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DENTAL HYGIENE EDUCATORS' PERSPECTIVES TOWARDS THE USE OF MANIKIN TESTING FOR CLINICAL LICENSURE EXAM

By

Cassandra Penning, RDH

A thesis

Submitted in partial fulfillment

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Master of Science in Dental Hygiene

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Committee Approval

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Cassandra Penning find it satisfactory and recommend that it be accepted.

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April 4, 2022

Cassandra Penning
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RE: Study Number IRB-FY2022-180: Dental Hygiene Educators Perspectives Towards Using Manikin Testing for Clinical Board Examination

Dear Ms. Penning:

Thank you for your responses to a previous review of the study listed above. I agree that this study qualifies as exempt from review under the following guideline: Category 1. Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
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Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

Acknowledgement

I would like to thank my parents for their support and encouragement during my graduate studies. Thank you for always pushing me to be the best I can be and never letting me give up. I value all of the life skills you have taught me and they have brought me to the place I am at today.

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Abstract

DENTAL HYGIENE EDUCATORS' PERSPECTIVES TOWARDS USING MANIKIN TESTING FOR CLINICAL LICENSURE EXAM

The purpose of this study was to identify perceptions of dental hygiene educators regarding the use of manikins for the dental hygiene clinical licensure exam. This qualitative study used an exploratory, online, focus group design with 20 dental hygiene educators recruited with purposive sampling. An interview guide was established and validated by focus group experts and pilot-testing procedures. Each focus group session was recorded and transcribed using Zoom. Themes were analyzed using the classic analysis strategy. Validity was established using investigator triangulation, member checks, and saturation. Three major themes were identified: lack of knowledge, testing considerations, and perception of value of clinical licensure exams. The manikin exam appears to resolve concerns about the use of the live patient clinical exam. The need for a clinical licensure exam was questioned as participants expressed the accreditation standards of the entry-level program is appropriate to demonstrate competence for licensure.

Key Words

Dental hygiene educators, dental hygiene licensure, clinical licensure exam, manikin treatment clinical examination, educator perceptions, focus groups

Chapter 1 Introduction

Background

In order to receive a dental hygiene license in the United States, a candidate must graduate from an accredited dental hygiene program, achieve a passing score on the written National Board Dental Hygiene Examination, and achieve a passing score on a regional or state clinical board examination (ADHA, 2021). Prior to 2020, the only available dental hygiene clinical board examination was the live patient treatment clinical examination. For this examination, candidates must select a live patient who has an acceptable medical history, has diagnostic radiographs, and has twelve surfaces of qualifying subgingival calculus (American Board of Dental Examiners [ADEX]/The Commission on Dental Competency Assessments [CDCA], 2021). The candidates are evaluated on their ability to assess and select a qualifying patient as well as their clinical skills which includes calculus detection and removal, ability to accurately measure periodontal pocket depths, and appropriate tissue management (ADEX/CDCA, 2021).

The COVID-19 pandemic created many issues for dental education. Dental and dental hygiene students had limited capacity to treat live patients for their program requirements (Stolberg, 2020). Many schools had to have a summer clinic session to help students receive their necessary requirements for graduation. Live patient exams could not be administered due to the pandemic which caused a delay in the students' timeline for receiving their dental or dental hygiene license (Stolberg, 2020). The pandemic did bring to light the need for an alternative to live patient testing for clinical board exams. It also motivated testing agencies to develop an alternative testing option quickly to enable students to begin their licensing process (Stolberg, 2020).

Dentistry had already been working on creating a clinical licensing alternative prior to the pandemic known as the Dental Licensure Objective Structured Clinical Examination (DLOSCE). The DLOSCE was launched in the summer of 2020 and served as an alternative to live patient testing for dental students. The exam consisted of 148 multiple choice questions and two prescription tasks (Joint Commission on National Dental Examinations [JCNDE], 2021). The exam uses 3-D models, radiographs, and photographs to help students clinically assess patients and answer questions.

The use of Objective Structured Clinical Examinations (OSCEs) for clinical licensure is new to dentistry in the United States, but the National Dental Examining Board of Canada (NDEB) has been using an OSCE since 1995 for their clinical licensure exam (Gerrow et al., 2003). Their exam consists of twenty-five stations that include a case history, photos, models, or casts and each station has four questions the candidates must answer (Gerrow et al., 2003). Gerrow et al. (2003) conducted a six-year study on the concurrent validity of the NDEB written and OSCE exams and found a high level of concurrent validity. The results of the studied revealed that no students who were academically in the top 50% of their class failed the NDEB OSCE and only six of the students in the top 50% failed their NDEB written examination (Gerrow et al., 2003). This study showed the correlation between how students perform in their schooling and how they perform on their licensure examinations. The JNDCE studied the NDEB OSCE when designing the DLOSCE.

Dental hygiene students also were presented with an alternative option for their clinical licensure exam due to the pandemic. All the dental hygiene testing agencies offered a manikin exam and a computer simulated clinical examination OSCE (CRDTS, 2021a; SRTA, 2021; CITA, 2021; ADEX/CDCA, 2020**)**. The students performed calculus detection, calculus

removal, and measurement of periodontal pockets on typodonts provided by the agencies. The OSCE provided radiographs, photos, model images, and lab data to help students answer questions regarding patient scenarios (CITA, 2021). As of February 2022, there are nine states that do not accept the manikin exam for clinical licensure and require students to perform their clinical exam on a live patient (CDCA, 2022a). Sixteen states were temporarily accepting the manikin exam and the dates per state vary on when they will return to only accepting live patient exams, many of the states will accept the manikin exam until the end of December 2022 (CDCA, 2022a). Twenty-five states now accept the manikin exam as a clinical licensure examination indefinitely (CDCA, 2022a).

There has been great debate over the years on the ethics of using live patients for clinical exams (Lantzy et al., 2012). Dentistry remains the only health profession that requires live patients for clinical licensure. In a recent study by Neito et al. (2020), a majority of dental hygiene program directors do agree with removing the single-encounter live patient exam and replacing it with OSCE assessments similar to the DLOSCE. The manikin exam has the potential of being a permanent replacement for live patients for the dental hygiene student clinical board examination.

Statement of Problem

The COVID-19 pandemic caused difficulties for dental hygiene students being able to complete licensure exams due to difficulty obtaining live patients for the clinical exam. Some states temporarily and permanently allowed manikin testing for the clinical exam to help students obtain dental hygiene licensure. The use of manikin testing is new in the dental hygiene profession and there is currently a lack of research about the efficacy and accuracy of manikin testing for clinical licensure. Dental hygiene educators' perceptions towards the exam and

whether it is considered a valid assessment of student's clinical skills has not been studied. More research is necessary to provide evidence-based information about the efficacy and accuracy of allowing manikin testing for clinical licensure.

Purpose of Study

The purpose of this study is to identify perceptions of dental hygiene educators regarding the use of manikins for the dental hygiene clinical licensure exam.

Professional Significance of the Study

This study will contribute to the body of knowledge in dental hygiene clinical licensure testing. The results of this study will provide valuable information that state dental boards can use when considering allowance of manikin use for clinical licensure. Therefore, this study supports the American Dental Hygienists' Association's (ADHA) National Dental Hygiene Research Agenda (2016a) Objective 3 "To communicate research priorities to legislative and policy-making bodies" (p.3).

Central Regional Dental Testing Services (CRDTS), Southern Regional Testing Agency, Inc. (SRTA), Council of Interstate Testing Agencies, Inc. (CITA), and The Commission on Dental Competency Assessments (CDCA-WREB) created simulation style testing procedures as an alternative option to performing procedures on live patients for licensure (CRDTS, 2021a; SRTA, 2021; CITA, 2021; ADEX/CDCA, 2020**).** The CDCA and Western Regional Examining Board (WREB) merged organizations in 2021 and are now known as CDCA-WREB (CDCA, 2022b) Manikin testing is evolving and the results of this study may be useful for dental professionals advocating against the use of live patient testing for clinical licensure. The COVID-19 pandemic brought to light the difficulties of using live patients for clinical skill

assessment and this study will explore the obstacles dental hygiene educators faced trying to help students complete testing requirements for licensure.

Dental hygiene educators prepare students for clinical practice and are regularly assessing students' clinical abilities while in school. The information obtained from this study will also assess how dental hygiene educators feel about alternative licensure methods. Learning the perceptions of dental hygiene educators towards manikin testing is valuable information that can be used for modifying existing manikin exams or creating new simulated patient exams that are specific to the dental hygiene profession.

Research Questions

The following research questions guided the conduct of this study.

1. What are dental hygiene educators' perceptions of using manikins for the dental hygiene clinical licensure exam?
2. What are dental hygiene educators' concerns about using manikins for the dental hygiene clinical licensure exam?
3. Why do dental hygiene educators believe manikin testing is a valid or not valid assessment of students' clinical skills?

Definitions

Clinical Skills

The ability to perform an extra/intra oral assessment and identify abnormalities, detect subgingival calculus with an explorer and on radiographs, remove calculus with subgingival scaling and root planing, accurately measure periodontal pocket depths, and maintain appropriate tissue management (CRDTS, 2021b; ADEX/CDCA, 2021).

Concerns

Feelings of worry that may be shared by multiple people (Oxford University Press, 2022a).

Dental Hygiene

Dental hygiene is defined as "the science and practice of recognition, prevention and treatment of oral diseases and conditions" (ADHA, 2016 p. 4) and this is as an essential element in achieving full body health.

Dental Hygienist

A dental hygienist is a licensed oral health professional who educates patients, performs oral assessments, performs a dental hygiene diagnosis, provides preventive and therapeutic treatments, and promotes oral health through research, advocacy, and practice. (ADHA, 2016).

Dental Hygiene Clinical Licensure Exam

An examination that evaluates a candidate's clinical abilities to select an eligible patient, detect and remove calculus, accurately measure periodontal pocket depths, and provide proper tissue management (ADEX/CDCA, 2021). Candidates must successfully pass the exam to receive a dental hygiene license (ADHA, 2021).

Dental Hygiene Educators

A dental hygiene educator must possess at least a baccalaureate degree and has current knowledge of dental hygiene subjects (CODA, 2021). They work closely with students to teach them oral health information and prepare them for clinical practice through didactic and clinical teaching.

Dental Licensure Objective Structured Clinical Examination (DLOSCE)

A 150-question comprehensive clinical exam for dental students. It is comprised of multiple-choice questions and two prescription tasks (JCNDE, 2021). The questions include radiographs, photos, patient information, and 3-D models to help candidates answer the questions.

Manikin

A typodont that is mounted on a pole attached to a dental unit (CRDTS, 2021b).

Manikin Treatment Clinical Examination (MTCE)

An alternative exam to the live patient exam for dental hygiene students and allows students to perform the exam on a typodont. Candidates are evaluated on calculus detection, removal, and probe measurements (ADEX/CDCA, 2020).

