
Technical Report
The National Board Dental Hygiene Examination

Joint Commission on National Dental Examinations

2008

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Executive Summary
Technical Report: The National Board Dental Hygiene Examination
2008

The 2008 edition of the Technical Report for the National Board Dental Hygiene Examination is the main source of validity evidence available to state licensing boards and other users of the dental hygiene examination scores. Validity is the most important consideration for any examination program. For the dental hygiene examination, validity refers to the degree to which logic and evidence support the use and interpretation of scores for making pass/fail decisions affecting candidates for licensure to practice dental hygiene. The Technical Report contains both direct evidence and references to other documents and sources of information that contribute to this body of validity evidence. This report also provides background and historical information that allows the user of the scores the opportunity to understand the developments that have led this program to its current status.

The content of the Technical Report is presented in such a way as to address a series of standards regarding the validity of credentialing examinations (American Educational Research Association, American Psychological Association, and the National Council on Measurement in Education, 1999). Successful completion of a credentialing examination by individuals indicates that they have achieved some acceptable level of performance in an area of knowledge. Some of the principal information presented in the Technical Report is summarized below.

- **Purpose:** The purpose of the National Board Dental Hygiene Examination is to measure whether a candidate possesses an entry-level knowledge adequate for the competent practice of dental hygiene. This entry-level knowledge includes the ability to understand important information from the basic biomedical, dental, and dental hygiene sciences and the ability to apply such information in a problem-solving context.
- **Content:** Traditionally, the content specifications have been based on the judgments of experts obtained in two ways. First, the dental hygiene and dental experts that serve on test construction committees have honed the specifications over the years by recommending changes. Second, educators and practitioners have routinely recommended modifications during conferences. Beginning in 2005, content specifications have been based on the findings of practice analyses conducted every five years. Test construction committees are responsible for recommending minor modifications during the interim period. The Joint Commission through its Committee on Dental Hygiene approves all changes to the content specifications.
- **Item and Examination Development:** Test construction committees are responsible for the development of items and editions of the examination using guidelines for writing high-quality multiple-choice items. Items are pretested on published editions to confirm their acceptability.
- **Standard Setting and Scoring:** The examination is criterion referenced and not norm-referenced. Specifically, the scores and the pass/fail standard are determined by specific criteria not by the process sometimes known as "grading on a curve." Expert educators and practitioners establish the criteria. The standard is maintained across editions of the examination through the use of equating processes. Essentially, the equating process allows for adjustments to the standard to control for subtle differences in the difficulty of items that appear on the different editions.
- **Administration:** A high level of security is maintained on all examination materials. Strict precautions are in place at the Joint Commission's offices, the publishing houses, and the testing centers to ensure that materials are not compromised before, during, or after test administration.

The report provides detailed information related to the items above along with information related to history, examination administration, and the rights and responsibilities of the examination taker, to name but some. A copy of the Technical Report is available for downloading on the American Dental Association's website (www.ada.org).

American Educational Research Association, American Psychological Association, and National Council on Measurement in Education. (1999). *Standards for Educational and Psychological Testing*. Washington, DC: Author.

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1. Introduction

High-stakes examination programs, such as those of the Joint Commission on National Dental Examinations (Joint Commission), should be concerned with validity, because validity relates to the degree to which logic and evidence support the interpretation and use of examination scores for making pass/fail decisions affecting candidates for licensure or certification. The Joint Commission also has an obligation to inform its constituency, i.e., state boards of dentistry, that it is doing its best to provide the highest quality examination programs possible.

In light of the recommendations from the *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], and the National Council on Measurement in Education [NCME], 1999), the Joint Commission publishes annual technical reports concerning the National Board Dental and Dental Hygiene Examinations. The objective of the Joint Commission's technical reports is to provide examination users with information to help them evaluate the validity of examination scores they interpret and use. Six standards from the *Standards* are relevant to this technical report about the National Board Dental Hygiene Examination as shown in Table 1.1.

As suggested by the *Standards*, this technical report provides a comprehensive summary of information regarding the validation of the National Board Dental Hygiene examination administered in 2007, including the development of the examination, the rationale underlying the examination, evidence of validity and score reliability, and test administration. Additionally, this report describes the Joint Commission's policies in light of the purpose of the examination program and information about changes and enhancements being made in the examination program. This report also provides background and historical information that allows each reader the opportunity to fully understand the history and processes that have led this examination program to its current status. Clearly, this report shows that the Joint Commission endeavors to provide the highest quality National Board Dental Hygiene examination program possible.

Table 1.1
Standards Pertaining to Supporting Documentation Found in a Technical Report

6.1 Test documents should be made available to prospective test users and other qualified persons at the time a test is published or released for use.

6.2 Test documents should be complete, accurate, and clearly written so that the intended reader can readily understand the content.

6.5 When statistical descriptions and analyses that provide evidence of the reliability of scores and the validity of their recommended interpretations are available, the information should be included in the test's documentation. When relevant for test interpretation, test documents ordinarily should include item level information, cut scores and configural rules,

information about raw scores and derived scores, normative data, the standard errors of measurement, and a description of the procedures used to equate multiple forms.

6.9 Test documents should cite a representative set of available studies pertaining to general and specific uses of the test.

6.14 Every test form and supporting document should carry a copyright date.

6.15 Test developers, publishers, and distributors should provide general information for test users and researchers who may be required to determine the appropriateness of an intended use in a specific context. When a particular test use cannot be justified, the response to an inquiry from a prospective test user should indicate this fact clearly. General information also should be provided for test takers and legal guardians who must provide consent prior to a test's administration.

2. Purpose of the National Board Dental Hygiene Examination

The *Bylaws* of the Joint Commission on National Dental Examinations (September 2007) state its purposes under Article I. The purposes of the Joint Commission are:

- A. To provide and conduct written examinations, exclusive of clinical demonstrations, for the purpose of assisting state boards in determining qualifications of dentists who seek licensure to practice in any state, district or dependency of the United States, which recognizes the National Board examinations, here and after referred to as National Board Dental Examinations.
- B. To provide and conduct written examinations, exclusive of clinical demonstrations, for the purpose of assisting state boards in determining qualifications of dental hygienists who seek licensure to practice in any state, district or dependency of the United States, which recognized the National Board examinations, here and after referred to as the National Board Dental Hygiene Examination.
- C. To make rules and regulations of the conduct of National Board Dental and Dental Hygiene Examinations and for the issuance of National Board Dental and Dental Hygiene Certificates.
- D. To serve as a resource for the dental profession in the development of written examinations.

The Joint Commission is the body that oversees the design, administration, scoring, and reporting of examination scores to its constituents. The Department of Testing Services of the American Dental Association provides the technical support for many steps in the examination development, administration, and scoring and reporting processes. The Joint Commission's *Standing Rules* (March 2007) provide descriptions of its membership, as well as the committees that serve the Joint Commission and their roles.

Four committees serve the Joint Commission. Each committee is assigned a portion of the materials to be considered by the Joint Commission, and each committee is responsible for making specific recommendations to the Joint Commission. The Committee on Administration deals with operations for both the dental and dental hygiene examinations. This includes security, examination regulations, bylaws and standing rules, and finance. The Committee on Dental Hygiene is responsible for content and examination specifications, test construction procedures, scoring procedures, dissemination of information about the examination process and validity, and matters affecting finance. The Committee on Examination Development deals with the dental examinations, their content and examination specifications, test construction procedures, scoring procedures, and reporting. It also concerns itself with the dissemination of information about the examination process and validity. The Committee on Research and Development relates to both the dental hygiene and dental examinations. This Committee concerns itself with any research or development activity related to the two examination programs.

Finally, with regard to the purpose of the examination, it is important to recognize that the first and most fundamental step in the development of any testing program is to establish a purpose. The purpose of the National Board Dental Hygiene Examination is to measure whether a candidate possesses what, in the judgment of experts, is an entry-level knowledge adequate for the competent practice of dental hygiene. This level of cognitive functioning includes the ability to understand important information from basic biomedical and dental sciences and the ability to apply such information in a problem-solving context.

3. Historical Perspective

The National Board of Dental Examiners was established in 1928 as a standing committee of the American Dental Association for the purpose of providing and conducting written examinations for use at the discretion of state boards of dentistry in licensing dentists. These examinations were to provide a national standard for the knowledge of basic and clinical sciences necessary for the competent practice of dentistry. The practical demonstrations of clinical skills were reserved for individual state examinations. The National Board responsibilities included not only developing and administering National Board examinations, but also formulating rules and regulations pertaining to examinations. By 1990, all U.S. licensing jurisdictions accepted the National Board Dental and Dental Hygiene Examinations as fulfillment of the written examination requirement for licensure.

When the National Board Dental Hygiene Examination program was introduced in 1962, there were four examinations of 100 test items each. Each of the four examinations covered three subjects. In 1973, a single, comprehensive dental hygiene examination of approximately 400 test items replaced the four-examination battery. The comprehensive examination was organized around functions that a dental hygienist could be asked to perform. Only functions that may be delegated to a dental hygienist in a majority of states are covered. In 1998, the examination was restructured to include 350 items, of which 150 were associated with patient case material.

4. The Dental Hygiene Examination Program

The *Examination Regulations* (Joint Commission on National Dental Examinations, March 2007) provides a description of the program. The dental hygiene examination is a comprehensive examination consisting of approximately 350 multiple-choice items. The examination has two components: 200 discipline-based items and 150 case-based items. (See examination specifications under Appendix A.) Test items cover functions that a dental hygienist is expected to be able to perform. Only functions that may be delegated to a dental hygienist in a majority of states are included in the examination. Items are selected by test construction committees in accordance with the Dental Hygiene Examination Specifications. Test constructors are appointed to represent the areas of (1) basic sciences, (2) radiology, (3) periodontics, (4) dental hygiene curriculum, (5) clinical dental hygiene, (6) community dental health, (7) oral medicine/oral diagnosis, and (8) special needs.

Formats Used

The dental hygiene examination is composed of multiple-choice items. Three multiple-choice formats are used. The case-independent format surveys basic science knowledge pertinent to dental hygiene practice. The case-dependent format uses case materials consisting of a patient dental/medical history, a dental chart, radiographs, and photographs. These items serve as stimulus material for a series of case-associated questions. The National Board Dental Hygiene Examination also includes the testlet format, which is one or two paragraphs describing a case study or problem from which at least four items are derived. In all cases, the key features of multiple-choice items are a stem pairing a question or statement followed by a list of possible responses. For National Board use, an item has at least three, but not more than five possible responses.

Released Items

A set of retired items and cases is available for purchase for \$25 per set from the Joint Commission office. The pilot dental hygiene examination is also available for \$15 from the Joint Commission office. Released items are items no longer in use. They are provided to familiarize candidates, educators, and others with the format and general nature of the examination. A disclaimer cautions users that some items may be outdated or no longer representative of content included in current examinations. All released items are the copyrighted property of the American Dental Association (ADA). These collections of retired items are intended for the use of educators and students within the educational environment and may not be reproduced in any format, whether paper or electronic, without the expressed written permission of the ADA, Joint Commission on National Dental Examinations.

Eligibility to Participate in the Dental Hygiene Examination

To participate in the Dental Hygiene Examination, a candidate must qualify under one of the provisions listed below:

Dental Hygiene Student. A student in an accredited program is eligible for examination when the dental hygiene program director, or a designee of the director, certifies that the student is prepared for examination and is within four months of anticipated issuance of a dental hygiene diploma. The dental hygiene program must be accredited by the Commission on Dental Accreditation of the American Dental Association. The Commission on Dental Accreditation evaluates and accredits programs only in the United States. Also, it recognizes by reciprocal agreement Canadian programs as accredited if they have been accredited by the Commission on Dental Accreditation of Canada. Certification of the student's eligibility must be provided by the director or designee in conjunction with the submission of the student's National Board application.

Graduate of an Accredited Program. A dental hygienist who graduated from a dental hygiene program that was accredited by the Commission on Dental Accreditation during the time the dental hygienist was enrolled is eligible for examination following the Joint Commission's receipt of evidence of graduation. The means of fulfilling this eligibility requirement for participating in the National Board Dental Hygiene Examination is a letter from the director of the accredited dental hygiene program from which the individual was graduated. Graduates of accredited programs who send an application without proof of graduation have their application returned. Recent graduates who are retaking the examination must also provide proof of graduation with their application and fee.

Graduate of a Non-accredited Program. A dental hygienist who is a graduate of a dental hygiene program that was not accredited during the time the dental hygienist was enrolled is eligible for examination if the program was equivalent to an accredited program. Accreditation standards in effect at the time the candidate applies for examination are used in evaluating the program. The means of fulfilling this provision must be in the form of letters of recommendation from the:

- (1) dean of an accredited dental school, or director of an accredited dental hygiene program, and
- (2) secretary of a board of dentistry of a U.S. licensing jurisdiction.

