

# RESEARCH

## Student Preparation for the National Board Dental Hygiene Examination: A national survey of dental hygiene program directors

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### Abstract

**Purpose:** Dental hygiene students nearing completion of their educational programs are required to take written and clinical examinations in order to be eligible for licensure. The written licensure exam, the National Board Dental Hygiene Examination (NBDHE), is administered by the Joint Commission of National Dental Examinations (JCNDE). Failing a licensing examination is a costly experience for students and has the potential for a negative impact on a program's accreditation status. Nursing programs have published extensively on strategies used to prepare students for licensure examinations. However, there appears to be a gap in the literature as to how dental hygiene programs prepare their students to take the NBDHE. The purpose of this study was to conduct a national survey of U.S. dental hygiene program directors to determine what strategies their programs employ to prepare students to take the NBDHE and to explore the viewpoints of dental hygiene program directors regarding student preparation methods for the NBDHE.

**Methods:** An survey instrument was developed, pilot tested, revised and mailed to directors of the 335 CODA accredited U.S. dental hygiene programs. The survey consisted of a combination of response formats including forced choice, multiple allowable answered, and open-ended written comments.

**Results:** A total of 154 surveys were returned, yielding an overall response rate of 45% (154/341). The vast majority of directors (93%) reported they use specific methods and practices to prepare students for the NBDHE. The top two strategies identified were dental hygiene review texts (84%) and a board review course (83%). The majority of directors (84%) reported supporting student participation in non-mandatory, commercial review courses. In regard to mock board exams, directors "agreed/strongly agreed" (75%) that the mock board exam is a useful coaching tool in the overall process of NBDHE preparations. A majority (65%) indicated they were not concerned with failure rates, and 43% reported failure rates do reflect on the program.

**Conclusion:** These results suggest that the majority of dental hygiene programs are utilizing strategies to prepare students for the NBDHE with board review textbooks and board review courses named as the top two strategies.

**Keywords:** dental hygiene education, dental hygiene students, National Board Dental Hygiene Examination (NBDHE), dental hygiene licensure, mock boards

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### Introduction

Dental hygiene students nearing completion of their educational programs are required to take written and clinical examinations in order to be eligible for licensure. The written test, the National Board Dental Hygiene Examination (NBDHE), is administered by the Joint Commission on National Dental Examinations (JCNDE). Both the NBDHE and clinical tests are considered high-stakes examinations due to the fact that dental hygiene students must pass them to be eligible for licensure.<sup>1</sup> In 2012, the

JCNDE reported a 4.2% failure rate among first-time NBDHE takers.<sup>2</sup> Students failing the NBDHE lose money in examination fees and time required to re-take the test. They also experience a loss of potential income as a result of being ineligible for licensure.

Additionally, dental hygiene program reputations are defined, in part, by student pass/fail rates on licensure examinations.<sup>4</sup> It is considered to be a universal goal for students to pass the NBDHE on the first attempt.<sup>5</sup> The Commission on Dental Accreditation (CODA) Standards for Dental Hygiene Education

Programs, Standard 1-Institutional Effectiveness, cites that the success of graduates on national boards can be evidence of a program's demonstration of effectiveness; one that utilizes a formal and ongoing planning and assessment process that can be systematically documented.<sup>6</sup> Hence, a poor class-wide pass rate could have a negative impact on a program's accreditation status. Conversely, student success on licensing examinations can be viewed as an indicator of program success, especially when considering the Commission on Dental Accreditation's (CODA) emphasis on outcomes-based education.<sup>7</sup>

A review of the health science literature reveals that nursing schools have published extensively on board preparation review strategies.<sup>8-20</sup> Nursing programs across the country use a wide variety of techniques to prepare students for the National Council Licensure Examination (NCLEX).<sup>9,10,12,16-23</sup> A national study to identify program requirements and educational interventions used to promote NCLEX-RN success identified the following nursing program interventions: academic referral (83 %, n = 132), commercial reviews (58 %, n = 91), social support referrals (57%, n = 91), computerized reviews (54%, n = 86), and faculty-led reviews (26%, n = 42).<sup>10</sup>

