The Canadian Society of Clinical Perfusion

La Société Canadienne de Perfusion Clinique

cscp.ca

CSCP NATIONAL CERTIFICATION EXAMINATION BLUEPRINT

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Prepared by the Accreditation, Certification, and Examination Committee
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Overview of Examination Blueprinting

When developing any sort of entry-to-practice examination, it is imperative that the examination content aligns to the breadth of actual knowledge, skills, and behaviours that are to be expected of new practitioners in that field. To ensure this is the case, one crucial step in the examination development process is creating a thorough and accurate model of the "content domain" that is to be measured. In line with this need, the competencies outlined in this document serve to delineate the breadth of content domain requirements for newly certified perfusionists in Canada.

Systematically developing and carefully vetting the underlying content domain required of practitioners serves to promote the ultimate reliability and validity of the examination being developed. Reliability in testing is defined as the degree to which examination results are consistent over repeated measurements using the same assessment approach (Pedhazur & Schmelkin, 1991). In other words, a reliable examination will consistently make the same judgment regarding a candidate's ability.

Conversely, 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 examinations is based primarily on content validity (i.e., how well the content of an examination reflects the concept(s) that it is intended to measure, as outlined in the examination blueprint). Indeed, as stated in the Standards for Educational and Psychological Testing:

"The content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance [obtained through the importance rating on the competency rating survey] of the content for credentialing-worthy performance in an occupation or profession. A rationale and evidence should be provided to support the claim that the knowledge or skills being assessed are required [obtained through the necessity rating on the competency rating survey] for credential-worthy performance in that occupation and are consistent with the purpose for which the credentialing program was instituted." (Standard 11.13, pp 181-182).

Examination items are developed according to the established examination blueprint. These items are reviewed and edited at various stages of the item and examination development process by subject matter experts who have been trained to author and review high-quality examination items. Thus, the validity of the final examination is established using a content validation process; and the examination blueprint is designed to ensure that the competencies required of entry-to-practice candidates are adequately assessed within the constraints of the examination itself. This approach ensures that inferences made from candidates' exam scores are valid.

Competency Profile and Examination Blueprint Update Process

Key Stakeholder Feedback

To ensure that a diversity of opinions was considered in the development of the new competencies, the CSCP sought input from key stakeholders identified by their team. Development of the revised competency framework and profile was led by the Competency Profile Revision Steering Committee and a Senior Psychometrician from Meazure Learning. To facilitate feedback, all key stakeholders were asked the following questions:

- How do the current competencies align with the current practice of a safety professional?
- Are there any new emergent areas that should be included in the next generation of competencies?
- Are the any areas currently found in the competencies that should not be included in the next generation of competencies?
- Do you have any other suggestions or recommendations for the Competency Revision Committee?

Key stakeholders' feedback was organized and used to create a draft competency profile. The keys changes are presented in the section below.

Initial validation of the competencies

Re-validation of the competency profile takes place approximately every five years. This involves an initial critical review by an expert committee, followed by consultation with regulators, education programs, practitioners, and service department heads / managers.
The list of competencies was developed and validated in 2015. The CSCP objective is to review and update the CSCP Competency Profile to ensure it remains relevant to the perfusionist profession and represents the competencies and skills required of perfusionists today and for the next five years.

The initial draft of the CSCP Competency Framework was prepared by CSCP. It consisted of the competencies grouped into the following five areas:

1. Safe Work Practice (6 competencies)
2. Planning & Clinical Decision Making (12 competencies)
3. Technical Expertise (26 competencies)
4. Clinical Practice (38 competencies)
5. Professional Responsibilities (25 competencies)

In the second quarter of 2022, the initial draft of the competencies was reviewed by the psychometric team to identify areas for improvement. The ACE Committee and a lead Senior Psychometrician from Meazure Learning then met to discuss potential edits. The ACE Committee completed the editing of the competencies and compiled a final draft.

