

Canadian Midwifery Registration Examination

Summary Technical Report 2018

Prepared by:

Debra A. (Dallie) Sandilands, Ph.D., EMP Educational Measurement Professionals

For the Canadian Midwifery Regulators Council

January 2019

Table of Contents	
Introduction	1
History of the Examination Development	2
<i>Exam Committee</i>	2
<i>Examination Standards</i>	2
<i>Development of a Valid, Defensible Examination</i>	2
CMRE Blueprint.....	3
Developing the Initial Item Bank.....	3
Pilot.....	3
Validation of Initial Bank Items.....	4
Translation of Initial Bank Items.....	4
Initial Cut-Score Setting.....	4
<i>Policies & Procedures</i>	5
<i>Confidentiality and Security</i>	5
<i>Ongoing Item Bank Maintenance and Development</i>	5
The Canadian Midwifery Registration Examination 2018	7
Item Writing and Item Review Activities in 2018.....	7
<i>Form Construction and Exam Composition in 2018</i>	9
Exam Form Creation.....	9
Pre-Exam Review.....	9
Final Versions of the 2018 Exams.....	10
<i>Administration 2018</i>	12
<i>Scoring and Quality Assurance for Scoring</i>	13
<i>Data Analysis and Review</i>	13
Key Validation and Item Review Process.....	14
<i>Report to Exam Committee</i>	15
References.....	16

Introduction

Each province and territory is responsible for ensuring that all applicants for registration as midwives meet an acceptable level of competence before they begin to practise midwifery in Canada. This level of competence is measured, in part, by the Canadian Midwifery Registration Examination (CMRE).

The CMRE is a national written examination designed to assess Canadian-educated and internationally-educated applicants for midwifery registration to ensure they meet entry-level competency standards set out in the *Canadian Competencies for Midwives*. Its goal is to ensure that midwives gaining registration are competent and safe practitioners providing a consistent standard of care across Canada.

The examination consists of between 210-230 multiple-choice questions. The majority of questions on the exam are case-based. Exam questions come from the CMRE exam databank according to the CMRE Blueprint and the examination content is based on the *Canadian Competencies for Midwives*. In order to represent the range of care a Canadian midwife is expected to provide, slightly more than half of the questions are set in an out-of-hospital setting with the remainder in a hospital setting. Slightly more than half of the questions represent normal midwifery situations and the remainder, abnormal situations.

This technical report begins with a brief overview of the history of the examination development, written primarily by previous psychometric consultants for the CMRE, including Raman K. Grover, Ph.D. and Sharon Mendes-Barnett, Ph.D. The remaining sections describe exam maintenance and development activities during the 2018 calendar year and the construction and administration of the May and October 2018 CMRE administrations. These sections of the report were written primarily by Dallie Sandilands, Ph.D. of EMP Educational Measurement Professionals (“EMP”), the current psychometric consultant for the CMRE.

History of the Examination Development

In 2003, the Canadian Midwifery Regulators Consortium launched the HRSDC-funded National Midwifery Assessment Strategy (NAS) project, an initiative designed to determine the best strategy for assessing the skills and abilities of internationally-educated midwives applying for registration in Canada. NAS research involved consultation with a wide variety of stakeholders. One of its results was a clear directive to create a national registration exam to ensure a consistent evaluation of midwives' competence to practise in Canada. The initial development of the examination took place in 2005 and 2006. More than 45 content experts (mostly practicing midwives) participated in the development activities. The CMRE is now required for midwifery registration in Canada for Canadian graduates of baccalaureate midwifery education programs and internationally-educated applicants in all jurisdictions where legislation permits.

Exam Committee

The Exam Committee was launched initially as the NAS Steering Committee. Committee members are nominated by their provincial regulatory authority. What is now known as the CMRE Committee reports to the Canadian Midwifery Regulators Council (CMRC) and provides guidance to the CMRE Administrator.

Examination Standards

The CMRE development was guided by research into exam standards and the resulting exam adheres as much as is feasible to generally accepted examination standards.