Objective Structured Clinical Examination (OSCE)

A clinical examination commonly used in health science education programs (Medical Council of Canada, 2021). The exam assesses multiple clinical abilities through the use of stations and is based on objective testing and examining student performance (University of South Dakota, 2021).

Perceptions

An idea, belief, or an image that develops as a result of how one views or understands a concept (Oxford University Press, 2022b).

Valid Assessment

The extent to which a test accurately measures what it is designed to measure (University of Illinois Board of Trustees ,2021)

Conclusion

Recently there has been increasing motivation to remove live patient testing for clinical board exams in dentistry. The COVID-19 pandemic presented the difficulties of using live patients during the clinical examination to receive licensure. The pandemic also allowed for alternative options to be explored and tested. The dental hygiene and dental professions are

making a shift towards eliminating live patient testing permanently and it is important to identify how dental hygiene educators perceive the impact of this change.

Chapter 2 Review of the Literature

Dental hygienists are required to successfully pass a clinical examination for licensure (ADHA, 2021). The reason for the clinical examination is to ensure that the student clinician is competent in their clinical skills and that only qualified candidates receive a license (Lantzy et al., 2012). The introduction of the manikin clinical exam provides another option for students to complete their clinical licensure exam. Presently, not all states allow the Manikin Treatment Clinical Examination (MTCE) as an acceptable clinical exam for licensure and many states are only temporarily accepting the exam due to the COVID-19 pandemic (CDCA, 2022a).

This literature review examines research to discuss the historical context of the live patient clinical licensure exam including validity, reliability, and ethical concerns with using live patients for testing. Alternative options for assessing clinical competency such as the Objective Structured Clinical Examinations (OSCEs), Dental Licensure Objective Structured Clinical Examinations (DLOSCE), the MTCE, Portfolios, the Buffalo Model, and the National Dental Examining Board of Canada (NDEB) clinical examination will be reviewed. Lastly, this literature review will discuss the status of the dental hygiene clinical licensure examinations in the U.S. and the recent transition to using manikins for testing.

The literature search was conducted using EBSCOhost databases, CINAHL Complete, PubMed, and Google Scholar with the following search terms: dental hygiene clinical licensure exams, live patient testing, Objective Structured Clinical Examination, alternative clinical licensure examinations, clinical competence, ethical issues of live patient testing, manikin testing, and dental hygiene education.

Historical Context

Obtaining a dental hygiene license is a multistep process. Candidates must graduate from an accredited dental hygiene program, pass the National Board Dental Hygiene Examination, and pass a state or regional clinical board examination (Johnson et al., 2020). Along with all of those requirements, each state requests that candidates complete requirements of their own such as a jurisprudence examination, local anesthesia certification, and basic life support certification (Johnson et al., 2020). These extra requirements must be completed for each state in which a candidate would like to be licensed. The clinical board examination is regional or state regulated which may require candidates to retake the examination if the state they are applying for a license in does not accept the regional examination they have already completed.

The purpose of having dental hygiene students complete a clinical licensure exam is to protect the public and ensure that clinicians are providing high quality care (Johnson et al., 2020). Candidates are required to provide their own patient and the patient must meet specific criteria. The clinical exam varies slightly depending on the regional testing agency. The following guidelines are in accordance with the CITA Candidate Manual (2021), the patient must be in good health and have any medical conditions under control. Candidates must identify twelve surfaces of subgingival calculus in a quadrant with at least six natural teeth, and they can include two posterior teeth from a second quadrant. Of the surfaces, eight must be on posterior teeth. After the patient has been accepted as a qualifying patient by the examiners, the student will need to remove the detected subgingival calculus, supragingival calculus, biofilm, and stain. They will also measure six periodontal pockets and maintain appropriate tissue management. The patient is then reviewed by examiners and a final score is determined (CITA, 2021).

Human subjects have been used for clinical licensure examinations in dentistry since the early 1900s (American Student Dental Association [ASDA], 2016). The ASDA (2016) discussed that the validity, reliability, and ethical nature of these clinical examinations have been questioned for many years. In the United States, dentistry is the only health profession that still requires a clinical licensure exam involving a live patient (ASDA, 2016). There have been many attempts to eliminate live patient clinical exams since 2005, but no progress was made until recently with the introduction of the Dental Licensure Objective Structured Clinical Licensure Examination (DLOSCE) and the Manikin Treatment Clinical Examination (MTCE).

In a survey that was conducted in 2016 by the American Dental Education Association (ADEA), 266 dental hygiene members of the ADEA Council of Allied Dental Program Directors (CADPD) were asked to complete a survey that presented questions on the use of human subjects during the clinical licensure exam. The survey participants were asked to provide feedback on the overall cost of the examination, methods used to secure patients, ethical implications related to the use of live patients, and alternate options for licensure that would eliminate the use of live patients.

The results showed that 94% answered that they do have concerns related to the cost of the examination and additional licensure fees (ADEA, 2016). Their concerns included the examination and licensure fees, as well as 86% stated that their students provide monetary compensation to their patients for participation in the exam and 85% said students cover the patient's travel expenses if they are required to travel for the exam. In another study performed by Lantzy et al., (2012) dental hygienists from across the nation were surveyed on ethical practices they experienced during their clinical board examinations and the most frequent additional expense related to the exam reported was travel costs for the candidate and patient

(54.5%). Lantzy et al. (2012) also found that 50.5% of the dental hygiene students believe board exam patients should be paid and 49.5% disagreed. Although almost half of the students did not agree with paying patients, 61.6% reported that they did pay their patient. These students are going against their beliefs for the purpose of guaranteeing a patient sits for their exam. Another common act is patients are often traded between students if one student cannot find a qualifying patient (ASDA, 2016). This treatment of paying and trading patients can cause students to view them as a commodity instead of a human patient.

When it came to concerns directors had about using live patients, 86% of the program directors said they or their faculty reported having some concerns about using live patients for the clinical licensure examination (ADEA, 2016). The top concerns that were reported in the ADEA (2016) survey were students having difficulty finding and securing a qualified patient (94%), 89% of the directors reported ethical concerns, and 77% reported obstacles with scheduling patients for the examination. For the ethical concern portion of the survey, 93% of the participants stated that their ethical concern was incomplete treatment when only using the patient for the clinical board examination. The other top ethical concern noted by program directors was 92% reported that they were worried students would postpone treatment for the patient or provide monetary incentive to convince the patient to participate in the examination (ADEA, 2016).

The last section of the ADEA (2016) survey discussed alternative pathways to dental hygiene licensure. The results reported that 65% of the directors were aware that there were alternative assessments of clinical competency. The top known alternatives were portfolios, postgraduate residency, and an OSCE. The survey participants were asked if they felt that the current live patient examination demonstrated student clinical competency and 78% reported that

it does not imply competency. A large amount of the directors (75%) said that they believed graduation from an accredited dental hygiene program was an appropriate measure of students' clinical competency without the need for a clinical licensure examination. The majority of the participants (86%) supported using an alternative pathway for licensure and terminating the current live patient clinical licensure examination. This ADEA (2016) survey suggested that dental hygiene program directors do favor replacing the live patient clinical examination and alternative pathways need to be studied to determine viable options.

Validity of the current dental clinical licensure exam has been investigated as well. A study that was conducted by Gadbury-Amyot et al. (2005) examined the ability of overall grade point average (GPA), National Board Dental Hygiene Examination scores, portfolios, and clinical GPA (predictor factors) to predict candidates score on the CRDTS licensure examination. The results of the study showed a small correlation between the predictive factors (clinical GPA, NBDHE, and portfolios) and CRDTS results. There was barely a moderate correlation between CRDTS and Overall GPA (Gadbury-Amyot et al., 2005). This data questions the validity of the current clinical examination. In a study by Ranney et al. (2003) 82% of deans at dental schools did not believe that the current clinical licensure exam provided a rational basis for determining competency for licensure. There have not been very many recent studies on validity of the current dental clinical licensure exam because dental schools are beginning to switch to OSCEs to evaluate clinical competence. In an older study by Feil et al. (1999) 51.6% of surveyed practicing dentists did not feel that the clinical licensure exam was a valid representation of their clinical skills. The issue of validity has provided a need for a clinical exam that truly assess students' clinical abilities. In another study offering a different point of view, dental hygienists from across the nation were asked if they felt the live patient clinical

licensure examination accurately assessed their clinical skills and 78.7% did agreed that it did (Lantzy et al., 2012).

The reliability of the clinical licensure examination has also been questioned. Ranney et al. (2004), conducted a study that observed 835 dental school graduates from 1994 to 2002 and compared their results from major sections of the NERB clinical exam to their class ranks. Class rank was determined based on overall GPA. For the restorative section of the exam, there was no statistically significant difference between percentile class rank and those who passed and those who failed. The average percentile class ranks for the candidates who passed the simulated patient and periodontics sections were a little higher than those who failed those sections; the differences were small and close to the median. The dental simulated clinical exercise section (DSCE), which is a written section of the exam, demonstrated the largest difference in class rank percentile between the passing and failing groups. The DSCE section had a 33% percentile difference between the pass and fail groups which was between double and triple the difference for the sections that were clinically evaluated. The researchers hypothesized the reason for this large difference is the uncontrolled variation of using live patients for the Restorative and Periodontics section which are not used in the DSCE or simulated patient sections (Ranney et al., 2004).

Ranney et al. (2004) also showed a large variation in failure rates in each section of the NERB exam from year to year. The variation questions whether the tested abilities varied from year to year or if the NERB examination was different year to year (Ranney et al., 2004). Overall, in this study the authors did not find a strong correlation between a graduate's academic rank and their performance on the clinical exam. This means that a graduate's academic success does not predict if they will successfully pass the clinical licensure examination.

However, in contrast, another study observed 524 dental students at the University of Florida College of Dentistry (UFCD) from 1996 to 2003 to determine if there was a relationship between their academic performance and their performance on a state dental licensure examination (Stewart et al., 2005). The students were divided into four quartiles, the top 25% of each graduating class from 1996-2003 were placed in the 1st quartile. The students in the bottom 25% were placed in the 4th quartile. The results of this study did show a significant relationship ($p<0.001$) between the 1st quartile and 4th quartile and overall performance on the Florida state licensing examination. For the graduates in the first quartile, 3.8% failed the overall licensure exam, 7.6% failed in the second quartile, 19.8% failed in the third quartile, and 26% failed in the fourth quartile (Stewart et al., 2005). Unlike the study performed by Ranney et al. (2004), this study did show a correlation between class rank and overall clinical examination performance.

To evaluate competency, the live patient clinical examination has examiners making one-time observations of clinical abilities for specific procedures and determining if that candidate is competent enough to receive a license (Ranney, 2006). Using human patients creates a lot of variation and there is a lack of standardization between patients (Formicola et al., 2002). Using a one-time exam is flawed and can misclassify candidates due to poor reliability or pass candidates who are not clinically ready due to luck (ASDA, 2016). Standardization is as issue with the current clinical licensure exam that has been researched thoroughly.