Dental education literature discusses preparation strategies for the National Board Dental Examinations (NBDE), Parts I and II. Researchers from the University of Texas Health Science Center at San Antonio (UTHSCSA) reported the use of mock board exams to prepare students for the national written board exam.<sup>8</sup> At UTHSCSA, an 18 hour prep course was provided by content experts covering all aspects of the exam in addition to test taking strategies. However, when students were asked about preferred methods for preparing for the board exam, they indicated the commercial Dental Deck flashcards as their favorite review method. Similar findings were confirmed in a national study conducted by a third year dental student in 2009.<sup>25</sup> Over half of the dental students surveyed reported that while their institution provided some form of a written board review course, they favored Dental Decks as a primary source for preparing for the NBDE.<sup>25</sup>

Gadbury-Amyot et al. found that online NBDE Part I and Part II review courses were shown to be effective in assisting dental students to prepare for high stakes licensure examinations.<sup>26</sup> Innovative online courses, containing both synchronous and asynchronous components, allowed dental students to access asynchronous online study materials at their convenience, in addition to giving students the opportunity to interact with content expert faculty members during synchronous sessions. Study results showed that students used the online program to provide a structure for weekly preparation for the NBDE exams along with other forms of preparation that were similar to other study findings.<sup>8,25</sup>

## **Dental Hygiene Education and NBDHE Preparation Practices**

A reported 6,882 students from over 330 dental hygiene programs in the United States took the NBDHE for a first attempt in 2012.<sup>2</sup> Despite the large number of dental hygiene students taking the NBDHE annually, very little research on how education programs prepare students for this high-stakes exam has been published in the literature. An Ovid Medline database search of the key word "NCLEX" in nursing produced 212 articles while a similar search using the key word "NBDHE" resulted in 11 citations.

A review of the existing literature supports that the most common strategy employed by dental hygiene programs to prepare students for taking the NBDHE has been the use of an institutional written mock dental hygiene board examination (MDHE).<sup>1,7,27</sup> Edenfeld and Henson examined the correlation between the NBDHE, MDHE scores, early course grade averages (ECA), and interim course grade averages (ICA).<sup>7</sup> They found that performance in courses taken by students prior to the mock board (ECA) was a better predictor of success on the NBDHE than the mock board exam itself.<sup>7</sup>

Gladstone et al. from New York University examined the effects of a required review course for preparing students for the NBDHE.<sup>27</sup> As a result of taking the required review course, students reported that they lowered their initial expectations of scoring 90% or above on the NBDHE and that they were better able to assess how much study was required in order to perform well on the national examination.<sup>27</sup> Students also reported that they valued the early review and assistance with setting a study schedule.<sup>27</sup>

In addition to institutional board review courses and mock board exams, the role of commercial board review courses in preparing students for the NBDHE has been investigated as a predictor variable in the literature.<sup>28-30</sup> Commercial board review courses have also been evaluated in regards to how students perceive them as a preparation strategy.<sup>28-30</sup> DeWald et al. compared students who took a particular commercial board review with students who did not take the course and found no significant difference in NBDHE performance between the two groups.<sup>28</sup> While higher scores as the result of taking a commercial board review course may not be supported by their study findings, DeWald et al. speculated that a commercial review course may help lower student stress by helping students feel more confident in their knowledge, more comfortable with the exam format and less anxious due to acquisition of study skills and preparation practices for written boards.<sup>28</sup>

In a 2006 poster presentation, Beatty evaluated dental hygiene alumnae perceptions of the value of a commercial board review as preparation for the NBDHE.<sup>29-30</sup> Alumnae of a dental hygiene program who had taken a commercial review course (n = 48) reported it as being somewhat to most beneficial

(98%). Beatty also reported that students used a variety of preparation methods including review of lecture notes, course textbooks, commercial review textbooks, previous examinations, and online resources and made the conclusion that commercial review courses have value, reinforce student learning, motivate students to study and present a plan of organized study.<sup>29,30</sup>

While the literature indicates that dental hygiene students utilize commercial board review courses as a NBDHE preparation strategy, there is a lack of research pertaining to the specific NBDHE preparation strategies specifically utilized by the dental hygiene education programs. The purpose of this quantitative study was to inform dental hygiene education programs on current NBDHE student preparation strategies by addressing the following questions:

What specific strategies are used to prepare students to take the NBDHE?

What are the views of the program director(s) regarding NBDHE preparation strategies?

Are there variations in NBDHE preparation strategies based on type of institution (Associate vs. Baccalaureate) or regional demographics?

