



Canadian Midwifery Registration Exam: 2021 Technical Report

Prepared by:

Nicole Evers, MSc

Meazure Learning

Prepared for:

Canadian Midwifery Regulators Council

Prepared on:

December 20, 2021

This page is intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES	4
EXECUTIVE SUMMARY	5
INTRODUCTION	6
EXAMINATION DEVELOPMENT	6
Test Blueprint and Core Competencies.....	6
Item Bank Status	7
Item Writing	9
Item Review.....	9
Examination Construction.....	10
EXAMINATION ADMINISTRATION.....	11
Examination Dates and Duration	11
Summary Statistics for the 2021 Administrations.....	12
Validity.....	13
Reliability.....	14
Candidate Feedback Questionnaire Data	14
CONCLUSION	16
REFERENCES	17

LIST OF TABLES

<i>Table 1. CMRE Blueprint</i>	7
<i>Table 2. Items currently in bank by competency category</i>	8
<i>Table 3. Items currently in bank by taxonomy</i>	8
<i>Table 4. Items currently in bank by Item Type</i>	8
<i>Table 5. CMRE Distribution of Case Study and Independent Items according to Part 1 and 2 of the Exam (October 2021)</i>	11
<i>Table 6. CMRE items according to blueprint competencies (October 2021)</i>	11
<i>Table 7. Summary of the statistics for the 2021 administrations of the CMRE</i>	12
<i>Table 8. Average of Passing Candidates per Competency Category</i>	13
<i>Table 9. CMRE Candidate Feedback (October 2021)</i>	15
<i>Table 10. CMRE Candidate ProctorU Feedback Data (October 2021)</i>	15

EXECUTIVE SUMMARY

The goal of this report is to provide key aspects of test development and item performance for the Canadian Midwifery Registration Exam (CMRE). This includes examination development activities conducted to date, and results from the 2021 administration.

- The CMRE is typically administered twice a year; however, in 2021 due to the ongoing pandemic, it was administered only once. The 2021 examination consisted of 213 multiple-choice items and was administered on 28 October by computer-based testing either proctored online or in test-centers.
- The examination uses a criterion-referenced approach to standard setting, namely the modified Angoff method. This method is advantageous in that the pass mark is determined based on the content and difficulty of the questions in the examination and not on group performance.
- To enhance validity, the examination is constructed according to an exam blueprint and, at the item-writing stage, each item is linked to a specific competency. The item writers and reviewers are registered midwives from across Canada. At least one authoritative reference is provided for each question.
- To enhance reliability, several measures are implemented to ensure that scoring is accurate. The integrity of the answer strings is checked multiple times through the scoring and reporting process. The Cronbach's alpha reliability index for the examination was 0.81.
- The CMRE is administered in French and English. The test items are developed in English and subsequently translated into French. One item writing session was conducted on June 7-11, 2021. One item review session was conducted on June 16-18, 2021.
- Several methods are used to safeguard test materials including restricting staff access to item banks and test materials, network security measures, and the signing of security agreements by all participants involved in the examination. As of December 2021, the CMRE item bank consisted of 729 multiple-choice items, 667 of which were considered Operational items.

INTRODUCTION

The Canadian Midwifery Regulators Council (CMRC) sets and administers the Canadian Midwifery Registration Exam (CMRE). This exam is designed to assess applicants for midwifery registration to ensure they meet entry-level competency standards set out in the *Canadian Competencies for Midwives*. Candidates are assessed in their knowledge, application of that knowledge and their critical thinking abilities to meet entry-level competencies. The goal of the CMRE is to ensure that midwives gaining registration are competent practitioners providing a consistent standard of care across Canada.

This technical report outlines the key activities conducted for the 2021 CMRE and presents the status of the item bank for the program as well as factors that contribute to the validity and reliability of the examination.

EXAMINATION DEVELOPMENT

This section highlights the status of the examination program with regard to the current test blueprint, item bank status, and method of selecting item writers and item writing process. Test assembly and standard-setting activities related to the 2021 examination had been completed prior to Measure Learning's contracted mandate with CMRC.

Test Blueprint and Core Competencies

The October 2021 exam was based on the current *Canadian Competencies for Midwives* from the CMRC available at https://cmrc-ccosf.ca/sites/default/files/pdf/National_Competencies_ENG.pdf. Each question on the CMRE is linked to a particular competency, which are organized in the following nine categories:

- I. General
- II. Education and Counseling
- III. Antepartum
- IV. Intrapartum
- V. Postpartum
- VI. Newborn
- VII. Well Woman
- VIII. Legal
- IX. Professional Development

The blueprint stipulates that the examination will consist of multiple-choice questions, presented as either case-based or independent questions. Case-based questions include a set of three to six

questions associated with a brief health-care scenario. Independent questions contain all the information necessary to answer the question without reference to other questions.