The letters must certify that the non-accredited program that the candidate completed met each of several requirements in terms of length of study, subjects, functions and hours. A list of criteria used in evaluating the program is available in the National Board Dental Hygiene Examination Candidate Guide.

Dental Student. A dental student is eligible for the examination if the dean of the dental school certifies that the student has completed the equivalent of an accredited dental hygiene program. A letter from the dean of the dental school fulfills this requirement.

Dentist. A dentist is eligible for examination if he or she meets the eligibility requirements for National Board Dental Examinations. This provision does not apply to a dentist who was endorsed for Part I by the dean of an accredited dental school that was considering admission of the dentist with advanced standing. With the dental hygiene

application and fee, the candidate should provide a note indicating that he or she is a dentist who wishes to take the dental hygiene examination. Also, the dentist must provide the necessary documentation to fulfill the dental eligibility requirements.

Limited Examination Attempts

Effective January 2007, National Board Dental and Dental Hygiene Examination candidates who have not passed an examination after three attempts will be required to wait 12 months after their third attempt before they can apply to retest. An examination attempt is defined as any test administration where the candidate broke the seal on a print-based exam or where the candidate has been seated at a computer testing facility and electronically agreed to the confidentially statement to start the exam. After the one year waiting period has lapsed, a new cycle of three examination attempts will apply. Candidates are encouraged to seek formal remediation before retesting.

5. Validity, Validation, and Validity Evidence

Validity is "the degree to which accumulated evidence and theory support specific interpretations of test scores entailed by proposed uses" (AERA, APA, & NCME, 1999, p. 84). For every examination program, there is a purpose. To fulfill this purpose, an examination score has a desired interpretation and an intended use. The sponsor of the examination program creates a logical argument and assembles validity evidence supporting that argument. Validity is the degree of support enabled by the logical argument and validity evidence upholding this argument. The investigative process of creating this argument and collecting validity evidence evaluating this argument is validation.

In the licensing of dental hygienists in the United States, all candidates for licensure must meet many criteria before they are licensed to practice in a state. Each state has the authority for issuing the license, although in dental hygiene, as in many other professions, national standards exist.

With the dental hygiene examination, the intended interpretation of the examination is professional knowledge that dental hygienists should have and their ability to apply this knowledge in settings involving patient care. The use of these scores is to recommend passing or failing the candidate. This technical report contains validity evidence and references to validity evidence that support both interpretation and use of examination scores.

6. Professional Test Standards

Large testing organizations responsible for developing, administering, and scoring examinations need criteria or standards upon which to judge their effectiveness. Three professional organizations have joined forces and resources to create the latest version of such standards (AERA, APA, & NCME, 1999). These standards provide useful information to guide testing organizations in the validation of their examination score interpretations and uses.

Throughout this technical report, validity evidence will be identified and connected to testing standards. Many sections of this technical report correspond to chapters in the standards (AERA, APA, & NCME, 1999).

AERA (2000) has also issued a set of guidelines that are intended to be used with high-stakes, high school graduation examination programs. Some of these guidelines apply to the dental hygiene examination. In the section 22 of this technical report, these guidelines are reviewed against the validity evidence presented in this technical report.

7. Legal Issues

Any examination program where the examination scores are used for high-stakes decisions runs a risk of legal challenge based on validity. Thus, it is important that such an examination program be designed to withstand legal challenge.

This technical report represents a single effective way to present the validity argument and validity evidence. This public document provides an effective communication device to organize, describe, and display a large array of validity evidence. This action speaks to the fact that the Joint Commission has acted responsibly in discharging its duty to its constituency for developing and administering an examination program leading to valid decision about candidates' knowledge and ability to apply knowledge to patient problems that is deemed necessary to the practice of dental hygiene.

8. Validity Evidence in this Technical Report

This report is organized to address major categories of validity evidence. Each section contains narrative and validity documentation. In some instances, data summaries are provided, as appropriate. In each major category, reference is made to one or more AERA, APA, and NCME (1999) standards.

The first two standards are:

Standard 1.1: A rationale should be presented for each recommended interpretation and use of test scores, together with a comprehensive summary of the evidence and theory bearing on the intended use or interpretation.

Standard 1.2: The test developer should set forth clearly how test scores are intended to be interpreted and used. The population (s) for which a test is appropriate should be clearly delimited, and the construct that the test is intended to assess should be clearly described.

This technical report and references to other existing documents provides evidence that standards 1.1 and 1.2 have been met. It shows that the Joint Commission has acted responsibly in validating its annual Dental Hygiene Examination.

Briefly, much of the rest of this report addresses important categories of validity evidence:

9. Content Basis for the Examination
10. Item Development
11. Item Validation
12. Test Design and Development
13. Test Administration
14. Reliability of Test Scores
15. Standard Setting
16. Scaling/Equating/Comparability of Test Forms
17. Scoring and Reporting Test Scores
18. Rights and Responsibilities of Test Takers
19. Threats to Validity
20. Validity Studies
21. Security
22. Guidelines for High-Stakes Testing

9. Content Basis for the Examination

The content of a certification/licensing test of knowledge for any profession is a primary type of validity evidence. Table 9.1 lists standards related to the content of such examinations. Key elements for validity evidence involve (1) the practice analysis that identifies the knowledge necessary for safe practice as a dental hygienist, (2) examination specifications, and (3) the role of content experts in many procedures involved in identifying and codifying content.

Table 9.1
Standards That Apply to the Content Basis of the Examination

1.6 When the validation rests in part on the appropriateness of test content, the procedures followed in specifying and generating test content should be described and justified in reference to the construct the test is intended to represent. If the definition of the content sampled incorporates criteria such as importance, frequency, criticality, these criteria should be clearly explained and justified.

1.7 When a validation rests in part on the opinions or decisions of expert judges, observers or raters, procedures for selecting such experts and for eliciting judgments or ratings should be fully described. The qualifications, and experience, of the judges should be presented. The description of procedures should include any training and instructions provided, should indicate whether participants reached their decisions independently, and should report the level of agreement reached. If participants interacted with one another or exchanged information, the procedures through which they may have influenced one another should be set forth.

1.8 If the rationale for a test use or score interpretation depends on premises about the psychological processes or cognitive operations used by examinees, then theoretical or empirical evidence in support of those premises should be provided. When statements about

the processes employed by observers or scorers are part of the argument for validity, similar information should be provided.

3.2 The purpose(s) of the test, definition of the domain, and the test specifications should be stated clearly so that the judgments can be made about the appropriateness of the defined domain for the stated purpose(s) of the test and about the relation of items to the dimensions of the domain they are intended to represent.

3.3 The test specifications should be documented, along with their rationale and the process by which they were developed. The test specifications should define the content of the test, the proposed number of items, the item formats, the desired psychometric properties of the items, and the item and section arrangement. They should also specify the amount of time for testing, directions to the test takers, procedures to be used for test administration and scoring, and other relevant information.

3.5 When appropriate, relevant experts to the testing program should review the test specifications. The purpose of the review, the process by which the review is conducted, and the results of the review should be documented. The qualifications, relevant experiences, and demographic characteristics of expert judges should also be documented.

3.11 Test developers should document the extent to which the content domain of a test represents the defined domain and test specifications.

14.8 Evidence of validity based on test content requires a thorough and explicit definition of the content domain of interest. For selection, classification, and promotion, the characterization of the domain should be based on job analysis.

14.9 When evidence of validity based on test content is a primary source of validity evidence in support of the use of a test in selection or promotion, a close link between test content and job content should be demonstrated.

14.14 The content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance of the content for credential worthy performance in an occupation or profession. A rationale should be provided to support a claim that the knowledge and skills being assessed are required for credential-worthy performance in an occupation and are consistent with the purposes for which the licensing or certification program was instituted

Practice Analyses

The content specifications for the National Board Dental Hygiene Examination have traditionally been based on the judgments of experts, which have been obtained in two ways. First, the dental hygiene and dental experts who serve on the test construction committees have honed the content specifications over the years by recommending revisions. The experts who serve on these committees are educators and full-time practitioners. Second,

educators and practitioners, including state board examiners, have routinely recommended modifications to the specifications during conferences. All recommendations, regardless of the source, are reviewed by the Joint Commission through its standing Committee on Dental Hygiene. The Joint Commission's Committee on Dental Hygiene includes four Joint Commissioners, three dental hygienists, and a student representative.

At its meeting in 2001, the Joint Commission, in recognition of the standards delineated above and specifically Standard 14.8, directed its staff to conduct a practice analysis to demonstrate a strong link between the content of the examination and the knowledge and problem solving skills appropriate to the initial practice of dental hygiene. The practice analysis was based on a two-dimensional model. The current content of the examination was one dimension of a matrix, and competencies associated with the recently licensed dental hygienist were the other dimension. For purposes of this practice analysis, a competency is a statement reflecting the specific skills and knowledge derived from training and experience that should be exhibited by beginning practitioners. As such, competencies encompass the major aspects of professional practice by organizing the knowledge, skills, values, and attitudes into broad demonstrable statements. In essence, a competency statement becomes the blueprint for identifying the necessary content and associated professional characteristics. Competency statements, as opposed to the more traditional lists of content by subject matter, provide a link between preparation and practice, and they reflect the processes involved in actual practice. The final list of 56 competencies was a synthesis of those included in the *Competencies for Entry Into the Profession of Dental Hygiene* promulgated by the American Dental Education Association (2000) and the Patient Care Competencies described in the *Accreditation Standards for Dental Hygiene Programs* of the American Dental Association's Commission on Dental Accreditation (1998).

A survey was developed, which required respondents to rate each of the competencies for its importance to patient care. The survey was distributed to a stratified random sample of 3,941 individuals who had passed the National Board Dental Hygiene Examination within the past five years. Of these, 1,841 responded to the survey, and 1,284 of these were full time practitioners. The importance ratings for the competencies provided by the full time practitioners were converted to numbers of examination items, assuming a test comprised of 350 items. The final phase of the practice analysis involved forging a link between the number of items assigned by the practicing dental hygienists in the sample to each competency and the number of items devoted to the various content elements. Relating competencies to test items is difficult, at best. To overcome this difficulty, a review committee was convened, and this committee used the two-dimensional model to forge the appropriate links. The review committee distributed the items devoted to individual competencies to the content elements that involve the knowledge and problem solving skills that support that competency. The review committee consisted of six members. The membership included four full-time practicing dental hygienists, one dental hygiene educator/test constructor, and the Joint Commissioner representing the American Dental Hygienists' Association.

As its March 2004 meeting, the methodology of the practice analysis and the revised content specifications were approved by the Joint Commission on National Dental Examinations through its Committees on Research and Development and Dental Hygiene.

The revised specifications were implemented in 2005 (Kramer & Neumann, 2007). Test construction committees are responsible for recommending to the Joint Commission minor modifications to the specifications during this period as needed.

The next validity study through the use of a practice analysis will be initiated in spring 2009. As one of the important steps involved in the overall process of validating the dental hygiene examination, the domain of dental hygiene practice will be defined by the Committee on Research and Development and the Committee on Dental Hygiene. A survey will be developed to collect the judgments of practicing dental hygienists regarding the importance ratings to patient care. The survey will include questions designed to gather general information and questions designed to gather information on the practice environment. Regarding criteria related to this study's research sample, this sample is a stratified random sample so that the number of survey participants from each licensing jurisdiction is proportional to the number of candidates residing in that jurisdiction at the time of application for the dental hygiene examination. Once the sample is determined, the survey will be distributed to the sample to gather importance ratings. Survey participants will be asked to rate the importance to patient care on a uniformly increasing 5-point Likert scale, with a "1" indicating very unimportant to patient care and a "5" indicating critical to patient care. The importance ratings will be converted to the number of items devoted to each competency or task. An *ad hoc* content review committee will be convened to revise the dental hygiene examination specifications so that the distribution of items across individual content elements reflects the importance ratings of practicing dental hygienists. The methodology and the revised content specifications will be forwarded to the Committees on Research and Development and Dental Hygiene to review. After reviews by these two committees, the revised specifications and associated recommendation will be forwarded to Joint Commission on National Dental Examinations. The Joint Commission will then review the revised content specifications. Once the Joint Commission approves the revised content specifications, they will be implemented.

Examination Specifications

The 2007 examination specifications appear under Appendix A.