## Methods and Materials

The target population for this survey consisted of the program directors and co-directors (when applicable) of the 335 accredited dental hygiene programs in the United States as identified by the Commission on Dental Accreditation (CODA) on June 5, 2014.<sup>31</sup> Following approval by the Institutional Review Board at University of Missouri-Kansas City (IRB #14-307), an electronic database of 341 dental hygiene director and co-director names and mailing addresses was created for the survey and reminder communications.

### Data Collection

A survey instrument, consisting of six sections and a total of twenty one questions, was developed based on a review of the literature and the use of content experts at the University of Missouri-Kansas City (UMKC). A preliminary pilot study was conducted with two associate degree and two baccalaureate degree dental hygiene programs. Feedback obtained from the pilot study was incorporated into the final version of the survey. Data collection, consisting of initial mailer, follow-up postcard, and two email reminders, took place over a two month period from October to December 2014.

### Statistical Analysis

Descriptive data analyses consisted of frequency distributions, measures of central tendency, and tests of mean differences. Demographic data were compared with methods of board preparation to determine if an association existed. Independent variables were program demographics: degree granted at institution (associate versus baccalaureate)

and the region of program location (Northeast, South, Midwest, and West). The dependent variables were the program directors' responses to preparation strategies used for the NBDHE. During statistical analysis, a decision was made to assign participants to specific groups according to responses. A one way ANOVA was performed to examine differences between NBDHE preparation strategies and program demographics. The level of statistical significance was .05 and the statistical analysis was performed using SPSS statistical package 22.0. Analysis of comments provided in the two open-ended questions were conducted following the principles of thematic analysis from Creswell, 1994 and Patton, 2002.

## Results

A total of 154 surveys were returned, yielding an overall response rate of 45% (n=154). The largest percentage of respondents (36%) reported having served less than five years as program director; nearly 30% had served five to ten years. An associate degree was the most frequently reported degree granted (71%), followed by a baccalaureate degree (22%). "Community/junior college" was the largest percentage of program setting (52%), followed by "university/or college not affiliated with a dental school" (20%). Respondents were divided geographically into four regions, Northeast, South, Midwest, and West, with Alaska and Hawaii included in the West region. Institutions in the South and Midwest were the highest responders with 32% and 31% respectively (Table I).

To address the first research question, directors were asked if they use specific methods or practices to prepare their students for taking the NBDHE and the specific strategies employed. The vast majority (93%) reported they do use specific methods and practices with the top two strategies identified as dental hygiene review texts (e.g., Mosby, Saunders) (84%) and a board review course (83%). Board review courses included commercial (42%), institutional (18%), or both (23%). The majority of directors (84%) reported supporting student participation in non-mandated commercial review courses. Table II lists the various preparation strategies and resources reported by program directors for preparing their students for the NDHBE. Additional preparation strategies frequently reported included: previously released NBDHE questions (73%), a mock board examination (72%), strategies on how to study (69%), Dental Decks, practice questions, and test taking strategies (66%), and strategies for reducing anxiety (63%). Directors agreed/strongly agreed (75%) that the mock board exam is a useful coaching tool in the overall process of NBDHE preparations but were neutral (44%) on whether or not the mock board exam is accurate in predicting which students will pass the NBDHE. For programs who report that they conduct a board review, 26% award college credit with 37% of those employing

Table I: Descriptive and demographics data

Years as director	N (%)
Less than 5 years	56 (36%)
5 to 10 years	46 (30%)
11-20 years	28 (18%)
21 or more years	16 (10%)
Missing/Not applicable	8 (5%)
Degrees granted by institution	
Associate	110 (71%)
Baccalaureate	34 (22%)
Master's	10 (7%)
Dental Hygiene program setting	
Community/junior college	80 (52%)
University/or college NOT affiliated with a dental school	29 (20%)
Technical school/institute	15 (10%)
University/college affiliated with a dental school	16 (10%)
Vocational school/institute	7 (5%)
Other	6 (4%)
Academic medical center	1 (.6%)
Region Program is located in	
South	49 (32%)
Midwest	47 (31%)
West	30 (20%)
Northeast	26 (17%)

a mandatory attendance policy (Table III). The majority report that the review occurs in the spring semester (62%) of the final year. Sixty five percent of directors reported that instructors review and update board review resource material regularly and 21% of directors confirmed that the faculty receive guidance for writing board review test items. The relationship between NBDHE results and program completion was explored. In regard to the NBDHE as a graduation requirement, 86% of program directors reported that students are not required to pass the NBDHE in order to graduate. When asked how their programs predict student success on the NBDHE, the vast majority chose cumulative dental hygiene grade point average (GPA) (61%) followed by overall GPA (58%), and science GPA (50%) Forty four percent of the respondents indicated they have a formal process for identifying students at risk of not passing the NBDHE.

