

2019

Technical Report

Assessment of Clinical Skills



Contents

Purpose of the NDEB Examinations.....	6
NDEB Certification.....	6
The Certification Process - Current Examinations for Graduates of Accredited Programs...8	
<i>Written Examination</i>	<i>8</i>
<i>Objective Structured Clinical Examination (OSCE).....</i>	<i>8</i>
Equivalency Process - Current Examinations for Graduates of Non-accredited Programs .9	
<i>Assessment of Fundamental Knowledge (AFK).....</i>	<i>10</i>
<i>Assessment of Clinical Skills (ACS)</i>	<i>10</i>
<i>Assessment of Clinical Judgement (ACJ)</i>	<i>10</i>
Test Construction Process and Validity Evidence	12
<i>Staff Support</i>	<i>12</i>
<i>Chief Examiner/Assistant Chief Examiner(s)</i>	<i>12</i>
<i>Executive Director and Registrar</i>	<i>12</i>
<i>NDEB staff</i>	<i>12</i>
<i>Selection of Assessment Centres.....</i>	<i>12</i>
<i>Requirement Selection</i>	<i>13</i>
<i>ACS Requirements - Blueprint</i>	<i>13</i>
<i>Selection of Daily Requirements.....</i>	<i>13</i>
<i>Preparation and Administration</i>	<i>13</i>
<i>Evaluation of ACS Materials.....</i>	<i>14</i>
Test Validity and Reliability	14
<i>Documentation</i>	<i>15</i>
<i>NDEB By-Laws.....</i>	<i>15</i>
<i>Competencies for a Beginning Dental Practitioner in Canada (Appendix B).....</i>	<i>15</i>
<i>Assessment of Clinical Skills Protocol.....</i>	<i>15</i>
<i>ACS Examiner's Manual</i>	<i>16</i>
<i>NDEB website</i>	<i>16</i>
<i>ACS Orientation Video</i>	<i>16</i>

Validity and Reliability Evidence Collected and Evaluated during the Administration of the ACS 17

Personnel 17
ACS Supervisors and Assistant Supervisors 17
Invigilators (2-15) 17
Registered Dental Assistants (2-4) 18
NDEB Staff (1-2) 18
Assessment Coordinator (1) 18
Equipment Technician (1-2) 18
Facility Monitor (1-3) 18
Training and Calibration prior to the ACS 18
Set Up and Verification 18
Participant Registration, Orientation and Set up 19
During the ACS 19

Validity and Reliability Evidence Collected and Evaluated during the Evaluation Session 21

Personnel 21
Chief Examiner and Assistant Chief Examiner(s) 21
Facilitators 21
Evaluators 21
NDEB staff 21
Training and Calibration 22
Calibration of Facilitators 22
Calibrations of Evaluators 22
The Evaluation Process 22
Dental Dam Requirement – Graded on site at the ACS 22
Infection control and safety – Graded on site at the ACS 22
Typodont Requirements – Graded at Evaluation Session 23
Record of Procedure – Graded at Evaluation Session 23
Grading Process 24
Restorative and Endodontic Requirement Grading Descriptions 24
Grading of Dental Dam Requirement 24
Grading of Infection Control and Safety Requirement 25
Grading of Record of Procedures Requirement 25
Computer Support 26
Reporting Results 26

Partial Example of a Participant's Report of Results	27
Appeals	30
Credential Verification	31
Examinee Information.....	31
Administration	31
On-site Security	31
Exam Security.....	31
Copyright	32
Pass Rate Statistics.....	33
Historical Participant Numbers.....	33
Results by Requirement	34
Appendix A – Key Supporting References	36
Appendix B – Competencies for a Beginning Dental Practitioner in Canada	37
Appendix C – Publications	40

Introduction

Organizations who administer high-stakes examinations must be concerned with validity, reliability, and fairness because these measures are required in making pass/fail decisions affecting candidates for licensure or certification. Fairness to examinees and protection of the public are the foremost concerns for the NDEB and the NDEB has an obligation to provide the highest quality examination program possible.

This Technical Report is a summary of the processes followed by the NDEB to develop, administer, and score the Assessment of Clinical Skills (ACS) administered in 2019. It provides a summary of the information needed to support the validity and reliability of the examination. For additional detailed information, key references are included in Appendix A. Any background information is included to assist in understanding the development of the NDEB's examination processes.

This report serves as a reference for the members of the NDEB Examinations Committee, NDEB Board, and Provincial Dental Regulatory Authorities (DRAs). The processes described in this report may differ from those used in other years.

Part A – NDEB Certification

Purpose of the NDEB Examinations

The purpose of the NDEB is, as per the Act of Parliament, to establish qualifying conditions for a single national certificate of qualification for general practitioner dentists. This purpose is restated in the NDEB's mission found on the corporate website.

The NDEB is responsible for developing, administering, and scoring the examinations. To do this, the NDEB appoints an Examinations Committee who, along with the Chief Examiners and staff, oversee all aspects of the examination processes. The responsibilities of the Examinations Committee are outlined in the NDEB By-laws.