The Role of Content Experts

The role of a test constructor is based on the purpose of the National Board Dental Hygiene Examination. The purpose of the examination is to assist state boards of dentistry in determining the qualifications of dental hygienists seeking a license to practice. The examination presumes that candidates have successfully completed appropriate dental hygiene education in an accredited dental hygiene program or the equivalent. The test construction process also serves as a complement to the state or regional clinical, or practical, examinations in the licensure process.

The examination determines qualifications by assessing the candidate's knowledge and problem solving skills in the scientific basis for dental hygiene practice, the provision of clinical dental hygiene services, and community health/research principles and their ability to use this knowledge in the provision of dental hygiene care. The examinations, therefore,

require candidates to demonstrate their knowledge and abilities across a sampling of test items. Through this demonstration, the measurement process discriminates between those who have the required knowledge level to begin practice and those who do not.

Both validity and reliability are essential measurement concepts. Examinations are deemed *valid* when the candidates are accurately judged to have, or not have, the requisite knowledge to enter the practice of dental hygiene. Examinations are considered *reliable* when they provide this accurate measurement on a consistent basis.

The role of the test constructors is fundamental to both the validity and reliability of the dental hygiene examination. Test constructors are responsible for revising the examination specifications based on current knowledge and practices within the field of dental hygiene and implementing these specifications in their item selection for each examination. This is one method toward ensuring test validity. In addition, test constructors are responsible for constructing a clear, precise, and cohesive group of test items for each examination, which directly influences score reliability. Therefore, it is essential to the quality of the examination that the test constructors use their subject-matter expertise, their familiarity with the curriculum in accredited programs, and their awareness of what is important to the practice of dental hygiene in the construction of each new examination. Most of this work is accomplished through committee activities.

The selection of test constructors from a pool of volunteers is based on a set of qualifications. Among others, evidence showing that these qualifications have been met include credentials demonstrating subject matter expertise and peer recognition of expertise. Maintaining geographical diversity is also a factor in selecting test constructors. A description of the selection criteria for dental hygiene test constructors appears in Section 12 related to the design and development of dental hygiene examinations.

10. Item Development

The most essential building block of any examination is the item. The development of test items and validation of item responses is one of the most important steps in test development. The Joint Commission greatly values item development and validation, and it continues to invest considerable resources into both activities. In this section of the technical report, the relevant standards are provided in Table 10.1 and sections are devoted to how items are developed and reviewed. Section 11 addresses item analysis and evaluation.

Who Writes Test Items?

The Joint Commission annually appoints and reappoints test constructors on test construction committees. Since the primary duty of the test construction committee is examination design, details of the qualifications of this committee, committee structures, duties, and other relevant information appears in Section 12. This information can also be found in *Standing Rules* (Joint Commission on National Dental Examinations, March 2007)

After the Joint Commission approves the appointment of new test constructors (based on the recommendation of the Committee on Dental Hygiene), letters are sent to new test

constructors to acknowledge their appointments and familiarize them with the examination development process. Each test constructor receives the following materials: *Test Item Development Guide*, *Orientation Manual for Test Constructors*, *Dental Hygiene Test Specifications*, and *Acceptance Form*.

Test Constructors are responsible for reviewing the examination specifications and reflecting them in examination development. They are also responsible for constructing a clear, precise, and cohesive group of items for each examination. Consultant reviewers review final drafts of the examination to ensure consistency and coherence of both case-independent and case dependent sections of the examination. When new test constructors come to their first meeting, the returning test constructors informally discuss the process with new members. These new members are mentored during their initial service as test constructors. The *Test Item Development Guide* (January 2007) describes the different item formats and general guidelines for writing items. The *Orientation Manual for Dental and Dental Hygiene Test Constructors* (January 2007) describes the responsibilities of the test constructors, the general item-development process, and selection criteria and number of members for each committee. The *Guidelines* are provided to all test constructors and specialty boards, and anyone else requesting them through the Joint Commission office. A manual of style serves as a guide in the production of the final examinations.

Table 10.1
Standards Relevant to Item Development and Validation

3.6 The types of items, the response formats, scoring procedures, and test administration procedures should be selected based on the purposes of the test, the domain to be measured, and the intended test takers. To the extent possible, test content should be chosen to ensure that intended inferences from test scores are equally valid for members of different groups of test takers. The test review process should include empirical analyses and, when appropriate, the use of expert judges to review items and response formats. The qualifications, relevant experiences, and demographic characteristics of expert judges should also be documented.

3.7 The procedures used to develop, review, and tryout items, and to select items from the item pool should be documented. If the items were classified into different categories or subtests according to the test specifications, the procedures used for the classification and the appropriateness and accuracy of the classification should also be documented.

3.8 When item tryouts or field tests are conducted, the procedures used to select the sample(s) of test takers for item tryouts and the resulting characteristics of the sample should be documented. When appropriate, the sample(s) should be as representative as possible of the population(s) for which the test is intended.

3.9 When a test developer evaluates the psychometric properties of items, the classical or item response theory (IRT) model used for evaluating the psychometric properties of items should be documented. The sample used for estimating item properties should be described

and should be of adequate size and diversity for the procedure. The process by which items are selected and the data used for item selection, such as item difficulty, item discrimination, and/or item information, should also be documented. When IRT is used to estimate item parameters in test development, the item response models, estimation procedures, and evidence of model fit should be documented.

7.4 Test developers should strive to identify and eliminate language, symbols, words, phrases, and content that are generally regarded as offensive by members of racial, ethnic, gender, or other groups, except when judged to be necessary for adequate representation of the domain.

7.7 In testing applications where the level of linguistic or reading ability is not part of the construct of interest, the linguistic or reading demands of the test should be kept to the minimum necessary for the valid assessment of the intended construct.

Item Formats

Standard 3.3 refers to identifying item formats in the examination specifications. The dental hygiene examination uses three multiple-choice formats. The case-independent format surveys basic science knowledge pertinent to patient care. The case-dependent format uses case materials consisting of a patient dental/medical history, a dental chart, radiographs, and photographs. The dental hygiene examination also includes testlets, which are one or two paragraphs describing a case study or problem from which at least five test items are derived. In all cases, the key features of multiple-choice items are a stem pairing a question or statement followed by a list of possible responses. For National Board use, an item has at least three, but not more than five possible responses.

The Process of Examination Revision

The process of reviewing and revising test items for the dental hygiene examination involves reviewing unsatisfactory items and revising items. Test items are unsatisfactory if they are too easy, too difficult, or not discriminatory. In reviewing test items, Test Construction Committees (TCCs) look at two key factors: the P (probability value) that represents difficulty, and R (point-biserial correlation between item and test performance) that represents discrimination. The Joint Commission accepts a broad range of difficulty of items, but an easy item – one that virtually all candidates answer correctly – detracts from accurate measurement. The same is true of items that are too difficult, i.e., those that no or few candidates reliably answer correctly. Discrimination of a test item indicates the relationship between the candidates who choose the correct answer and their rank in scoring on the total number of items. Following are the acceptable ranges of indices for difficulty and discrimination according to the standards approved by the Joint Commission.

Table 10.2
Acceptable Ranges for Discrimination and Difficulty Indices
Dental Hygiene Examination

<i>Discrimination (R)</i>	<i>Difficulty (P)</i>
H = .26 or higher	E = .90 or higher
M = .08 – .25	M = .40 – .89
L = under .08	D = 0 – .39

(R): H — High; M — Medium; L — Low
(P): E — Easy; M — Medium; D — Difficult

For an item to be considered effective, it must produce a difficulty index between 40 and 89%, and a corresponding discrimination index of .08 or higher for the dental hygiene examination. Test items that do not meet these standards are deleted or revised. An item is deleted from scoring when the keyed response has 0.00 or a negative R-value. A negative R indicates that high-scoring examinees are answering the item incorrectly and that low-scoring examinees are answering the item correctly. An item is reviewed when: (1) the keyed response has a P value below .25, or (2) the keyed response has a P value less than one of the distractors and both the keyed response and the distractor have positive R values.

11. Item Validation

After an item is written, Downing and Haladyna (1997) recommend a series of reviews that improve the quality of the item. Evidence should be presented that qualified personnel have done these reviews. Standards 3.6, 3.7, and 3.9 included in Table 10.1 show those standards pertaining to item validation.

The *Standards* (AERA, APA, & NCME, 1999) suggest that those test items that count toward candidates' scores should exhibit sound psychometric characteristics. Specifically, the item statistics of difficulty and discrimination should compare favorably with the item-performance standards set by the Joint Commission. Item statistics result from the analysis of data obtained from the administration of the items to a representative sample of candidates. While the statistics are important for determining the value of items, statistics are not available for some items on National Board examinations because they are new and untested.

Items used on each dental hygiene examination have different histories. First, approximately 20% of the items are anchor items. These are sound items that have appeared on previous editions. Anchor items allow for the equating of test forms across administrations of the examinations. Second, approximately 40% of the items have appeared on previous editions of the examination, and they exhibited acceptable items statistics. As a

general guideline, no more than 20% of these items are from any one previous edition. Finally, approximately 40% of the items are new and un-tested. Therefore, item statistics are not available for these items. Because of this, some items on the examinations may not meet item-performance standards and they are excluded from the final scoring.

Evaluating and Revising Weak or Unacceptable Items

The Joint Commission (November 1995) has published a document that is intended to help test constructors review unsatisfactorily performing items and then revise or retire such items. This activity replenishes the item bank and helps the committee members sharpen their ability to evaluate and improve items.

Pretest Items

A pretest item is a new item that is included on a regular administration of the examination but is reviewed for acceptable item statistics before being used as a scored item. The objective of pretesting items is to ensure the use of items with acceptable item statistics. The pretesting of items enhances the quality of the examinations and the reliability of the scores while allowing for the development of a high-quality item pool. To balance the need for using only previously administered items and the need for maintaining acceptable reliabilities, the Joint Commission has set the maximum percentage of pretest items at 15%. Each examination includes at least 85% scored items and up to 15% pretest items.

12. Test Design and Development

The design of each examination is a very important step in test development. Items chosen for each examination must conform to the examination specifications. Not only must content requirements be met, but also the difficulty of the examination (based on the average of the item difficulties) must approximate previous and future test forms. Table 12.1 lists standards that pertain to test design and development.

Table 12.1
Standards Relevant to Test Design and Development

3.1 Tests and testing programs should be developed on a sound scientific basis. Test developers and publishers should compile and document adequate evidence bearing on test development.

3.7 The procedures used to develop, review, and try out items, and to select items from the item pool should be documented. If the items were classified into different categories of subtests according to the test specifications, the procedures used for the classification and the appropriateness and accuracy of the classification should be documented.

3.11 Test developers should document the extent to which the content domain of a test represents the defined domain and test specifications.

Examinations are designed with the participation of the test construction committees and supervised by the staff of examination specialists from the Joint Commission's examination development area. This process ensures that the expertise of highly qualified dental and dental hygiene educators, licensed dentists, and dental hygienists is fully used in the selection of items and the examination design. The examination specialists provide technical support and guidance to ensure that the desired technical qualities of the examination are achieved during this design phase.

The Joint Commission convenes several committees. The details of committee eligibility, recruitment, and service are provided in this section. As noted earlier in this technical report, these committees also write and evaluate examination items as part of the item development phase of the overall examination development process.

The Role of a Test Constructor

The role of a test constructor is based on the purpose of the examination. This role is fundamental to the validity of score interpretations and uses. Test constructors are responsible for reviewing the examination specifications and reflecting them in examination development. This action provides content-related validity evidence. The test constructors also are responsible for constructing a clear, precise, and cohesive group of items for each examination.

Test constructors meet in discipline or case-based committees each year to engage in their examination development activities. It is essential to the quality of the examinations that the test constructors use their subject-matter expertise, their familiarity with the curriculum in accredited dental schools and dental hygiene programs, and their awareness of what is important in the practice of dental hygiene in the construction of each new examination. This work is accomplished through collaborative and meticulous committee work.

Criteria for Dental Hygiene Test Constructors

The *Selection Criteria for National Board Dental Hygiene Test Constructors* (Joint Commission on National Dental Examinations, September 2007) provides criteria for the one-to five-year appointment of its test constructors. The Dental Hygiene Examination is constructed by committees of consultants with subject-matter expertise in the following eight areas.

Basic Sciences: The basic sciences include anatomy, histology, biochemistry and nutrition, physiology, microbiology and immunology, pathology, pharmacology, and oral biology.