Research question two asked program directors about their views concerning preparation methods

Table II: Respondents' preparation methods and resources, both institutional and commercial, used for preparing students to take the National Board Dental Hygiene Examination (NBDHE)

Preparation method:	N (%)
Dental hygiene review texts (e.g., Mosby, Saunders)	129 (84%)
Board review course	128 (83%)
Previously released NBDHE questions	113 (73%)
Mock boards examination	111 (72%)
Strategies for studying	107 (69%)
Dental Decks (flashcards)	104 (66%)
Practice questions	104 (66%)
Strategies for test taking	101 (66%)
Strategies for reducing anxiety	97 (63%)
Face-to-face review course	95 (62%)
Mock quizzes or tests	88 (58%)
Online websites (e.g., Dentalcare.com)	88 (57%)
Computer simulated NBDHE practice	85 (55%)
Organized discussion	74 (47%)
Formal review of course content	64 (42%)
Mini-lectures	58 (38%)
Study Groups	57 (37%)
Online preparation documents posted to a web-based learning system such as Blackboard	53 (34%)
Study apps (e.g., Pass It!)	51 (33%)
Online review course	47 (31%)
Dedicated time away from curriculum to study	44 (29%)
Workshop	22 (14%)
Other resources	12 (8%)

for the NBDHE. Questions about failure rates on the NBDHE and whether or not failure rates reflected on the quality of dental hygiene programs were addressed (Table IV). A majority (65%) indicated they were not concerned with failure rates, and 43% reported failure rates do reflect on the program. Directors were asked to respond to several statements concerning their perceptions of commercial board reviews. Of those programs using a commercial review course, 59% indicated student participation was not mandatory. They supported commercial reviews for a variety of reasons with the top two reasons being: increase self-confidence in what is already known (92%), and provide familiarity with question format (92%).

Table III: Directors' affirmative responses to strategies provided directly by institution for preparing students for the NBDHE

Instructors review and update board review resource material regularly.	101 (66%)
Review occurs during the spring semester.	96 (62%)
Faculty provide board review in areas of their content expertise.	90 (58%)
Attendance is mandatory.	55 (37%)
Review occurs during the fall semester.	44 (29%)
College credit given for review course participation.	40 (26%)
Instructors are provided guidance for the writing of board review test-items.	33 (21%)
Review occurs during the summer semester or other.	19 (12%)

Data in Table V shows that directors report the mock exam helps identify student strengths and weaknesses (68%), encourages students to study (67%), provides the opportunity to review results with students (62%), and provides students with a simulation of the actual NBDHE (60%). The majority indicated that the mock board exam is offered during the fourth semester (58%) and is incorporated into a required course (56%). Program provisions for students following a poor mock NBDHE can be found in Table VI.

Differences in NBDHE preparation practices based on type of degree awarded (Associate vs. Baccalaureate) or regional location (Northeast, South, Midwest, West) were examined to address research question three. Preparation methods were grouped according to institutional, commercial, or both. A one way ANOVA was completed and identified no significant differences ( $p > .05$ ) between the four regional locations in which the programs were located and preparation strategies ( $F(3, 142) = 1.75, p = .16$ ). Additionally, no significant differences were found in regard to type of strategies employed in relationship to type of degree granted ( $t(142) = -.741, p = .46$ ).

Qualitative analysis of written comments resulted in the emergence of five key themes. The first theme was student preparation (35/130). Directors commented on students' willingness to study long hours, begin preparation early and prepare consistently throughout the program as key to success on the NBDHE. A strong performance in the dental hygiene program surfaced as the second theme (22/130). Directors noted students who consistently excelled in course work, had a strong work ethic, displayed motivation and strong organizational skills, were committed, prepared, confident and dedicated throughout the program were successful on the NBDHE, as well. The third theme was a comprehensive program with a strong curriculum (19/130). Directors stressed a rigorous, well designed curriculum with high expectations of students. A fourth theme was participation in a board review course, either faculty-led or a commercial review (18/130). The use of faculty-led board reviews and commercial board reviews were expressed as being beneficial. Directors stated board reviews helped students become familiar with the format of board questions, provided critical thinking exercises and helped identify areas of weakness. The strength and dedication of faculty was a fifth and final theme (14/130). Directors pointed to faculty who were committed to student success, available to students and used board-type questions or other innovative teaching methods in their courses to prepare students for the NBDHE. Experience of faculty was cited as well.