A study in 2015 surveyed 411 dental students and 186 dental faculty on their perceptions and attitudes regarding dental licensure; 79% of the respondents either agreed or strongly agreed in preferring one standard national clinical examination rather than having regional and state clinical examinations (Abdelkari & Sullivan, 2015). The respondents' comments in the survey showed a theme towards agreement that a clinical examination is necessary for licensure. Out of

the total participants in the survey, only 14 people favored not using live patients for the clinical examination (Abdelkarim & Sullivan, 2015). Using a one-time high-stakes examination is situation reliant; the exam assesses what the candidate has already accomplished (Chimea et al., 2020). It does not take into consideration the growth and evolution "…of the student's complex skills, knowledge, and attributes required for professional practice" (Chimea et al., 2020, p. 84).

As briefly mentioned earlier, the ethics of using a human patient for a clinical examination is a top concern. In a study by Lantzy et al. (2012), 53.1% of dental hygiene students felt that delaying dental hygiene treatment for a patient who would qualify as a clinical board exam patient was appropriate. Students commented that they felt delaying treatment would depend on the length of time the treatment would need to be delayed for and that identifying a qualifying patient is a challenging task and sometimes delaying treatment is required (Lantzy et al., 2012). Postponing treatment to meet exam criteria can cause the patient to remain in a painful or diseased state for an unnecessary amount of time (Feil et al., 1999). This could lead to compromising patient care for personal gain.

For the dental clinical board exam if a candidate fails their exam, it means the patient is likely left with a restoration that is below the standard of care (ASDA, 2016). These patients then need to be referred to a dentist and pay for the restoration to be repaired. In a study by Feil et al. (1999) 19.3% of dental students purposely treated a lesion that did not necessarily need to be restored for clinical board exam purposes. Students who reported that they knew of unnecessary radiographs being taken was 32.5% and 23.9% of students stated that they did not assist their patient in scheduling necessary follow-up treatment after the clinical exam was completed (Feil et al., 1999).

Another ethical issue that arises with using live patients are students are pressured to find patients who meet certain requirements and sharing patient details with one another without patient consent (Hasegawa, 2002). Sharing patient information without patient consent is a HIPAA violation. There is difficulty in finding a qualifying patient for the clinical board exam and students will end up screening multiple patients before securing their board patient. Program directors reported that the most common method of securing a patient for the clinical board examination was through screenings (99%) and many students (84%) found patients through social media as well (ADEA, 2016).

Lastly, since board patients only sit for a specified exam with limited treatment, they are prone to patient abandonment by the student once the students pass the exam and graduates (Chu et al., 2018). Students who do not complete a patient's treatment will refer the patient to finish treatment elsewhere, but they typically do not follow up with the patient to see if they were able to finish treatment. Overall, these validity, reliability, and ethical issues demonstrate a need to research alternative testing options for dental hygiene students' clinical examinations.

Alternative Options for Testing Clinical Competence

OSCEs were introduced in the 1970s as a tool to assess students' clinical competency (Harden, 2016). They measure students' clinical competence using various stations with different scenarios to test different clinical skills (Kirton & Kravitz, 2011). They are used widely in health professional education programs today and are considered a high-quality measurement of clinical assessment (Harden, 2016). OSCEs eliminate the need for live patients for clinical testing and provide a more standardized measurement of clinical skills.

OSCEs are used regularly in medical education. Nursing OSCES have been used world-wide in a many different settings (Goh et al., 2019). Goh et al. (2019) reviewed 204 studies on

nursing OSCEs in a systematic search using seven electronic databases. The studies evaluated the validity, reliability, acceptability, and costs of nursing OSCEs. The authors discovered there was evidence in the studies that OSCEs are a valid, reliable and an acceptable measurement of nursing competence (Goh et al., 2019).

There were 55 studies that reported on the validity of their OSCEs saying their exams had measurement instruments established, were pilot tested or reviewed by a panel of experts to establish validity (Goh et al., 2019). Forty-five studies reported on the reliability of their OSCEs with interrater reliability (IRR) being the most common method of determining reliability. The IRR uses multiple statistical tests to establish reliability. Seventy-eight of the studies reviewed looked at the acceptability of OSCEs. These studies researched student perspectives, faculty feedback, researchers' feedback, and both students and faculty views of nursing OSCEs. There was overall acceptance of the exam with mostly positive feedback. The positive comments outweighed negative comments. The negative feedback received suggested the OSCE can create stress and anxiety for students. Recommendations to reduce stress and anxiety included providing mock exams, providing manuals with the necessary information of what is expected on the exam, and proctoring trainings (Goh et al., 2019). The researchers found three studies that discussed the cost of OSCEs and reported that the US dollar range for nursing OSCEs was between $75 to $275 per participant. This high cost was a concern for nursing educators, but the reviews in this study demonstrated that the educational benefit of OSCEs outweighed the cost (Goh et al., 2019). OSCEs have been used more frequently in nursing programs and dental schools compared to dental hygiene programs. OSCE use is beginning to be studied more in the field of dental hygiene.

In dental hygiene, OSCE stations include standardized patients, typodonts, manikins, medical histories, radiographs, and instruments (Nieto et al., 2020). Nieto et al. (2020) discussed that the stations are timed, and a simulated scenario is orchestrated. The stations are also evaluated by a proctor who is calibrated using rubrics and checklists designed to measure clinical skills. OSCEs have been used in dental education since the 1990s beginning with the National Dental Examining Board of Canada (NDEB) who uses OSCEs as an assessment for initial licensure (Zartman et al., 2002).

The NDEB OSCE consists of twenty-five stations and is case-based (Gerrow et al., 2003). Each station has a case history, photographs, models, or casts and the candidates must answer four multiple choice questions per station. They have five minutes at each station before rotating to another station (Gerrow et al., 2003). Gerrow et al. (2003) performed a six-year study on graduating students from Canadian dental schools' academic performance in the last year of school compared to the results on the NDEB written and OSCE exam. The results of the study showed a positive correlation between both the written and OSCE exams with the academic rank in the final year. The researchers also found a positive correlation between the written exam scores and the OSCE scores. No student in the top academic portion of the class scored below a 65 on their OSCE and only 0.4% scored below 65 on their written exam (Gerrow et al., 2003). This study demonstrated evidence of validity for the NDEB written exam and OSCE.

The effectiveness of OSCEs in dental education have been researched and in a study by Park et al. (2016) that found there is a positive correlation between scores students received on their OSCE and their clinical and didactic performance. OSCEs have the potential to be a valid and reliable examinations of students' clinical abilities. A recent study assessing dental faculty's attitudes towards OSCEs discovered that the overall attitudes towards OSCEs were positive and

many of the faculty agreed that an OSCE is a suitable exam for high stakes purposes such as a licensing exam (Wali et al., 2021).

In 2019 the DLOSCE was created as an alternative to live patient examinations in dentistry in the U.S and was launched in 2020 (Joint Commission on National Dental Examinations [JCNDE], n.d). The examination uses 3-D models, clinical photographs, and radiographs as assessment tools for the questions on the exam; the questions involve a patient but does not require a live patient (JCNDE, n.d.). The DLOSCE assess candidates on the following categories: restorative, prosthodontics, oral pathology, pain management, TMJ dysfunction, periodontics, oral surgery, endodontics, orthodontics, medical emergencies, and prescriptions (JCNDE, n.d.).

OSCE use in dental hygiene has not been widely researched. A recent study by Nieto et al. (2020) assessed dental hygiene directors' knowledge and attitudes towards using a OSCE for assessing clinical competency and licensure. A nine-question survey was developed and sent to all dental hygiene program directors across the nation. One hundred and twenty-one program directors completed the survey. The results of the study revealed that only 49% of the surveyed program directors currently utilize OSCEs in their programs. Of the programs who implement OSCEs, the directors reported that OSCEs were used in preclinic and in clinic to assess competencies, test cases, and proficiencies. Very few of the directors use OSCEs for graduation requirements. When questioned about the DLOSCE, one-third of the directors did not have prior knowledge that the exam was being used for clinical licensure for dentists. They did support using the DLOSCE to replace using live patients for the clinical licensure exam. A statistical significance was observed in participants who believed that OSCEs were a valid and reliable assessment of students' clinical skills (Nieto et al., 2020). The COVID-19 pandemic created

difficulty in obtaining live patients for clinical licensure exams and generated a situation where dental hygiene clinical exam agencies constructed an OSCE that could be used as a clinical licensure exam. This led to the administration of the MTCE in 2020.

The CDCA-WREB and the CITA both administered the MTCE to allow students the option of using a manikin instead of a live patient for their clinical licensure exam (ADEX/CDCA, 2020; CITA, 2021). For the MTCE the students performed their assessment on a standardized typodont provided by CDCA-WREB and CITA. They were assessed on calculus detection, calculus removal, and probing measurements. Additionally, the students were also assessed using a Computer Simulated Clinical Examination OSCE (CSCE OSCE). This exam presented clinical questions that assessed their diagnosis and treatment planning knowledge, skills and abilities (ADEX/CDCA, 2020; CITA, 2021).

The Southern Regional Testing Agency, Inc (SRTA) also administered a manikin exam using a typodont. A standardized typodont is provided to candidates on the testing day and they are scored on calculus detection, periodontal pocket depth measurement, calculus removal, tissue management, and calculus remaining on unassigned surfaces (SRTA, 2021). The candidates have an optional intra/extra oral computerized exam they can complete that consists of 50 multiple choice questions discussing radiographs, oral manifestations and disease, and healthy tissue management (SRTA, 2021). This exam is available to be taken within one year of starting the clinical portion. The candidates are not required to complete this test to pass the clinical exam. If the candidates decided to take the exam, a score of 75 out of 100 is required to pass (SRTA, 2021).

In 2021 the Central Regional Dental Testing Service, Inc. (CRDTS) offered a simulated patient option for their clinical licensure exam (CRDTS, 2021b). According to the 2021 CRDTS

manual, the exam consisted of an extra/intra oral assessment OSCE, calculus detection, scaling/subgingival calculus removal and periodontal probing on a typodont/manikin. Candidates had fifteen minutes for the oral assessment OSCE and two hours for calculus detection, scaling, and probing. CRDTS provided the pre-assembled typodont with the oral cavity cover that simulates the cheek tissue (CRDTS, 2021b). The MTCE is a new clinical assessment and will need to be further studied to determine reliability and validity.

The Buffalo Model is an alternative option for the dental clinical licensure exam. This option does not eliminate the use of human patients but revises the current exam to prevent ethical concerns. The University at Buffalo School of Dental Medicine worked with the CDCA to create a revised version of the dental clinical board exam, and pilot tested this model on their dental students (Gambacorta et al., 2016). The pilot study was performed on the dental students at the University at Buffalo School of Dental Medicine in Buffalo, New York.