- Doctoral degree in a biomedical science, or a dentist or dental hygienist with an advanced degree in a biomedical or dental science
- At least three years experience within the last five years teaching a biomedical or dental science to dental hygiene students

Radiology:

- Dentist or dental hygienist with a baccalaureate degree from an accredited program
- Formal education in dental radiology beyond what was provided in a dental or dental hygiene program
- At least three years experience within the last five years teaching radiology

Periodontics:

- Graduate of an accredited dental or dental hygiene program with advanced formal education or training in periodontics
- At least three years experience within the last five years teaching or practicing periodontics

Oral Medicine/Oral Diagnosis:

- Dentist with advanced clinical training
- At least three years experience within the last five years teaching Oral Medicine/Oral Diagnosis

Special Needs Professional:

- Dentist or dental hygienist with advanced clinical training
- At least three years experience within the last five years in teaching a clinical science

Dental Hygiene Curriculum:

- Dental hygienist who has graduated from an accredited program
- Advanced degree, preferably in dental hygiene
- At least three years experience within the last five years teaching dental hygiene students
- Experience in curriculum design as a dental hygiene program director, member of a dental hygiene curriculum committee, or accreditation consultant for dental hygiene

Clinical Dental Hygiene:

- Dental hygienist who has graduated from an accredited program
- Baccalaureate degree in dental hygiene, education, or a biomedical science
- At least three years experience within the last five years teaching and practicing clinical dental hygiene; full-time or part-time in private practice or faculty practice.

Community Dental Health:

- Dentist or dental hygienist who has graduated from an accredited program
- Advanced degree in public health or related field
- At least three years experience within the last five years in a public health position or teaching community and public health courses to dental or dental hygiene students

Dental Hygiene Test Construction Committees

Six test construction committees work together to develop the dental hygiene examination. Membership in a committee ranges from two to eight consultants to the Joint Commission.

Component A Committee: This committee consists of three subcommittees. The Dental Hygiene I subcommittee consists of three basic science experts, and one dental hygiene curriculum expert. The Dental Hygiene II subcommittee consists of three periodontists, one dental hygiene curriculum expert, two clinical dental hygiene experts, and one oral and maxillofacial radiologist or dental hygienist with formal education in radiology. The Dental Hygiene III subcommittee consists of one dental hygiene curriculum expert, one clinical dental hygiene expert, and two community dental health experts.

Component B Committee: This committee, which develops the 150 case-based items for the dental hygiene examination, has one basic science expert, one radiologist, one periodontist, one dental hygiene curriculum expert, one clinical dental hygiene expert, one community dental health expert, one dentist with advanced education in oral medicine/oral diagnosis, one dentist or dental hygienist with advanced clinical training in special needs.

Case Selection Committee: This four-member committee reviews new patient cases and identifies suitable cases for the examinations. The committee also drafts and reviews the patient histories, dental charts, and treatment plans that will be the bases for writing test items by the Component B Committee.

Consultant Review Committee: This four-member Committee reviews final drafts of the examinations to ensure consistency and coherence of both the Component A and Component B examinations.

The Responsibilities of Test Construction Committee Members

Following is a list of the responsibilities of every test construction committee member:

1. Submit new test items for the National Board item banks, according to Joint Commission guidelines, specifications, and content outlines by the designated time. This requirement applies to members after they have completed their first year of committee service, and the number of new items expected may vary according to the needs of each committee.
2. Attend each test construction meeting for the duration of the session.

3. Construct National Board Dental Hygiene Examinations according to Joint Commission guidelines, specifications, and content outlines within the designated time frame.
4. Construct additional items for the item banks when necessary.
5. Assign ownership of all test materials to the American Dental Association/Joint Commission on National Dental Examinations by agreeing to the terms of the Copyright Assignment.
6. Inform the Joint Commission of changes in the standard curricula, and suggest modifications in test specifications and content outlines.
7. Consider special issues and make recommendations at the request of the Joint Commission.
8. Safeguard the security and confidentiality of the National Board Examinations by declining any arrangement to assist with review courses or reviewing books pertaining to the examinations while serving as a test constructor, and for at least one year following the final term of appointment.
9. Comply with the American Dental Association's policy on professional conduct. The policy includes prohibitions against sexual harassment, as well as other forms of unlawful conduct.

An Orientation Manual for Dental Test Constructors (Joint Commission on National Dental Examinations, January 2007) provides basic information to new test constructors.

How Dental Hygiene Examinations are Developed

Test construction meetings typically begin with a review of the statistical characteristics of examinations administered since the last meeting. These characteristics include reliability, mean and standard deviation of scores. Individual item statistics are also reviewed. These statistics include the difficulty of the item, the proportion of candidates choosing each option, and the point-biserial correlation between each response and the total score, which is the discrimination index. Items that produce statistics below the standards set by the Joint Commission are reviewed.

Next, test constructors review the *Dental Hygiene Examination Specifications* to ensure that discipline areas continue to reflect current teachings in the majority of dental hygiene programs. Then they finalize the draft examinations by reviewing all items, according to the examination specifications. During the final review, before each item is read aloud for approval, committee members are asked to "take" the examination as though they were students.

The final step of the meeting is to draft new examinations using both new items and existing items with proven records of accomplishment.

Results of Test Design

Examination specifications are provided in Appendix A. The Joint Commission seeks clinical application of all items and directs all test construction committees (TCCs) to

emphasize problem solving rather than simple recall of facts in the construction of examinations. While finalizing items for the March, July, and December examinations, all TCCs identify each item's clinical applicability and cognitive level.

Summary of Section 12

This section has provided much detailed documentation of the examination design and development processes that are used for the dental hygiene examination.

13. Test Administration

Although administration may seem like one of the more mundane aspects of an examination program, several important issues are addressed in this section and are linked to standards. Table 13.1 provides a short list of relevant standards.

Table 13.1
Standards Pertaining to Administration

3.19 The directions for test administration should be presented with sufficient clarity and emphasis so that it is possible for others to replicate adequately the administration conditions under which the data on reliability and validity, and where appropriate, norms were obtained.

3.20 The instructions presented to test takers should contain sufficient detail so that test takers can respond to a task in the manner that the test developer intended. When appropriate, sample material, practice or sample questions, criteria for scoring, and a representative item identified with each major area in the test's classification or domain should be provided to the test takers prior to the administration of the test or included in the testing material as part of the standard administration instructions.

The Joint Commission on National Dental Examinations in its *Examination Regulations* (March 2007) describes the eligibility requirements for candidates for the dental hygiene examination who take it for the first time or who are re-examined. This publication also describes how candidates apply for the examination.

The Joint Commission has published *Procedures for Test Administration* (Joint Commission, July 2007) that identifies the purpose of the examination programs, the print-based examination procedures to be followed, and the personnel who administer the examinations. The role of proctors is described. An examination security agent is described who is responsible for receipt and storage of the examination. This document also describes facilities, handling of examination material, seating charts, how candidates are identified, and how to deal with late-arriving candidates. The conduct of the examination is described.

Specific procedures are expected to be followed by these examination administration staffs. Collecting and returning of material is discussed. This document provides ample evidence of the standardized administration procedures followed in each testing site. The issue of examination irregularities is discussed in another document (*Examination Regulations*, Joint Commission on Dental Examination, March 2007).

With regard to the actual administration of the print-based examination, *Oral Instructions* (Joint Commission on National Dental Examinations, March 2007) are developed and provided to the test administrators who read these detailed directions directly to the candidates. Along with the other procedures, the reading of the instructions maintains standardized conditions across testing centers.

A Candidate Guide is published annually. The Candidate Guide provides detailed information regarding the format and content of the examination, candidate eligibility requirements, examination regulations, and the scoring of the examination. The Candidate Guide also provides examples of item formats and sample items. The Candidate Guide is available online at the American Dental Association's website: www.ada.org. For those individuals interested in obtaining additional and more detailed information regarding the format and content of the dental hygiene examination, a released set of items is available for \$25.00 through the Joint Commission's office. The pilot dental hygiene examination is also available for \$15.00 from the Joint Commission's offices.

The dental hygiene examination was offered in print format three times in 2007 and 2008: March, July, and December and will be offered once in 2009: March. The print-based examination requires one day for administration. Effective December 1, 2008, the dental hygiene examination became available for candidates in computer-based format. This computer version of the dental hygiene examination is offered on any business day at Pearson VUE Testing Centers. The computer version requires one day for administration.

The print-based dental hygiene examination is administered in the United States and Canada. Specific sites are determined by need. The computer version of the examination is offered in the United States and its territories and Canada and is administered at Pearson VUE Testing Centers.

14. Reliability of Test Scores

A primary type of validity evidence is reliability. Reliability refers to the consistency of scores under repeated conditions. Another perspective of reliability is that it is based on the degree of measurement error present in scores relevant to score variability. Low reliability would suggest a large average margin of error in scores that would undermine accurate reporting of true achievement and create doubt or caution about passing or failing a candidate based on a score. Therefore, in an examination programs like this, a high standard is to achieve reliability estimates that reach or exceed 0.90. The technique for estimating reliability is coefficient alpha, and the KR₂₀ method is suitable for estimating alpha when items are scored right/wrong. The main strategy in achieving such high estimates is to have

long examinations, because examination length is the single most effective way to achieve high reliability. However, having uniformly high quality items also contributes to reliability.

Table 14.1
Standards that Apply to Reliability

2.1 For each total score, subscore, or combination of scores that is to be interpreted, estimates of relevant reliabilities and standard errors of measurement or test information should be reported.

2.14 Conditional standard errors of measurement should be reported at several score levels if constancy cannot be assumed. Where cut scores are specified for selection or classification, the standard errors should be reported in the vicinity of each cut score.

14.14 Estimates of reliability of test-based credentialing decisions should be provided.

Table 14.2 provides trend statistics for the dental hygiene examination results for 2006 and 2007. As shown, the average composite score (standard score mean) earned by the reference group for the March, 2007 examination is higher than the mean score earned by the reference group for the March, 2006 examination (84.2 vs. 82.9); same results are found for the December examination (82.5 vs. 80.6); the average composite scores for the July examination in 2006 and 2007 are about the same (81.4 vs. 81.5). The standard deviations in a standard score metric (standard score standard deviations) are similar across examinations for 2006 and 2007. The average percentage of test items answered correctly by the reference group (mean percent) for examinations in 2006 and 2007 has ranged between 64% and 74%. The reliability of examination scores has consistently ranged between 0.90 and 0.92. The failure rate for the 2007 examinations decreased from the previous year for the March examination (3.1% vs. 5.5%); slightly increased for the July examination (11.1% vs. 11.0%), but decreased significantly for the December examination (5.7 % vs. 15.2%). Please note the sample sizes are relatively small for the July and December examinations in comparison with the March examination.

Table 14.2
Trend Statistics for the Dental Hygiene Examination

TEST INFORMATION	March 2006	July 2006	December 2006	March 2007	July 2007	December 2007
Number in Reference Group	5,483	477	227	5,513	557	311
Number of Test Items	335	338	326	340	338	338
Standard Score Mean	82.9	81.4	80.6	84.2	81.5	82.5
Standard Score Standard Deviation	5.3	5.4	5.8	5.2	5.8	5.1
Raw Score Mean	220.5	217.7	207.0	236.5	217.0	228.8
Mean Percent (%)	65.8	64.4	63.5	69.6	64.2	73.6
Raw Score Standard Deviation	24.2	25.6	27.4	24.1	27.8	24.3
Reliability (KR ₂₀)	0.90	0.91	0.92	0.90	0.92	0.90
Prophecy Formula	0	0	0	0	0	0
Minimal Passing Raw Score	181	184	178	189	183	189
Failure Rate (%)	5.5	11.0	15.2	3.1	11.1	5.7

Reference Group: The reference group is comprised of all students enrolled in schools with approval accreditation status who took the examination for the first time. Performance of the reference group establishes standards for all candidates taking the examination.

Standard Score Mean: The standard score mean is the average composite standard score earned by the reference group.

Raw Score Mean (No. and %): The raw score mean is the average number or percentage of test items answered correctly by the reference group.

Raw Score/Standard Score Standard Deviation: The standard deviation provides a measure of spread in scores in a raw score metric or a standard score metric.

Reliability KR₂₀: Reliability refers to accuracy of test scores from one occasion to the next. Perfect reliability of test scores produces a reliability coefficient of +1.00, but no set of scores is perfectly reliable. The higher the coefficient, the more reliable are the examination scores.

Prophecy Formula: The Spearman-Brown prophecy formula estimates the number of additional test items needed to obtain a reliability (KR₂₀) of +0.90. An underlying assumption is that quality of added items is similar to that of existing items.

Minimal Passing Raw Score: The minimal passing raw score is the lowest number of test items that a candidate has to answer correctly to pass. The minimal passing raw score is always converted to the standard score of 75.

Failure Rate: The failure rate reported here is the percentage of the reference group who scored below the minimal passing score.