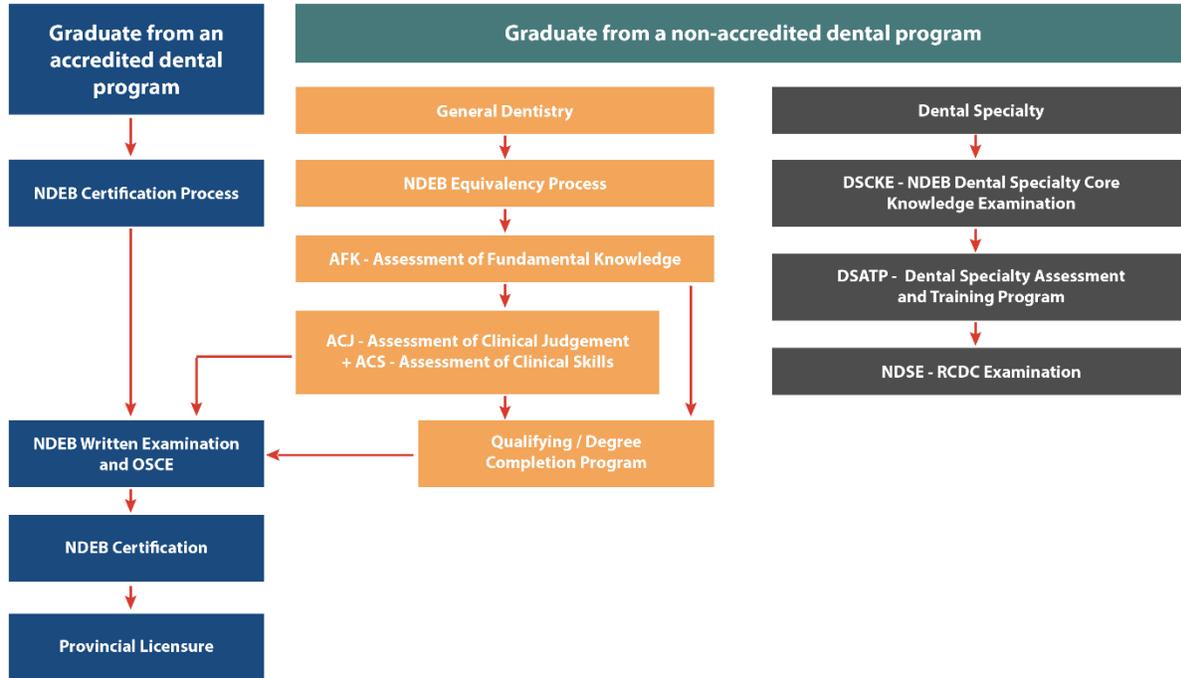
NDEB Certification

This section of the Technical Report is intended to provide an overview of all the examinations required to obtain an NDEB certificate.

Successful completion of the NDEB's Written Examination and Objective Structured Clinical Examination (OSCE) is one of the conditions for receiving a licence to practice dentistry in Canada. A candidate, as defined under the NDEB By-laws, is granted a certificate upon presentation of the following documentation:

- Proper application to the Board which includes, if applicable, providing evidence to the satisfaction of the Board that the Candidate is considered in good standing with all Dental Licensing/Regulatory Authorities in all jurisdictions in which the Candidate has been or is currently registered or licensed.
- Evidence, to the satisfaction of the Board, of graduation from an Accredited Program or successful completion of the Board Equivalency Process.
- Evidence, to the satisfaction of the Board, that the person has passed the Written Examination described in By-law 14.00 and the OSCE described in By-law 15.00.

The following diagram illustrates the pathways to obtaining NDEB certification and licensure as a dentist in Canada.



The Certification Process - Current Examinations for Graduates of Accredited Programs¹

Written Examination

The purpose of the Written Examination is to assess the competence of beginning dental practitioners in Canada through multiple-choice questions. The content categories that form the blueprint for the Written Examination are based on the 47 Competencies for beginning dental practitioners in Canada (Appendix B). The Written Examination assesses the following constructs: basic science knowledge and applied clinical science knowledge and judgement, including diagnosis, treatment planning, prognosis, treatment methods, and clinical decision-making.

The Written Examination consists of two books, each with 150 single-answer multiple-choice questions. Each book is given in a 2.5-hour (150-minute) examination session. The sessions are held in the morning and afternoon of one day at established examination centres. Generally, candidates complete the Written Examination with time remaining. Consequently, there is no evidence that the Written Examination is a speeded test.

Resources for the Written Examination can be found on the NDEB website and include:

- the Examination format
- the Examination Protocol including the blueprint, schedule, and exam regulations
- information on scoring and appeals
- a list of reference texts commonly used in Canadian dental programs

Approximately 3,500 questions, including many used on past examinations are also available on the NDEB website (www.ndeb-bned.ca). In 2018, the Examinations Committee voted to no longer provide new released questions annually.

Objective Structured Clinical Examination (OSCE)

The purpose of the OSCE is to assess the competence of beginning dental practitioners in Canada through multiple-choice formats. The content categories that form the blueprint for the OSCE are based on the 47 Competencies for beginning dental practitioners in Canada (Appendix B). The OSCE is designed to test aspects of clinical judgement, including diagnosis, treatment planning, prognosis, treatment methods, and clinical decision-making.

The OSCE is a station-type examination administered in two half-day sessions the day after the Written Examination. OSCE stations generally have two questions and require the candidate to review the information supplied (e.g. patient history, photographs, radiographic images, casts, models) and answer multiple response type questions. Each question has up to 15 answer

¹ Accredited programs are programs recognized by the Commission on Dental Accreditation of Canada and include the 10 Canadian dental programs and programs in the United States, Australia, Ireland, and New Zealand that are recognized through reciprocity agreements with accreditation agencies in those countries.

options and one or more correct answer(s). Some stations may require the candidate to review the information supplied and write an acceptable prescription for a medication commonly prescribed by general dentists in Canada. Candidates have five minutes at each station to answer the questions. After five minutes, the candidates move to the next station.

Resources for the OSCE can be found on the NDEB website and include:

- the Examination format
- the Examination Protocol including the blueprint, schedule, and exam regulations
- information on scoring and appeals
- a list of reference texts commonly used in Canadian dental programs
- the OSCE frameworks

Equivalency Process - Current Examinations for Graduates of Non-accredited Programs²

Graduates of non-accredited dental programs are required to complete the NDEB Equivalency Process or a minimum two-year Degree Completion Program prior to being eligible to participate in the Certification Process. The Equivalency Process comprises three examinations. Successful completion of the three examinations demonstrates that an individual is equivalent to a graduate of an accredited dental program.

Prior to taking the examinations, applicants are encouraged to take the on-line self-assessment available on the NDEB website. The self-assessment is 100 single-answer multiple-choice questions. Guidance is provided to individuals based on their self-assessment results. Additionally, applicants must provide a series of documents to the NDEB demonstrating their successful completion of a dental program. The NDEB performs an in-depth credential verification for each applicant prior to approving the applicant as a participant in the NDEB Equivalency Process.

² Non-accredited dental programs are international dental programs that award a BDS/DDS/DMD degree and are not recognized by the Commission on Dental Accreditation of Canada through reciprocity agreements.

Assessment of Fundamental Knowledge (AFK)

The purpose of the AFK is to test biomedical science and applied clinical science knowledge. The AFK serves a dual purpose; it is both an admission requirement for Canadian Degree Completion Programs and one of the examinations in the Equivalency Process. A passing grade is required before a participant can continue to the other examinations in the Equivalency Process.

The AFK consists of two books, each with 150 multiple-choice questions. Each book is given in a three-hour session. The sessions are held in the morning and afternoon of a single day.

Resources for the AFK are found on the NDEB website and include:

- the Assessment format
- the Assessment Protocol including the blueprint, schedule, and exam regulations
- information on scoring and appeals
- a list of reference texts commonly used in Canadian dental programs
- NDEB released questions

Assessment of Clinical Skills (ACS)

The purpose of the ACS is to assess clinical competence. During the two-day ACS, participants perform 12 dental procedures on simulated patients (manikins) in a clinical setting. Procedures must be performed as if working with real patients. Participants are required to use their judgement and follow accepted clinical care guidelines/standards.

