MEASURE LEARNING

2025 Standard Setting Report of MDCB CMD Examination

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Prepared for

Medical Dosimetrist Certification Board

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Summary of the Standard Setting Process

The Medical Dosimetrist Certification Board (MDCB) Certified Medical Dosimetrist (CMD) examination program rolled out an updated Competency Profile and administered the first examination form based on it for the CMD January 2025 administration. The provisional performance standard (i.e., passing score or cut score) for the CMD examination was established by MDCB after reviewing standard setting data collected from a panel of subject matter experts (SMEs).

The CMD Examination standard setting panel comprised SMEs recruited and approved by MDCB. The process was facilitated by Dustin Shullick from Meazure Learning. The panel met remotely on January 10, 2025 to undergo a Standard Setting Training and Orientation. After the panelists individually provided their Angoff ratings, the panel again met remotely January 15-16, 2025 to review and finalize their ratings, with the focus being on items for which the range of Angoff ratings was greater than 25 percentage points. After the CMD January 2025 Examination Form was administered and data analysis was performed on candidate scores, the panel met remotely on February 4, 2025 to finalize review post-administration data and confirm their final passmark recommendation. The MDCB Board then met remotely to go over candidate results and to approve the final passmark.

The standard setting meeting process is described in brief, below:

1. Meazure Learning emphasized the importance of maintaining strict confidentiality with respect to the exam items and the cut score discussions.
2. Panelists received an explanation of the standard setting process and training in the modified Angoff method.
3. Panelists reviewed and discussed the CMD exam eligibility requirements.
4. The panelists discussed and defined the *minimally qualified candidate* with reference to candidates taking the CMD Examination.
5. Panelists worked independently to provide Angoff ratings for the multiple-choice items on CMD January 2025 Examination Form.
6. As a group, panelists reviewed and discussed their initial ratings for the multiple-choice items, including the mean and standard deviation for each rater and the dispersion of ratings for various items. During the discussion, items for which the range of Angoff ratings was greater than 25 percentage points were emphasized.
7. Panelists were provided the opportunity to amend their Angoff ratings, with the instructions that they could change their original ratings based on the group discussion but were not obligated to do so.
8. The psychometrician analyzed the panelists' ratings and facilitated a discussion about the panel's overall cut score recommendation based on the Angoff ratings and the acceptable range of cut scores.

The panel's recommended that a raw cut score for the CMD January 2025 Examination Form was 85 out of 134 scored items, falling within the confidence interval. The 95% confidence interval (CI) around the recommended cut score ranged from 80 to 96 items.

The Standard Setting Process

This report details the procedures used to establish the performance standard for the MDCB CMD examination. It presents information on the standard setting process, the qualifications of the individuals involved in the process, the materials and data collection methods, and other documentation relevant to the standard setting study.

What is a Performance Standard?

Performance standards refer to the minimum level of competency that must be met to receive a credential or license to practice. In certification and licensure testing, the goal is to identify a passing score, or cut score, that distinguishes candidates who meet this minimum level of competency from those who do not. Beginning in the 1950s, methods were developed to establish the cut score(s) of an examination. These techniques are typically referred to as standard setting methods. Most standard setting methods start with an assembled examination that is presented to a panel of subject matter experts. Data are collected from the panelists to try to identify the score that a candidate on the border between acceptable and unacceptable (or between qualified and unqualified) would achieve on the examination.

Generally, only criterion-referenced procedures are appropriate for setting a performance standard on a credentialing examination (*Standards for Educational and Psychological Testing*, American Educational Research Association, 2014). These methods define the minimally acceptable level of competence and evaluate each question relative to this definition (Cizek, 2012). Criterion-referenced procedures provide a demonstrable link between minimally acceptable knowledge and skill in the profession and the cut score that is identified by the standard setting study.

Why Set a Performance Standard?

Establishing a performance standard and the corresponding passing score using appropriate standard setting methodology is a critical part of ensuring that the passing score on the MDCB CMD examination accurately reflects the minimal level of competence required to earn the certification. In using such methodology, MDCB can provide assurance that individuals who have obtained the CMB certification have met eligibility requirements pertaining to education and training and have obtained at least a minimally acceptable level of knowledge necessary for qualified practice in the field.

MDCB CMD Examination

The CMD January 2025 Examination Form was constructed according to a blueprint based on a job analysis of medical dosimetrists conducted in 2023. The CMD January 2025 Examination Form comprised of 134 scored multiple-choice items and 21 unscored pilot items. Each multiple-choice item is scored dichotomously.

Standard Setting Meeting Participants

The MDCB CMD standard setting panel met remotely for a series of meetings in January and February of 2025 and involved a panel of 7 subject matter experts. Factors such as title, organization, location, and experience were all considered during panel selection. The relevant qualifications and demographic information for all panelists who participated in the meeting are provided in Appendix A.

Meeting Security

The psychometrician provided instruction on the importance of maintaining strict confidentiality of exam content and the content of meeting discussions and provided examples of specific behaviors that would constitute a violation of confidentiality or conflict of interest policies. All panelists completed and signed MDCB confidentiality agreements prior to the session.