Development of a Valid, Defensible Examination

Standards dictate that a credentialing examination must be based on clearly defined competencies that fit the purpose of the exam. In keeping with this, the exam committee started exam development in 2004 with the creation of a document that detailed the knowledge and skills expected of an entry-level midwife in Canada.

The first step in that process was a comparative analysis of provincial competency documents resulting in a spreadsheet providing a detailed comparison competency-by-competency. The first draft of the *Canadian Competencies for Midwives* document was then created based on common competencies. A final document was approved in May 2005.

CMRE Blueprint

It is critical that a credentialing exam be standardized in format and content. Assessment Strategies Inc. (ASI), a high stakes exam development consulting firm, was contracted to coordinate the initial exam development, including the development of the CMRE blueprint. A written survey sent to exam committee members enabled ASI to identify the relative importance of each competency so that the blueprint could define the number of questions on each competency. Several teleconferences with the exam committee were held to discuss and refine survey results and to make decisions regarding the exam structure. The resulting exam blueprint approved in June 2005 provides a detailed description of the CMRE.

Developing the Initial Item Bank

In order to create as many test items as possible for the CMRE bank, regulators and educators were asked if they would contribute questions from provincial examinations that the CMRE would be replacing. The CMBC, the CMO, and the Alberta MHDC contributed their PLEA written examinations to the process. ASI facilitated the process of revising and creating items in two item-writing workshops in 2005 (one English and one French). The English workshop resulted in 128 potential items for the CMRE, and the French workshop produced 47 items.

Pilot

Due to the small numbers of potential participants in a pilot administration of the CMRE, a qualitative, rather than quantitative, pilot of the exam was conducted in 2005 with approximately 20 registered midwives with a range of midwifery experience. Each participant reviewed half of the more than 250 items that were available to the CMRE. Participants were

asked to answer each item without reference to the answer key, and then to review the answer key and provide written feedback on each item regarding its clarity, currency, and accuracy.

Validation of Initial Bank Items

A four-day in-person exam committee meeting was held in English in November 2005 to review the feedback from the exam pilot and to confirm the exam items. Validation involved reviewing each item and revising them as appropriate. A validation process in March 2007 was held with committee members to ensure that each of the new questions was appropriate for all Canadian jurisdictions, that it was relevant to the competency selected, and that it read clearly. Each item was reviewed and discussed. Revisions were made, as required, to the items and to references.

Translation of Initial Bank Items

ASI's professional translation team translated the items into French, and a session was held in April 2007 to review the final translation.

Initial Cut-Score Setting

It is critical that the cut score set for a credentialing exam be done through careful analysis to determine the level of skills and knowledge needed for safe, entry-level practice. To accomplish this, a standard setting procedure was used to determine an administration specific cut-score (pass score). Based on a recommendation from ASI and further research, the Angoff method was used.

In 2005, six participants (exam committee members and midwives) from four jurisdictions participated in a four-day workshop. Participants reviewed all aspects of each exam item to estimate the probability that an entry-level candidate would get it correct. A provisional cut-score resulted from this workshop. The group also confirmed that cut-scores for the CMRE will range from 70-80%.

The Angoff method was used again in March 2007, when a session was held to identify a standard score for each new item in the bank. All new items were successfully reviewed and assigned an Angoff score.

Policies & Procedures

The NAS Project Coordinator engaged in research to determine the policies and procedures that would best protect the security of the exam, ensure the effectiveness of the exam, and be most fair to exam candidates. The Coordinator drafted policies, procedures, manuals, and forms for review by exam committee members and other relevant stakeholders. This process resulted in the following documents available in both English and French:

- Candidate information sheets posted to the website;
- Proctor Manual, and associated forms;
- Marker Manual, and associated form (not required after 2007).

Confidentiality and Security

The CMRE and all associated materials are protected by copyright law. Stringent measures were in place throughout examination development to protect the examination before, during, and after the administration. All those with access to examination materials sign affidavits of non-disclosure. Examination materials are kept locked and/or password protected when not in use. A USB drive back up of examination materials is also kept in a locked cabinet.