Resources for the ACS are found on the NDEB website and include:

- the Assessment format
- the Assessment Protocol including the blueprint, schedule, and exam regulations
- information on scoring and appeals
- handpiece connection information
- frequently asked questions specific to the ACS
- an orientation video

Assessment of Clinical Judgement (ACJ)

The purpose of the ACJ is to assess the participant's ability to formulate a diagnosis and make clinical decisions, as well as evaluate the participant's knowledge in oral radiology and ability to make a radiographic interpretation and diagnosis.

The ACJ is a computer-based test consisting in 120-150 single and multi-answer multiple-choice questions given in a 5-hour session. There is one scheduled 30-minute break during the examination. Questions may include patient histories, dental charts, and radiographs and photographs of patients of all ages. Although most questions are standalone questions, a number of questions are grouped into cases. The cases are interspersed throughout the standalone questions. The ACJ was administered electronically by a third party in May and November. A small administration of the ACJ was offered on paper in August. The examination consisted of three books as described in the August 2019 ACJ Protocol.

Resources for the ACJ can be found on the NDEB website and include:

- the Assessment format
- the Assessment Protocol including the blueprint, schedule, and exam regulations
- information on scoring and appeals
- a list of reference texts commonly used in Canadian dental programs
- ACJ frameworks

Part B – Development

Test Construction Process and Validity Evidence

Staff Support

The following is a summary of the staff roles involved in the ACS test construction and production process.

Chief Examiner/Assistant Chief Examiner(s)

The Chief Examiner and Assistant Chief Examiner(s), in consultation with the Executive Director and Registrar and other NDEB staff, are responsible for overseeing the preparations for the ACS administration including:

- appointing appropriate personnel
- assisting with communications between the NDEB and personnel for each site
- selecting the specific teeth used in the ACS
- preparing typodont teeth for ACS restorations
- drafting ACS documents
- preparing training and calibration documents
- directing staff on the preparation and assembly of materials
- assuring uniformity of the typodont setups

Executive Director and Registrar

The Executive Director and Registrar is responsible for staff supervision and the implementation of all policies approved by the Board to ensure the process operates efficiently and effectively.

NDEB staff

In consultation with the Executive Director, NDEB staff manage the operational delivery of the ACS. This includes corresponding with the coordinators, supervisors, and examiners, production and translation of the examination documents, preparation of examination materials and supplies, and making arrangements with hosting institutions.

All staff is responsible for carrying out directives from the Examinations Committee as approved by the Board.

Selection of Assessment Centres

The ACS is held in June and December at participating Faculties of Dentistry across Canada. A minimum of 25 participants must register for a location to establish an ACS centre at that

location. At least one centre must be able to accommodate participants who request to take the ACS in French.

At least nine months prior to the ACS, a letter is sent to the Dean/Director of nine Canadian Faculties of Dentistry requesting that their school host an ACS session. This letter provides detailed information regarding both the physical and human resources required to host a session and the financial arrangements.

Requirement Selection

The ACS evaluates a participant's clinical skills through the completion of dental procedures (requirements) on a simulated patient (manikin). The NDEB Examinations Committee reviews and revises the ACS requirements annually and recommends the requirements to the Board as part of a protocol.

ACS Requirements - Blueprint

- Class II amalgam preparation
- Class III composite resin preparation
- Full metal crown preparation
- Metal-ceramic (porcelain fused to metal) crown preparation
- Endodontic access preparation
- Direct Class II composite resin restoration on a pre-prepared* tooth
- Direct Class IV composite resin restoration on a pre-prepared* tooth
- Class II amalgam restoration on a pre-prepared* tooth
- Provisional crown restoration for a pre-prepared metal-ceramic (porcelain fused to metal) crown preparation. A study model (one arch of a typodont) containing an unprepared assessment tooth is provided.
- Dental dam application
- Record keeping
- Infection control and safety

Selection of Daily Requirements

The Chief and Assistant Chief Examiners select the teeth for the Day 1 and Day 2 typodont requirements, the tooth and restorative procedure for the dental dam requirement, and the procedures for the record of procedure requirement for each administration.

Preparation and Administration

The NDEB performed an in-depth review of commercially available manikins and typodont products prior to deciding to use the Nissin system distributed in North America by Kilgore International. The NDEB determined that this product simulates actual patient conditions better

than other available systems. Simulation and technology are periodically reviewed to ensure that the examination reflects current practice.

Typodont systems are regularly reviewed so that advances in simulations can be integrated into the ACS.

In the ACS protocol, participants are supplied detailed information on all the simulated teeth used in the examination. Kilgore International sells teeth to individuals, allowing participants to become familiar with the simulated teeth used in the ACS. For some of the requirements, Nissin manufactures custom teeth for the NDEB, and these are only available to the NDEB. However, standard versions of these custom teeth are available for participants to purchase.

Evaluation of ACS Materials

To ensure calibration, several ACS teeth are cut in the axial and sagittal planes. They are made available to the examiners at the Evaluation Session and for the Appeals Committee meetings.

Each examinee receives brand new typodonts for the ACS. The typodonts are individually reviewed by the Chief Examiner or the Assistant Chief Examiner(s). The position, alignment, occlusion, and tightness of the assessment teeth are checked.

Test Validity and Reliability

Evidence of validity for a certification examination's scores and decision is essential to allow a program to make confident inferences about examinee results. Validity studies serve the purpose to demonstrate that the content is associated with job-related practice and that processes used to create the examination, as well as the results obtained from examinees, are consistent with the professional domain of interest and the goals of the program. The NDEB has conducted several studies (internal and published) that support validity claims for the examination program.

Additionally, evidence of reliability for scores and decisions is vital to an examination because it is a measure of the consistency with which examinees are evaluated and scored. Evidence of reliability asserts that the outcomes of the examination – scores and decisions – can be reproduced over repeated administrations.

The examinations in the Equivalency Process are built to be consistent with the "Competencies for a Beginning Dental Practitioner in Canada" (Appendix B). The content categories reflect both the educational programs and the demands of practice. The content blueprint of the Assessment of Clinical Skills (ACS) was established on the direction of the Canadian Dental Regulatory Authorities and is identical to the blueprint of the Assessment of Clinical Skills administered by l'Ordre des dentistes du Québec from 2001 to 2010. The blueprint was approved by a joint Examinations Committee meeting of the NDEB and l'ODQ and is shown as Requirement Selection. The blueprint is under revision following the 2015 Task Analysis.

Documentation

Evidence of test validity is collected through multiple means, one of which is the documentation of development and administration procedures. The NDEB makes these documents publicly available. Only confidential material or material that could jeopardize the integrity of the examination is retained internally. These documents are also updated frequently (generally on an annual basis) to reflect the most recent information.

Publications and external evidence reinforcing the validity and reliability of NDEB processes can be found in Appendix A and C.

