



Standard Setting Report: Radiography - Effective March 2023

Background

The mission of the American Registry of Radiologic Technologists (ARRT) is to “promote high standards of patient care by recognizing qualified individuals in medical imaging, interventional procedures, and radiation therapy.” The ARRT’s equation for excellence states that excellence equals education plus ethics plus examination; standard setting is one of many processes within the examination component that ensure it is an accurate reflection of the knowledge, skills, and abilities required of entry level technologists.

This report details a standard setting conducted in September 2021 for Radiography, including committee composition, methods, results, recommendations, and any changes to the exam cut score. It is ARRT’s primary goal for the exam to reflect the current state of practice and expectations for entry-level radiographers. Therefore, this meeting served to update those expectations from the previous standard setting in 2012.

The ARRT utilizes experts in standard setting, called psychometricians, to train and facilitate a committee of subject matter experts from the field to define expectations, collect data, and make recommendations before presenting the results to the ARRT Board of Trustees. The facilitators provided training throughout the meeting to ensure that the committee was prepared to hold productive discussions, make well-reasoned judgments, and provide suitable recommendations at the meeting’s conclusion.

Facilitators:

- Jessica Anderson, ICE-CCP, Director, Test Development, Licensure and Certification at DRC
- Ross Brown, PhD, Senior Psychometrician, Licensure and Certification at DRC

The ARRT Board of Trustees reviewed the results of the standard setting meeting and committee recommendations before approving the final standard. ARRT psychometrics staff will ensure the passing threshold for all exams administered on or after the effective date reflect that prescribed level of performance.

Committee Composition

ARRT staff selected individuals from the volunteer database with the goal of maximizing diversity in role, geography, and experience in Radiography. When possible, ARRT will bias the volunteer pool towards individuals early in their career as the exam is designed to assess candidates at entry level. In addition, the radiologist assigned to the exam committee by the American College of Radiology is invited to attend. In total, 15 subject matter experts participated in the standard setting meeting. Please refer to the following table for specific demographics of this group.



Table 1. Committee Demographics

Rater	Role	Location	Credentials
A	Technologist	OR	R.T.(R)(BD)(ARRT)
B	Technologist	NC	Ph.D., R.T.(R)(ARRT)
C	Technologist	MI	R.T.(R)(ARRT)
D	Technologist	TX	Ph.D., R.T.(R)(M)(ARRT)
E	Technologist	MN	R.T.(R)(ARRT)
F	Technologist	GA	R.T.(R)(CT)(ARRT)
G	Technologist	NY	R.T.(R)(MR)(ARRT)
H	Technologist	PA	R.T.(R)(M)(ARRT)
I	Radiologist	GA	M.D.
J	Technologist	NY	R.T.(R)(CT)(BD)(ARRT), CRA
K	Technologist	AZ	R.T.(R)(ARRT)
L	Physicist	KS	D.M.P., DABR
M	Technologist	CA	R.T.(R)(ARRT)
N	Radiologist	WI	M.D., FACR
O	Technologist	AR	Ph.D., R.T.(R)(CT)(MR)(QM)(ARRT), MRSO

Minimally Qualified Candidate

After training regarding the purpose and implications of standard setting, the committee discussed the knowledge, skills, and abilities expected of an entry level radiographer with primary focus on the minimum qualifications that should be demonstrated to earn an ARRT credential. This discussion of the “minimally qualified candidate,” who possesses only the knowledge, skills, and abilities required for certification, is important because it allows the committee to come to a common understanding of what is required for the role prior to any data collection activities. Note that “entry level” and “minimally qualified” are not interchangeable terms. Entry level individuals are early in their career with limited clinical experience irrespective of their level of qualification.

Through their discussion, the committee created a list of generic and discipline-specific examples of knowledge, skills, and abilities that are representative of well qualified, minimally qualified, and not yet qualified candidates.

Modified Angoff

The committee performed a modified Angoff activity (Angoff, 1971) using a recently retired exam form. The facilitator provided training to explain the function and intent of the Angoff to the committee and the committee performed a practice activity with a few items to familiarize themselves with the software.

The committee practiced a modified Angoff (Angoff, 1971) procedure with an initial set of twenty items. ARRT staff read each item aloud and committee members independently made judgements for the percentage of minimally qualified candidates that would answer it correctly. The facilitator asked committee members to share their ratings and provide a brief rationale for their judgment. The committee discussed these results with a particular focus on the shared definition of a minimally qualified candidate and clarified their required knowledge, skills, and abilities as necessary.

In the first round of the full activity, the committee reviewed and provided individual judgements for each item on the form. The ratings for each item were averaged across all panelists, and those values were then averaged across all items to determine the minimum percent correct needed to pass the test.



After the first round, the facilitator provided the Angoff-derived cut score for the group as well impact data showing how that score would affect the pass rate of recent candidates. The facilitator then encouraged the committee to discuss their judgments and further clarify their expectations for the minimally qualified candidate based on real-world experiences with candidates during their coursework or clinical training. The committee reviewed 100 items with high disagreement, possessing either a standard deviation greater than 13.

In round two, committee members reviewed the items again and revised their initial item-level judgments, as desired, based on their discussions during the feedback period.

Table 2. Modified Angoff Results

<u>Percent Correct Cut</u>	<u>Round 1</u>	<u>Round 2</u>
Mean	71.8%	71.1%
Minimum	63.6%	65.0%
Maximum	80.9%	77.2%
Standard Deviation	5.0%	3.9%

Hofstee

The facilitator asked the committee to answer the following four questions to determine the Hofstee recommendation (Hofstee, 1983):

1. What is the lowest acceptable percent correct on the total test you would be comfortable with in order to pass?
2. What is the highest acceptable percent correct on the total test you would be comfortable with in order to pass?
3. What is the minimum percent of test takers that you would be comfortable to fail?
4. What is the maximum percent of test takers that you would be comfortable to fail?

Table 3. Mean Hofstee Responses

Minimum cut score	71%
Maximum cut score	80%
Lowest fail rate	15%
Highest fail rate	32%

Final Discussion

The committee discussed the results of the two activities and recommendations for the ARRT Board of Trustees. The final recommendations were to utilize the conditional standard error of measurement to adjust the cut score recommended by the committee to increase the degree of confidence in the accuracy of the pass/fail decisions that are made, especially for candidates who fall close to the cut score.



New Standard and Implementation

The ARRT Board of Trustees reviewed the results and discussed the impact of potential new standards before approving a final standard for the Radiography exam.

The board approved a new standard equivalent to 138 out of 200 items on the exam form used for this meeting. The new standard will go into effect March 2023 and remain in place until at least 2028 when the next standard setting is scheduled to take place. ARRT staff expect a future pass rate for first-time candidates around 70% based on the impact data provided to both the board and standard setting committee.

References

Angoff, W.H. (1971). Scales, norms, and equivalent scores. In R.L. Thorndike (Ed.), *Educational Measurement* (2nd ed., pp. 508-600). American Council on Education.

Beuk, C. H. (1984). A method for reaching a compromise between absolute and relative standards in examinations. *Journal of Educational Measurement*, 21(2), 147-152.

Hofstee, W. K. (1983). The case for compromise in educational selection and grading. In S.B. Anderson & J.S. Helmick (Eds.), *On educational testing*, (pp.109-127). Jossey-Bass.