Ongoing Item Bank Maintenance and Development

Having a robust bank of examination items for the CMRE enables midwifery regulators to follow accepted standards for examination construction as outlined in the CMRE blueprint. It allows for the construction of new examination forms that bolster security with enough items to allow for the construction of comparable examination forms. This in turn contributes to fair and more effective decisions over time.

Item writing or item review workshops are held once every year, if possible. The item writing group typically contains registered, practicing midwives from across Canada, with a range of practice experience as well as experience with CMRE item writing. The item writing workshops are facilitated by the CMRE Psychometrician who provides training on how to write items in an effective manner based on evidence-based practice. Once trained, the item writers independently write new items. Newly-written items are discussed and reviewed by other members of the item writing team. After this, they are submitted to a separate group of registered, practicing midwives for validation. Validation involves a thorough review of the items (i.e. editing for grammar/spelling errors, fairness reviews, and extensive content-related reviews

to ensure: items tap the intended competency it has been designed to measure, the correct response is clearly correct and the incorrect response options are clearly incorrect and the items do not contain terminology that may be unfamiliar to English language learners).

Beginning in 2018, item writing and item validation activities were conducted simultaneously in English and French whenever possible. Validated items are then submitted to a translation company for full translation or verification of translations prepared by the midwife item writers and validators. Upon completion of translation or translation verification, the items undergo standard setting where, after receiving training from a psychometrician, a different group of midwives set a cut-score for each item that indicates the probability of correct response by a minimally qualified, entry-level midwife.

Item bank maintenance and development activities that occurred during previous years are described in the respective CMRE Technical Report for each year. Item bank maintenance and development activities that occurred in the current year are described in the following sections of this report.

The Canadian Midwifery Registration Examination 2018

Item Writing and Item Review Activities in 2018

Two dedicated item review sessions were held in Vancouver, BC during 2018: one from February 6 to February 9 and the other from May 2 to May 4, 2018. One English-speaking and one French-speaking item validator and the CMRE psychometrician attended each session. The item validators worked together to review items simultaneously in English and in French. At the end of the two sessions, a total of 82 items (44 case-based and 38 independent items) had been reviewed for midwifery currency and accuracy (including updating item references), psychometric quality, grammar, spelling and item metadata/blueprint mapping.

The main item development event of 2018 was a combined item writing and validation workshop held from October 22 to October 26, 2018 in Vancouver, BC. Five midwife item writers attended all 5 days of the workshop, and five midwife item validators joined the workshop from October 24 to October 26th. Half of the workshop participants spoke English and the remaining half were fluent in English and French. One midwife item validator was also a certified English/French translator. The workshop was led by the CMRE psychometrician.

The primary purpose of the workshop was to create and validate new items for the CMRE. A secondary purpose was to translate as many of the new items as possible and to revise and translate existing CMRE items that had been flagged for review, if time would allow.

Independent item writing was supported during the workshop by both structured (twice a day) and informal (throughout the day and during breaks) group discussion and review of items. One item writer prepared her items simultaneously in English and French and four item writers wrote items in English only. Item validation occurred with 4 validators working in two pairs (one English and one French midwife per pair) to allow discussion of midwifery and psychometric concepts. One French midwife/certified translator worked mainly independently to translate and validate items but could engage with the other validators at any time to discuss specific items or concerns. Item validators could either approve an item as written, revise the item, or defer decision and recommend the item for large group review and revision until consensus was achieved.