To support the various sources of validity and reliability evidence, NDEB produces the following documents:

NDEB By-Laws

The NDEB By-laws contain a number of sections related to the NDEB's examination programs. Examples of relevant information include:

- certification eligibility
- the Board's certification and equivalency processes
- examinations
- conduct and appeals policies
- Terms of Reference for various examination-related committees
- test Accommodations
- misconduct

The By-Laws are available free of charge on NDEB's website (www.ndeb-bned.ca).

Competencies for a Beginning Dental Practitioner in Canada (Appendix B)

This document outlines the body of knowledge that is assessed by the NDEB's examinations and assessments. A clearly outlined body of knowledge is key to establishing the content validity of examinations by providing a link between practice and the examination. This document is available in English and French on NDEB's website (www.ndeb-bned.ca).

Assessment of Clinical Skills Protocol

The Assessment of Clinical Skills (ACS) Protocol contains all the information the participant needs to prepare for the ACS. In addition to providing logistical information, this document is meant to reduce construct irrelevant variance related to testing. Participants acquire advance information on examination content, instructions, and other procedures. At a high level, the ACS Protocol contains the following information:

- Schedule
- Instructions
- Requirements
- Equipment, Instruments and Supplies

- Regulations
- Misconduct
- Grading Requirements
- Results
- Grading Criteria
- Appeals
- Repeats

ACS Examiner's Manual

The ACS Examiner's Manual is an internal document provided to examiners that outlines the roles of the individuals involved in the ACS administration and Evaluation Session and provides information about calibration and grading.

NDEB website

The NDEB website, www.ndeb-bned.ca, provides information on the cost, times and locations of the ACS. The ACS Protocol is posted on the website and includes the list of requirements and details of the criteria used in the evaluation process of the requirements and grade derivation grids. Details regarding the clinic equipment at each centre is also available on the website. These details include a written description and photographs of the handpiece coupler compatible with the school's equipment.

The quality and comprehensiveness of the information on the website about the ACS represent best practices in transparency and accountability. The objective information available ensures fairness in allowing participants to prepare and practice the requirements. The website is thorough and available to interested individuals prior to application.

ACS Orientation Video

Examinees are provided with a link to an orientation video for the ACS ahead of the examination. The video covers what to expect on test day. The video is hosted on the NDEB website, as well as the NDEB's YouTube and Vimeo channels.

Part C – Administration

Validity and Reliability Evidence Collected and Evaluated during the Administration of the ACS

Personnel

The following personnel are appointed to be present at each ACS centre.

ACS Supervisors and Assistant Supervisors

These are examiners appointed by the Board on the recommendation of a DRA or Faculty of Dentistry. They have advanced training in the ACS process and procedures. These individuals are calibrated and responsible for:

- ensuring appropriate training and calibration of invigilators.
- set up and security of ACS materials.
- ensuring compliance with standardized ACS protocols.
- addressing any onsite disputes on process.
- ensuring independent invigilator assessments of infection control and dental dam requirements.
- confirming the evaluation of the onsite assessments of infection control and dental dam requirements.

Invigilators (2-15)

These are examiners appointed by the Board on the recommendation of a DRA or Faculty of Dentistry. Invigilators are responsible for setting up the clinic, monitoring participant compliance during the ACS, reporting misconduct, and evaluating infection control and dental dam placements based on the grading criteria.

Registered Dental Assistants (2-4)

The host institution recommends dental assistants. They have knowledge of the clinic and operations, provide access to Faculty sites, obtain and monitor Faculty equipment, and support supervisors and invigilators in their ACS functions. Dental assistants do not provide dental assisting services to any of the participants. Dental assistants are trained and delegated tasks by the supervisors.

NDEB Staff (1-2)

NDEB staff members are onsite to provide support, ensure compliance with NDEB standardized processes and procedures, and secure ACS material and equipment during transport to and from NDEB offices in Ottawa.

Assessment Coordinator (1)

The assessment coordinator is normally a clinical Faculty member, often the Faculty of Dentistry Clinic Director. They provide onsite pre-ACS logistical support, provide general support to the supervisors, and monitor the use of Faculty supplies and personnel.

Equipment Technician (1-2)

An equipment technician is provided by the Faculty of Dentistry to calibrate equipment prior to the ACS, assist participants in the initial set up, address any malfunctions during the examination, and provide general support to the supervisors.

Facility Monitor (1-3)

One or more facility monitors are recommended by the Faculty of Dentistry. Their responsibilities include monitoring the entrances and common spaces to ensure only participants are in the examination area and notifying the supervisor or assistant supervisor of any misconduct that is witnessed in the common areas.

Training and Calibration prior to the ACS

Each category of personnel receives specific written instructions before the ACS. On the day prior to the examination, the supervisor and assistant supervisor conduct training and calibration sessions for invigilators and school staff. Strict adherence to the ACS schedule and procedures for uniform administration of the ACS are emphasized. Assessment coordinators review any unique features of their clinic's equipment and discuss safety and emergency protocols.

Set Up and Verification

On the day prior to the ACS, all personnel assist in setting up the clinic for the examination. Participants are assigned to specific clinical operatories based on seating charts prepared by

NDEB staff. ACS personnel verify that the typodont ID number on each typodont matches the operatory assignment map and that the appropriate participant photo ID card is visible in each operatory. Supervisors and invigilators verify the uniform setup of each manikin, torso and typodont, including the occlusion. The opening of the typodont is adjusted using a gauge. Each participant's ID card is signed by an invigilator or supervisor during setup to confirm there are no irregularities in the typodont, such as damage to the gingiva.

Participant Registration, Orientation and Set up

On the morning of Day 1, participants are required to provide government-issued photo identification for comparison to material sent to the NDEB during the application process.

Participants receive a short orientation session on clinic equipment and specific emergency procedures before entering the clinic.

At the time indicated in the ACS schedule, participants are directed to their pre-assigned operatories in the clinic. All ACS personnel are available to assist participants in setting up their equipment and ensuring that equipment is in working order. The equipment technician addresses any technical issues. During this time, participants are also able to prepare the teeth assigned for practice.

During the ACS

At the indicated time, the list of requirements for the day is distributed and the ACS begins.

The infection control requirement is observed and graded by invigilators and supervisors throughout the two-day examination. Violations are noted and recorded on forms pre-printed for each participant. Final grades for this requirement are tabulated after the ACS is completed.

The dental dam requirement is performed at designated operatories separate from the participants' assigned operatories. Each participant is pre-assigned a time during the two-day examination. Participants are advised of their assigned day and time on their ID Card.