Changes

The following changes were approved by the Steering Committee and included in the survey:

- Safe Work Practice: two competencies were removed from the competency profile, and one was added.
- Planning and Clinical Decision Making: several competencies were merged under a new competency statement to avoid redundancy and increase clarity.
- Technical Expertise: six competencies were removed because they were perceived as difficult to evaluate in a multiple-choice format. In addition, four competency statements were edited to provide more clarifications.
- Clinical Practice: six competencies were removed because they were perceived as difficult to evaluate or to avoid redundancy with other competency statements. In addition, two competencies were added and eight were edited.
- Professional Responsibilities: 14 competencies were removed from the list; one was added and five were edited.

The draft of the revised competency profile includes 5 competency domains:

1. Safe Work Practice – SWP (5 competencies)
2. Planning & Clinical Decision Making – PCM (11 competencies)
3. Technical Expertise – TE (20 competencies)
4. Clinical Practice – CP (33 competencies)
5. Professional Responsibilities - PR (12 competencies)

This revised draft competency profile was subsequently used for the competency validation survey.

Competency Validation Survey Procedure

Acknowledgements

The revision and validation of the National Entry-Level Competency Profile for Clinical Perfusionists was successfully completed due to the time, effort, and expertise of a dedicated group of key stakeholders and the participation of perfusionists from across the country in completing the survey.

Survey Distribution

After the ACE Committee created the draft of the competencies, an online survey based on the draft was created and administered online by Meazure Learning via the SurveyMonkey platform. The survey was developed in English and translated into French. The survey link was distributed to all CSCP certified perfusionists in Canada. The survey was launched on May 17th, 2022 and closed on June 6th, 2022.

Each survey participant was asked to rate the importance and frequency of each proposed competency deemed to be the most applicable or required in order to be a competent perfusionist in Canada. The data obtained from the competency survey was then reviewed.

Survey Content

The survey was available in French and English. A total of four sections were included on the survey. Section I presented the objective of the survey, while Section II captured demographic information including, but not limited to, language used to serve clients, gender, geographical location, years of experience, current job title/role, and level of education. Section III introduced the purpose of competency profiles and the rating tasks (importance and frequency, respectively). Section IV, the last section of the survey, contained the competencies to be evaluated.

Survey Results

Response Summary

In total, 146 perfusionists completed the survey. However, only 130 perfusionists completed the sociodemographic section, and 113 completed the entire survey (rating for the competencies). Based on this last number of 113, this yields an overall response rate of 43.79%. Of all the participants, 80% (116) completed the survey in English. In the process of data cleaning, incomplete responses (i.e., individuals who answered demographic questions only), were removed from the analyses on the competencies. Thus, the survey data analyses were conducted on a sample of 113 perfusionists.

Competency Ratings

The report summarizes the respondents' ratings of competencies with regards to importance and frequency.

Importance was assessed by asking "How SERIOUS are the CONSEQUENCES if an entry-level perfusionist does not possess this competency?" This was reported on a 4-point scale with (1) Minimally serious, (2) Moderately Serious, (3) Very Serious, and (4) Critically Serious.

Frequency was captured by asking "How OFTEN, on average, is this competency performed by a full-time entry-level perfusionist in practice?". This was reported on a 4-point scale with (1) Occasionally, (2) Frequently, (3) Very Frequently, and (4) Continuously.

For each competency, the average obtained frequency and importance ratings are presented. The average criticality index for each competency was calculated using the following formula:
*Criticality Index = (Importance*2) + Frequency*

The overall average importance rating was 3.16, indicating that most respondents viewed the consequences of lack of competencies as being very serious. Average ratings for the competencies were narrow with means fluctuating between 2.4 and 3.7.