Questions are also classified according to contextual variables, such as health care setting (i.e., hospital or out-of-hospital) and health care situation (i.e., normal or abnormal). However, there is no specific percentage of questions on the examination assigned to these categories. Table 1 provides a summary of the CMRC blueprint which was applied in building the 2021 exam.

Table 1. CMRE Blueprint

STRUCTURAL VARIABLES		
Exam length	210 - 230 questions	
Question format	Format: Multiple-choice questions	
Presentation	Case-based questions	65-75%
	Independent question	25-35%
	I. General	5-10%
	II. Education and Counseling	5-10%
	III. Antepartum	25-30%
	IV. Intrapartum	25-30%
	V. Postpartum	10-15%
	VI. Newborn	10-15%
	VII. Well Woman	1-5%
	VIII. Legal	1-3%
	IX. Professional Development	1-3%
CONTEXTUAL VARIABLES		
Health Care Setting	Hospital Out-of-Hospital	
Health Care Situation	Normal Abnormal	

In May 2019, the CMRC contacted Measure Learning for assistance with the modernization of its CMRE competency profile. As part of this process, an updated CMRE competency profile was created to accurately reflect updated competencies required for competent performance of Canadian Midwives. As such, in 2021, a blueprint for CMRE based on the updated competency profile was developed. A detailed account of these development activities is described in the *CMRE Blueprint Revision Summary Report (2021)*. Implementation of the updated blueprint is intended for Fall of 2022 at which time the CMRE content will reflect the new blueprint specifications.

Item Bank Status

As of December 2021, the CMRE item bank had a total of 729 items, of which 667 were Operational, and is, for the most part, meeting the needs for examination development. Tables 2, 3, and 4 present a breakdown of operational items - by competency category, taxonomy, and item type respectively

- of the number of questions in the item bank versus the percentage of items required for the exam blueprint.

Although examination development can be supported with the current item bank, continued item development is required across all competency categories to improve the health of the item bank.

Table 2. Items currently in bank by competency category

Competency Categories	# Items in Bank (Percent)	% Indicated on Blueprint
I. General	82 (13%)	5-10%
II. Education and Counseling	42 (7%)	5-10%
III. Antepartum	137 (21%)	25-30%
IV. Intrapartum	178 (28%)	25-30%
V. Postpartum	78 (12%)	10-15%
VI. Newborn	73 (11%)	10-15%
VII. Well Woman	29 (5%)	1-5%
VIII. Legal	9 (1%)	1-3%
IX. Professional Development	15 (2%)	1-3%
Total	643 (100%)	100%

**Items missing from count have been classified according to the new competency categories.*

Table 3. Items currently in bank by taxonomy

Taxonomy levels of cognitive ability	# of Items in Bank (Percent)	% Indicated on Blueprint
Knowledge/Comprehension	317 (48%)	NA
Application	241 (36%)	NA
Critical Thinking	106 (16%)	NA
Total (Percent)	664 (100%)	100%

Table 4. Items currently in bank by Item Type

Item Type	# of Items in Bank (Percent)	% Indicated on Blueprint
Independent	338 (51%)	25-35%
Case-Based	326 (49%)	65-75%
Total (Percent)	664 (100%)	100%

As previously mentioned, a new competency framework and exam blueprint has been developed and is expected to be implemented in the Fall of 2022. Preliminary work was completed throughout the Summer of 2021 to prepare for the remapping of current items in bank to the new competency categories. First, a comparison of the current and new competency framework was conducted to identify competency categories and indicators which are identical across frameworks. Items for which competency categories and indicators are identical will undergo a bulk update to automatically recode items to the new framework. Second, for the remaining items in bank, subject matter experts (SMEs) were asked to review items and determine their new competency category and indicator. SMEs worked in pairs to review a set number of questions independently and then validate their classification with their counterpart. The item bank remapping will be completed in 2022.

Item Writing

METHOD OF SELECTING ITEM WRITERS

Item writers for the CMRE are registered midwives and they are recruited and approved by the CMRE Committee. Item writers received training on June 7th concerning the development of quality multiple choice questions and were required to sign a non-disclosure agreement stating that they would not disclose content of the examination.