The record of procedures and the provisional crown restoration requirements are performed on the morning of Day 2. The record of procedures requirement must be submitted by 9:00 AM. The provisional crown requirement must be submitted by 11:30 AM or 12:15 PM, depending on the participant's dental dam time. Once collected, an invigilator will sign off that requirement was submitted.

Participants are given a study model to take the impression for the provisional crown preparation requirement. Once completed, the participant places the provisional crown in a clear crown container. Each provisional is inspected for breaks by one or two invigilators prior to packing. The clear crown containers are then packed securely for shipping to the NDEB office.

Very few defects with typodont teeth are found. If a void is found on an axial surface, a pre-printed sticker is placed on the participant's Notification Card to alert evaluators to the manufacturing defect. If a void is found on a preparation margin, the participant can choose to

have a sticker placed on the Notification Card and continue working or replace the tooth and receive a time extension.

Participants who experience an undue delay because of clinic equipment failures or other circumstances are given a time extension by a supervisor or invigilator. Time delays are recorded on the Time Delay Forms. Time extensions are granted for cumulative delays of five minutes or more.

Following the end of day procedures on Day 2, all typodonts and documents are boxed and shipped to Ottawa for grading.

Part D - Scoring

Validity and Reliability Evidence Collected and Evaluated during the Evaluation Session

Personnel

Chief Examiner and Assistant Chief Examiner(s)

The Chief Examiner and Assistant Chief Examiners(s) are responsible for:

- ensuring appropriate personnel are appointed for the Evaluation Session
- preparing all training and calibration material including PowerPoint presentations and example requirements for calibration,
- drafting documents used in evaluation procedures
- directing the typodont and document setup for evaluation and
- providing direction to facilitators and evaluators throughout the evaluation session.

Facilitators

These are examiners appointed by the Board on the recommendation of a DRA or Faculty of Dentistry. Two or more facilitators are appointed for each requirement. They direct the calibration session for their assigned requirement, review requirements and grades in cases where evaluators have not fully agreed on grades or locations to determine the appropriate final grades, and coordinate discussion between evaluators on any issues that arise during the Evaluation Session.

Evaluators

These are examiners appointed by the Board on the recommendation of a DRA or Faculty of Dentistry. Sufficient evaluators are appointed for each requirement. They evaluate the required procedures performed by the participants and assign grades based on the criteria listed in the ACS Protocol.

NDEB staff

Full-time staff members of the NDEB are onsite to secure ACS material and equipment during transport to and from the NDEB offices in Ottawa, set up and take down the calibration and evaluation material, provide tablet computer support, and enter participant grades into the evaluation system for requirements evaluated onsite during ACS.

Training and Calibration

Calibration of Facilitators

The calibration of facilitators takes place the day prior to the Evaluation Session. Chief Examiners and facilitators review the grading criteria for the teeth selected for the ACS and discuss modifications to the grading criteria as needed. The facilitators for each requirement select six typodonts from the ACS typodonts that represent different levels of performance for their requirement. First, they individually grade their requirement for each of the six typodonts. Then they discuss their grades to reach an agreement of the final grade for each typodont. Facilitators spend two to three hours in calibration.

Calibrations of Evaluators

The Evaluation Session starts with an introduction to the Equivalency Process and purpose and administration of the ACS.

Evaluators meet with the facilitators to discuss the grading criteria for their requirement. ACS teeth with caries cut in the axial and sagittal planes are reviewed for the Class III Composite Resin Preparation and the Class II Amalgam Preparation Requirements. Evaluators then proceed to practice grading the six typodonts selected by the facilitators. They are required to agree on five out of six evaluations to proceed to the evaluation process. Facilitators and evaluators spend two to three hours in calibration and practice grading activities.

The Evaluation Process

Dental Dam Requirement – Graded on site at the ACS

Two invigilators independently grade each dental dam placement. A supervisor performs a third independent grading of the dental dam placement to confirm or facilitate the two invigilator grades. In case of disagreement, a discussion takes place. The final grade is achieved by consensus. The dental dam requirement grades are entered in MobileLink by staff at the Evaluation Session.

Infection control and safety – Graded on site at the ACS

Infection control and safety are monitored on site by the invigilators, assistant supervisor, and supervisor. Violations are documented on the Infection Control Grading sheets. The Infection control and safety requirement grades are entered in MobileLink by staff at the Evaluation Session.

Typodont Requirements – Graded at Evaluation Session

Typodonts are arranged numerically by participant number with no indication of the participant name or examination centre on the material.

The evaluation is performed using tablet computers. An orientation on the use of tablet computers for recording evaluations is provided. Each evaluator has the exclusive use of a tablet computer for grading.

Facilitators are given instruction in the facilitation process and in the use of the tablet computers for facilitation procedures.

Each requirement is graded independently by two evaluators. If there is any disagreement in the grade or the errors selected between the two evaluations, the facilitators' tablet computer will show that facilitation is needed. A facilitator reviews the typodont and the evaluations and assigns the appropriate grade and error. Facilitators are advised to look for patterns of grading discrepancies amongst the evaluators and if such patterns are noted, to revisit the calibration materials with the evaluators involved.

Assessment teeth are evaluated in the typodonts. On rare occasions, a tooth may be unscrewed and screwed back in the typodont to confirm the evaluation.

Pictures of typodonts may be taken particularly for debris that may be dislodged.

Record of Procedure – Graded at Evaluation Session

The written Record of Procedure pages are sorted numerically and independently graded by two separate evaluators. Discrepancies in grading are reviewed and final grades assigned by Facilitators. The Record of Procedure requirement grades are entered in MobileLink by staff at the Evaluation Session.

Grading Process

All requirements are assessed using a four-point system.

Restorative and Endodontic Requirement Grading Descriptions

Each restorative and endodontic requirement is evaluated based on three criteria. Each criterion is assigned a grade. The requirement grade for the restorative and endodontic requirements is determined using the table below.

Criteria Grades	Requirement Grade
2 A+ and no D or E	A+
No more than 1 D and no E	A
2 D and no E	D
1 or more E or 3 D	E

Grading of Dental Dam Requirement

The dental dam requirement grade is determined by the number of errors using the table below.

Number of Errors	Requirement Grade
No errors	A+
1 or more errors in the A section of the criteria	A
1 or 2 errors in the D section of the criteria	D
3 or more errors in the D section of the criteria or 1 or more errors in the E section of the criteria	E

Grading of Infection Control and Safety Requirement

The infection control and safety requirement grade is determined by the number of infection control violations using the table below.

Number of Violations	Requirement Grade
No infection control and safety violations	A+
1 infection control and safety violation	A
2 infection control and safety violations	D
3 or more infection control and safety violations	E

Grading of Record of Procedures Requirement

The record of procedures requirement is determined by the number of errors using the table below.

