to the task inventory because they surveyed at greater than 40% responsible:

- Perform c-spine immobilization during patient transfer.
- Evaluate phantom QC test data.
- Respond to dose alert or dose notification.
- Document dose report.
- Utilize iterative reconstruction to reduce dose.
- Evaluate the existing line for compatibility for IV contrast injection.
- Gather quality images and documentation for accreditation.
- Mandible.
- Low dose lung screening.
- Shoulder.
- CTA for aortic dissection.
- Venogram (CTV).

The following tasks that were previously on the task inventory were removed because they surveyed below 40% responsible:

- Evaluate blood coagulation prior to interventional procedures.
- Radiation therapy planning.
- Colonography or virtual colonoscopy scan.
- Transplant studies.

The Board of Trustees approved the final task inventory at the July 2016 board meeting

Content Specifications and Structured Education Requirements

     Outline of Topics. 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. The most notable changes from the previous version of the content specifications are:

- The content was restructured into four major content sections following the universal content outline. The sections are: patient care, safety, image production, and procedures.

- Topics concerning radiation protection for personnel, dose notifications, and dose alerts were added to the Safety section.

- Topics concerning electronic medical records (EMR) were added to the informatics subsection of Image Production.

- Topics concerning aspirations were added to the Focus of Questions subsection within the Procedures section.

- Radiation therapy planning, colonography or virtual colonography, and transplant studies were all removed from the list of examinations in the Additional Procedures subsection of the Procedures section.

     The restructuring of the major content categories impacted the structured education requirements as the content categories of the structured education requirements were also retitled to follow the naming conventions in the universal content outlines. The structured education requirements document was also updated to include the new version of the content specifications.

     The Board of Trustees approved the final content specifications document implemented July 2017. The final content specifications can be found at: [Examination Content Specifications | ARRT - The American Registry of Radiologic Technologists](). The final structured education requirements can be found at: [Structured Education Requirements | ARRT - The American Registry of Radiologic Technologists]().

Clinical Requirements

     The purpose of clinical experience requirements is to verify that candidates have completed a subset of the clinical procedures within a modality. Successful performance of these fundamental procedures, in combination with mastery of the cognitive knowledge and skills covered by the certification examination, provides the basis for the acquisition of the full range of clinical skills required in a variety of settings. Thus, when establishing the clinical experience requirements, the Practice Analysis Committee focused on those procedures in the task inventory typically performed by most entry-level technologists. The most notable changes from the previous version of the clinical experience requirements are:

- Changed who can verify exams from "a certified and registered technologist, supervisor or licensed physician" to "an ARRT certified and registered technologist (post-primary certification not required) or an interpreting physician."
- Reduced the number of eligible categories from seven to six.
- Made procedures performed in conjunction with a PET or SPECT attenuation correction scan ineligible for CT clinical experience documentation.
- Made procedures performed in conjunction with radiation therapy planning ineligible for CT clinical experience documentation.
- Organized and retitled individual procedures to match the Examination Content Specifications.
- Mandated the use of iodinated IV contrast for 19 procedures.
- Divided "head without and/or with contrast" into two procedures: a head CT without contrast and a head CT with contrast; this was also done for chest and abdomen/pelvis procedures.
- Added pituitary, orbits, brain perfusion, should and/or scapula, CTV procedures, low-dose lung procedures, and pediatric procedures as options to the clinicals.
- Removed radiation therapy planning, colongraphy or virtual colongraphy, transplant studies, linearity, spatial resolution, and contrast resolutions from the clinicals.
- Combined and clarified a few procedures in the image display and post processing section.

The Board of Trustees approved the final clinical requirements document implemented July 2017. The final clinical experience requirements can be found at: Clinical Experience 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. The Practice Analysis Committee participated in a Hofstee and Beuk exercise to evaluate the passing standard. The committee reviewed the results from this exercise and considered the changes in content to the CT exam and when the last standard setting was done in CT. It was noted that there have been some content changes to CT exam and the last standard setting for CT was in 1995. Based on these factors, it was recommended that a standard setting be done. The ARRT Board of Trustees reviewed this recommendation and decided to conduct a standard setting in 2018 or 2019.

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 CT, and thanks to the efforts of all involved it assures that the ARRT CT exam program will continue to be an excellent assessment of technologists wishing to demonstrate their qualifications by seeking certification and registration.