There are eight changes the Buffalo Model implemented into the existing exam format (Gambacorta et al., 2016). The changes included that patient care must be authorized and organized by the dental school based on the school's protocols for appropriateness and timing of treatment. Prior to the exam calibrated faculty can help students with identifying carious lesions while on the clinic floor. During the exam calibrated faculty are available to observe candidates for any critical errors and if errors are committed and the faculty supervise the patient's final treatment. Any treatment that is performed for the exam is documented in the permanent record of the patient and procedures may only be performed on patients of record at the dental school. Students can challenge completed school competencies that will also count towards licensing exam requirements. This means that students could use a single case to meet their school competency requirements and for meeting licensure requirements. (Gambacorta et al., 2016).

Another change is that the licensing exams are conducted during a normal school session and scheduled on multiple days throughout the school year (Gambacorta et al., 2016). The students also have the flexibility of registering for the exam with two or three procedures that qualify and any procedures that remain can be schedule on a different date, meaning all testing procedures do not need to be completed on the same day. Lastly, there is a licensed dentist affiliated with the school who is responsible for treatment and any follow-up care patients may require after completion of the clinical exam (Gambacorta et al., 2016).

The Buffalo Model requires calibrated faculty and has members participate in a calibration session organized by the CDCA (Gambacorta et al., 2016). The faculty had to receive a score of 80% on a ten-question exam to be qualified to be faculty consultants for the clinical exam. The results of the pilot study showed that all faculty members who participated in the calibration session did score at least an 80% on the calibration exam. There was a total of 133 restorative cases and 67 periodontal cases that were approved by the calibrated faculty for use during the clinical licensure exam that were also approved by the CDCA examiners. This showed a 98.5% agreement rate between the calibrated faculty and CDCA examiners (Gambacorta et al., 2016).

The Gambacorta et al. (2016) pilot study included five examination dates throughout the year where candidates could register qualifying patients for one or multiple sections of the clinical licensure exam. The results of the study revealed that the frequent test administration during the student's fourth year of dental school provided nine of the ten candidates that had failed on their first attempt an opportunity to retake the exam before graduation. In this study, one candidate decided to withdraw from the examination and another candidate failed twice,

meaning the exam would need to be taken at a different site. However, the remaining seven candidates did pass the exam on their second attempt (Gambacorta et al., 2016).

During the study school competences were evaluated simultaneously with the ADEX exam 52 times (Gambacorta et al. 2016). This means the students used a single patient case to meet school competencies as well as licensure requirements. Performance on the licensing exam, which was assessed by CDCA examiners, was compared to performance on school competencies, assessed by calibrated faculty and based on school criteria. The results of the comparisons showed there were only two occurrences where students were taking the restorative section of the clinical exam and failed the school competency but still passed the clinical license exam based on ADEX criteria. For the periodontal section of the clinical exam, all students were successful on their school competency and passed the clinical exam section (Gambacorta et al., 2016).

The Buffalo Model addressed many ethical issues that are brought up as a concern with live patient use. The modifications of the Buffalo Model put an emphasis on patient care. With the current clinical licensure exam, when students found patients who had qualifying lesions, treatment was delayed for the purpose of saving the patient for the clinical board exam at the end of the school year. With the Buffalo Model, the students can treat the patients sooner with multiple exam dates (Gambacorta et al., 2016). Requiring students to only complete licensure exam requirements on patients of record with the dental school allows the students to create a comprehensive treatment plan before the exam which can help ensure patients receive follow up care and are not abandoned after the exam (Gambacorta et al., 2016).

During the study there were ten occurrences where candidates did not pass a section of the clinical exam (Gambacorta et al., 2016). Instead of placing a temporary restoration and

having the patient seek follow-up care at a dental office, with the Buffalo Model, there were calibrated and licensed faculty members available during the exam to supervise completion of the proposed procedure. Since the Buffalo Model offers the exam during the regular clinic schedule instead of the weekend, it eliminated the pressure students felt to pay patients for the exam time since the patients were still receiving free treatment during regular workday hours (Gambacorta et al., 2016). Overall, the Buffalo Model focused on the patients' needs as well as the candidates and is a viable option when using live patients for the clinical licensure exam.

Another competency assessment that has been explored are portfolio assessments. Portfolios are a collection of academic evidence throughout a student's education that demonstrates knowledge, abilities, and a reflection of learning (Cleveland State University, 2021). Portfolios also provide examples of students critical thinking skills, the ability to problem solve, self-assess, and self-guide learning that helps express competency (Gadbury-Amyot et al., 2014).

In California, as of 2014, graduates applying for a dental license may qualify by completing a portfolio examination (Dental Board of California, 2014). Candidates create a portfolio that contains documentation of completed required clinical experiences and required clinical competencies in oral diagnosis and treatment planning, direct and indirect restorations, removeable prosthodontics, endodontics, and periodontics (Dental Board of California, 2014). This alternative clinical licensing options allows candidates the opportunity to obtain a dental license without having to complete a high stakes one-time clinical exam on a live patient.

To determine validity of portfolio assessments in a dental hygiene program, researchers studied portfolios that were implemented into a dental hygiene program (Gadbury-Amyot et al., 2003). For evaluating external validity, the researchers compared scores on student portfolios to

traditional competency assessments like the NBDHE, GPS, and the CRDDTS examination. The study demonstrated there was a moderate and significant relationship between portfolios and GPA ($p<.01$) and the NBDHE ($p<.01$). However, there was a weak and nonsignificant correlation between the CRDTS exam and portfolios ($p>.05$) (Gadbury-Amyot et al., 2003).

The positive relationship between GPA and portfolios is justified because GPA is measured by multiple evaluations in multiple circumstances, which is very similar to the function of portfolios (Gadbury-Amyot et al., 2003). The NBDHE has been studied and determined to be a valid and reliable competency assessment; this explains the positive correlation between the exam and portfolios (Kramer & DeMarais, 1997). There is limited research about the reliability and validity of the CRDTS exam which could explain the poor correlation between the exam and portfolios (Gadbury-Amyot et al., 2003). These results bring into question the validity of live patient clinical exams when portfolios have significant correlations between other competency assessments and not the current clinical licensure examination.

The students in the study were also surveyed with open-ended questions about their experience with the administration of the portfolios (Gadbury-Amyot et al., 2003). Ninety-five percent of the students felt that the portfolios they created provided evidence of achievement of their program's dental hygiene competencies. Many of the students made comments about not being excited to create portfolios but were grateful to see their growth throughout the program and felt the portfolios demonstrated academic accomplishments (Gadbury-Amyot et al., 2003).

A similar study researched the validity of using portfolios for a competency assessment in two dental schools (Gadbury-Amyot et al., 2014). The researchers compared portfolio scores to the NBDE Part I and Part II, GPA, and WREB clinical scores. The results showed significant correlations between the National Board Dental Examination (NBDE) Part I ($p<0.01$) and Part II

($p<0.05$). There were no significant correlations between the WREB clinical exam and GPA. However, there was no significant correlation between GPA and portfolios, although, previous studies indicated a correlation between the two (Gadbury-Amyot et al., 2014). There are many alternative options for assessing clinical competency in dentistry and dental hygiene that are being utilized and researched. Deciding which assessment is the most standardized, reliable and valid measurement for determining if graduates are competent enough to treat the public is an ongoing process.

Current Status of the Dental Hygiene Clinical Licensure Examination

As of February 4, 2022 there are only nine states that still require a live patient for the dental hygiene clinical licensure exam (CDCA, 2022a). There are twenty-five states that accept the MTCE indefinitely. Sixteen states are temporarily accepting the MTCE until the end of 2022 (CDCA, 2022a). State dental boards are beginning to eliminate the need for live patients and transitioning to manikins and OSCEs to evaluate the competence of graduates. Over half of the states in the U.S. are currently accepting the MTCE; more studies are needed to examine how students and faculty feel about the new clinical licensure exam.

The use of manikins for the last few years has provided an insight into a possible future of using simulated patient manikin-based examinations regularly. Manikin use addresses safety concerns, standardization issues, unexpected financial costs, ethical concerns with live patient use, and potentially allows for licensure portability in the future (University of Nebraska Medical Center College of Dentistry Dental Hygiene Department, 2020). In 2016, a study performed by the ADEA reported that out of 156 dental hygiene program directors 86% supported eliminating the live patient portion of the clinical licensure examination. The same study revealed that 75% of the program directors felt that graduation from an accredited dental hygiene program alone

demonstrated the student competency without a need for a live patient clinical exam (ADEA, 2016). Now that an alternative clinical examination has been introduced, future studies will examine the effectiveness of manikin exams in evaluating a candidate's clinical competency for licensure and may provide evidence for the elimination of the live patient clinical examination completely.

In 2019, Arizona became the first state to allow licensure reciprocity. This means that the Arizona dental board accepts licenses from other jurisdictions and dental hygienists do not need an Arizona license to work in the state (Arizona Dental Hygienists' Association, 2019). Otherwise, a dental hygienist from another state would need to apply for an Arizona license and be a resident of the state with a current license in good standing. In addition, the hygienist would be required to complete a jurisprudence exam (Arizona Dental Hygienists' Association, 2019). In the U.S. there is limited access to oral health care for underserved populations and improved license reciprocity could increase the number of providers available to serve these populations (Bersell, 2017). License reciprocity is something future dental hygienist could encounter as they prepare to enter the work force after graduation due to the continued advocacy of increased access to care by the dental hygiene profession.

A Task Force was created in 2018 by the ADEA to assess the readiness for practice in the dental profession. The Task Force opposed the current clinical licensure pathway of a single-encounter examination on a live patient. The Task Force identified ethical concerns, validity matters, and lack of standardization involving the single encounter live patient clinical examination. Recommendations included state dental boards seek out alternatives to the current licensure exam such as an OSCE, graduation from an accredited program, and a portfolio collection that demonstrated successful passage of standardized clinical competency

assessments. The assessments are designed to evaluate clinical skills, as well as patient care knowledge, skills and abilities (ADEA, 2018).

The Task Force was also in support of increasing licensure portability (ADEA, 2018). Restrictions on licensure portability that were identified included portability for providers serving in the military or federal services, but no license portability for the spouses or partners of these providers. This creates significant financial burdens and time for the spouses or partners who can only obtain a license by credentials. The Task Force identified that dental and dental hygiene educators seeking employment in other states also experience a similar process for credential licensure. Some states allow a teaching license, but it comes with many restrictions for practice outside of the school setting (ADEA, 2018). A teaching license allows a dental hygienist to teach dental hygiene in an academic setting with a valid dental hygiene license from any state (Council of the District of Columbia, n.d.). Licensure portability restrictions also presents a negative impact on dentists' ability to volunteer in outreach situations to increase access to care as only a few states allow a volunteer license (ADEA, 2018).