During the workshop, 72 new items were written and 11 previously-written items were reviewed and validated. Half of the new items were case-based (in 9 new cases), and the other half were independent items. Table 1 presents a summary of how the session contributed to building the CMRE item bank:

Table 1: Products of Item Writing and Item Validation Workshop

Item status at end of workshop:	Number of Items
<i>Newly-written items:</i>	
Written, validated and translated (ready for standard setting)	24
Written and validated (ready for translation then standard setting)	18
Written (ready for validation, then translation and standard setting)	30
TOTAL:	72
<i>Previously-written items:</i>	
Revised and translated (major revisions may impact item difficulty level therefore previously standard set items require standard setting again)	9
Revised and translated (minor revisions – item can be put back into operational item bank for immediate use on exams)	2
TOTAL:	11

The 72 new items cover CMRE blueprint competency categories shown in Table 2:

Table 2: Blueprint Categories of New Items written at the Workshop

Blueprint Competency:	Number of New Items Written for this Competency
Antepartum	18
Intrapartum	9
Postpartum	5
Newborn	10
General Competencies	12
Education and Counseling	3
Well Woman	6
Professional, Inter-Professional, Legal	4
Professional Development	5

A comprehensive report (providing details of the midwife participants, item writing and validation training provided, setup and work flow during the workshop, and products of the workshop, as well as feedback and recommendations from the participants and the psychometrician) has been provided to the CMRE Committee under separate cover.

The ongoing item validation, translation and standard setting activities flowing from the item writing and validation workshop are planned for early 2019.

Form Construction and Exam Composition in 2018

All CMRE exam forms are based on the CMRE blueprint. To maintain security, the CMRE examination forms are changed after each sitting to the extent allowed by the availability of items in the item bank while still allowing for adequate coverage of the blueprint categories.

To ensure comparability of exam forms over time, an effort is made to keep all aspects of the item balance on the CMRE as consistent as possible. Comparability of the examination forms across administration is essential for fairness. Adherence to the examination blueprint ensures, as much as is reasonably possible, that the examination forms measure the same construct (midwifery proficiency) in the same way (across specified competencies of a specified weight and across specified conditions within specific proportions). Further, comparability is achieved by ensuring that the examination is administered by proctors in a consistent manner and that settings conform to identified standards. Examination form construction and the administration of the May and October 2018 CMRE are outlined here.

Exam Form Creation

The May and October 2018 exam forms were automatically generated using a computerized algorithm designed to select cases and items to match the required blueprint categories. Each form was carefully reviewed by the psychometrician to ensure its overall quality and appropriate mapping to the blueprint prior to forwarding it to a midwife subject matter expert (“SME”) for review prior to finalizing and printing.

Pre-Exam Review

The May and October 2018 exams were administered only in English because no candidate requested a French version. Each exam form was sent for review by an English-speaking SME, a different SME for each exam. The SME reviewers provided feedback for improving the exams (including removing 2 potentially flawed items from the May exam) as well as suggestions for reviewing specific items in the future. The SME’s comments were taken into consideration by the psychometrician when finalizing each exam, and the item bank was updated accordingly.

Final Versions of the 2018 Exams

The following section provides details of the final versions of the May and October 2018 exam forms.

Both the May 2018 and October 2018 CMRE forms were composed of two parts: Part 1 administered before the lunch break and Part 2 administered after the lunch break. Both parts consist of case-based items and independent items. The composition of each exam is shown in the following tables:

Table 3: May 2018 CMRE composition

Part	Case Study	Independent	Total
1	63	47	110
2	62	46	108
Total	125	83	218

Table 4: October 2018 CMRE composition

Part	Case Study	Independent	Total
1	68	48	116
2	62	48	110
Total	130	96	226

Both the May and October forms of the CMRE meet the requirements of tau equivalence. Tau equivalence is achieved in the CMRE by ensuring that all examination forms are constructed from the same blueprint and that items contributing to the content are generated using a common model across item writing sessions. Adherence to the CMRE blueprint competencies for administrations between 2014 and 2018 is shown in Table 5.