15. Standard Setting

A critical step in the development of any pass/fail examination is the setting of the cut score that separates passing and failing candidates (AERA, APA, NCME, 1999, p. 53-54). The implication of a cut score for the dental hygiene examination is that it represents a collective judgment that those who fail are likely to make serious errors in the practice of dental hygiene. The setting of cut scores may involve empirical study, but value judgments by content experts are inevitable. The judges should be qualified, and documentation should be provided of their qualifications. The process for setting the cut score should be well described and documented. Table 15.1 provides standards that are relevant to setting the cut scores for the dental hygiene examination.

Table 15.1
Standards Pertaining to Standard Setting

4.19. When proposed score interpretation involve one or more cut scores, the rationale and procedures used for establishing cut scores should be clearly recommended.

4.20. When feasible, cut scores defining categories with distinct substantive interpretations should be established based on sound empirical data concerning the relation of test performance to relevant criteria.

4.21. When cut scores defining pass-fail or proficiency categories are based on direct judgment about the adequacy of items or test performances or performance levels, the judgmental process should be designed so that judges can bring their knowledge and experience to bear in a reasonable way.

14.16. Rules and procedures used to combine scores on multiple measures to determine the overall outcome of a credentialing test should be reported to test takers, preferably before the test is administered.

14.17. The level of performance required for passing a credentialing test should depend on the knowledge and skills necessary for acceptable performance in the occupation or profession and should not be adjusted to regulate the number or proportion of persons passing the test.

The criterion-referenced approach that has been successfully used by the Joint Commission is the method described by Grosse and Wright (1985) and Kramer and DeMarais (1992b). Using this approach, Rasch calibration statistics for criterion items are used, in concert with judgments about the ability of candidates, to set the cut score. The advantages of using a Rasch measurement approach have been described in detail in Wright and Stone (1979).

There are essentially three steps involved in the standard setting procedures used by the Joint Commission.

1. A standard setting committee is convened. The committee includes specialists in the disciplines included on the examination and general practitioners. The size of the committee and its exact composition are determined by the purpose and content of the examination.
2. The committee members engage in a complete and thorough discussion of the characteristics and behaviors of the minimally competent candidate and the importance of individual content elements on the examinations.
3. Following this discussion phase, three types of information are gathered from the committee members using a sample examination. The first type of information is related to an estimate of the percentage of the reference group that does not possess the requisite knowledge and problem-solving skills to pass, i.e., the failure rate. For the National Board, the reference group is defined as those candidates who are enrolled in dental hygiene programs with accreditation status of Approval and who are being examined for the first time. The second type of information relates to test content. This information is independent of the abilities of the candidates. Information regarding test content requires that committee members select a subset of test items that they consider to be of critical importance. These are designated as the criterion items. Selection rules have been established for use by the committee members in order to achieve consistency in judgments. These rules are based on research in the area of criterion-referenced testing (Kramer & DeMarais, 1992b) and are listed below. The third type of information is related to the ability level of minimally competent candidates. Committee members are asked to indicate the passing rule. Specifically, what level of criterion item difficulty is necessary for candidates to pass the examination?

Selection Rules

1. The content of criterion items must be central, or directly related, to the practice of dental hygiene.
2. Criterion items must assess the knowledge and problem-solving skills that are employed frequently in the practice of dental hygiene.
3. Criterion items must assess the knowledge and problem-solving skills that are subject to change with current research and development in the field of dental hygiene.
4. The content of the criterion items must be of fundamental and critical importance to the successful practice of dental hygiene.

5. The content of the criterion items must assess the knowledge and problem-solving skills that the minimally competent candidate is to have acquired in order to be licensed.
6. Criterion items must be selected from Components A and B.
7. Criterion items must be selected from a full range of the content included on the examination.

Using these types of information, the cut score can be set using the Rasch measurement model. Using the Rasch model, candidate ability and item difficulty are described by a single measurement scale. This means that candidate ability can be directly related to the specific knowledge and skills that underlie items on the examination. The Rasch ability scale is based on the log odds of responding to an item correctly. The measurement scale is defined in terms of these log-odds or logits. The Rasch model is defined by the expression:

$$P\{x_{vi} = 1 | \beta_v, \delta_i\} = \frac{\exp(\beta_v - \delta_i)}{[1 + \exp(\beta_v - \delta_i)]}$$

where P_{vi} is the probability of person v correctly responding to item i , β_v is the ability of the person v , and δ_i is the difficulty of the item i (Wright and Stone, 1979).

The underlying log-ability scale is centered on zero and typically ranges from a -5.00 to a +5.00 logits, with more negative values indicating relatively easier items and lower-scoring candidates. In like manner, values that are more positive indicate relatively more difficult items and higher-scoring candidates. Because candidate ability and item difficulty are on the same measurement scale, it is possible to directly relate the two relative to the criterion items. Therefore, if the passing rule sets the cut score at the average logit difficulty of the criterion items, then the cut score is set at that point along the scale. Those candidates who score at or above this point would pass. This point along the measurement scale is assigned a standard score of 75.

The current standard for the dental hygiene examination is based on a compensatory decision-making strategy. Regardless of how a candidate performs on any section of the dental hygiene examination, total score based on all 350 items is the score that is used to make a pass/fail decision. If a candidate passes (has a scale score of 75 or higher), no retest on any section of the examination is required. There is no retesting of any section of the dental hygiene examination.

Table 15.2 provides summary of failure rates and numbers of examinations administered to candidates during the ten-year period beginning with 1998. From 1998 to 1999, the total number of examinations administered to candidates increased from 6,006 to 7,179. From 1999 to 2000, the total number of examinations administered to candidates decreased from 7,179 to 6,789. From 2000 to 2006, the number of examinations has increased annually from 6,789 to 7,801, which represents an increase of 14.9%. During 2007, the number of

examinations decreased slightly to 7,749. The highest failure rate was found for 1999 (i.e., 20.3%). Note that the examination format, with revised standard, was first administered in the spring of 1998. From 2000 to 2006, failure rates have been stable at about 16%. For 2007, the failure rate is the lowest (i.e., 11.0%) in ten years.

Table 15.2
Summary of Failure Rates for the Dental Hygiene Examination

Year	Number of Examinations	% Failed
1998	6,006	12.0%
1999	7,179	20.3%
2000	6,789	16.4%
2001	7,046	14.1%
2002	7,250	18.2%
2003	7,298	16.7%
2004	7,407	15.8%
2005	7,490	16.0%
2006	7,801	16.0%
2007	7,749	11.0%

16. Scaling/Equating/Comparability of Test Forms

The *Standards* (AERA, APA, & NCME, 1999) devotes chapter four to this topic. When different versions of the same examination are used, it is critical to ensure that every candidate take an examination of equal difficulty relevant to the passing cut score of 75 on the standardized test score scale. Table 16.1 lists four relevant standards applying to scaling/equating/comparability.

Table 16.1
Standards Pertaining to Scaling/Equating/Comparability

4.10. A clear rationale and supporting evidence should be provided for any claim that scores earned on different forms of a test may be used interchangeably. In some cases, direct evidence of score equivalency may be provided. In other cases, evidence may come from a demonstration that the theoretical assumptions underlying procedures for establishing score comparability have been sufficiently satisfied. The specific rationale and the evidence required will depend in part on the intended uses for which score equivalence is claimed.

4.11 *When claims of form-to-form score equivalence are based on equating procedures, detailed technical information should be provided on the method by which equating functions or other linkages were established and on the accuracy of equating functions.*

4.13. *In equating studies that employ an anchor test design, the characteristics of the anchor test and its similarity to the forms being equated should be presented, including both content specifications and empirically determined relationships among test scores. If anchor items are used, as in some IRT-based and classical equating studies, the representativeness and psychometric characteristics of anchor items should be presented.*

4.17. *Testing programs that attempt to maintain a common scale over time should conduct periodic checks of the stability of the scale on which scores are reported.*

The dental hygiene examination is a criterion-referenced examination and not a norm-referenced one. That is to say, the scores and the pass/fail status are determined by specific criteria not by the process sometimes known as "grading on a curve." Using an objective measurement methodology in concert with the judgment of experts in the biomedical sciences, clinical dental hygiene sciences, and community dental health, a minimum passing score is set on a single, base year edition or form of the examination. However, different forms of the dental hygiene examinations are used for each administration of the test. In order to insure that the scores of candidates completing the examination at different administrations can be compared, some statistical adjustment to their scores is necessary. Raw scores can provide an indication of how well a candidate has performed when compared to others taking the same test, but comparing scores across test forms or test administrations is inappropriate without assuming that the distribution of test scores remains constant from one testing situation to another. Because score distributions vary, raw scores must be modified to enable the achievement of each candidate to be evaluated properly. The process of adjusting scores to make them comparable to the scores of other administrations is known as *test equating*.

Once standardized scores are equated, they are on a common scale. Thus, the scores of candidates completing different forms can be evaluated on the same scale using the same cut score of 75. Also, because the mean scores obtained by different groups of candidates may be expressed on the same metric, yearly trends in test performance can be evaluated fairly.

To equate two examinations of the same content, certain requirements need to be met (Lord, 1980). First, both examinations must assess the same content. Second, the equation used to adjust scores remains the same regardless of the groups used. And third, the correspondence between the scores must be symmetric—that is, it should make no difference whether examination X is adjusted to the scale of examination Y or vice-versa. The equating procedures are presented here within the context of *horizontal score* transformations. That is, the alternative forms of the examination are of similar difficulty and identical content and have been constructed for the same population of candidates.

Equating Designs

Many different data collection designs have been used for equating (Petersen, Kolen, and Hoover, 1989). All require that either the same group (or equivalent groups) of candidates complete both forms of the test, or that a group of common items, called *anchor* items, appear on both forms of the test.

In the simplest of the designs, the same group of candidates completes both examinations. Because only one group is used, possible between-group differences in ability cannot influence the equating, as might occur when multi-group designs are used. However, the use of a single group could produce fatigue, practice, and order effects. This equating design is not feasible due to the length of the dental hygiene examination.

Random differences between equivalent groups may be controlled by the use of anchor items. Anchor items are administered to both groups in the design and may or may not be counted in computing total scores. Performance on the anchor items can be used to make statistical adjustments to each of the examination forms so that an estimate can be made of how the combined group of candidates would score on both forms of the examination. Because the anchor items serves as the link among the alternate forms, the format and content of the anchor items should be similar to those of the other items administered. Not only is this design feasible, it is widely used and accepted throughout large-scale testing.

Statistical Methods for Adjusting Scores

Once an equating design has been chosen, the next decision is to select an appropriate statistical method for producing equivalent scores on the parallel content examinations. The three most often used techniques are linear, equipercentile, and item response theory (IRT). Equivalence of scores is defined differently in each method, and each makes different assumptions about the data and the distributions of scores.

The IRT method has many advantages that warrant its use. First, IRT approaches to equating are based on the item level rather than the total score level. Traditional methods, such as equipercentile equating, require entire total score distributions to be used. The use of cumulative distributions of scores introduces imprecision into the equating process. Rounding and interpolation errors may occur. One IRT often used for equating is the one-parameter or Rasch model. The Rasch model is more precise. Second, the Rasch model allows each candidate to complete a set of items different from that attempted by any other candidate, and still be scored on the same scale of measurement. This process, now used in adaptive testing, has the potential to improve measurement accuracy for most candidates, but it requires that IRT methods of equating be implemented. Third, the Rasch model allows for extensive cross-checking of item parameters. Because each equating event may introduce error into the estimation of item and person parameters, it is essential to double check item parameters by linking them through various paths back to the scale of the base year. This precaution prevents item difficulties from drifting too far away from the correct scale, but is cumbersome to do with any method other than Rasch equating. The versatility and precision associated with using the Rasch model to equate enables the item bank to be managed more

easily and updated more accurately.

IRT postulates that the response of an individual to an item is a function of that person's ability and certain characteristics, or parameters, of the item. Currently, the Rasch model, IRT-based model, is used with the dental hygiene examination. Under this model, the only characteristic of the item that can influence a response is its difficulty. The function used to determine the probability of a correct response of person v to item i is shown below (Wright & Stone, 1979):

$$P(x_{vi} = I) = \exp(\beta_v - \delta_i) / [1 + \exp(\beta_v - \delta_i)] \quad [1]$$

where β_v is the ability of person and δ_i is the difficulty of item i . Both item difficulty and person ability are expressed in the same unit of measurement, called the logit. A logit may be defined as the natural log odds of a correct response to an item chosen to represent the center (or "zero" point) of the measurement scale.