A second open ended question asked what methods or interventions directors found to be most effective in preparing students for the NBDHE. Two themes materialized with the first being the use of a review course, either institutional or commercial (41/114). Similar to the feedback provided in the question analyzed above, directors felt a review course provided students with a structured method of study for board preparation, familiarity with question format and provided students with confidence and a feeling of being prepared. The use of a mock board exam to prepare for the NBDHE arose as a second theme (16/114). Directors reported using a variety of methods to facilitate a mock board exam including previously released NBDHE questions, a weekly board review class followed by a mock board exam, and posting a mock board exam on Blackboard.

## Discussion

In this study, the number one preparation strategy used by dental hygiene programs to prepare students for the NBDHE is the use of dental hygiene review texts (e.g., Mosby, Saunders), followed by a board review course. These results differ from previous studies where the use of a mock board review exam was noted as the number one preparation strategy.<sup>1,7,27</sup> Research of dental students found that while over half of dental programs (58%,) provide a board review course, this preparation strategy was endorsed by only 3% of students in one study as a primary source of study for the NBDE Part I.<sup>25</sup> Unlike dental education, nursing reports academic referral for study/test taking strategies as the most frequent strategy used for preparing their students for their written licensure examination, followed by review courses.<sup>10</sup> Medical schools have also reported the use of board preparation courses as a strategy to prepare students for licensing exams.<sup>8,32,33</sup> It is clear that review courses are valued as a study strategy by healthcare educational programs. Dental and dental hygiene students appear to be using Dental Decks as an additional study strategy, with a

Table IV: Directors' perceptions of statements relating to the NBDHE.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am concerned about the failure rates of our program's students on the NBDHE.	62 (40%)	39 (25%)	16 (10%)	23 (15%)	9 (6%)
The failure rate on the NBDHE tends to reflect on the quality of a dental hygiene program.	15 (10%)	35 (23%)	34 (22%)	50 (33%)	16 (10%)
Preparing for the NBDHE is entirely the responsibility of the student.	13 (8%)	85 (55%)	24 (16%)	23 (15%)	6 (4%)
I support students participating in a non-mandated commercial review course.	7 (5%)	1 (.6%)	14 (15%)	66 (43%)	63 (41%)
The mock board exam is a useful coaching tool in the overall process of NBDHE preparations.	3 (2%)	0 (1%)	31 (20%)	72 (47%)	43 (28%)
A mock board exam is accurate in predicting who will pass the NBDHE.	3 (2%)	35 (23%)	67 (44%)	34% (22%)	11 (7%)

majority of dental students reporting it as their primary resource.<sup>8,25</sup>

Seventy three percent of dental hygiene directors reported using released NBDHE questions as a preparation strategy, with 40% noting their program uses the most recently released NBDHE exam as a mock board. Several directors voiced concerns that the released exam questions were old and out of date. However, while these resources are available, the JCNDE does not recommend the use of released board exams for studying and instead encourages students to use textbooks and notes.<sup>30</sup> The exams currently available for purchase are from 2006 and 2009.<sup>34</sup> Dental students rated previously released National Board Exams as their second most utilized form of board preparation.<sup>25</sup> Despite the dated questions, students likely gain confidence by becoming familiar with board-type question content and format and will want to continuing using them.

It has been suggested in the nursing literature that programs have in place a formal process for identifying students at-risk of failing licensure exams. This study found 44% of directors indicating their programs do so. While this study did not seek to identify specifically what processes are used to identify students at risk of failure on the NBDHE, previous studies show the mock board exam and early course average have been used for this purpose.<sup>1,7</sup> It is interesting to note that only 14% of programs require

Table V: Responses of directors reporting the use of a mock board examination to statements about the mock board examination.