Number of Errors	Requirement Grade
No errors	A+
1 error	A
2 or 3 errors	D
More than 3 errors or no entries	E

ACS results are determined by the 12 requirement grades using the table below.

Requirement Grades			ACS Result
A+/A	D	E	
12			Pass
11	1		Pass
11		1	Pass
10	2		Pass
10	1	1	Pass
9	3		Pass
9	2	1	Pass
8	4		Pass
Any other combination			Fail

Computer Support

A central server compiles all evaluations and gives reports on the progress of the session. Results are immediately viewable in the same format that participants access results in their online profile. Results of participants that submitted a compassionate appeal are withheld by NDEB until the appeal is heard. An import from the central server to the NDEB online portal is conducted generating a report of results for verification. Results are released after the statistical analysis and verification steps are completed.

Reporting Results

Detailed results are provided to participants using the NDEB's online portal. Participants receive an email notification once results are posted. Participants can log in and view their overall results and a Report of Results containing details for each requirement. A partial example of a Report of Results follows.

Partial Example of a Participant's Report of Results

Class II Amalgam Preparation	Result: A+
<p data-bbox="300 359 623 390">A+: External Outline Form</p> <p data-bbox="367 432 483 464">No errors</p> <p data-bbox="300 575 505 606">A: Internal Form</p> <p data-bbox="337 648 764 680">Minor overpreparation occlusally</p> <p data-bbox="337 791 719 823">Axial wall too deep: > 1.5 mm</p> <p data-bbox="300 934 423 966">A+: Finish</p> <p data-bbox="337 1008 454 1039">No errors</p>	

Infection Control	Result: A+
<p data-bbox="282 1350 547 1381">A+: Infection Control</p> <p data-bbox="337 1423 505 1455">No violations</p>	

Full Metal Crown Preparation

Result: A+

A: Path of Draw and Axial Convergence

A+: Preservation of Tooth/Structural Durability

No errors

A+: Finish and Margin

No errors

Provisional Crown Restoration

Result: E

D: Margin Contour and Adaptation

Underextended 0.5 – 1.0mm

D: Morphology and Occlusion

Undercontoured

D: Polish

Unacceptable roughness

A: Path of Draw and Axial Convergence

Minor undercuts. Manageable by lab.

D: Preservation of Tooth/Structural Durability

Buccal, mesial, distal reduction 1.5 - 2.5mm

Lingual reduction 1.0 - 1.5mm

A: Finish and Margin

Located supragingival 0 - 1.0mm

Appeals

Participants who fail the ACS can request an appointment to view their ACS typodonts. Typodont viewing appointments are held at the NDEB office in Ottawa.

Participants who fail the ACS can submit a written appeal to the NDEB, provided the submission is received within three months of the release of results. Appeals are submitted using the NDEB's online submission form accessed through the NDEB website.

Part E - Security

The NDEB takes several measures to ensure the security of its processes.

Credential Verification

Credential verification of applicants is performed to ensure that applicants to all processes are eligible for participation. While the credential verification process differs depending on the process applied for, each process includes source verification with the university to confirm the applicant's graduation.

Examinee Information

The NDEB uses a third-party web tool called BrightTrac for its registration application. BrightTrac accounts are password protected, and the data is stored on Amazon servers.

In house, the NDEB has candidate information in MS Access databases, and various documents are stored on NDEB servers. This information is only accessible to staff with valid network accounts and drive permissions.

Administration

The NDEB is in regular communication with on-site staff to keep them apprised of changes to administration processes and emphasize the importance of security measures such as standardized check-in procedures and restricted items. Supervisors and evaluators are trained to identify, manage, and report misconduct.

On-site Security

The assessment coordinator stores all examination material in a secure, locked area. After the completion of the examination, all materials are returned to the NDEB office by courier. NDEB staff verifies the return of all materials. These security measures help maintain the integrity of the examination by limiting exposure to examination items before and after the administration of the examination.

Exam Security

The NDEB's examination metadata and statistics are stored in a SQL Server database on a separate secure server that is only accessible via the database's user interface. Individuals who do not have permissions to access the NDEB network are restricted.

The NDEB has a policy that questions under development are never sent via email. Rather, they are uploaded to either our password-protected SharePoint or Basecamp sites for sharing and collaboration.

All NDEB portable devices are encrypted using BitLocker so no one can access anything without the proper credentials.

Copyright

NDEB staff regularly monitors online forums for exam content that is shared and follows up with legal action as needed.

Part F – Outcomes Summary

Pass Rate Statistics

	June 2019	Dec 2019
Number of Participants	386	397
Number of Passes	160	102
Pass Rate	41.45%	25.69%

Historical Participant Numbers

Number of Participants	June 2019	Dec 2019
Total	386	397
No. of 1st Try Participants	213	230
No. of 2nd Try Participants	127	119
No. of 3rd Try Participants	46	48

Note: Numbers are based on original participants who sat the ACS and include compassionate appeals which may have been granted and removed at a later date.

Results by Requirement

Requirement	Grade	June 2019	Dec 2019
Full Metal Crown Preparation	A+/A	60.36%	67.50%
	D	13.47%	19.65%
	E	26.17%	12.85%
Ceramometal Crown Preparation	A+/A	8.29%	16.12%
	D	47.15%	65.99%
	E	44.56%	17.88%
Provisional Crown Restoration	A+/A	74.10%	53.90%
	D	12.95%	21.66%
	E	12.95%	24.43%
Endodontic Access Preparation	A+/A	76.42%	59.95%
	D	17.62%	23.93%
	E	5.96%	16.12%
Class II Composite Resin Restoration	A+/A	89.38%	76.32%
	D	7.25%	17.63%
	E	3.37%	6.05%
Class IV Composite Resin Restoration	A+/A	34.46%	35.01%
	D	32.64%	22.67%
	E	32.90%	42.32%
Class III Composite Resin Preparation	A+/A	83.42%	58.44%
	D	5.70%	6.80%
	E	10.88%	34.76%
Class II Amalgam Restoration	A+/A	53.63%	46.85%
	D	24.09%	25.44%
	E	22.28%	27.71%
Class II Amalgam Preparation	A+/A	70.47%	43.07%
	D	21.24%	28.97%
	E	8.29%	27.96%
Infection Control	A+/A	89.90%	74.56%
	D	6.99%	17.88%
	E	3.11%	7.56%
Record of Procedures	A+/A	94.56%	92.44%
	D	4.66%	4.28%
	E	0.78%	3.27%
Dental Dam Application	A+/A	90.93%	72.80%
	D	6.99%	20.15%
	E	2.07%	7.05%

Note: Numbers are based on original participants who sat the ACS and include compassionate appeals which may have been granted and removed at a later date.