The Rasch model assumes that all the items in a test measure the same construct, and that the logistic curve, defined by Equation 1 is a satisfactory representation of the data. Items that do not fit the model can be detected statistically and discarded. An important reason for using the Rasch model is that it provides objective measurement. By this, it is meant that the estimate of a person's ability does not depend on the items attempted and that the estimate of an item's difficulty does not depend on the particular sample of individuals used in its calibration. Thus, when a set of items is administered to two samples, and calibrated separately for each group, the two resulting sets of Rasch item difficulties will be linearly related. Therefore, a set of anchor items, present in each of two different tests administered to two different samples, may assume the linking function of anchor items. Determining the linear relation between the linking items yields a constant that, if added to the difficulties of the anchor items as calibrated in examination Y , will transform them to the scale of examination X . The same constant, added to the difficulties of the remaining items of examination Y , also places them on the examination X scale of measurement because the same linear relation must apply to all the items, even those present on only one of the tests.

The necessary constant used to transform the item difficulty parameters of examination Y onto the scale of examination X is given by Wright and Stone (1979):

$$G_{xy} = \sum_{i=1}^K (\delta_{ix} - \delta_{iy}) / K \quad [2]$$

where δ_{ix} is the difficulty of item i when calibrated with the items on examination X ; δ_{iy} is its difficulty on the examination Y scale; and K is the number of anchor items.

After two examinations have been linked in this manner, the same procedure may be repeated to link one of the examinations with yet another examination using a (possibly) new set of linking items. In this way, many alternate versions of an examination may be equated, enabling examination performance to be evaluated over periods of several years. Large

inventories of items (item banks) may also be built up systematically over time using the chaining process. A certain degree of error, however, accompanies each linking step, so it is advisable to crosscheck item difficulty parameters periodically to insure that the equating process remains accurate.

Person ability estimates, p_v , also expressed on the logit scale, may be transformed by the same constant used to place items on a common scale. Equating the ability scales makes possible the comparison of group differences even though alternate examination forms may have been used at each administration.

The dental hygiene examination is scaled according to the Rasch model using the unconditional/maximum likelihood estimation procedure (Wright & Panchepakesan, 1969) using the WINSTEPS computer program (Linacre, 2002). Output includes person and item parameters scored in logits and indices of how well the responses of each person and item fit the model. Included among the items is a set of linking or anchor items. As discussed above, links enable each item and each candidate to be located on the same scale of measurement as that of the base year of the examination.

The following simple example illustrates how common (anchor) item equating is carried out. Table 16.2 presents item statistics obtained on two separate administrations of seven anchor items. The first column shows item difficulties scaled on the base year logit scale. Standard errors show how accurately difficulty has been estimated. The corresponding statistics for the new testing are shown in the next two columns. The linking constant is simply the difference between the mean item difficulties of the two calibrations. In this example, the linking constant is -0.36. Ideally, when the link is added to the new difficulty, the sum should equal the corresponding base year difficulty for each item. However, error due to sampling and imperfect measurement usually results in a discrepancy between these two values. If the difference is too large for a given item, it should not be included in the equating process. Wright and Stone (1979) provide a statistical chi-square test that allows us to determine how large a difference in difficulties one may expect by chance.

Table 16.2.
Difficulties of Anchor Items Calibrated on Two Test Administrations

<i>Item</i>	<i>Base Year</i>		<i>New Testing</i>		<i>New Testing</i>	<i>Square Error</i>
	<i>Diff.</i>	<i>S.E.</i>	<i>Diff.</i>	<i>S.E.</i>	<i>Diff. + Link</i>	
<i>1</i>	-0.88	.05	-0.72	.04	-1.08	.0400
<i>2</i>	-0.74	.05	-0.42	.04	-0.78	.0016
<i>3</i>	-0.62	.05	-0.28	.04	-0.64	.0004
<i>4</i>	-0.15	.04	-0.02	.04	-0.34	.0361
<i>5</i>	0.26	.04	-0.61	.04	-0.25	.0001
<i>6</i>	-0.18	.04	-0.05	.04	-0.31	.0169
<i>7</i>	-1.03	.05	-0.08	.04	-0.44	.3481**
<i>Sum</i>	-3.34		-0.82		-3.34	.4432**
<i>Mean</i>	-0.48		-0.12		-0.48	

** $p < .01$

In the example, Item 7 produced a difference in difficulties greater than that which would be expected by chance alone. As a result, the overall fit of the equating was not acceptable.

When an unsuitable item is detected, the equating process begins again without it. This requires that the mean item difficulties be recalculated for the remaining items, a new linking constant determined, and the discrepancies between the old and new calibrations recalculated. In this case, the new linking constant is equal to -0.27. Once a satisfactory equivalence between the base year and current year anchor items has been established, the next step is to adjust the difficulties of all the remaining items in the new examination by adding the link constant to them. This adjustment places all the items on the original base year scale, even though none of the non-anchor items was administered in the base year. Since all item parameters are now grounded in the same scale of measurement originally used in the base year, estimates of person ability (determined from Equation 1 using the WINSTEPS Rasch scaling program) will be on that scale. This enables any person's score to be compared to that of any other person, regardless of the year in which they completed the examination, and regardless of which particular items were included on that examination. Mean scores, too, may be compared from examination to examination.

17. Scoring and Reporting Test Scores

Standards pertaining to scoring and reporting of scores appear in Table 17.1 below. Quality control in scoring is an important, yet often invisible, feature of any examination program. Standard 5.8 refers to the scoring and potential scoring errors. Standard 5.10 refers generally to making responsible interpretation of scores to recipients of these scores. Standard 5.13 makes certain the transmission of scores is done responsibly. Standard 5.15

and 5.16 refers to record keeping.

Table 17.1
Standards Pertaining to Scoring and Reporting of Test Scores

5.8 Test scoring services should document the procedures that were followed to assure accuracy of scoring. The frequency of scoring errors should be monitored and reported to users of the service on reasonable request. Any systematic source of scoring error should be corrected.

5.10 When test information is released to students, parents, legal representatives, teachers, clients, or the media, those responsible for testing programs should provide appropriate interpretations. The interpretations should describe in simple language what the test covers, what scores mean, the precision of the scores, common misinterpretations of test scores, and how scores will be used.

5.13 Transmission of test scores to authorized individuals or institutions should be done in a manner that protects the confidential nature of the scores.

5.15 When test data about a person are retained, both the test protocol and any written report should also be preserved in some form. Test users should adhere to the policies and record-keeping practice of their professional organizations.

5.16 Organizations that maintain test scores on individuals in data files or in an individual's records should develop a clear set of guidelines on the duration of retention of an individual's records, and on the availability, and use over time, of such data.

Scoring the Print-based National Board Dental Hygiene Examinations

Procedures for scoring the print-based National Board Dental Hygiene examinations are presented in *Examination Regulations* (Joint Commission on Dental Examination, March 2007). A quality control system is in place that increases confidence in scoring. For the print-based examination, once answer sheets are received, they are optically scanned. A computer program is used to search for potential errors such as missing responses, more than one response per item, and missing answer sheets, to name a few. A computer program checks to see if the candidate would have achieved a better raw score if the answer sheet were scored with the key for one of the two remaining forms. As there are three forms for each test date, each form is identical except that items are randomized in groups of five. In this way, no item is placed too far away from the sequence in the base form. Department editors check all potential errors against the actual answer sheets. Following the editing process, traditional item statistics (difficulty and discrimination) are computed. The examination development staff are asked to key check all items with unusual statistics. One

unusual statistic is when the correct alternative has a negative point-biserial correlation. Another unusual statistic is the proportion of candidates selecting the correct alternative is less than the proportion of candidates selecting one (or more) of the distracters. Once the key is confirmed, items are removed from the scoring process if they do not meet the standard guidelines. Essentially, items are removed if the point-biserial is negative. In a final audit, staff hand check a significant number of failing and passing candidates' answer sheets. Staff confirms the accuracy of the raw score count as well as the standard score. The answer sheets of candidates who performed at or near the passing point are the focus of an auditing process.

Candidate's Scores

Candidate score reporting is more fully discussed in *Examination Regulations* (Joint Commission on National Dental Examinations, March 2007).

Two factors affecting a candidate's score are (1) the number of correct answers selected by the candidate and (2) the conversion scale for the examination. For the dental hygiene examination, there is no penalty for selecting an incorrect response. A candidate's score is based on the total number of correct answers. If two or more answers are marked by a candidate for the same item, credit is not awarded. If an item is found that does not meet established standards, the Joint Commission may exclude the item from scoring. Also, on any edition of the examination up to 15% of the items are administered in order to determine if they meet established standards of quality. These pretest items are not included in the scoring process and, therefore, do not contribute to candidates' scores.

The conversion scale used to score a new edition of an examination is based upon the performance of a well-defined reference group. This group consists of all students enrolled in dental hygiene education programs with approval accreditation status and who are being examined for the first time. To insure consistency in the scoring process, a comparison is made between the performance of this group and previous reference groups.

The standard score of 75 is used by the Joint Commission to reflect the minimum passing score on an examination in a standard score range of 49 to 99. A score below 75 is considered a failing score.

Score Reports

Results are mailed approximately six to eight weeks after the test. Currently, the Joint Commission regulations prohibit reporting scores by telephone, fax, or e-mail. By signing the application, a candidate gives permission to provide a report of scores to the director of the dental hygiene program in which the candidate is enrolled or from which the candidate has graduated. The examination fee covers a report of scores for the candidate and the dental hygiene program director. The examination fee also covers the cost of sending reports of scores to three dental licensing boards, providing requests to send such scores are included on the application. For a period of 30 days after scores are mailed, the Joint Commission is willing to audit a candidate's score upon written request from the candidate.

Currently, a candidate who has previously passed the dental hygiene examination may retake the examination if eligible. However, the most recent score is always reported. A report of previous scores may also be provided with the report of the most current score at the request of the candidate.

Certificates

A small National Board Certificate as part of the score report is issued to each candidate who passes the dental hygiene examination. After receiving scores, any passing dental hygiene candidate may order a full-size (8 1/2" x 11") certificate. An order form with information is provided with the examination results. Available certificates include a full-size certificate on paper, a certificate mounted on a simulated wood plaque, a certificate mounted on a genuine walnut plaque, and a certificate with a custom matted frame. Replacement certificates are available for name changes or for certificates that have been destroyed or lost.

18. Rights and Responsibilities of Test Takers

Chapter 8 of the *Standards* (AERA, APA, NCME, 1999) addresses the issue of fairness and the interests of the examination taker of the dental hygiene examination. Since so much is at stake in taking these examinations, the Joint Commission ensures that candidates for licensure receive utmost fair treatment in the preparation, administration, and scoring of the examination. Table 18.1 below provides four relevant standards 8.1 and 8.2 require that examination information is made available to all candidates. Generally, a candidate guide or web page is the most suitable way of accomplishing this. Standard 8.7 refers to cheating, and standard 8.13 refers to challenges and other conflicts in examination scoring.

Table 18.1
Standards Addressing Rights and Responsibilities of Test Takers

8.1 Any information about test content and purposes that is available to any test taker prior to testing should be available to all test takers. Important information should be available free of charge and in accessible formats.

8.2 Where appropriate, test takers should be provided, in advance, as much information about the test, the testing process, the intended test use, test scoring criteria, testing policy, and confidentiality protection as is consistent with obtaining valid responses.

8.7. Test takers should be made aware that having someone else take the test for them, disclosing confidential test material, or any other form of cheating is inappropriate and that such behavior may result in sanctions.

8.13. In educational testing programs and in licensing and certification applications,

test takers are entitled to fair consideration and reasonable process, as appropriate to the particular circumstances, in resolving disputes about testing. Test takers are entitled to be informed of any available means of recourse.

Candidate Guide

A single most effective means for satisfying the standards appearing in Table 18.1 is the publication of a Candidate Guide. Annually, the Joint Commission publishes a *National Board Dental Hygiene Examination Candidate Guide*. The guide is available online at www.ada.org. The Guide contains detailed information related to the format and content of the examination, eligibility requirements, examination regulations, the appeal process, and the scoring of the examination. There are also sections in the Guide that provide examples of item formats and sample items.

Obligations of Candidates

Some frequently asked questions regarding the obligations of National Board Dental Hygiene Examination candidates are listed in Appendix B along with the answers to those questions.

Testing Candidates with a Disability

At the discretion of the Joint Commission, special arrangements may be made to enable a candidate with a disability to be examined. Candidates are expected to submit a written request well in advance of the testing date. Candidates must document their disability and request an accommodation. The Joint Commission complies with the requirements of the Americans with Disabilities Act. The procedures are clearly stated in the Candidate Guide.