ITEM WRITING PARTICIPANTS

The following Item Writers participated in a virtual item writing session on 7-11 June 2021:

- Annie Léger, QC
- Emmanuelle Dennie-Filion, ON
- Lourie Rose, BC
- Naomi Brooks, Nunavut & ON
- Nicole Romeiko, ON
- Nicole Waithe, ON
- Tobi-Lynn Bayarova, QC

ITEM WRITING OUTCOME

In total, over the course of the 4-day item writing session, 40 new items were developed.

Item Review

METHOD OF SELECTING ITEM REVIEWERS

The selection criteria for item reviewers are the same as the selection criteria for item writers. However, during item review, subject matter experts review 1) newly written questions and 2) questions that have been flagged as having questionable statistics or outdated content.

ITEM REVIEW PARTICIPANTS

The following individuals participated in a virtual item validation session on 16-18 June 2021:

- Annie Léger, QC
- Lourie Rose, BC
- Manon Lachapelle, QC
- Mounia Amine, QC
- Naomi Brooks, Nunavut & ON
- Patrice Latka, ON
- Patricia Rohlfs, BC
- Sinclair Harris, QC
- Tobi-Lynn Bayarova, QC

ITEM REVIEW OUTCOME

In total, over the course of the 3-day item validation session, 79 items were reviewed; 47 were approved for translation, 26 were flagged for further review and 6 were retired.

Examination Construction

Given that Measure Learning was not involved in the exam assembly and standard setting process of the CMRE administered in 2021, this section will provide information limited to the content of the examination form and test book configuration.

EXAM CONFIGURATION AND MATCH TO BLUEPRINT

For administration, the CMRE examination consists of multiple-choice items administered in two parts with Part 1 being administered in the morning and Part 2 in the afternoon. Each part consists of case-based items and independent items, in which case-based items appear first on the examination and are followed by the independent items. Because of the small numbers of candidates per year, there is currently only one active test form per year.

Table 5 provides a summary of case-based and independent item representation on each exam part for the 2021 examination. Table 6 provides the number of items in the 2021 examination by competency category and taxonomy level. For the 2021 examination, blueprint requirements were met.

Table 5. CMRE Distribution of Case Study and Independent Items according to Part 1 and 2 of the Exam (October 2021)

Part	Case Study Items	Independent Items	Total
1	64	42	106
2	64	43	107
Total	128	85	213

Table 6. CMRE items according to blueprint competencies (October 2021)

Competency	Blueprint %	CMRE #	CMRE %
I. General	5-10%	20	9%
II. Education and Counseling	5-10%	16	8%
III. Antepartum	25-30%	52	24%
IV. Intrapartum	25-30%	56	26%
V. Postpartum	10-15%	29	14%
VI. Newborn	10-15%	23	11%
VII. Well Woman	1-5%	6	3%
VIII. Legal	1-3%	5	2%
IX. Professional Development	1-3%	6	3%

EXAMINATION ADMINISTRATION

The examination administration activities in this section include examination administration dates, duration and modality along with summary statistics regarding the 2021 examination.

Examination Dates and Duration

In 2021, the CMRE was administered on October 28 using computer-based testing either proctored online or in test-centers.

PROCTORED COMPUTER-BASED TESTING

In 2021, the CMRE was administered via computer-based online proctoring for the first time. Overall, the majority of candidates, 92% (n=118), chose to write their exam online with proctoring, whereas, 7% (n=8) wrote the exam in test centres.

Online proctoring was offered through Meazure Learning-Proctor U. Meazure Learning-Proctor U offers a highly secure and standardized online testing environment. Proctors are selected and trained by Meazure Learning-Proctor U. They undergo a rigorous training process and ongoing

audits are performed to ensure procedural compliance and ability to identify nefarious examinee behaviours. Strict access controls are in place to allow for authorized personnel only to access client data and proctors must sign confidentiality agreements upon their employment with Meazure Learning.

DELIVERY OF EXAMINATIONS VIA PROCTORED COMPUTER-BASED TESTING

Approximately 10-12 weeks prior to the scheduled examination administration date, CMRC provided Meazure Learning with a list of candidates who were eligible to write the CMRE. The list of candidates was uploaded into Meazure Learning's software program. Meazure Learning performed quality assurance checks to ensure accuracy of candidate information following which each candidate received a link to book their exam time. All candidates, except one, wrote the exam within a one-day window. Technical difficulties caused one candidate to write Part 2 of the exam on the following day (i.e., 29 October 2021).