Part G - Glossary

AADE	American Association of Dental Examinations
ACFD	Association of Canadian Faculties of Dentistry
ADA	American Dental Association
ADAC	American Dental Association Commission on Dental Accreditation
ADC	Australian Dental Council
AERA	American Educational Research Association
APA	American Psychological Association
CDA	Canadian Dental Association
CDAC	Commission on Dental Accreditation of Canada
CDRAF	Canadian Dental Regulatory Authorities Federation
DRA	Provincial Dental Regulatory Authorities
NCME	National Council on Measurement in Education
NDEB	National Dental Examining Board of Canada
ODQ	Ordre des dentistes du Québec
RCDC	Royal College of Dentists of Canada

Part H – Appendices

Appendix A – Key Supporting References

American Educational Research Association, American Psychological Association and National Council on Measurement in Education. Standards for Educational and Psychological Testing (2014). Washington, DC: American Educational Research Association.

Angoff, W.H. (1971). Scales, norms and equivalent scores. In R.L. Thorndike (Ed.), Education measurement (2nd ed., 508-600). Washington DC: American Council on Education.

Hambleton, R. K., & Plake, B. S. (1995). Using an extended Angoff procedure to set standards on complex performance assessments. *Applied Measurement in Education*, 8(1), 41–56.

Impara, J. C. & Plake, B. S. (1997). Standard setting: An alternative approach. *Journal of Educational Measurement*, 34(4), 353-366.

National Dental Examining Board of Canada (2019). *Assessment of Clinical Skills Examiner's Manual*.

National Dental Examining Board of Canada (2010). *By-Laws*.

National Dental Examining Board of Canada (2019). *NDEB Glossary*.

National Dental Examining Board of Canada (2019). Instructions for Assessment of Clinical Skills Supervisors, Assistant Supervisors, Invigilators, Coordinators, Dental Assistants, and Technicians.

Appendix B – Competencies for a Beginning Dental Practitioner in Canada

A competent beginning dental practitioner in Canada must be able to provide oral health care for the benefit of individual patients and communities in a culturally sensitive manner.

Competency assumes that all behaviours are supported by foundation knowledge and skills in biomedical, behavioural and clinical dental science and by professional behaviour. Beginning dental practitioners in Canada must be able to apply foundation knowledge and skills to justify their decisions and actions and to evaluate outcomes. Therefore, foundation knowledge, skills and professional behaviour are understood to be a part of every competency.

Competency also assumes that all behaviours are performed to an acceptable level and that the practitioner can evaluate their quality and effectiveness. Competency cannot be achieved without the ability to self-evaluate. Moreover, there are no degrees of competence: a dentist is either competent or not competent. The competencies below refer to general dental practice and include the management of patients of all ages including those with special needs. It is assumed that all oral health care is provided in an ethical manner, in accordance with legal requirements at the national and provincial level.

A beginning dental practitioner in Canada must be competent to:

1. recognize the determinants of oral health in individuals and populations and the role of dentists in health promotion, including the disadvantaged.
2. recognize the relationship between general health and oral health.
3. evaluate the scientific literature and justify management recommendations based on the level of evidence available.
4. communicate effectively with patients, parents or guardians, staff, peers, other health professionals and the public.
5. identify the patient's chief complaint/concern and obtain the associated history.
6. obtain and interpret a medical, dental and psychosocial history, including a review of systems as necessary, and evaluate physical or psychosocial conditions that may affect dental management.
7. maintain accurate and complete patient records in a confidential manner.
8. prevent the transmission of infectious diseases by following current infection control guidelines.
9. perform a clinical examination.
10. differentiate between normal and abnormal hard and soft tissues of the maxillofacial complex.
11. prescribe and obtain the required diagnostic tests, considering their risks and benefits.
12. perform a radiographic examination.
13. interpret the findings from a patient's history, clinical examination, radiographic examination and from other diagnostic tests and procedures.
14. recognize and manage the anxious or fearful dental patient.

15. recognize signs of abuse and/or neglect and make appropriate reports.
16. assess patient risk (including, but not limited to, diet and tobacco use) for oral disease or injuries.
17. develop a problem list and establish diagnoses.
18. determine the level of expertise required for treatment and formulate a written request for consultation and/or referral when appropriate.
19. develop treatment options based on the evaluation of all relevant data.
20. discuss the findings, diagnoses, etiology, risks, benefits and prognoses of the treatment options, with a view to patient participation in oral health management.
21. develop an appropriate comprehensive, prioritized and sequenced treatment plan.
22. present and discuss the sequence of treatment, estimated fees, payment arrangements, time requirements and the patient's responsibilities for treatment.
23. obtain informed consent including the patient's written acceptance of the treatment plan and any modifications.
24. modify the treatment plan as required during the course of treatment.
25. provide education regarding the risks and prevention of oral disease and injury to encourage the adoption of healthy behaviors.
26. provide therapies for the prevention of oral disease and injury.
27. recognize and institute procedures to minimize occupational hazards related to the practice of dentistry.
28. achieve local anesthesia for dental procedures and manage related complications.
29. determine the indications and contraindications for the use of drugs used in dental practice, their dosages and routes of administration and write prescriptions for drugs used in dentistry.
30. manage dental emergencies.
31. recognize and manage systemic emergencies which may occur in dental practice.
32. manage conditions and diseases of the periodontium, provide periodontal treatment when indicated and monitor treatment outcomes.
33. assess the risk, extent and activity of caries and recommend appropriate non-surgical and surgical therapy.
34. manage dental caries, tooth defects and esthetic problems and, when restoration is warranted, use techniques that conserve tooth structure and preserve pulp vitality to restore form and function.
35. manage patients with orofacial pain and/or dysfunction.
36. manage surgical procedures related to oral soft and hard tissues and their complications
37. manage trauma to the orofacial complex.
38. manage conditions and pathology of the pulp and provide endodontic treatment when indicated.
39. manage abnormalities of orofacial growth and development and treat minor orthodontic problems.
40. recognize and manage functional and non-functional occlusion.

41. select and, where indicated, prescribe appropriate biomaterials for patient treatment.
42. manage partially and completely edentulous patients with prosthodontic needs including the provision of fixed, removable and implant prostheses.
43. make records required for use in the laboratory fabrication of dental prostheses and appliances.
44. design a dental prosthesis or appliance, write a laboratory prescription and evaluate laboratory products.
45. apply accepted principles of ethics and jurisprudence to maintain standards and advance knowledge and skills.
46. apply basic principles of practice administration, financial and personnel management to a dental practice.
47. demonstrate professional behaviour that is ethical, supersedes self-interest, strives for excellence, is committed to continued professional development and is accountable to individual patients, society and the profession.