Policy Regarding Re-examination

Beginning 2007, candidates who have not passed the dental hygiene examination after three attempts are required to wait one year (12 months) after their third attempt to apply to retest. Candidates who are unsuccessful after three attempts are encouraged to seek formal remediation. Increasing the required time period between examinations will allow candidates the opportunity to seek meaningful remediation.

Privacy and Security

The Joint Commission is concerned with maintaining the privacy and security for all personal information of test-takers. The Joint Commission takes the responsibility for protecting candidate personal information very seriously and uses industry standard methods to secure and protect the candidate's confidential information.

The NBDHE program collects and retains personal information only to the extent necessary to serve the candidate's needs, administer the NBDHE; fulfill NBDHE program responsibilities, including maintaining the integrity of the test and detecting and preventing unlawful activity; and fulfill legal requirements. NBDHE scores are retained indefinitely, along with testing records and necessary personal data.

NBDHE scores are released and/or reported to state dental boards, education programs or other entities only on the candidate's written authorization or designation by electronic means through the online application or score report request form. Scores will not be reported to a candidate or others by telephone, in person or by other informal means.

The ADA provides technical support for the NBDHE program and uses data security procedures to protect the integrity of personal and test information at all times. Security safeguards include administrative, technical, and physical safeguards over data and data processing systems.

By registering for the test, candidates consent to the collection, processing, use and transmission of personal information for purposes related to the NBDHE program as outlined in the Candidate Guide.

19. Threats to Validity

According to Messick (1989), two major threats to validity are construct-irrelevant variance (CIV) and construct under representation (CUR). This part of the technical report discusses validity evidence bearing on these two threats.

Construct-Irrelevant Variance (CIV)

This threat to validity involves systematic error in scores. Haladyna (2002) identifies many sources, including non-equivalent forms, cheating, improper preparation, errors in scoring results, and faulty items. Previous sections of this report address some of these issues.

The Joint Commission periodically releases editions of National Board examinations in order to familiarize candidates with test item format. However, the Joint Commission recommends that candidates use textbooks and lecture notes as their primary sources of study material. Released examinations are available at most dental hygiene programs and the library of the American Dental Association. The Joint Commission provides defensible examination preparation and discourages superficial learning as a basis for examination preparation.

The Joint Commission on National Dental Examinations does not discriminate based on race, color, religion, gender, age, sex, national origin, disability, sexual orientation, or marital status. One source of CIV is such discrimination.

Irregularities and Appeals

Standard 5.7 states "Test users have the responsibility of protecting the security of test materials at all times." The integrity of any dental hygiene examination score is dependent on each candidate working independently. Each candidate is responsible for protecting his or her answers from copying by another candidate. If a candidate finds testing facilities too crowded or poorly arranged to protect his or her answers, the candidate is advised to immediately register a complaint with the examination administrator. Candidates should not share unreleased examination content or items.

When an irregularity is reported by a test administrator or noted during the processing of examinations or analysis of results, scores of the candidate or candidates involved will be withheld and may be voided. One method employed by the Joint Commission in monitoring irregularities, which may result in withholding scores, is based upon unrealistic similar answer patterns. Statistical criteria for withholding scores are based on the comparison of answers of candidates with those of other candidates.

A candidate whose scores are being withheld is notified by written correspondence. If a candidate whose scores are being withheld is enrolled in an accredited dental hygiene school, notification is sent to the program director pursuant to policies on score reports. This notification to the program director does not provide the reason for or evidence upon which the withholding of scores is based.

Provisions that apply when scores are withheld are contained in the Joint Commission's *Examination Regulations*. A copy of the *Limited Right of Appeal for Examination Candidates* is provided to the candidate(s) whose scores are being withheld, as well as specific information regarding the appeal process. In accordance with its rules, the Joint Commission may consider an appeal. An appeal must be submitted in writing and must include adequate documentation. A candidate's appeal may include documentation that he or she believes supports his or her appeal. The appeal should also indicate the specific relief requested.

Appeals pertaining to examination irregularities must be initiated within 60 days after official notification of the irregularity. If a candidate's scores have been reported prior to notification of an irregularity, submission of an appeal will stay the decision to withhold or void scores until such time as the appeal is decided. The candidate will be notified of the Joint Commission's action within 60 days after receipt of the appeal.

When considering an appeal, the Joint Commission will strive to ensure that the appealing candidate has an opportunity to gain National Board certification equal to, but not greater than, the opportunity provided to other candidates.

Candidates should be aware that the Joint Commission considers irregularities other than natural disasters and emergencies beyond the control of the candidate to be a serious breach of the examination process. The Joint Commission handles irregularities in a confidential

manner and does not voluntarily share details regarding irregularities. However, candidates should be aware that reports of irregularities may have consequences beyond the withholding or voiding of scores if information regarding the irregularities is brought to the attention of school authorities or regulatory agencies by other sources.

Candidates can report suspicious activity or observations of violations of the Examination Regulations to the Joint Commission office or electronically at education@ada.org.

Construct Under Representation

Another threat to validity is construct under representation. When an examination does not completely represent the domain of knowledge intended in the initial creation of the content, this bias leads to inadequate validity and caution or doubt about the meaning of an examination score and its legitimacy in making a pass/fail decision.

The processes in defining the domain of knowledge to be tested and determining the examination specifications goes very far in assuring the public and the dental community that the dental hygiene examination does not under represent professional knowledge deemed essential for entering dental hygienists.

20. Validity Studies

Studies are undertaken to address significant problems that threaten validity or may provide a new source of validity evidence strengthening the argument to use dental hygiene examination scores to make pass/fail licensing decisions in states that use these test scores.

Validity studies can vary significantly in type and scope. One important validity study is based on the practice analysis that is conducted periodically to update the examination specifications and ensure that the examination is current. A validity study for the dental hygiene examination was initiated early in 2002. The findings of this practice analysis were reviewed by the Joint Commission in 2004 and revised examination specifications became effective in 2005. The next validity study for the dental hygiene examination will be initiated in spring 2009.

Standard-setting studies are essential when a new set of examination specifications is used and the new resulting examination needs a new cut score. Kramer and DeMarais (1992) provide a good example of this kind of study. A standard setting activity will be scheduled for 2009. The purpose of this activity will be to confirm the existing standard or cutscore.

Reliability studies are considered a standard and primary type of validity evidence. Therefore, such studies are conducted on a routine basis (Kramer & DeMarais, 1992).

Studies of the content and content structure of the examination are also important. Since item response theory requires unidimensionality in its item responses, evidence should be

consistent with this requirement. Indeed, in a study by Kramer and DeMarais (1997), this was established.

21. Security

A threat to validity is any security leak, including the inadvertent loss of any examination booklet or content. Table 21.1 provides a list of standards that pertain to security. The Joint Commission has policies and procedures in place to provide for security.

Table 21.1
Standards Pertaining to Security

5.7 Test users have the responsibility of protecting the security of test materials at all times.

8.6 Test data maintained in data files should be adequately protected from improper disclosure. Use of facsimile transmission, computer networks, data banks, and other electronic data processing or transmittal systems should be restricted to situations in which confidentiality can be reasonably assured.

11.7 Test users have the responsibility to protect the security of tests, to the extent that developers enjoin users to do so.

General Principles: Effective examination security procedures are critical to the success of any examination program. Responsibilities for examination security are clearly defined for examination developers, examination administrators and examination users. Examination security is maintained throughout the examination development and examination administration processes in a variety of ways. Policies of the Department of Testing Services address issues related to examination security and are reviewed periodically by the Joint Commission and staff of the department.

Identification of Secure Materials: The Joint Commission has identified the following materials as secure:

1. individual items and case material, e.g. radiographs, clinical photographs, and dental charts in development, in camera-ready copy, in the printing process, in waste materials from printing, in printed test booklets, and in electronic files for transmission to printing or administration sites;
2. answer sheets completed by candidates and answer keys;
3. scoring material, e.g., item analyses and statistical analyses;
4. computer scoring software;
5. standard setting materials and meeting notes;

6. item banks; and
7. candidate personal information.

Departmental Procedures:

- Policies and legal issues: All items and examinations are copyrighted to establish ownership and restrict their use or dissemination through unauthorized means. Policies and procedures for handling secure materials require continuous secure custody of materials and a chain of evidence attesting to the status and location of secure materials.
- Personnel: The team that maintains security on the examination materials includes Joint Commission staff, vendors, and volunteers.
 - Personnel handling examination materials must be screened at the time of hire or selection for committee assignment to disqualify individuals whose history may show them to be potentially untrustworthy.
 - All staff are trained in the procedures for handling secure materials and are required to comply with policies on confidentiality and conflict of interest.
 - Staff: The examination development staff maintains security on examination materials during the development process by storing materials in locked storage areas. Examination administration staff is responsible for receiving and shipping materials and storing them in a secure location while in the central office. Once materials are returned after administration, they are once again stored in a secure location prior to shredding by the disposal company.
 - Vendors: All vendors, including printers and disposal companies, are responsible for maintaining security on materials. The operations of vendors are reviewed by the Joint Commission staff to ensure compliance with security policy. All service agreements with vendors require adherence to security procedures specified by the Joint Commission.
 - Volunteers: Volunteers who assist in the development of items and editions of the examination must complete agreements regarding confidentiality, copyright assignment and conflict of interest. Volunteers are thus prohibited from releasing information regarding examination content.
- Facilities and storage of examination materials: access to the offices of the Joint Commission is restricted and secure storage is provided for examination materials. Dual attestation to the movement of secure materials in the packing and shipping process is required. Security of materials stored or transmitted in electronic format includes technology for password protection, encryption, firewalls, etc.

- No factor is more critical to effective examination administration and security than an adequate test administration facility. With regard to security, examination material is shipped to the examination security agent at the center about three weeks before the testing date. The examination security agent is expected to store examination material in a secure area, such as a locked cabinet or closet. Examination material should remain sealed until opened by the examination administrator on the morning of the examination. Specific instructions are provided to examination administrators for the storage and handling of materials.
- Shipping and receiving: All examination materials are shipped by traceable means. Cartons containing examination material are shipped to centers and stored in a secure location. The cartons are not opened until the morning of examination, unless the state board has authorized the opening, verification and re-securing of the examination material. The first step in the conduct of National Board examinations is to verify counts of the various examination materials provided on the Shipment Inventory. Initial counts of booklets must be confirmed before distribution of any examination materials.
- Examination materials are shipped back to the central office by traceable means, where they are counted again to verify the return of all materials.
- Destruction of materials: Used examination booklets, including case booklets and completed answer sheets are stored in a secure location and destroyed after a proscribed period of time. The period depends on the Joint Commission's policies on retention of confidential material.
- Confidentiality of candidate information: Candidate scores and personal information are released only on written request or with written permission of candidates. No telephone or e-mail requests for scores or transcripts are accepted.

Test administration policies and procedures

- The examination administration team for the National Board Dental Hygiene Examination includes three categories of personnel: examination administrators, proctors, and an examination security agent.
- Examination Administrator: Examination administrators have overall responsibility for all aspects of the conduct of examinations and security at their centers. One or two examination administrators serve at each center. If a center is located in a school, the school is asked to identify an individual to serve as an examination administrator. The state board of dentistry is encouraged to appoint a second examination administrator. Prior to the day of examination, the examination administrator from the school is expected to arrange for facilities. The examination administrator from the school and the test security agent arranges for the delivery of examination material and for securing the material. The examination administrator from the school usually returns examination material after

examinations are completed. Examination administrators provide written reports following each examination administration to confirm testing procedures and provide information regarding any irregularities.

- **Proctors:** Proctors are used as additional monitors in large testing centers. These proctors assist the examination administrator in monitoring the conduct of the examination in order to maintain security on examination materials and to preclude the occurrence of a testing irregularity.
- **Examination Security Agent:** One examination security agent is identified for each testing center. The examination security agent is responsible for the receipt and secure storage of examination material. If the examination administrator from the school has a secure storage area available, he or she usually also serves as examination security agent. Otherwise, the dean usually fills this role.

Security of Examination Materials in Electronic Format: Departmental and vendor computers are protected with firewalls, login identifications, passwords and other forms of security. Access to electronic files is limited to authorized individuals.

Computerized Testing Procedures: The computer version of the examination is administered by Pearson VUE at its testing centers. The Candidate Guide describes procedures for identification of candidates, including requirements for multiple forms of positive identification. Conduct of candidates is closely monitored during the examination period and is limited by the Examination Regulations and testing center policies to deter cheating and breaches of security.

Policies and Procedures for Dealing with Breaches in Security: Specific procedures for observing and reporting breaches in security are established and communicated to examination administrators. Reports of security breaches are promptly investigated. Once it has been established that security has been breached, an examination is removed from use. Appropriate sanctions are applied or legal action is taken when the source of a security breach is identified.