The mock National Board Dental Hygiene Exam...	
...helps identify student strengths & weaknesses	104 (66%)
...encourages students to study	103 (67%)
...results are reviewed with students	96 (62%)
...provides students with a simulation of the actual NBDHE	92 (60%)
...is offered 4th semester (second semester senior year)	89 (58%)
...is incorporated into a required course	86 (56%)
...identifies test anxiety	68 (44%)
...is computerized	67 (44%)
...utilizes the most recently released NBDHE exam	61 (40%)
...requires students to analyze weaknesses and develop a formal study plan for NBDHE preparation	57 (37%)
...results are used to analyze for curricular weaknesses	52 (34%)
...has undergone validity and reliability testing	45 (29%)
...is written by faculty	36 (23%)
...is offered 3rd semester (first semester senior year)	31 (20%)
...is graded and calculated into student's course average	30 (20%)
...is offered during summer session or other	15 (10%)
...must receive a passing grade on in order to graduate	12 (8%)

Table VI: Program provisions to students following a poor mock board examination performance.

Provide students the ability to review results determining their own strengths and weaknesses by content area and question type	81 (53%)
Departmental topic review sessions	42 (27%)
Recommend commercial board review courses	61 (40%)
Referral for study skills	57 (37%)
Remediation	46 (30%)
Test anxiety counseling	42 (27%)
Tutoring	40 (26%)
Other	7 (5%)

students pass the NBDHE as part of the requirements for graduation. Researchers reported that requiring students to pass the NBDHE was one strategy for increasing the likelihood that students would take board preparation more seriously.<sup>27</sup>

Over half of directors indicated they are not concerned with pass rates on the NBDHE. This would seem to be supported by the 95.8% pass rate on the 2012 NBDHE exam.<sup>2</sup> This compares with an NCLEX first time pass rate of 82% in 2014 and a 94% first time pass rate on the 2012 NBDE Part I and 95% first time pass rate on the NBDE Part II.<sup>35,36</sup> Clearly, dental hygiene programs are successful at preparing students to take the NBDHE. Still, this leaves 21% agreeing/strongly agreeing with the statement "I am concerned with pass rates on the NBDHE."

A majority of directors indicated that their programs do expect to assist in board preparation. And even though findings on the relationship between dental hygiene students participating in a review course and performance on the NBDHE is conflicting, the majority of directors report supporting student participation in non-mandated commercial review courses.<sup>28-30</sup> Not all programs encourage board reviews, and reasons given included the cost of reviews, which could be prohibitive to students, and the assertion that students who do well in course work should have the skills to do well on the NBDHE.

This study found just one third of directors agreeing with the mock board statement: "results are used to analyze for curricular weakness". Research has suggested results of a mock board could be used to identify areas in the curriculum in need of revision.<sup>7</sup> One director in this study commented that their program compares its scores to the national average, in all areas of testing. If the test scores are found to be average or below average, the content and teaching methodologies employed are examined to determine if there are specific areas needing improvement at the institution. This finding

may indicate an opportunity for dental hygiene programs to change or revise the curriculum or teaching methods in areas where students are scoring lower on the mock boards, as well.

The quantitative and qualitative findings from this study differed somewhat, providing further insight into preparation strategy choices for the NBDHE. While directors chose "dental hygiene review texts (e.g., Mosby, Saunders)" as the most used preparation strategy for the NBDHE, when asked the open ended question "What methods or interventions have you found to be most effective in preparing students for the NBDHE?", the top theme emerging from comments was the use of a board review course. The fact that review texts ranked first in use may be due, in part, to their affordability and ease of use. However, for effectiveness, directors' number one choice of a review course is supported by other studies which cite "provide a structured format of study" and "contribute to hours of study" as reasons for supporting a review course as an effective preparation method.<sup>8,25,26</sup> Interestingly, when asked the open ended question, "What do you believe contributes to students' success on the NBDHE?", directors ranked "participation in a board review course" fourth of the five themes garnered from responses. "Student dedication to preparation" and a "strong performance in the dental hygiene program", were the top two themes that emerged from directors' written comments, indicating directors believe NBDHE success is multifactorial and also depends on intrinsic qualities of students.

This study focused on program directors of U.S. accredited dental hygiene programs in order to determine how programs are preparing students to take the NBDHE. There were limitations to this study. Since survey research consists of self-reported data, there is the potential for bias in the responses. Additional research might include how students self-report preparing to take the NBDHE versus how faculty self-report preparing students to take the NBDHE. Since this study found that directors were divided on the statement, "The failure rate on the NBDHE tends to reflect on the quality of a dental hygiene program", it may be revealing to explore what is behind this division of opinion in future studies. Lastly, in regard to the NBDHE as a graduation requirement, 14%

of program directors reported that students are required to pass the NBDHE in order to graduate. Future studies may seek to examine why this percentage is so low.