Table 5: Adherence to Blueprint Competencies Sept. 2014 to Oct. 2018 Administrations

Competency	Blueprint %	Administration								
		Oct-18	May-18	Oct-17	May-17	Oct-16	May-16	Oct-15	May-15	Sep-14
General	5 to 10	11.50%	11.01%	8.72%	8.26%	8.84%	7.34%	8.00%	8.00%	9.95%
Education and Counseling	5 to 10	5.75%	5.50%	5.50%	7.80%	6.98%	6.42%	7.11%	7.11%	7.24%
Antepartum	25 to 30	23.45%	24.77%	22.94%	25.69%	26.51%	27.52%	24.89%	24.89%	26.24%
Intrapartum	25 to 30	26.11%	25.23%	25.23%	27.52%	29.30%	25.69%	27.11%	27.11%	27.15%
Postpartum	10 to 15	13.27%	14.22%	14.22%	12.39%	12.09%	13.30%	13.78%	13.78%	12.67%
Newborn	10 to 15	12.39%	12.39%	14.22%	11.93%	11.63%	12.84%	11.56%	11.56%	10.41%
Well Woman	1 to 5	3.54%	3.67%	4.13%	2.75%	2.33%	3.67%	4.89%	4.89%	4.07%
Legal	1 to 3	2.21%	1.83%	2.29%	1.38%	1.40%	1.83%	0.89%	0.89%	0.90%
Professional Development	1 to 3	1.77%	1.38%	2.75%	2.29%	0.93%	1.38%	1.78%	1.78%	1.36%

To promote fairness through form comparability, items are selected to maximize consistency in item difficulty (as estimated using the Angoff standard setting method) across administrations and over time. The Angoff score for each of the major competencies and the overall Angoff score is considered in the examination construction. The Angoff scores from May 2010 through to October 2018 are given in Table 6.

Table 6. Angoff scores for major Blueprint competencies, 2010 to 2018 (%)

Administration	General	Antepartum	Intrapartum	Postpartum	Newborn
May 2010	79.40	77.66	76.91	77.25	75.71
Oct 2010	79.07	76.95	77.08	76.93	75.63
May 2011	79.07	76.95	77.08	76.93	75.63
Oct 2011	78.87	77.61	78.13	76.31	75.89
May 2012	78.49	76.95	79.08	76.85	75.86
Aug 2012	78.49	76.95	79.08	76.85	75.86
Oct 2012	78.84	76.64	79.93	77.40	76.74
May 2013	79.60	77.23	79.84	77.94	76.66
Sep 2013	78.56	77.56	79.33	78.10	76.79
May 2014	78.14	77.45	79.08	77.59	76.60
Sep 2014	78.95	77.84	79.43	78.22	76.43
May 2015	78.64	76.89	79.63	77.57	75.90
Oct 2015	79.07	76.89	79.63	77.57	75.90
May 2016	78.56	77.83	80.83	76.75	77.35
Oct 2016	78.52	76.74	80.34	77.79	78.15
May 2017	79.56	76.69	78.83	78.65	77.93
Oct 2017	79.72	78.48	79.87	77.58	78.56
May 2018	78.97	79.33	80.26	77.49	78.68
Oct 2018	78.38	79.31	80.79	77.34	78.10

Administration 2018

A total of 121 candidates completed the CMRE in 2018. Table 7 below summarizes the number of candidates in each sitting.

Table 7. Number of candidates who completed the CMRE in 2018

Administration	Number of Candidates from:						Total Number of Candidates
	BC	AB	MB	SK	ON	QC	
May 2018	21	12	1	1	71	0	106
October 2018	10	2	1	0	2	0	15

Exam administration tasks included the printing and distribution of the CMRE; the updating, printing and distribution of administration/data collection materials; and the printing of score package materials. Given a set of site requirements and guidelines, provincial registrars

arranged for the examination sites and identified exam proctors. To ensure consistency (and comparability) across site locations and administrations over time, a teleconference with proctors was held to review the written protocols outlined in the Proctor Manual, as well as the proctor script.