22. Guidelines for High-Stakes Testing

The American Educational Research Association is the largest organization in the world devoted to the scientific study of education. In 2000, it issued a brief publication listing guidelines that it thinks should be followed in designing and using a high-stakes examination. These guidelines are intended for educational examinations given in a high-stakes setting, such as for high-school graduation. However, some of the guidelines seem very appropriate for the dental hygiene examination. This section presents a selected set of these guidelines and provides a brief discussion of each guideline *vis a vis* the dental hygiene examination.

Protection Against High-Stakes Decisions Based on a Single Examination

Can a single examination prevent a candidate from practicing as a dental hygienist after other criteria for licensure have been met? The dental hygiene examination provides repeated opportunities for candidates to prepare for and pass these examinations. The decision to license a dental hygienist is based on meeting many other criteria. Since the public welfare and safety are at issue, the Joint Commission bears a heavy responsibility along with states for using this examinations information with other information for making licensing decisions.

Adequate Resources and Opportunity to Learn

The Joint Commission has no responsibility for the preparation of dental hygienist. This task falls to the schools in the United States. Failure to provide adequate opportunities to learn professional knowledge can lead to a candidate failing the dental hygiene examination. The Joint Commission provides on request a list of reference texts and resources for the examination.

Validation for Each Separate Intended Use

For each use of an examination score, there is a separate validation. The Joint Commission adheres to this guideline, as this technical report has demonstrated.

Full Disclosure of Likely Negative Consequences of High-Stakes Testing Programs

Where credible scientific evidence suggests that a given type of examination program is likely to have negative side effects, examinations developers and users should make a serious effort to explain these possible effects to policy makers. This guideline does not seem relevant to this examination program.

Alignment Between the Examination and the Curriculum

While the National Board content is not aligned with curriculum in schools providing dental hygiene education, it is the responsibility of the schools to align student learning with the knowledge, skills, and abilities that national practice analyses have determined is the core knowledge of practicing dental hygienists. Dental hygiene curricula may include content beyond the knowledge and abilities required for clinical dental hygiene practice.

Validity of Passing Scores and Achievement Levels

The Joint Commission has determined its passing scores using methodology that is consistent with the *Standards for Educational and Psychological Testing* (1999).

Opportunities for Meaningful Remediation for Examinees Who Fail High-Stakes Examinations

The Joint Commission bears no responsibility for remediation, but schools may choose to provide remediation if a candidate fails. The Joint Commission provides a list of reference materials that maybe useful to candidates but does not endorse any specific review courses.

Appropriate Attention to Students with Disabilities

In testing individuals with disabilities, steps should be taken to ensure that the examination score inferences accurately reflect the intended construct rather than any disabilities and their associated characteristics extraneous to the intent of the measurement. The Joint Commission complies with federal regulations bearing on examination administration of candidates with disabilities. Score reports do not identify candidates who may have received special accommodations for an examination.

Sufficient Reliability for Each Intended Use

Reliability refers to the accuracy or precision of examination scores. It must be shown that scores reported for individuals or for schools are sufficiently accurate to support each intended interpretation. Accuracy should be examined for the scores actually used. This technical report provides solid evidence of the adequacy of reliability estimates.

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Appendix A

Dental Hygiene Examination Specifications, 2007

The examination specifications shown on the following pages went into effect in January of 2007.

The National Board Dental Hygiene Examination is a comprehensive examination comprised of 350 multiple choice test items. Although performance on the examination is reported by means of one official score, the examination has two components. The discipline-based Component A includes 200 items addressing three major areas:

- I. Scientific Basis for Dental Hygiene Practice
- II. Provision of Clinical Dental Hygiene Services
- III. Community Health / Research Principles.

Component B includes 150 case-based items that refer to 12-15 dental hygiene patient cases. These cases present information dealing with adult and child patients by means of patient histories, dental charts, radiographs, and, at times, intra- and extra-oral photographs. Each examination includes at least one case regarding patients of the following types: Geriatric, Adult-Periodontal, Pediatric, Special Needs, and Medically Compromised. A compromised patient is one whose health status may require modification of standard treatment or special consideration.

The case-based items address knowledge and skills required in:

- 1.0. Assessing patient characteristics
- 2.0. Obtaining and interpreting radiographs
- 3.0. Planning and managing dental hygiene care
- 4.0. Performing periodontal procedures
- 5.0. Using preventive agents
- 6.0. Providing supportive treatment services
- 7.0. Professional responsibility

The distribution of items in Component A is defined by the following outline. The number in brackets after each topic designates the number of questions assigned to this topic.

Case Independent Items [200]

SCIENTIFIC BASIS FOR DENTAL HYGIENE PRACTICE [60]

- 1.0. Anatomic Sciences [15]
 - 1.1. Anatomy [11]
 - 1.1.1. Head and neck anatomy [6]
 - 1.1.2. Dental anatomy [5]
 - 1.1.2.1. General anatomy
 - 1.1.2.2. Root anatomy
 - 1.2. Histology and Embryology [4]
- 2.0. Physiology [4]
- 3.0. Biochemistry and Nutrition [7]
- 4.0. Microbiology and Immunology [11]
- 5.0. Pathology [13] (1*)
 - 5.1. General [5]
 - 5.2. Oral [7]
- 6.0. Pharmacology [10]

PROVISION OF CLINICAL DENTAL HYGIENE SERVICES [116]

- 1.0. Assessing Patient Characteristics [16](3*)
 - 1.1. Medical and dental history [3]
 - 1.2. Head and neck examination [1]
 - 1.3. Periodontal evaluation [6]
 - 1.4. Oral evaluation [2]
 - 1.5. Occlusal evaluation [1]
- 2.0. Obtaining and Interpreting Radiographs [14](7*)
 - 2.1. Principles of radiophysics and radiobiology [1]
 - 2.2. Principles of radiologic health [3]
 - 2.3. Technique [1]
 - 2.4. Recognition of normalities and abnormalities [2]
- 3.0. Planning / Managing Dental Hygiene Care [34](3*)
 - 3.1. Infection control (application) [4]
 - 3.2. Recognition of emergency situations and provision of appropriate care [5]
 - 3.3. Individualized patient education [11](1*)
 - 3.3.1. Planning of individualized instruction [4]
 - 3.3.2. Provision of instruction for prevention and management of oral diseases [7]
 - 3.3.2.1. Dental caries
 - 3.3.2.2. Periodontal diseases
 - 3.3.2.3. Oral conditions
 - 3.4. Anxiety and pain control [4]
 - 3.5. Recognition and management of compromised patients [3]
 - 3.6. Dental hygiene treatment strategies [4]

- 3.6.2. Treatment plan [2]
- 3.6.3. Case presentation [1]
 - 3.6.1. Diagnosis [1]

- 4.0. Performing Periodontal Procedures [19]
 - 4.1. Etiology and pathogenesis of periodontal diseases [4]
 - 4.2. Prescribed therapy [10](3)
 - 4.2.1. Periodontal debridement [5]
 - 4.2.2. Surgical support services [1]
 - 4.2.3. Chemotherapeutic agents [1]
 - 4.3. Reassessment and maintenance [5] (e.g. implant care)
- 5.0. Using Preventive Agents [9]
 - 5.1. Fluorides - systemic and topical [5]
 - 5.1.1. Mechanisms of action [1]
 - 5.1.2. Toxicology [2]
 - 5.1.3. Methods of administration [2]
 - 5.1.3.1. Water fluoridation
 - 5.1.3.2. Self-administered
 - 5.2. Pit and fissure sealants [3]
 - 5.2.1. Mechanisms of action [1]
 - 5.2.2. Techniques for application [2]
 - 5.3. Other preventive agents [1]
- 6.0. Providing Supportive Treatment Services [7](1*)
 - 6.1. Properties and manipulation of materials [3]
 - 6.2. Polishing natural and restored teeth [1]
 - 6.3. Making of impressions and preparation of study casts [1]
 - 6.4. Other supportive services, e.g., tooth desensitization [1]
- 7.0. Professional Responsibility [17] (1*)
 - 7.1. Ethical principles, including informed consent [8]
 - 7.2. Regulatory compliance [3]
 - 7.3. Patient and professional communication [5]

COMMUNITY HEALTH/RESEARCH PRINCIPLES [24]

- 1.0. Promoting Health and Preventing Disease Within Groups [5]
- 2.0. Participating in Community Programs [11]
 - 2.1. Assessing populations and defining objectives [5]
 - 2.2. Designing, implementing, and evaluating programs [6]
- 3.0. Analyzing Scientific Literature, Understanding Statistical Concepts, and Applying Research Results [8]

* Item is designated under the general topic.

Appendix B
Important Notice
Regarding the Obligations of National Board Dental Hygiene Examination Candidates

Important Notice
Regarding the Obligations of National Board Dental Hygiene Examination Candidates

What is the purpose and intent of the National Board Examination Regulations?

Examination Regulations are established to ensure that examination results are valid. This means that a candidate's score is an accurate reflection of his or her knowledge and understanding. Candidates are expected to understand and interpret information and respond to examination questions without assistance or the advantage of having prior knowledge of questions or answers. The *Examination Regulations* are intended to prevent candidates from retaining or remembering questions and sharing them with other candidates and to prevent candidates from obtaining unreleased questions or answers from any source.

The National Board examinations are criterion-referenced, i.e., candidates are not graded on a curve but against a pre-determined standard. *Examination Regulations* are also intended to provide all candidates with an equivalent opportunity to gain National Board certification; no candidate should have unfair advantage over others.

All examination materials including released materials that are made available by the Joint Commission through various authorized channels, are copyrighted to protect the security and confidentiality of the examination content, as well as the investment of resources, primarily from candidate fees, that support the examination program.

How candidates are informed of the Examination Regulations?

The *Examination Regulations* are provided in writing in the *Candidate Guides* for each exam. The guides are provided on the testing area of the ADA website, www.ada.org. Information in the guides is updated annually; but the general nature and intent of the regulations remains the same as described above. Candidates also receive oral instructions from the test administrator at the time of testing. Each version of the examination session begins with a confidentiality statement that candidates must agree to as a condition of testing.

What happens if a candidate violates Examination Regulations?

When the Joint Commission receives information that indicates possible inappropriate behavior or violation of *Examination Regulations*, the candidate's results may be withheld. Established Joint Commission regulations identify prohibited activities and behavior and related penalties. In most cases, scores are voided and the candidate must wait up to two years to retest. When scores are withheld, the candidate is notified of the regulation that has been breached and the related penalty. Joint Commission policies provide an appeal process and candidates who are notified that their scores have been withheld receive information about the appeal process. If a candidate's scores have been reported prior to notification of an irregularity, submission of an appeal will stay the decision to withhold or void scores until such time as the appeal is decided.

Is it acceptable for candidates to remember and share unreleased questions or to solicit or use unreleased questions that have been recalled or obtained by others?

No. This violates the *Confidentiality Agreement* that all candidates sign before they begin examination. In addition, all examinations are protected by Federal Copyright Law and sharing or soliciting recalled questions violates the law. These practices are also unethical in that they violate principles of veracity (truthfulness) and justice (fairness).

Why is it unethical to ask someone for unreleased, recalled questions or to otherwise obtain and use recalled questions?

First, all candidates are expected to pass the examination on their own merit without assistance. Members of the public who entrust dental hygienists with their well-being expect that they are trustworthy and competent individuals. The purpose of the examinations is to ensure that you, as a candidate for licensure, have achieved entry-level competence. By asking previous test-takers to share unreleased questions, or by obtaining them, you undermine the very purpose of the examination.

What information can I share about the examination?

You can tell others whether you thought it was difficult or easy. You can tell them that you felt well prepared, or not. You can share any broad topic areas that are also listed in the National Board examination specifications that are published in the Candidate Guide or on the Joint Commission website, e.g., osteogenesis, premolar tooth morphology. You *cannot* describe specific questions and answers or context of questions related to these topics. If another student or member of the faculty suggests that you should remember and/or share confidential examination information with other students or faculty, you should decline and explain that this is not permitted.

What if some one offers unreleased questions to me?

You should not agree to accept unreleased examination items or confidential examination information or participate in the exchange of this information. If you receive unsolicited confidential or unreleased examination materials, you should inform the program director, dean or associate dean at your school or contact the Joint Commission office. They may request that you forward the materials for evaluation to determine whether the materials are indeed unreleased or confidential. Failure to do so could inadvertently implicate you in activity that violates *Examination Regulations* and may jeopardize your ability to achieve National Board certification and licensure.

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