The Task Force reported that more than half of the states accept clinical board exam results from all five of the regional testing agencies (ADEA, 2018). Ten states only accept two or three exams and four states only accept one exam. Recommendations suggest that all state dental boards accept clinical examinations from all regional testing agencies (ADEA, 2018). Acceptance of using standardized manikins for the clinical examination can help create a nationally recognized clinical examination that will allow for license portability between states. Manikins are used in many different health care fields for education purposes and determining clinical competency (Nieto et al., 2020; Goh et al., 2019; Gerrow et al., 2003). Thus, manikins

could become a useful instrument in determining clinical competency in the field of dental hygiene as well.

Conclusion

Students in dental hygiene programs can prepare and practice diligently for board examination. Ultimately, though, dental hygiene students must rely on another person to sit for the board exam and meet all the eligibility requirements on the day of that exam. Validity, reliability, and ethical concerns arise from using live patients as was discussed in the literature review. Clinical licensure examinations are required nationwide to determine graduates' competence and readiness for clinical practice. With the development of many clinical exam alternatives such as the manikin licensure exams, the Buffalo Model, portfolios, and OSCEs, progress is being made in improving the current clinical licensure examination. Dental hygiene educators are the individuals working one-on-one with students and preparing them to be competent for licensure exams. There are no current studies on how dental hygiene educators feel about manikin use for clinical licensure. Additional research is necessary for understanding educators' perspectives towards the use of manikins for clinical licensure exams and determining the reliability of the exam.

Chapter 3 Methodology

The purpose of this qualitative study was to identify perceptions of dental hygiene educators regarding the use of manikins for the dental hygiene clinical licensure exam. The following sections will explain the research design, context, participants, data collection instruments, limitations to the study, and the proposed analysis.

Research Design

This qualitative study used an exploratory online focus group design among a random sample of dental hygiene educators across the United States. The focus group design is useful for gaining an insight to the different perspectives of a group of people on a specific topic (Krueger and Casey, 2015). The exploratory design was chosen due to a lack of data regarding dental hygiene educators' perceptions on manikin testing for board exams. Exploratory designs are used when there are limited or no studies available (Merriam & Tisdell, 2016).

Four groups of dental hygiene educators were interviewed. Two groups of educators were from institutions that did not use manikin testing during COVID-19. And two groups of educators were from institutions that did use manikin testing during the COVID-19 pandemic. These groups were interviewed using Zoom, which is an online conferencing platform. Using an online platform for communication allows participants from across the nation to participate without the stress and cost of traveling.

Moderating online focus groups is different from in-person interviews. Clear instructions were established as well as continued communication and feedback throughout the focus group sessions (Krueger and Casey, 2015). An email was sent to the participants prior to the interview sessions that provided the guidelines for the interview and was again repeated by the moderator at the beginning of each interview (see Appendix A). This allowed participants to have a better

understanding of what to expect before joining the Zoom sessions. The focus group interviews continued until saturation was reached and there was no new information being presented (Krueger and Casey, 2015).

The following research questions helped direct the study:

1. What are dental hygiene educators' perceptions of using manikins for the dental hygiene clinical licensure exam?
2. What are dental hygiene educators' concerns about using manikins for the dental hygiene clinical licensure exam?
3. Why do dental hygiene educators believe manikin testing is a valid or not valid assessment of students' clinical skills?

Research Context

The focus groups consisted of a random sample of dental hygiene educators throughout the United States who have experienced manikin testing and those who have not experienced manikin testing. Participants chose a pseudonym for the interview to maintain confidentiality and anonymity. Each focus group session was recorded on Zoom and an iPhone and saved in an encrypted account. Recorded interviews were transcribed through Zoom.

Research Participants

The ideal size for a focus group is five to eight participants (Krueger & Casey, 2015). This study used a small focus group design, which consisted of between four to six participants in each group, because it is easier to recruit participants and participants tend to feel more comfortable in interview sessions with less people according to Krueger and Casey (2015). There were an equal number of participants who had experienced the manikin clinical licensure exam and participants who had not.

Sample Description. Once approval from the Idaho State University Human Subjects Committee was granted, the participants were recruited by emailing dental hygiene program directors from across the U.S. and asking if they had any faculty members that were willing to participate in the study. Ten participants were chosen from programs who did use manikin exams and ten were chosen from programs who did not use manikin exams for a total of twenty participants in the study. There were four focus groups consisting of five participants each. Participants were be entered into a drawing and one participant was randomly chosen to win a $50 gift card to Amazon for participating in the study.

Inclusion/Exclusion Criteria. Only educators who were full-time faculty in the U.S. and had been teaching for three or more years were included in the study. Adjunct or part-time faculty were excluded from the study as well as faculty with less than three years of teaching experience. Participants who do not teach in the U.S. were also excluded in the study. These criterion was included in the email sent to program directors.

Human Subjects Protection. After approval from the Human Subjects Committee had been granted, the PI emailed the informed consent document to the participants in the focus groups for review prior to the scheduled interviews (see Appendix B). Participants were given the opportunity to continue with the study or not continue with the study at this time. Participants were informed that their identity and dental hygiene program affiliation would be kept confidential and anonymous since they would be using pseudonyms during the focus group sessions. They were also informed that their participation in the study was completely voluntary and they were allowed to withdraw at any point during the study without repercussions.

Data Collection

Instrument. With the approval of Idaho State University's Human Subjects Committee, online focus group interviews were conducted through Zoom. There were four focus group sessions with five participants in each group, a moderator, and an investigator. The interviews lasted between 45 to 60 minutes. Two groups were educators from programs who did use manikin exams and the other two groups included educators from programs who did not use manikin exams.

The participants were asked demographic questions about how long they have been a dental hygienist, their years of teaching experience, and why they chose a career in education. Then they were asked to answer open-ended questions regarding clinical manikin examinations. The interview guide (see Appendix C) was reviewed for content validity by two qualitative researchers prior to being used in the study. The interviews were recorded via Zoom and an iPhone as a backup recording, then transcribed word for word through Zoom. Once the transcription was completed, the PI and the co-investigators worked together to identify codes and then themes from the coded data using the classic analysis strategy.

Procedure and Protocols

After approval from the Idaho State University Human Subjects Committee, the PI contacted dental hygiene program directors through email and asked if they would forward the email to their full-time faculty to see if anyone was interested in participating in the study (see Appendix D). The email discussed the purpose of the study and what was being asked of participants. The email also mentioned that participants were entered in a drawing for a chance to win a $50 Amazon gift card. Using a monetary incentive can increase the chances of acquiring

participants for online focus groups (Krueger & Casey, 2015). The inclusion criteria was included in the recruitment email to filter out participants who did not meet the criteria.

Participants were emailed the informed consent for the study and were asked to choose a pseudonym that they used during the group interviews to establish confidentiality. The PI only referred to them by their pseudonyms during the interview. Access to the Zoom recordings was limited to the PI. The PI organized the transcribed interviews by their pseudonyms. The PI and co-investigators reviewed each transcript to verify accuracy.

The PI was the moderator of the Zoom meetings and met with five participants in each group. There was a total of four Zoom sessions. The moderator asked the same interview questions to each participant and allowed several minutes for each response to keep the session from becoming too lengthy. The moderator remained unbiased throughout the interviews and kept the discussion on track. The PI pilot-tested the questions by asking the questions in a recorded interview with an educator who is against manikin use for clinical licensure exams and an educator who is in support of manikin use. The PI reviewed the recording with an experienced moderator for feedback on any adjustments that needed to be made with presenting the questions and preventing a reaction to the responses. The pilot-test also allowed the researchers to evaluate the interview order of the questions and determine if any questions needed to be adjusted for improved understanding (Krueger and Casey, 2015). Participants were able to add any comments or opinions they had at the end of the discussion. The participants were asked to speak loudly and clearly during the session so that everyone could hear well, and the transcriber was able to accurately transcribe the recordings.

Limitations

Some potential limitations to using the focus group design for this research is participants may make up responses to not look incompetent to the other participants in the focus group. There may also be a participant who is dominant in the interview and prevents others from having equal response time (Krueger and Casey, 2015). A dominant participant can be limited with a skilled moderator who can control the situation and provide fair response time for each participant.

Another limitation may be having the PI as the moderator of the focus interviews. The PI does have implicit bias towards the use of manikin testing for clinical board exams. The researcher supports the need for a more standardized exam to evaluate students' clinical competency. Steps will be taken to control biases, such as pilot-testing the questions, member checks, having an additional investigator in the interviews, and using an ending question that allows participants to restate their position on the matter.

Proposed Statistical Analysis

The PI and graduate faculty advisors sorted through the transcripts to identify codes and themes. Codes are created when the data is interpreted and given labels that describe the comment (Casey and Krueger, 2015). Each question response was interpreted thoroughly until codes for all the participant responses had been identified. Once all the data had been categorized, the researchers identified the themes of the data. Themes are identified through the frequency of similar responses, the number of different participants providing the same responses, the passion behind the responses, and the specific detail of the responses (Casey and Kreger, 2015). The recorded interviews were reviewed after each focus group sessions to determine saturation and decide if questions needed adjusting for better clarification.

Validity for the study was established through investigator triangulation. Investigator triangulation is when several different evaluators evaluate the same project separately (Guion et al., 2011). The findings from each evaluator are compared and if the different findings have the same conclusion the study can be considered valid (Guion et al., 2011). Using a triangulation method increases the credibility of the research being performed (Merriam and Tisdell, 2016). The PI and the co-investigators evaluated the transcripts separately using the Dedoose qualitative analysis software and they compared the codes and themes they each discovered.

Another method of validity was through respondent validation and member checks. This method allows some participants the opportunity to view the researchers' interpretation of the data to verify accuracy. This method can ensure that participants' responses were understood correctly and avoid any personal biases (Merriam and Tisdell, 2016). The PI's interpretation of the participants responses may contain different words, but the participant should be able to recognize their experience in the interpretation. The participants can offer suggestions for rewording to better describe their perspectives if needed (Merriam and Tisdell, 2016).

The third strategy that was used to validate the study is "adequate engagement in data collection" (Merriam and Tisdell, 2016, p. 248). This helps the researchers determine when enough participants have been interviewed that the data feels saturated. Saturation is reached when the same information is being repeated and there is no new information is being relayed (Merriam and Tisdell, 2016).

Conclusion

This chapter outlines how the research was conducted. This was an exploratory qualitative study that used focus groups to collect data from dental hygiene educators who did and did not experience the use of manikins for clinical testing these past few years. The results

and discussion of the study are in the form of a manuscript that will be submitted to *The Journal of Dental Hygiene* for publication.

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Appendix A

Interview Guidelines

Thank you for participating in this online Zoom focus group. To be successful, a focus group should have at least five members. If you find that you are unable to attend, please call or text me (307-290-0742) as soon as possible so that I can arrange for another to take your place. In order to have an organized meeting please adhere to the following guidelines.