The overall average frequency rating was 2.76, indicating that most respondents viewed the skills outlined by each competency as being applied frequently or very frequently.
All the competencies with an average frequency and/or average importance lower than 2 were flagged for review. Additionally, all the competencies with a criticality index inferior at 7.5 were flagged. In total, 12 competencies were flagged and discussed with the ACE Committee.
All the flagged competencies were reviewed and discussed. All of them were flagged because of their low frequency average, which was expected by the ACE Committee. Some operations are not frequently performed but are extremely important. Uncommon procedures and unsafe situations are not routinely seen in the practice, but those competencies are very important for the practice as well.

Despite their lower frequency average, all the flagged competencies were rated as being important by the participant, which was confirmed by the ACE Committee. Therefore, all those competencies were kept and are part of the final list of competencies.

CSCP Exam Blueprint Process

Statistical Weighting

In total, there are 5 competency categories and 81 competencies required of entry-to-practice perfusionists. Each of the competency categories contains a different number of specific competencies that vary by the level of importance and frequency of use for entry-to-practice perfusionists. To ensure that the examination places an appropriate emphasis on the

knowledge, skills, and behaviors expected of an entry-level perfusionists, competency categories need to be weighted in terms of their relative importance based on the mean importance and frequency for each competency within the category, as represented by a criticality value.

As an initial step in the blueprinting process, statistical weights were calculated based on the mean importance and frequency combined (criticality index), and number of competencies to be assessed in each competency category.

Subject Matter Experts Review

The CSCP ACE Committee, comprised of 6 certified perfusionists from various jurisdictions was established to provide subject matter expert advice in all aspect of the development of the exam (item writing, exam development and validation, pass mark, competency development and blueprint). The committee was recruited to attend two meeting sessions where they were briefed on all stages of the CSCP blueprint development process, provided input on exam blueprint content and respective weightings, and reviewed the recommended exam blueprint before it was presented the CSCP board for approval. The ACE Committee is comprised of the following certified perfusionists:

- Jackie Cavanagh
- Brigitte Chappellaz, Chair
- Tyler Laird
- Andrew McArthur
- Sarah Monfils
- Marlee Parker

Following the review of the competency profile, committee members were provided with the preliminary statistical weights for each competency category. Committee members were asked if any modifications were required to the weighting of the competency categories. After an extensive discussion, the committee recommended minor changes of the blueprint developed with mathematical weights. See the following table for the final weights by competency category.

Table 1. CSCP Mathematical Weights and Final Weights Range by Competency Category

Competency Categories	Mathematical weight	Lower range	Higher range
Safe Work Practice	6%	5%	10%
Planning and Clinical Decision Making	14%	15%	25%
Technical Expertise	24%	20%	30%
Clinical Practice	41%	35%	45%
Professional Responsibilities	14%	5%	10%
	100%		

In addition to the specifications related to the competencies, other variables must be considered during the development of the CSCP examination. These variables are categorized as structural or contextual variables. The committee members reviewed and discussed the weighting of these variables as well.

Structural Variables

Structural variables include those characteristics that determine the general design and appearance of the examination. They define the length of the examination, the expectations for establishing and maintaining the standard, the format/presentation of the examination questions (i.e., multiple-choice format), and any specific functions related to the examination questions (i.e., to measure a competency within the cognitive domain).

1. **Examination Length and Format:** The CSCP will consist of 175 multiple-choice items that meet the blueprint guidelines. With 81 specific competencies (grouped under five competency categories), an examination of this length is sufficient to make both reliable and valid decisions about a candidate's readiness to perform effectively as a Canadian certified perfusionists.

2. **Exam duration:** the exam duration is set at 4hours.

3. **Question Presentation:** The multiple-choice questions will be presented as independent or case/scenario-based questions. Independent questions are stand-alone four-option, multiple choice items that contain all the necessary information to answer the question. Scenario-based questions consist of a set of approximately three to five questions that are associated with a more detailed scenario. The exam should consist of 75-85% independent questions and 15-25% scenario-based questions.