The Modified Angoff Standard Setting Method

The primary method for establishing the performance standard for the MDCB CMD examination was an item-based standard setting method referred to as the Modified Angoff method (Angoff, 1971). The Modified Angoff method was used because it is the most widely used and well-accepted method for setting a criterion-referenced performance standard on a credentialing exam. This method requires panelists to consider each scored item on an examination and make a judgment about the percentage of minimally qualified candidates who would answer the item correctly. Specifically, for each item, the Angoff question that was asked of panelists was:

What percentage of minimally qualified candidates would answer this item correctly?

Before the Angoff question could be answered, it was necessary to define the minimally qualified candidate. The panel started this activity by discussing the MDCB CMD exam eligibility requirements and the characteristics of the general candidate population. Subsequently, the panelists participated in an exercise intended to help them define and focus more specifically on the minimally qualified candidate. In this exercise, panelists were asked to describe the defining characteristics of the minimally qualified candidate and the not-qualified candidate and the well-qualified candidate as comparison points.

Next, the panelists were asked to provide Angoff ratings for a small sample of items. In a group discussion, panelists discussed the rationale behind each of their individual ratings as a way of ensuring that panelists had a clear understanding of the Angoff method and that a consensus had been reached regarding the operational definition of a minimally qualified candidate. After completing the practice items, panelists independently completed their Angoff ratings for the items on MDCB CMD January 2025 Examination Form.

The panelists' first round of Angoff ratings were presented to the group and a discussion was facilitated that focused on the variability in ratings within and across panelists and the reasons why various panelists assigned the ratings that they did for certain items. The discussion centered on items that exhibited Angoff ratings with large variation (i.e., discrepancies larger than 2025) across panelists. After the discussion of their individual ratings, panelists were given a chance to modify their Angoff ratings for any items that they desired.

Results

Angoff Ratings

Each panelist's recommended passing score was estimated by calculating the mean of their Angoff ratings for the 134 scored items. The average of the panelists' recommendations is the panel's overall recommendation. The formula for the panel's overall recommended passing score (on the raw score scale), M, is

$$M = \frac{n}{100\ p}\sum_{i=1}^{p}\left(\frac{\sum_{j=1}^{n} r_{ij}}{n}\right)$$

where p represents the total number of panelists, n represents the total number of items, and r_{ij} represents the Angoff rating for panelist i and item j.

Table 1 contains summary statistics of the panel's Angoff ratings. The standard deviation of the panelists' recommendations is of interest because it is reflective of the amount of variation in the individual panelists' recommendations.

To help interpret the panel's overall recommendation, and because there is a certain amount of error inherent in any statistical estimation process, a 95% confidence interval (CI)[1] was calculated based on the standard error of the mean (SEM)[2]. A 95% CI provides a range of values that would likely contain the mean recommendation from the entire population of potential panelists. More specifically, a 95% CI indicates that if the same process were repeated a large number of times, 95% of the panel recommendations would fall between the upper and lower limit.

Table 1. **Angoff Rating Summary Statistics**

Number of Raters	**7**
Mean Panelist Recommendation (% Correct)	65.6
Mean Panelist Recommendation (Raw Score)	87.9
Standard Deviation of Panelist Recommendations	11.83
Standard Error of the Mean (SEM)	2.97

After reviewing post-administration data, the panel recommended a passing score following round two of 85 out of 100 scored items on MDCB CMD January 2025 Examination Form, with an acceptable cut score range of 81 to 96, based on the 95% confidence interval.

Conclusion

The panelists recommended a raw cut score of 85 out of 134 (63.4% correct) for the MDCB CMD January 2025 Examination Form.

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[1] Confidence Interval Limits = Average Recommendation ± (SEM*Student's *t* for a given confidence level)

[2] SEM is computed as the standard deviation (SD) of the panelists' recommendations divided by the square root of the number of panelists.

References

American Educational Research Association (AERA), American Psychological Association (APA), & National Council on Measurement in Education (NCME). (2014). *Standards for educational and psychological testing.* American Educational Research Association.

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Appendix A: MDCB CMD Examination Standard Setting Panelists

Name	Job Title	Place of Employment	Mos/Yrs of Exp	Location
Marah McLaurin	Medical Dosimetrist	University of Maryland Capital Region Medical Center	7 mos	Largo, MD
Donna Branche	Staff Dosimetrist	Maryland Proton Treatment Center	6 mos	Baltimore, MD
Michael Wheatley	Staff Dosimetrist	Brown Cancer Center	4 yrs	Louisville, KY
Jemsh Desai	Lead Medical Dosimetrist	Hampton University Proton Cancer Institute	8 yrs	Hampton, VA
Breanna Peyton	Staff Dosimetrist	University Hospitals Seidman Cancer Center	3 yrs	Cleveland, OH
Michael South	Lead Dosimetrist	Houston Methodist Hospital	27 yrs	Houston, TX
Martha Chadband	Medical Dosimetrist	University of Alabama at Birmingham	4 yrs	Birmingham, AL