1. Make sure that you are using a computer or tablet with a camera, but your video will be turned off and you will choose a pseudonym to be shown.
2. Use a reliable internet connection.
3. You will receive a Zoom invitation that includes a link three days prior to the meeting. Please click the link to join the meeting 10 minutes prior to the start time of the meeting, this will allow for any trouble shooting if technical issues arise.
4. When asked what name you would like to be identified as, use your pseudonym.
5. Please do not speak over others as they are speaking, you can use the "raise your hand" button and the moderator will allow you to speak once the other is done.
6. Please keep the discussions related to the questions, the moderator will step in if the conversation is getting off track.
7. If a response is becoming lengthy, the moderator may stop the speaker and have them continue their comments at the end of the interview. This will allow equal time for all participants to respond.
8. Mute your microphone when not speaking.

Please respect the privacy of others and keep this meeting confidential. Do not share any of the information with your colleagues. To ensure your confidentiality, do not say the name of your institution or state that you work in. You have the ability to leave the meeting at any time for any reason.

Appendix B

Human Subjects Informed Consent Form

Idaho State University Department of Dental Hygiene

Dental Hygiene Educators' Perspectives Towards Using

Manikins For The Clinical Licensure Examination

Cassandra Penning, RDH, BS

What is the Research?

You have been asked to participate in a research study about your perspective towards using manikins for the clinical licensure exam. The Human Subjects Committee at Idaho State University has approved this research project. You may be familiar with manikin testing or you may not. By your participation we will have a better understanding of how educators feel about using manikins for the clinical licensure examination.

Procedures

If you agree to participate in this study, you agree to the following procedures

- Before formally agreeing to participate in this study, a written informed consent will be sent to you via email on a password protected, private e-mail account. Upon agreeing to participate, the informed consent document will be signed and returned to the investigator via email.
- To protect your confidentiality, a pseudonym will be chosen by you and be used throughout the course of the focus group, and during any further transcripts or documentation. You will be asked to download the Zoom app on your personal computer or tablet. An email will be sent that is linked to a calendar and you will be asked to identify your availability to meet for the focus group. The focus group time that works best for the majority of the participants will be pinpointed. There will be several focus groups, hopefully your schedule will fit one of them, if not, you may not be selected to participate in the focus group. A Zoom invitation will be sent out with the designated focus group time and a specific meeting link to join the discussion.
- You will participate in a focus group consisting of 5 participants, a moderator and investigator(s). The focus group will last approximately 1 hour, and questions will pertain to your experience with and opinion on using manikins for testing. Zoom will record the discussion as well as a back up recording on an iPhone, and then will be downloaded to a password protected computer. Only the primary investigator, the thesis committee members, and the professional transcriptionist will have access to the recording.

- Participants will use only pseudonyms on the audio recording, and every effort will be taken to keep the recordings confidential. You will be asked to not use specific college, dental hygiene program, or state names. Instead you can say “my program” or “my state”. A transcriptionist will make a word for word transcription of the recording. The transcriptionist will only know the participants by their pseudonyms. At the completion of the study, all transcripts and recordings will be sent to Idaho State University, to be help in the Idaho State University secured storage for seven years. At that point, all material to the study will be destroyed by Idaho State University following university protocol.
- A summary of your statements will be sent to you to review. A copy of the results of the study will be sent to participants upon request.

Why Have I Been Asked to Take Part?

You have been asked to participate because you have important insights as a dental hygiene educator who works with students preparing to take the clinical licensure exam. Your perspectives on using manikins for the clinical licensure exam can provide valuable information.

Voluntary Participation

This discussion is voluntary—you do not have to take part if you do not want to. If you do not take part it will not have any effect on your dental hygiene program of your career. If any questions make you feel uncomfortable, you do not have to answer them. You may leave the Zoom group at any time for any reason.

Risks and Benefits

There may be a very slight risk of a colleague recognizing your voice during the interviews, but the researchers will take steps to prevent educators from the same institution being in the same focus group. There are no personal benefits for taking part in this research. Your insights and that of others may be helpful to researchers as they seek insights on this topic.

Privacy and Confidentiality

This discussion will be audio and audiovisual recorded to ensure that we have accurately captured the comments of each individual. The recording will only be available to the research team and a transcriptionist. The recordings will be stored in a secure location and will be erased when the analysis is complete. Your privacy will be protected by the use of a pseudonym. Pseudonyms will be used in the focus group and on all reports, and the discuss will be kept strictly confidential.

Due to the group setting and protecting each member’s confidentiality, you are asked to keep focus group discussion private and during the discussion be in a private location where others cannot hear. However, due to the group setting and the choices of other participants, we are unable to ensure complete confidentiality about the discussion. However, each person will only be identified through use of his or her pseudonym and the video camera will be turned off during the focus group interview.

Questions

If you have any additional questions about the study, you may contact the primary investigator or faculty members.

Investigator

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I have read the information in the consent form. I have been given an opportunity to ask questions, and any questions I had have been answer to my satisfaction. I have been given a copy of the informed consent form.

I give my consent for the results of the research to be published or discussed using my pseudonym. No information will be included that will reveal my identity.

I HAVE REVIEWED THIS CONSENT FORM AND UNDERSTAND AND AGREE TO ITS CONTENTS.

Printed Name Date

Signature

Adapted from Krueger and Casey, 2015, p. 13

Appendix C

Interview Guide

	Questions for participants
Opening	1. Tell us your pseudonym for this research, how long have you been a dental hygienist, the number of years you have been teaching, and why you chose a career in education.
Introduction	2. Have you used manikins (typodonts) to evaluate students' clinical abilities? Why or why not?
Transition	3. What do you think are some of the advantages of using manikins to evaluate students' clinical skills.
	4. What do you think are some of the disadvantages of using manikins to evaluate students' clinical skills.
Key	5. What do you know about the Manikin Clinical Licensure Examination?
	6. What are the advantages of using manikins instead of live patients for the clinical licensure exam?
	7. What are the disadvantages of using manikins instead of live patients for the clinical licensure exam?
	8. Do you believe the manikin exam is a valid assessment of students' clinical skills? Why or why not?
	9. If you live in a state that does not allow the manikin exam, would you advocate to your state legislature to accept the manikin examination as a clinical licensure examination? Would you tell me more about that? 9a. OR what would you tell someone who lives in a state that does not allow the manikin exam so they could advocate to their state legislature to accept the manikin exam? Would you tell me more about that?
	10. What other options would you consider to be a valid evaluation of students' clinical skills for licensure? Why do you think they are valid?
Ending	11. Is there anything else you would like the researchers to know about this topic?

Appendix D

Email Sent to Program Directors

Hello,

My name is Cassandra Penning and I am a graduate dental hygiene student at Idaho State University. My thesis advisors Leciel Bono and Dr. JoAnn Gurenlian and I are conducting a study on the perspectives of dental hygiene educators toward the use of manikin testing for the clinical licensure exam. I am looking to recruit full-time dental hygiene educators who have been teaching for at least three years to participate in a 45-60 minute Zoom focus group interview. I would appreciate it if you would please forward this email to your full-time faculty members. If you or any of your faculty members would be willing to participate in the study, please email me at penncass@isu.edu and I will send an email providing more details. If you will add in the email if your state does or does not allow the manikin clinical licensure examination at this time that would be appreciated as well. All participants in the study will be entered in a drawing and one lucky person will win a $50 Amazon gift card.

Thank you for helping me further our profession!

Cassandra Penning, RDH, BS, MSDH student

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Title: Dental Hygiene Educators' Perspectives Towards the use of Manikin Testing for Clinical Licensure Exam

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Title: Dental Hygiene Educators' Perspectives Towards the use of Manikin Testing for Clinical Licensure Exam

Abstract:

Purpose: The use of manikin testing is new in the dental hygiene profession and there is currently a lack of research about the efficacy and accuracy of manikin testing for clinical licensure. The purpose of this study is to identify perceptions of dental hygiene educators regarding the use of manikins for the dental hygiene clinical licensure exam.

Methods: This qualitative study used an exploratory, online, focus group design with 20 dental hygiene educator participants recruited through purposive sampling. Pseudonyms were used to protect participants confidentiality. Two groups of educators were from institutions that did not use manikin testing during COVID-19, and two groups of educators were from institutions that did use manikin testing during the pandemic. An interview guide was established for the groups and validated by focus group experts and pilot-testing procedures. Each focus group session was recorded and transcribed using Zoom. Themes were analyzed using the classic analysis strategy. Validity was established using investigator triangulation, member checks, and saturation.

Results: Three major themes were identified regarding the use of manikin testing for clinical licensure exam. The first theme identified was the lack of knowledge and the assumptions educators made about the manikin exam. The second theme was testing considerations including benefits and concerns about the manikin exam. The third theme related to perception of value of clinical licensure exams.

Conclusion: Perspectives on the use of manikins for the dental hygiene clinical licensure exam were explored. The manikin exam appears to resolve concerns about the use of the live patient clinical exam. The need for a clinical licensure exam was questioned as participants expressed

the accreditation standards of the entry-level program is appropriate to demonstrate competence for licensure.

Key Words: clinical licensure exam, manikin exam, dental hygiene education, competency

This manuscript supports the NDHRA priority area **Professional development: Regulation** (scope of practice).

INTRODUCTION

In order to receive a dental hygiene license in the United States, a candidate must graduate from an accredited dental hygiene program, achieve a passing score on the written National Board Dental Hygiene Examination, and achieve a passing score on a regional or state clinical board examination.[1] Prior to 2020, the only available dental hygiene clinical board examination was the live patient treatment clinical examination. For this examination, candidates must select a live patient who has an acceptable medical history, has diagnostic radiographs, and has twelve surfaces of qualifying subgingival calculus.[2] The candidates are evaluated on their ability to assess and select a qualifying patient as well as their clinical skills, which includes calculus detection and removal, ability to accurately measure periodontal pocket depths, and appropriate tissue management.[2]

The COVID-19 pandemic created many issues for dental education. Dental and dental hygiene students had limited capacity to treat live patients for their program requirements.[3] Many schools had to have a summer clinic session to help students receive their necessary requirements for graduation. Live patient exams could not be administered due to the pandemic which caused a delay in the students' timeline for receiving their dental or dental hygiene license.[3] The pandemic did bring to light the need for an alternative to live patient testing for clinical board exams. It also motivated testing agencies to develop an alternative testing option quickly to enable students to begin their licensing process.[3]

Dental hygiene students were presented with a new alternative option for their clinical licensure exam in 2020. All the dental hygiene testing agencies offered a manikin clinical licensure exam and a computer simulated Objective Structure Clinical Examination (OSCE).[4-7] The students performed calculus detection, calculus removal, and measurement of periodontal pockets on typodonts provided by the agencies. The OSCE provided radiographs, photos, model images, and lab data to help students answer questions regarding patient scenarios.[6] The use of OSCEs for clinical licensure is new to dentistry in the United States, but the National

Dental Examining Board of Canada (NDEB) has been using an OSCE since 1995 for their clinical licensure exam.[8] At this point in time, many states permanently allow the manikin exam as an acceptable clinical licensure exam. However, there are a few states that are only accepting the manikin exam until the end of 2022 or do not accept the exam for licensing at all.[9]

The use of manikin testing is new in the dental hygiene profession and there is currently a lack of research about the efficacy and accuracy of manikin testing for clinical licensure. More research is necessary to provide evidence-based information about the efficacy and accuracy of manikin testing. Dental hygiene educators' perceptions towards the exam and whether it is considered a valid assessment of student's clinical skills also has not been studied. Dental hygiene educators prepare students for clinical practice and regularly assess students' clinical abilities while in school. The information obtained from this study will assess how dental hygiene educators feel about alternative licensure methods. Learning the perceptions of dental hygiene educators towards manikin testing is valuable information that can be used for modifying existing manikin exams or creating new simulated patient exams that are specific to the dental hygiene profession.