SCORING AND REPORTING

Following examination administration, item analyses was conducted to identify poorly performing items. Four (4) items were flagged for review. The CMRE Administrator reviewed these questions to ensure they were properly keyed, unambiguous, fair, and appropriate for entry to practice. No items were removed from the scoring of the exam and exam scores were calculated based on candidates' performance on all 213 items. It should also be noted that for approximately 150 items out of the 213 items on the exam, at least 90% of respondents got the answer correct. This indicates that a significant portion of the exam content was relatively very easy for test-takers. Ideally, only a limited number of exam items with an item difficulty over .90 would appear on an exam, whereas most items would be of moderate difficulty (i.e., p-value of .50 to .70).

Individual candidate scores were sent to the CMRE Committee. Unsuccessful candidates receive a detailed profile that provides examination score point percentages by blueprint category. Successful candidates receive a "pass" notification indicating that they have passed the examination.

Summary Statistics for the 2021 Administrations

Table 7. Summary of the statistics for the 2021 administrations of the CMRE

Exam parameters for English and French	October 2021
Total number of multiple-choice (MC) items	213
Number of items excluded based on poor psychometric properties	0
Total of number of items included	213

Minimum obtained score	141 (66.2%)
Maximum obtained score	208 (97.7%)
Mean (Average) score	189.65 (89.0%)
Median (half the scores are above the median and half are below the median)	191.00 (89.7%)
Standard deviation	9.39
Mean (Average) proportion correct	0.89
Mean (Average) item-total correlation	0.14
Mean (Average) biserial correlation	0.16
Reliability coefficient (Alpha)	0.81
Pass mark and Pass rate	
Pass mark (%)	164 (77%)
Number of candidates writing the exam	126
Pass (N)	124
Pass (%)	98.4 %

Table 8. Average of Passing Candidates per Competency Category

Competency	Average % Passing Candidates
I. General	86%
II. Education and Counseling	92%
III. Antepartum	89%
IV. Intrapartum	90%
V. Postpartum	88%
VI. Newborn	93%
VII. Well Woman	79%
VIII. Legal	96%
IX. Professional Development	83%

Validity

Validity is defined as “the evaluative judgment of the degree to which empirical evidence and theory rationale support the adequacy and appropriateness of inferences and actions based on test scores” (Messick, 1989). The validity of credentialing tests is based primarily upon content validity or how well the content of an examination reflects the concepts it is intended to measure as outlined in the blueprint.

As described in the item development section, all items are developed according to the established blueprint and approved for the CMRE. Items are then reviewed and edited at various stages of the process by subject matter experts who have been trained in developing high-quality test items. Items are also reviewed after performance statistics are available to ensure that they have adequate statistical performance.

Thus, through extensive subject matter expert involvement in the development of the examination items, and efforts made to control the construct under representation and construct-irrelevant variance, the 2021 CMRE met and/or exceeded testing industry standards with respect to all issues involving its content validity.

Although p-values are an indicator of item difficulty rather than direct evidence in support of validity, the high proportion of items with p-values over 0.90 and the significantly high pass rate is noteworthy, though not unusual for professions with rigorous post-secondary training. As such, it is important that continued efforts be made to ensure that items on the exam target the appropriate level of competence. It is essential that subject matter experts involved throughout the development of the exam have a sound understanding of expected standards for entry-level midwives.

Reliability

Reliability in testing is defined as the degree to which test results are consistent with repeated measurements (Pedhazur & Schmelkin, 1991). Reliability is the consistency of a set of measurements or measuring instrument. In other words, a reliable instrument will consistently make the same judgment regarding a candidate's ability.

The reliability coefficient for CMRE in October was 0.81 (see Table 7). For certification exams such as CMRE, a reliability value above 0.80 is recommended. Despite an acceptable reliability, the significantly high proportion of items with p-values over 0.90 suggest that it remains important to continue the review and revise items with non-functioning distractors as items with low variations in responses are inconsequential to exam reliability.

Candidate Feedback Questionnaire Data

All Candidates were asked to complete a post administration survey following the completion of their examination. Furthermore, candidates who wrote the exam via online proctoring were asked to complete a feedback survey after Part 1 and 2 of the examination. Of the 126 candidates who wrote the CMRE, 72 candidates completed the post administration survey, and 87 candidates completed the Measure Learning-ProctorU survey, yielding a response rate of 57.1% and 73.7% respectively. The results for each survey are summarized in Tables 9 and 10.