4. **Cognitive Levels:** To ensure that competencies measure different levels of cognitive ability, each question on the CSCP examination should be classified into one of three categories adapted from Bloom's Taxonomy of Cognitive Abilities (Bloom, Engelhart, Furst, Hill, & Kratwohl, 1956). Specifically, each question is categorized into one of the following levels.

    a. **Knowledge/Comprehension**
    This level combines the ability to recall previously learned material and to understand its meaning. It includes such mental abilities as knowing and understanding definitions, facts and principles, and interpreting data.
    b. **Application**
    This level refers to the ability to apply knowledge and learning to new or practical situations.
    c. **Critical Thinking**
    The third level deals with higher-level thinking processes. It includes the ability to judge the relevance of data, to deal with abstractions and to solve problems. The CSCP candidate should be able to identify cause-and-effect relationships, distinguish between relevant and irrelevant data, formulate valid conclusions, and make judgments concerning the needs of clients.

Based on these definitions, the recommended distribution of questions by cognitive level is provided in the Table below.

Table 2. Distribution of questions by cognitive level

Taxonomy Level	Mid-range	Lower range	Higher range
Knowledge	25%	20%	30%
Application	45%	40%	50%
Critical Thinking	30%	25%	35%

5. **Standard Setting:** The standard setting cut score or pass mark is set in reference to the content and the difficulty of the examination questions. The pass mark should be set by a panel of content experts from across Canada using the modified-Angoff standard setting method. Based on this process, an appropriate pass mark is set at a minimum performance level expected of a competent entry-level registered perfusionists.

Contextual Variables

Contextual variables qualify the content domains by specifying the context in which the exam questions will be set. Although it is recommended that the CSCP represent as closely as possible the recommended distribution for each of the following categories, contextual variable will not be used when developing the exam (except for the patient's age).

1. **Patient's Sex and Gender**: Patient sex and gender will be monitored by the ACE Committee to ensure face validity of the CSCP National Exam.
2. **Patient's Age**: 10-20% of the questions of the exam should be associated with patients aged between 0-18 years old. 80-90% of the questions of the exam should be associated with patients aged 19 years old and older.
3. **Health Situation:** Patient health situations will reflect the varied population encountered by the entry-level clinical perfusionist.
4. **Patient Culture:** The CSCP National Exam reflects awareness, sensitivity, and respect for cultural values, beliefs, and practices. Cultural issues are integrated without introducing cultural stereotypes.
5. **Environment:** Characteristics of the health care environment are specified only when such information is required to provide guidance to the candidate.

Conclusion

The CSCP Blueprint is the product of a collaborative effort between Meazure Learning and the CSCP ACE Committee, comprised of subject matter experts from various jurisdictions across Canada. This process has resulted in a compilation of the competencies required of the proficient entry-level perfusionist and of the guidelines that determined how the competencies will be assessed on the CSCP examination. A summary of these guidelines can be found in Appendix C in the *Summary Chart Guidelines*.

It is recognized that the role and scope of practice of perfusionists within Canada may continue to evolve over time. As this occurs, the exam blueprint developmental process (i.e., both the competencies and the test development guidelines) may require revisions to accurately reflects the scope of practice, and the roles and responsibilities of the entry-level perfusionist.

Final Blueprint

Number of Questions	175 multiple choice items
Time	4 hours

Question Types	Lower Range	Higher Range
Independent	75%	85%
Case-based	15%	25%

Competency Categories	Lower Range	Higher Range
Safe Work Practice – SWP	5%	10%
Planning & Clinical Decision Making – PCM	15%	25%
Technical Expertise – TE	20%	30%
Clinical Practice – CP	35%	45%
Professional Responsibilities - PR	5%	10%

Taxonomy Level	Lower Range	Higher Range
Knowledge	20%	30%
Application	40%	50%
Critical Thinking	25%	35%

Patient-age	Lower Range	Higher Range
0-18 years	10%	20%
19 + years	80%	90%