This study will contribute to the body of knowledge in dental hygiene clinical licensure testing. The results of this study will provide valuable information that state dental boards can use when considering allowance of manikin use for clinical licensure. This study supports the American Dental Hygienists' Association's (ADHA) National Dental Hygiene Research Agenda Objective 3 "To communicate research priorities to legislative and policy-making bodies."[10]

The purpose of this study is to identify perceptions of dental hygiene educators regarding the use of manikins for the dental hygiene clinical licensure exam. The following research questions guided the conduct of this study: What are dental hygiene educators' perceptions of using manikins for the dental hygiene clinical licensure exam? What are dental hygiene educators' concerns about using manikins for the dental hygiene clinical licensure

exam? Why do dental hygiene educators believe manikin testing is a valid or not valid assessment of students' clinical skills?

METHODS AND MATERIALS

This qualitative study used an exploratory online focus group design among a random sample of dental hygiene educators across the United States (IRB-FY2022-180). The focus group design is useful for gaining an insight to the different perspectives of a group of people on a specific topic.[11] The exploratory design was chosen due to a lack of data regarding dental hygiene educators' perceptions on manikin testing for board exams. Exploratory designs are used when there are limited or no studies available.[12] This study used a small focus group design, which consists of between four to six participants in each group, because it is easier to recruit participants and participants tend to feel more comfortable in interview sessions with less people.[11]

Four groups of dental hygiene educators were interviewed. Two groups of educators were from institutions that did not use manikin testing during COVID-19 and two groups of educators were from institutions that did use manikin testing during the COVID-19 pandemic. The participants were recruited by emailing dental hygiene program directors from across the U.S. and asking if they have any faculty members that were willing to participate in the study. These groups were interviewed using Zoom, which is an online conferencing platform. Using an online platform for communication allows participants from across the nation to participate without the stress and cost of traveling.

Only educators who are full-time faculty in the U.S. and had been teaching for three or more years were included in the study. Adjunct or part-time faculty were excluded from the study as well as faculty with less than three years of teaching experience. Participants who do not teach in the U.S. were also excluded in the study. Participants chose a pseudonym for the interview to maintain confidentiality and anonymity. They were also informed that their

participation in the study was completely voluntary and they were allowed to withdraw at any point during the study without repercussions.

The primary investigator (PI) pilot-tested the questions by asking the questions in a recorded interview with an educator who is against manikin use for clinical licensure exams and an educator who is in support of manikin use. The PI reviewed the recording with an experienced moderator for feedback on any adjustments that needed to be made with presenting the questions and preventing a reaction to the responses. The pilot-test also allowed the researchers to evaluate the interview order of the questions and determine if any questions needed to be adjusted for improved understanding.[11]

The Zoom interviews lasted between 45 to 60 minutes. The participants were asked demographic questions about how long they have been a dental hygienist, their years of teaching experience, and why they chose a career in education. Then they were asked to answer open-ended questions regarding clinical manikin examinations. The interview guide was reviewed for content validity by two qualitative researchers, prior to being used in the study. The interviews were recorded via Zoom and an iPhone as a backup recording, then transcribed word-for-word through Zoom. Once the transcription was completed, the PI and two research members worked together to perform an analysis of the data. The analysis was completed using an online qualitative data analysis software (Dedoose, SocioCultural Research Consultants, Los Angeles, California) to consolidate the data into parent and child codes. The classic analysis strategy was used to identify themes. This strategy reviews data based on frequency, consistency, emotion, and extensiveness.[11]

Validity for the study was established through investigator triangulation. Investigator triangulation is when several different evaluators evaluate the same project separately[13]. Another method of validity was through respondent validation and member checks. This method allows participants the opportunity to view the researchers' interpretation of the data to verify accuracy. The third strategy that was used to validate the study is saturation. When the same

information was being repeated and no new information was being relayed during the interviews, the researchers determined that saturation had been reached.[12]

RESULTS

This study consisted of 20 participants with various years of experience in teaching and length of careers as dental hygienists. Of these participants, 95% (n=19) were female, 65% (n=13) have been dental hygienists for 20+ years, and 45% (n=9) have been teaching for 13 or more years. Reasons for choosing a career in education were that they were influenced by dental hygiene educators from the programs they had attended or in the areas they lived 30% (n=6) or they had a desire to teach 35% (n=7). Participants were from 14 states from the west, central, and eastern regions of the United States. Demographic information is summarized in Table I.

Prior to addressing manikin use for clinical exams for licensure, participants were asked if they used manikins as part of the education experience for dental hygiene students. If so, they were asked to describe the advantages and disadvantages of manikin use. Many of the participants had used manikins in their programs to evaluate students' clinical ability. Advantages of using manikins to evaluate clinical skills were it was a more standardized method of evaluating students, instructors can demonstrate while the student is working and provide immediate feedback when there is no live patient, and patient safety is not a concern. The disadvantages participants stated were manikins lack human characteristics such as saliva, blood, cheeks, and tongue, and students are not experiencing realistic scenarios during instrumentation. Other disadvantages noted were patient management is not able to be evaluated with manikins and the cost and maintenance of manikins is expensive.

Three major themes along with subthemes were identified regarding the use of manikin testing for clinical licensure exam through the focus group sessions (see Figure 1). Participant quotes supporting the themes are shown in Table II.

Theme 1. Lack of Knowledge

Focus group participants expressed an overwhelming concern about the lack of knowledge related to the manikin clinical exam. These concerns centered around lack of information and preparation. S stated, “I actually feel less prepared with the manikin clinical exam because it is so new; I don’t feel like I have enough information to help [students] feel confident going into it.” CDRDH expressed a similar concern.

> I have learned that they have an educators’ conference each year that I was not aware of that would be very helpful. I feel like personally the educators were not properly prepared to teach students the manikins; I wish we would have had better guidance.

Focus group participants who did not have experience with the manikin clinical exam had many assumptions about the exam, not all of which were accurate. These assumptions represented a subtheme. Topics were related to assessment procedures, characteristics of the manikin, and calculus qualities. Evelyn stated, “The calculus is pre found for them,” while Thelma indicated:

> I know that they are graded on calculus detection plus calculus removal. I don't think there's radiographs involved, I guess that's not something I know about. I think most of the periodontal aspects of that manikin clinical exam is non-existent.

Theme II: Testing Considerations

Five subthemes emerged related to testing considerations. These subthemes included ethics, standardization, operations, critical thinking, and outcomes. Participants had considerable concerns about the live patient clinical exam and the manikin removed some of those concerns. Ethical considerations regarding students and patients were discussed. Y Knot expressed, “[They] had a couple of students whose patients were extorting them for more money or they weren't going to show up to the exam.” Bellamuse stated, “Students wouldn't have to pay for patients to travel, and hotel rooms, and gas, and food as well.” Patient ethical concerns focused on completing treatment and preventing disease progression as was demonstrated in the following quotes:

> I also believe that the manikin exam is more ethical because [in] the live patient exam, the student only removes calculus in part of the mouth, and therefore total patient care is not provided. And to me that is totally unethical and I can't believe that the licensing agencies have gotten away with that for years and years and years.
>
> They [students] have a patient that is maybe perfect, but their boards aren't for months. They hang on to that patient and let them continue in their disease. And how ethical is that? Furthermore, they complete their exam, and patients [are] left high and dry and do not get complete care.

Many participants felt the manikin provided testing standardization and created equity in testing conditions between the students. A representation of this subtheme was discussed as "I think it's a more fair playing field that all students are taking the same board across the nation. And it's more calibrated," and "I think you can get a true assessment if you test everybody on the same manikin, the same typodont, the same calculus, the same teeth." Liz Lemon discussed how the manikin exam can help alleviate stress for the students, "I think the biggest thing is that standardizes it, and it eliminates a lot of the things that are out of the students' control [with] their patient."

Cost for live patient exam administration and infection control concerns were topics of discussion regarding operations. M discussed how operating costs were decreased with manikin use due to, "You don't have to buy gauze and suction. Less bloodborne pathogens, there's no contamination, [and] no dentist needed to do anesthesia for the patient so overall less costs," while Me commented about the issue of contaminated instruments, "With a live patient, the candidates are having to take their used instruments out of that facility without being able to sterilize them there."

Concerns about decreased critical thinking regarding comprehensive care were articulated by participants and best represented by the following quotes.

> The reduction of critical thinking. It takes [away] the students' ability to choose the correct patient, to calculus detect in advance, [because] the mountain of the exam is picking the right teeth. If we take that away [and] give the manikin, can you really detect calculus? There's no blood, there's no saliva, there's no obstacles to see what you can do on a real person. You're going to be treating people every day after graduation. So, does the manikin really tell me that you are a capable dental hygienist?

Another concern mentioned was students' preparation for the manikin exam. Y Knot stated, "I think that the students feel that it's going to be easier being on a manikin, so they do not prepare mentally as well for the exam."

A final subtheme was many participants were concerned about the outcomes of clinical examinations for dental hygiene students. For example, Moonflower38 stated clinical exams "don't truly demonstrate that the student is competent to manage a patient once they get out in the field" while LuLu expressed "I think it's a false sense of passing, I just think it gives the false sense of skills." Moonflower38 also noted "I just don't feel that it's a true representation of what's truly going to be expected of them." Other participants voiced concern about excellent student clinicians failing the manikin clinical exam and the outcome of the test result did not reflect the ability of the clinician.

> We also had a student who was a very good clinician that was unsuccessful, and we were discussing do you appeal it and pay $400 and not be sure that you're going to pass, and it was a half a point.

Theme III: Perception of Value

Focus group participants had mixed feelings about the validity of a clinical manikin exam for licensure as well as any clinical exam for licensure. Some participants believed there was value in third-party assessment.

> We have seen in our own program the value in the students who have graduated from our program going on to sit for the clinical exam. Whether it's patient-based or manikin-based and that computer simulated exam. I don't want to say weeds out, but we have had opportunities for that to be very valuable. We wouldn't want our program, even though it's CODA accredited to be the be all, end all for licensure. We feel that going on and sitting for that clinical examination is a very high value for licensure.