Definition

To “manage” the oral health care needs of a patient is assumed to include all actions performed by a health care provider that are designed to alter the course of a patient's condition. Such actions may include providing education, advice, treatment by the dentist, treatment by the dentist after consultation with another health care professional, referral of a patient to another health care professional, monitoring treatment provided, but also may include providing no treatment or observation. “Manage” assumes the use of the least invasive therapy necessary to gain a successful outcome in accordance with patient wishes.

Appendix C – Publications

- Boyd, M. A., Gerrow, J. D., Chambers, D. W., & Henderson, B. J. (1996). Competencies for Dental Licensure in Canada. *Journal of Dental Education*, 60(10), 842.
- Boyd, M. A., & Gerrow, J. D. (1996). A National Standard for Dentistry in Canada. *Journal of the Canadian Dental Association*, 62(12), 928.
- Buckendahl, C. W., Ferdous, A., & Gerrow, J. (2010). Recommending Cut Scores with a Subset of Items: An Empirical Illustration. *Practical Assessment Research & Evaluation*, 15(6).
- Buckendahl, C. W., & Gerrow, J. (2016). Evaluating the Impact of Releasing an Item Pool on a Test's Empirical Characteristics. *Journal of Dental Education*, 80(10), 1253–1260.
- Chambers, D. W., & Gerrow, J. D. (1994). Manual for Developing and Formatting Competency Statements. *Journal of Dental Education*, 58(5), 361.
- Charbonneau, A., Walton, J. N., & Morin, S. (2019). Association of Canadian Faculties of Dentistry Education Framework for the Development of Competency in Dental Programs. *Journal of Dental Education*, 83(4), 464–473.
- Davis, a, Buckendahl, C. W., & Gerrow, J. (2011). Evaluating Panelists' Bookmark Standard Setting Judgments: The Impact of Random Item Ordering. *International Journal of Testing*, 11(1), 24–37.
- Davis-Becker, S. W., Buckendahl, C., & Gerrow, J. (2011). Evaluating the Bookmark Standard Setting Method: The Impact of Random Ordering. *International Journal of Testing*, 11(24), 24–37.
- Gerrow, J. D., Boyd, M. B., Doyle, M. G., & Scott, D. (1996). Clinical Evaluation in Prosthodontics: Practical Methods to Improve Validity and Reliability. *Journal of Prosthetic Dentistry*, 75(6), 675.
- Gerrow, J. D., Boyd, M. A., Duquette, P., & Bentley, K. A. (1997). Results of the National Dental Examining Board of Canada's Written Examination and Implications for Licensure. *Journal of Dental Education*, 6(12), 921.
- Gerrow, J. D., Chambers, D. W., Henderson, B. J., & Boyd, M. A. (1998). Competencies for a Beginning Dental Practitioner in Canada. *Journal of the Canadian Dental Association*, 64(2), 94.
- Gerrow, J. D., Boyd, M. A., Donaldson, D., Watson, P. A., & Henderson, B. J. (1998). Modifications to the National Dental Examining Board of Canada's Certification Process. *Journal of the Canadian Dental Association*, 64(2), 98.
- Gerrow, J. D., Boyd, M. B., Scott, D., & Boulais, A. P. (1999). Use of Discriminant and Regression Analysis to Improve Certification Board Examinations. *Journal of Dental Education*, 63(6), 459.
- Gerrow, J. D., Murphy, H. J., Scott, M. A., & Scott, D. (2003). Concurrent Validity of Written and OSCE Components of the Canadian Dental Certification Examinations. *Journal of Dental Examinations*, 67(8), 896.
- Gerrow, J. D., Boyd, M. A., & Scott, D. (2003). Portability of Licensure in Canada Based on Accreditation and Certification. *Journal of the American Colleges of Dentists*, 70(1), 8.

Gerrow, J. D., Murphy, H. J., Boyd, M. A., & Scott, D. (2006). An Analysis of the Contribution of a Patient-Based Component to a Clinical Licensure Examination. *Journal of American Dental Association*, 137, 1434.

Gerrow, J. D., Murphy, H. J., & Boyd, M. A. (2006). A Validity Survey of Competencies for the Beginning Dental Practitioner in Canada. *Journal of Dental Education*, 70(10), 1076.

Gerrow, J. D., Murphy, H. J., & Boyd, M. A. (2007). Review and Revision of the Competencies for a Beginning Dental Practitioner in Canada. *Journal of Canadian Dental Association*, 73(2), 157.

Wolkowitz, A., Davis-Becker, S., & Gerrow, J. (2016). Releasing Content to Deter Cheating: An Analysis of the Impact on Candidate Performance. *Journal of Applied Testing Technology*, 17(1), 33–40.

Abstracts and Minor Publications

Boyd, M. A., & Gerrow, J. D. (1997). An Analysis of the 1994 to 1996 Results of the National Dental Examining Board of Canada Written Examination. *Journal of Dental Research*, 76(43).

Boyd, M. A., Gerrow, J. D., & Duquette, P. (2003). Rethinking the OSCE as a Tool for National Competency Evaluation. *Proceedings Association of Dental Educators of Europe*. Dresden, Germany, September 2003.

Boyd, M. A., Gerrow, J. D., Haas, D. A., & Loney, R. W. (2004). National Dental Certification in Canada: An "Improved" OSCE Format. *Journal of Dental Education*, 68(2), 229.

Buckendahl, C., Ferdous, A., & Gerrow, J. (2008). Setting Cut Scores with a Subset of Items: An Empirical Illustration. *Annual Meeting of the National Council on Measurement in Education*, New York, NY. 2008

Davis, S., Buckendahl, C., & Gerrow, J. (2008). Comparing the Angoff and Bookmark Methods for an International Licensure Examination. *Annual Meeting of the National Council on Measurement in Education*, New York, NY. 2008.

Ferdous, A., Smith, R., & Gerrow, J. (2008). Considerations for Using Subsets of Items for Standard Setting. *Annual Meeting of the National Council on Measurement in Education*, New York, NY. 2008.

Gerrow, J. D., Boyd, M. A., & Duquette, P. (1997). The Development and Implementation Process for a New National Certification Examination in Canada. *Journal of Dental Education*, 61(2), 185.

Gerrow, J. D., Boyd, M. B., Scott, D., & Boulais, A. P. (1998). Use of Discriminant and Regression Analysis to Improve Certification Board Examinations. *Journal of Dental Education*, 62(1), 110.

Murphy, J., Gerrow, J. D., Scott, M. A., & Scott, D. (2002). Validity Evidence for the Canadian National Dental Examining Board Examinations. *Journal of Dental Education*, 66(2), 319.

MOTION

That the 2019 Technical Report for the Assessment of Clinical Skills be approved.