Table 9. CMRE Candidate Feedback (October 2021)

Candidate feedback statements	Percentage of candidates
How well did the exam address Midwifery knowledge/competencies?	100% “Very well” or “Fairly well”
How well did the exam address Evidence-based practice?	97.2% “Very well” or “Fairly well”
In terms of timing, did you have...	51.4% “Too much time”; 47.2% “Just enough time”
Would you prefer to...	70.5% “Keep the current morning and afternoon sessions and break timing” 29.5% “Keep morning and afternoon sessions but make each shorter” 12.9% “Complete the exam in one long session with no lunch break”
Did the exam give you an opportunity to demonstrate your midwifery knowledge?	97.2% “Yes”
Was the online exam format adequate? (i.e., easy to navigate, no technological issues, minimal distractions)	87.1% “Yes”
Was the sign in and/or online proctoring experience satisfactory?	80.6% “Yes”
If you were at a testing centre, was the exam facility adequate? (i.e., noise level, lighting, seating arrangements, health and safety precautions)	88.9% “Yes”

*n=72

Table 10. CMRE Candidate ProctorU Feedback Data (October 2021)

Candidate feedback statements	Percentage of candidates who were “Very Satisfied” or “Satisfied”
Where you satisfied with your experience with ProctorU?	82.4%
Please rate your proctor?	89.7%

*n=87 (of which 49 candidates responded after Part 1 and Part 2 of the exam)

CONCLUSION

Based on the information reviewed, there is strong evidence to support the assertion that the CMRE is congruent with the blueprint specifications outlined in the current *Canadian Competencies for Midwives* and hence a valid assessment for entry-level midwives. To ensure validity at the item-writing stage, each item is linked to a specific competency, at least one authoritative reference is provided for the correct answer and items are reviewed and edited at various stages of the process by SMEs who have been trained in developing high-quality test items. Similarly, the reliability value was found to be above the recommended threshold of 0.80 for certification examinations.

Despite strong evidence in support of CMRE's validity and reliability, the high proportion of items with p-values over 0.90 and the significantly high pass rate is notable. Although infrequent such results are not unfounded; professional cohorts in which candidates undergo rigorous post-secondary training can justifiably find exam content to be easy. It is recommended however, that continued efforts be taken to ensure content validity and reduce the number of items with non-functioning distractors.

An Exam Length analysis is currently underway and aims at determining the feasibility of reducing the CMRE length without compromising its psychometric integrity. CMRE candidate feedback does seem to suggest that the current exam length totaling 7 hours could be shortened.

DRAFT

REFERENCES

- American Education Research Association, American Psychological Association & the National Council on Measurement in Education. (2014). *Standards for educational and psychological testing*. Washington, DC: Author.
- Angoff, W. (1971). Scales, norms and equivalent scores. In R. L. Thorndike (Ed.), *Educational measurement*. Washington, DC: American Council.
- Biddle, R. E. (1993). How to set cutoff scores for knowledge tests used in promotion, training, certification, and licensing. *Public Personnel Management*, 22, 63-79.
- Bloom, B. S. (1956). *Taxonomy of educational objectives, handbook I: The cognitive domain*. New York, NY: David McKay.
- Canadian Nurses Association. (2010). *Blueprint for the Canadian Nurse Practitioner Examination: Family/All Ages* (2nd ed.). Ottawa: Author.
- Canadian Nurses Association. (2010). *Canadian nurse practitioner core competency framework*. Ottawa: Author.
- Cizek, G. J. (2012). *Setting Performance Standards: Foundations, Methods and Innovation* (2nd ed.). New York, NY: Routledge.
- Haladyna, T. M. & Rodriguez, M. C. (2013), *Developing and Validating Test Items*. New York, NY: Routledge.
- Institute for Credentialing Excellence (2009). *Certification: The ICE Handbook*. Washington, DC: Author.
- Lane, S., Raymond, M. R., & Haladyna, T. M. (2016) *Handbook of test development* (2nd ed.). New York, NY: Routledge.
- Messick, S. (1989). Validity. In R. L. Linn (Ed.). *Educational measurement* (3rd ed.). New York, NY: American Council on Education and Macmillan.
- Pedhazur, E., & Schmelkin, L. (1991). *Measurement, designs and analysis: An integrated approach*. Hillsdale, NJ: Lawrence Erlbaum and Associate Publishers.