## Conclusion:

This study reveals insights into the strategies used by dental hygiene programs to prepare students to take the NBDHE. The data suggest that the majority of dental hygiene programs use multiple strategies for this purpose, with commercial review texts and a board review course the two most common strategies found. Dental hygiene program directors supported students participating in a non-mandated commercial review course, indicating that commercial review courses increased student self-confidence in knowledge of information that is already known and provided familiarity with NBDE question format. Directors also agreed that a mock board exam is a useful coaching tool in board preparation by helping students identify strengths and weaknesses and encouraging students to study. The majority of directors are not concerned about program failure rates on the NBDHE and the majority agree that the failure rate on the NBDHE reflects on the quality of a program. In addition to a board review course, directors suggested student willingness to prepare and overall performance in the dental hygiene program were important factors in success on the NBDHE.

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## References

1. Dadian T, Guerink K, Olney C, Littlefield J. The effectiveness of a mock board experience in coaching students for the dental hygiene national board examination. *J Dent Educ.* 2002 May;66(5):643-8.
2. American Dental Association. Joint Commission on National Dental Examinations Resources; Technical Report NBDHE[Internet]. Chicago (IL): American Dental Association [cited 2015 May 10]; Available from: [http://ada.org/~media/JCNDE/pdfs/nbdhe\\_technical\\_report.ashx](http://ada.org/~media/JCNDE/pdfs/nbdhe_technical_report.ashx).
3. American Dental Association. Joint Commission on National Dental Examination; National Board Dental Hygiene Examination 2014 Guide [Internet]. Chicago (IL): American Dental Association [cited 2015 Mar 1]; Available from: [http://www.ada.org/~media/JCNDE/pdfs/nbdhe\\_faq.ashx](http://www.ada.org/~media/JCNDE/pdfs/nbdhe_faq.ashx).
4. Olmstead J. An analysis of student performance benchmarks in dental hygiene via distance education. *J Dent Hyg.* Spring;84(2):75-80.
5. Bauchmoyer S, Carr M, Clutter J, Hoberty P. Predicting academic and national board dental hygiene examination performance based on academic factors. *J Dent Hyg.* 2004 Winter;78(1):39-45.
6. American Dental Association. Commission on Dental Accreditation; Accreditation Standards for Dental Hygiene Education Programs [Internet]. Chicago (IL): American Dental [Cited 2015 May 30]; Available from: [http://www.ada.org/~media/CODA/Files/2016\\_dn.ashx](http://www.ada.org/~media/CODA/Files/2016_dn.ashx)
7. Edenfield S, Hansen J. Relationships among dental hygiene course grades, a mock board dental hygiene examination, and the national board dental hygiene examination. *J Dent Hyg.* 2000 Spring;74(2):124-8.
8. Wright E, Henzi D. Preparation course for part I of the national dental boards: lessons learned. *J Dent Educ.* 2007 Jun;71(6):785-96.
9. Herman J, Johnson A. From beta-blockers to boot camp: preparing students for the NCLEX-RN. *Nurs Educ Perspect.* 2009 Nov-Dec;30(6):384-8.
10. Crow C, Handley M, Morrison R, Shelton M. Requirements and interventions used by SDN programs to promote and predict NCLEX-RN success: a national study. *J Prof Nurs.* 2004 May-Jun;20(3):174-86.
11. March K, Ambrose J. Rx for NCLEX-RN success: reflections on development of an effective preparation process for senior baccalaureate students. *Nurs Educ Perspect.* 2010 Jul-Aug;31(4):230-2.
12. Frith K, Sewell J, Clark D. Best practices in NCLEX-RN readiness preparation for baccalaureate student success. *Comput Inform Nurs.* 2005 Nov-Dec;23(6):322-9.
13. Higgins B. Strategies for lowering attrition rates and raising NCLEX-RN pass rates. *J Nurs Educ.* 2005 Dec;44(12):541-7.

