

**Practice Analysis and Content Specifications
for Radiography**

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 Radiography conducted between the dates of January 2014 and January 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 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 October 2014 and July 2015 by the Practice Analysis Committee with facilitation from ARRT staff. The Practice Analysis Committee held its first meeting in October 2014. Part of the meeting was devoted to the development of a task inventory survey. The survey consisted of tasks thought to define Radiography. 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 149 job tasks that were to be rated using the frequency responsibility scale. The first 79 job tasks focused on non-procedure related tasks and the remaining 70 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 13 demographic and work experience questions. These included questions on the respondents' work place, experience, and demographic characteristics as well as affective questions on how long it took them to complete the survey and how they used the rating scale to provide their ratings for the job tasks.

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 Radiography, working full-time in Radiography, 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, 41,149 technologists were identified by ARRT staff that satisfied the above criteria. From the population of technologists, a stratified random sample of 1,000 was drawn such that 600 people had 1 to 3 years of experience, 200 people had 4 to 5 years of experience, and 200 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 3 years of experience because the Radiography examination is an entry-level exam and people with less experience represent the people typically working at entry level.

Once the sample was determined, the task inventory survey was mailed in January 2015. The initial mailing was followed up by a reminder postcard that was sent in February 2015. A total of 288 surveys were returned by March 2015 (allowing 6 weeks for completion), for a response rate of 28.8%. 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 247 surveys were retained for an effective response rate of 24.7%.

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 reported responsibility for the task. Results suggested that out of the 149 job tasks that were surveyed, 127 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 118 out of the 149 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 127 tasks above the 40% responsibility threshold only 16 had less than 20% daily or weekly performance. Of the 22 tasks that were below the 40% responsibility threshold there were seven 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, work location, and whether someone had CT certification or was pursuing it or not. Results suggested that there were not significant differences based on years of experience. There were 35 tasks that showed significant differences based on work location. The tasks with significant differences included five tasks related to the administration and monitoring of contrast, six fluoroscopy related tasks, 15 radiography procedures that often use contrast, and the nine CT related procedures. People reported less responsibility for all 35 procedures in physician groups than in other locations. People in hospitals with less than 100 beds tended to report more responsibility for the contrast administration and monitoring tasks and CT procedures than in other locations, while for the fluoroscopy and radiography procedures that use contrast people in hospitals with less than 100 beds reported less responsibility than in larger hospitals. These results were discussed with the Practice Analysis Committee and they confirmed that there can be some key differences in how facilities perform various procedures. The committee felt that most of the contrast administration and monitoring, fluoroscopy, and radiography procedures tasks that use contrast were an important part of the job duties of an entry-level technologist and recommended that these tasks be retained on the final task inventory. The additional analyses on the CT procedures helped inform the committee's decision on these tasks. There were 12 tasks that showed significant differences based on whether someone was CT certified or pursuing CT certification or not. People certified or pursuing CT certification were more likely to be responsible for the nine CT related imaging procedures and three tasks that dealt with the administration and monitoring of contrast. Each of the CT related procedures were well below the 40% threshold and it was clear that the people reporting responsibility for CT related tasks were those that were CT certified or pursuing it. These results lend support to CT related content not being on the Radiography task inventory, content specification, or clinical requirements.

CHAPTER 3

CONTENT SPECIFICATIONS AND CLINICAL REQUIREMENTS

Revision of the Task Inventory

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

The following tasks surveyed at less than 40% but were kept on the task inventory because the committee believed that these tasks represented critical knowledge for entry-level technologists:

- Administer IV contrast agents.
- Perform Venipuncture.
- Position patient, x-ray tube, and image receptor to produce the following diagnostic images: Intravenous urography.
- Position patient, x-ray tube, and image receptor to produce the following diagnostic images: ERCP.
- Assist the radiologist with: Myelography-fluoroscopic guided contrast injection.

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

- Position patient, x-ray tube, and image receptor to produce the following diagnostic images: Hysterosalpingography.
- Follow environmental protection standards for handling hazardous materials (e.g., chemotherapy IV, radioactive implant).
- Manage complex interpersonal interactions with the workplace in an effective manner.
- Demonstrate and promote professional and ethical behavior.
- Use patient transfer devices when needed.
- Prior to the administration of a medication other than a contrast agent, review information to prepare appropriate type and dosage.
- Document radiographic procedure dose.
- Document fluoroscopy dose.
- Advocate radiation safety and protection.
- Describe the potential risk of radiation exposure when asked.
- Operate electronic imaging and record keeping devices including: Electronic medical record (EMR).
- Modify technical factors to correct for noise in a digital image.
- Respond appropriately to digital exposure indicator values.
- Identify image artifacts and make appropriate corrections as needed.
- Adapt radiographic and fluoroscopic procedures for patient condition (e.g., age, size, trauma, pathology) and location (e.g., mobile, surgical, isolation).
- Select appropriate geometric factors (e.g., SID, OID, focal spot size, tube angle).

The following tasks that were previously on the task inventory were removed.

- Use film-screen cassettes and automatic film processing.
- Operate radiographic unit and accessories: Dedicated chest unit.

The following separate tasks were combined into single tasks.

- The knee and patella tasks were combined into a knee/patella task.
- The cervical spine and soft tissue neck tasks were combined into a cervical spine/ soft tissue neck task.

The Board of Trustees approved the final task inventory at the July 2015 board meeting.

Content Specifications

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.
- The content in the patient care section was reorganized to maintain consistency with the other primary disciplines.
- Conventional units of measurement were removed from the safety section and units of measurements will only focus on SI units.
- Film-screen and automatic process topics were removed from the image production section and digital imaging topics were expanded.
- The knee and patella and the soft tissue neck and cervical spine tasks were combined.
- Hysterosalpingography was added to the procedures section.

The Board of Trustees approved the final content specifications document implemented January 2017. The final 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 most notable changes from the previous version of the clinical competency requirements are:

- Language clarifying acceptable simulation of both general patient care and clinical procedure competencies was added in section 4.1.2.
- Language clarifying that CPR certification is mandatory and the remaining five patient care competencies must be demonstrated, preferably on patients, was added to section 4.2.1.
- Temperature and pulse oximetry were added to the list of mandatory vital sign competencies in section 4.2.1.
- Patient identity verification was added to the list of items that must be included to demonstrate competence in section 4.2.2.
- The number of radiography-specific mandatory procedures was increased by six, from 31 to 37. The breakdown of these additions is as follows:
 - The clavicle procedure was moved from an elective to a mandatory procedure.
 - Trauma: cervical spine cross-table lateral was rewritten as cross-table (horizontal beam) lateral spine and moved from an elective to a mandatory procedure.
 - The two surgical C-arm studies were retitled as mobile c-arm studies. One was mandatory and the other was elective. Both procedures will now be mandatory.
 - Three mandatory procedures to be performed on geriatric patients were added.
- The number of elective procedures was decreased by one, from 35 to 34. The upper airway (soft tissue neck) was deleted from the list of imaging procedure competencies.

The Board of Trustees approved the final clinical requirements document implemented January 2017. The final clinical competency 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. 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 Radiography exam and when the last standard setting was done in Radiography. The committee noted that the changes to the Radiography content specifications were mainly reorganizing previously existing content and that the content weights were very similar. The last standard setting for Radiography was in November 2011. Based on these factors, it was recommended that a standard setting was not necessary at this time. The ARRT Board of Trustees reviewed this recommendation and decided to not conduct a standard setting.

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