Scoring and Quality Assurance for Scoring

All candidate optical answer (“bubble sheet”) responses that were received by EMP were scanned by Verita Strategy Group, Inc. and saved to a *Microsoft Excel* file. Verita Strategy Group verified the accuracy of the data records before providing them to EMP for scoring. As a further quality control step, EMP also did random checks of the contents of the data files against the contents of the bubble sheets before undertaking scoring activities. One May 2018 candidate’s bubble sheet had been inadvertently omitted from the package of bubble sheets received by EMP for scanning, and therefore had not been scanned. That candidate’s responses were entered directly into an Excel workbook by the CMRE Exam Coordinator, verified by EMP, and added to the raw data file for scoring and analysis.

After the initial scoring of both exams, the data of candidates whose scores were below or near the cut score were reviewed and compared with their “bubble sheet” responses to ensure responses had been captured accurately. No errors in data capture were identified. As an additional precaution, the responses of the only candidate who failed to achieve a pass score on the May 2018 exam were hand-entered in an Excel spreadsheet and the candidate’s score was calculated in Excel to check the accuracy of the automated scoring. The hand re-scored results matched the results generated through automated scoring 100%.

Data Analysis and Review

Scoring, item analyses and reliability analyses were conducted using the Classical Test Theory (CTT) Package (Willse 2014) of the *R Language and Environment for Statistical Computing* (R Core Team, 2016) as follows:

- Total and subscale (competency) number correct scores and percentages.
- Total and subscale (competency) reliability statistics.
- The Standard Error of Measurement for total scores.
- Total and subscale (competency) Angoff scores (cut scores used to set pass/fail standard).

- Observed item statistics (response option frequencies, mean item difficulty (p) values, standard deviation, item discrimination (point biserial statistic) and test reliability if item deleted).

Key Validation and Item Review Process

The psychometrician met with SMEs after the exams had been scored to review items with unexpected response patterns and items with potentially significant candidate comments, as follows:

Items with unexpected response patterns (such as when more than half of the candidates selected a single incorrect response option) or negative point biserial statistics (negative item discrimination) were identified and reviewed by the psychometrician. Item statistics of items considered to require further investigation were compared to past performance and information about the item in the item bank if available.

After each sitting, the candidates are asked to provide feedback on their examination experience and to comment on specific items on the exam. Candidate comments were summarized by the CMRE Administrator and presented to the psychometrician to review and identify any items that should be reviewed at the key validation and item review meeting.

Following the May 2018 administration, 15 items were flagged for key validation and item review. The reviewers recommended: no scoring change for 13 items (all of which were recommended to be reviewed or update their references before future use); and re-score 2 items accepting two correct responses (and review/revise before future use).

Following the October 2018 administration, 36 items were flagged for key validation and item review (or had been identified during the exam pre-review process by the SME as potentially benefitting from review). The reviewers recommended:

- 15 items: do not change scoring for October 2018 exam; flag each item to be reviewed/revise or provide references before future use;
- 9 items: do not change scoring for October 2018 exam, however, the team made minor revisions to the item;
- 1 item: accept two correct responses for October 2018 exam; flag the item to be reviewed and revised so there is only one correct response and provide references before future use;
- 1 item: review the statistics for this item's performance on future examinations and consider revising at that time;
- 10 items: no action necessary.

Report to Exam Committee

Secure CMRE Committee web/teleconferences were held to review the recommendations of the key validators and item reviewers, and the resulting CMRE candidate scores, statistics, and candidate feedback for both exam sittings in 2018. At both meetings, the CMRE Committee accepted the recommendations and ratified the score results.

CMRE score results were then reported to provincial regulators. Regulators received information regarding their candidates' pass/fail status and general weak areas, as well as summary comparisons with other candidates at this sitting (without candidate names). All score-related correspondence with candidates was via their provincial regulator. Candidates received reports with their pass/fail status; failing candidates also received general feedback of strong and weak areas vis-à-vis the competency categories (ex. intrapartum, newborn, etc.).

References

John T. Willse (2014). CTT: Classical Test Theory Functions. R package version 2.1.
<https://CRAN.R-project.org/package=CTT>

R Core Team (2016). R: A language and environment for statistical computing. R Foundation for
Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.