14. Morton A. Improving NCLEX scores with structured learning assistance. *Nurse Educ.* 2006 Jul-Aug;31(4):163-5.
15. Candela L, Bowles C. Recent RN graduate perceptions of educational preparation. *Nurs Educ Perspect.* 2008 Sep-Oct;29(5):266-71.
16. Emory J. Standardized mastery content assessments for predicting NCLEX-RN outcomes. *Nurse Educ.* 2013 Mar-Apr;38(2):66-70.
17. Pressler J, Kenner C. Supporting student success on the NCLEX-RN. *Nurse Educ.* 2012 May-Jun;37(3):94-6.
18. Harding M. Usefulness of a midcurricular examination for identifying at-risk nursing students. *Comput Inform Nurs.* 2010 May-Jun;28(3):178-82.
19. Rogers T. Prescription for success in an associate degree nursing program. *J Nurs Educ.* 2010 Feb;49(2):96-100.
20. McDowell B. KATTS: A Framework for Maximizing NCLEX-RN Performance. *J Nurs Educ.* 2008 Apr;47(4):183-6.
21. Johnson A. NCLEX-RN success with boot camp. *Nurs Educ Perspect.* 2009 Sep-Oct;30(5):328-9.
22. March K, Ambrose J. Rx for NCLEX-RN success: reflections on development of an effective preparation process for senior baccalaureate students. *Nurs Educ Perspect.* 2010 Jul-Aug;31(4):230-2.
23. McQueen L, Shelton P, Zimmerman L. A collective community approach to preparing nursing students for the NCLEX RN examination. *ABNF J.* 2004 May-Jun;15(3):55-8.
24. McCann A, Schneiderman E. Effectiveness of a national board review course for dental students. *J Dent Educ.* 1989 Aug;53(8):476-9.
25. Hawley N, et al.. Dental students' preparation and study habits for the national board dental examination part I. *J Dent Educ.* 2009 Nov;73(11):1274-8.
26. Gadbury-Amyot C, Austin K, Overman P. Development and implementation of online National Board Dental Examination Review Courses. *J Dent Educ.* 2013 Dec;77(12):1556-65.
27. Gladstone R, Stefanou L, Westphal CM. A three-year study on the relationship of an internal board review course and dental hygiene student performance on the national board dental hygiene examination. *J Dent Hyg.* 2006 Jan; 80(1):24-26.
28. DeWald J, Gutmann M, Solomon E. Effect of grade point average and enrollment in a dental hygiene national board review course on student performance on the national board examination. *J Dent Educ.* 2004 Jan;68(1):77-80.
29. Beatty C F. Assessment of a national board dental hygiene review course. *J Dent Educ.* 2003 Feb;67(2):193-4. Abstract
30. Beatty, CF. Value of a national board dental hygiene review course: a national survey. Poster session presented at: American Dental Education Association Annual Conference 2005 Mar 3-9 ; Baltimore, MD
31. American Dental Association. Commission on Dental Accreditation [Internet]. Chicago (IL): American Dental Association [cited 2014 Jun 5]; Available from <http://www.ada.org/en/coda/find-a-program/search-dentalprogram/allied-programs>.
32. Zhang C, Rauchwarger A, Toth C, et al. Student USMLE step 1 preparation and performance. *Adv Health Sci Educ Theory Pract.* 2004;9(4):291-7.
33. Werner L, Bull B. The effect of three commercial coaching courses on step one USMLE performance. *Med Educ.* 2003 Jun;37(6):527-31.
34. American Dental Association. Joint Commission on National Dental Examinations. National Board Dental Hygiene Examinations General Information [Internet]. Chicago (IL): American Dental Association [cited 2015 June 1]; Available from [http://www.ada.org/~media/JCNDE/pdfs/nbdhe\\_released\\_item\\_order.ashx](http://www.ada.org/~media/JCNDE/pdfs/nbdhe_released_item_order.ashx).
35. National Council of State Boards of Nursing. NCLEX Statistics from NCSBN [Internet]. Chicago (IL): National Council of State Boards of Nursing [cited 2015 May 30]; Available from [https://www.ncsbn.org/Table\\_of\\_Pass\\_Rates\\_2014.pdf](https://www.ncsbn.org/Table_of_Pass_Rates_2014.pdf)
36. American Dental Association. Joint Commission on National Dental Examinations; Resources; Technical Report [Internet]. Chicago (IL): American Dental Association [cited 2015 May 10] Available from [http://www.ada.org/~media/JCNDE/pdfs/nbde\\_technical\\_report.ashx](http://www.ada.org/~media/JCNDE/pdfs/nbde_technical_report.ashx)