> We are the gatekeepers for our profession. And if somebody doesn't pass the standards, unfortunately, they're out of the program. Not all fields are for everyone. So sometimes it's good that they don't pass and end up with something that's really not a good fit for them.

On the other hand, some participants expressed fulfilling the accreditation standards of the entry-level program was sufficient to demonstrate competence for licensure. This discussion

led to the subtheme of measuring competence. Participant Z stated, “The institution should be the final decision maker if the graduate is competent enough to practice in dental hygiene. That should be left up to the institution.” Other key quotes supporting this theme follow.

> I think graduating from a CODA accredited dental hygiene program is a valid measure of their skills. And this standardizes things because the Commission on Dental Accreditation requires the same standards for every program. If the program meets those standards, the student is competent, and they should be granted licensure.

> No, I don't believe the manikin exam is a true assessment of their skills. What I personally believe is it's a high stakes exam. It's a gamble as to whether or not in this one shot they're going to pass or not. What I feel is that all clinical examinations should be removed. Through our accreditation process your program is graduating individuals who are confident in each one of the skills, clinical skills, critical thinking, problem solving, providing comprehensive care, and therefore, by virtue of graduating from an accredited program you should be able to become licensed. No other healthcare profession has to pass a clinical exam in order to become licensed. We should be on the same level as other healthcare professionals, and that there's no need for the exam. As long as people pass the National Board and have graduated from a CODA accredited program.

Further, participants identified concerns about a one-time exam being relevant in relation to measuring competence across time in the dental hygiene program. Y Knot explained, “In general, I am opposed to having a one-shot deal to get your licensure with an exam. I feel that fully accredited programs have proven themselves to graduate competent hygienists. A clinical exam is not needed.” Bellamuse expressed:

> I do not think the manikin exam is a valid assessment, but I would have to say the same for the human exam. I think the years that they're in school and the competencies that they pass within the 2 years overall is a valid assessment.

Finally, participants were asked what other options they would consider to be a valid evaluation of students’ clinical skills for licensure. Two participants recommended the use of E-portfolios to provide additional means of measuring student competence. Evelyn stated, “I think an E-portfolio could showcase the educational journey of the student and show the different competencies besides just calculus removal. You could see radiographic competencies, local anesthesia, restorative, [and] all the components of dental hygiene process of care,” while Liz

Lemon indicated, “I feel like there could be some merit to portfolio system too, where we are demonstrating the clinical aspects through our programs throughout the students time at our institutions and showcasing those in a portfolio.”

DISCUSSION

The manikin clinical licensure exam appears to be a step forward in addressing the ethical concerns educators have about testing with live patients. Educators have voiced concern about the ethics of requiring students to test on live patients to obtain a license after graduation for over twenty years. A 2016 ADEA survey questioned dental hygiene program directors about ethical implications with human subjects for the clinical board exam and 93% of the participants stated that their primary concern was incomplete treatment when only using the patient for the clinical board examination.[14] Feil et al. expressed concern about postponing treatment of patients to meet exam criteria can cause the patient to remain in a painful or diseased state for an unnecessary amount of time and can lead to compromising patient care for personal gain.[15] Other researchers noted that students felt delaying treatment depends on the length of time and that sometimes delaying treatment is required.[16]

Another ethical concern reported by 92% of program directors was they were worried students would postpone treatment for the patient or provide monetary incentive to convince the patient to participate in the examination.[14] Participants in the study mentioned another ethical concern the manikin exam addressed was patient abandonment. Since board patients only sit for a specified exam with limited treatment, they are prone to patient abandonment by the student once the students pass the exam and graduates. A study conducted by Chu et al. found similar responses regarding ethical concerns and favored the manikin exam because it eliminates these concerns.[17]

Although eliminating ethical concerns was an advantage of the manikin exam, a common disadvantage mentioned during this qualitative focus group study was the manikin exam only tests a limited skillset. Participants frequently mentioned the manikin exam is a one-

time high stakes exam and does not represent comprehensive dental hygiene care. Research has shown using this type of examination is situation reliant; the exam assesses what the candidate has already accomplished.[18] The manikin exam may provide a standardized approach, but it is still only assessing a small portion of the student's clinical skill that is required in clinical practice and does not evaluate critical thinking, decision making, patient management, and other aspects that reflect the broad range of scope of practice that comprises dental hygiene care.

In this study many of the participants discussed whether they favor neither of the one-time clinical board exams. These individuals believe graduating from an accredited dental hygiene program is sufficient for licensure. This perspective has been addressed in previous research. An ADEA study published in 2016 reported that 75% of dental hygiene program director believed graduation from an accredited dental hygiene program was an appropriate measure of students' clinical competency without the need for a clinical licensure examination.[14] Further, 86% supported using an alternative pathway for licensure and terminating the current live patient clinical licensure examination.[14]

In the United States, the dental professions are the only health professions that still require a clinical licensure exam involving a live patient.[19] There have been many attempts to eliminate live patient clinical exams since 2005, but no progress has been made until recently with the introduction of the Dental Licensure Objective Structured Clinical Licensure Examination (DLOSCE) for dentistry and the Manikin Treatment Clinical Examination (MTCE) for dental hygiene. Research has examined alternative options for the live patient clinical exam such as OSCEs, the Buffalo Model, and the use of portfolios.[8, 20-23] It appears the field of dental hygiene is beginning to progress towards the elimination of live patient exams; however, additional steps will need to be taken to move beyond the use of clinical board examinations.

This study is not without limitations. The use of purposive sampling and qualitative technique used to gather data limits generalization to the entire population of dental hygiene

educators. Qualitative research is not intended to generalize, but rather provides the ability to learn in depth perceptions, opinions, and trends and patterns which may not be apparent through survey research.[12] Another limitation was the PI served as the moderator for the focus group. However, steps were taken to control moderator bias. These steps included pilot-testing the questions, member checks, having an additional investigator in the interviews, and using an ending question that allows participants to restate their position on the matter. Additional research could include further investigation on the perspective of dental hygiene students and recent graduates who are practicing clinicians on the manikin exam. Future studies may also include the need for clinical licensure examinations in general.

CONCLUSION

This qualitative study offers perspective on the use of manikins for the dental hygiene clinical licensure exam. Concern about the use of the live patient clinical exam appears to be resolved with manikin exams; however, participants expressed satisfying the accreditation standards of the entry-level program is appropriate to demonstrate competence for licensure.

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Table I: Demographics

Characteristic	N=20 (%)
Gender	
Female	19 (95%)
Male	1 (5%)
Years as a Dental Hygienist	
0-9	1 (5%)
10-19	6 (30%)
20-29	10 (50%)
30+	3 (15%)
Years Teaching	
0-9	8 (40%)
10-19	10 (50%)
20-29	1 (5%)
30+	1 (5%)
Location of Participant	
Georgia	4 (20%)
New York	1 (5%)
South Carolina	1 (5%)
Ohio	1 (5%)
Tennessee	1 (5%)
Wyoming	1 (5%)
Washington	1 (5%)
Minnesota	1 (5%)
Mississippi	1 (5%)
California	1 (5%)
Texas	1 (5%)
Utah	1 (5%)
Idaho	1 (5%)
Missouri	1 (5%)
Alaska	1 (5%)
Florida	1 (5%)
New Mexico	1 (5%)

Table II: Interview guide with selected responses

Focus Group Question	Selected Responses
What do you know about the Manikin Clinical Licensure Examination?	Calculus removal is different than a human mouth, it's easy to cause tissue trauma. (*Wilma*) Every single tooth is pre-designed with moderate calculus.(*M*) I think most of the students are choosing it because they are not confident that they will be able to find a live patient. (*Me*)
What do you think are the advantages and disadvantages of using manikins instead of a live patient for the clinical licensure exam?	From an ethical standpoint typically if the student finishes on a live patient and that patient departs what happens if the patient still has areas that has not had treatment? If they don't return, we don't know what happens with that patient. At least with the manikin base you don't have that issue because it is a manikin. (*Participant Z*) The ethical thing is that some of these patients will be waiting for months before the board exam. If a student finds them, say, in August but their clinical exams not till March that patient is just on hold for getting their teeth cleaned to be a board patient. (*LuLu*) It does make it standard across the board for every student who's taking it, potentially across multiple schools, multiple states just making it the same for everybody. (*Moonflower38*) The main advantage is the standardization. Everybody has the same manikin, or essentially the same manikin, same types of calculus because it's all lab manufactured and should be similar depths of calculus, I would think that they place it so that it is assessing similar skills. (*LuLu*) With a manikin exam you don't have to have a doctor on staff, which is an added expense for the college giving the exam. (*Me*) There's no way that you can 100% replicate an exact human mouth, and calculus, and tissues. I don't think it's the same feel as a

	real mouth. You don't have the tissues, the tongue, and the saliva to deal with. You don't have to give anesthetic and I think that's a disadvantage as well. (*Wilma*) Everyone here knows that providing dental hygiene care isn't about just removing calculus. The manikin exam only [focuses] on one small piece of the comprehensive care that we provide as dental hygienist. (*Erin*)
Do you believe the manikin exam is a valid assessment of students' clinical skills and what other options would you consider to be a valid evaluation for students' clinical skills for licensure?	I firmly believe that validation of skills by the clinical instructors throughout the 2 years of a dental hygiene program, getting them to the point of a manikin exam should be worth something. (*S*) I believe that their 2 years of schooling at an accredited college is what evaluates the student's skills. Not a one patient or one manikin exam. (*LuLu*) I believe the CODA standards that we set up our programs on and we're evaluated on are enough. (*CiCi*) I see other options to validate, just as every other health care field, nursing, doctors, respiratory therapist, and all others except dental. The competencies and the tests and exams that they have in schools, and their professors saying that they're competent. That's what I would say would be a valid assessment of the students to receive licensure. (*Bellamuse*) Fully accredited programs don't haphazardly pass students. Therefore, the clinical board exam really is not needed. And I do approve of the written exam to show retention of knowledge as well as critical thinking to get through things. But I really don't think there needs to be a clinical exam with fully accredited programs. (*Y Knot*) I have concerns with it being a valid exam because it is only assessing debridement. It's not a realistic assessment of the periodontal components. We're looking at the dental hygiene process of care. Like others said

	other healthcare professions don't require a clinical exam. (*Evelyn*) I do not, because it's not real calculus. So if that's the skill, you're assessing calculus detection and removal, if it's not the same as real calculus, then I don't think that translates over to a real patient. (*RDH*) Why are we having these students take this amount of boards? They're taking 4 different boards, the clinical board, the computerized portion, the ethical board. It's an overkill and I think that needs to be looked at across the nation where as other professions are taking one board and they're done. (*CDRDH*)

Figure 1. Themes and subthemes