ORIGINAL ARTICLE

ADEA | THE VOICE OF DENTAL EDUCATION WILEY

Dental hygiene educators' knowledge and implementation of objective structured clinical examination in United States dental hygiene programs

Khulood M. Aboalsaud MSDH | **Valerie K. Nieto RDH, MS** |
Iwonka T. Eagle RDH, MS | **Danielle Rulli RDH, MS, DHSc**

Department of Periodontics and Oral
Medicine, Division of Dental Hygiene,
University of Michigan School of
Dentistry, Ann Arbor, Michigan, USA

Correspondence
Khulood M. Aboalsaud, MSDH,
Department of Periodontics and Oral
Medicine, Division of Dental Hygiene,
University of Michigan School of
Dentistry, 1011 N University Ave, Ann
Arbor, MI 48109, USA.
Email: kaboalsa@umich.edu

Abstract

Purpose: In 2021, the American Dental Association (ADA) announced the intention to develop a standardized dental hygiene licensure objective structured clinical examination (DHLOSCE). The purpose of this study was to measure the United States (US) dental hygiene (DH) educators' foundational knowledge of OSCE development and delivery in light of the impending development of the DHLOSCE by the ADA's Testing Services.

Methods: The study was determined to be exempt from Institutional Review Board oversight. A 21-question survey was developed, pilot tested, and electronically disseminated through Qualtrics. The survey recruitment was emailed to the directors of all entry-level DH education programs in the US ($n = 328$), asking them to participate in the survey and to forward it to the clinical faculty in their institutions. Descriptive and inferential statistics were utilized to analyze the data.

Results: There were 143 study participants, for a completion rate of 45%. Over two-thirds of respondents (64%) were unaware of the plans to develop the DHLOSCE, while 13% reported utilizing OSCEs to meet accreditation standards. Only 3% reported receiving a formal education in OSCE development compared to 29% who learned through a colleague or peer. Nearly half reported a lack of faculty experience as a barrier to OSCE implementation. Over three-quarters, 76% reported a lack of OCSE development committees within their program and only 14% had experience developing an OSCE station.

Conclusion: The study results suggest an urgent need for the development of OSCE training resources specific to DH education, as programs across the US prepare for the impending DHLOSCE.

KEYWORDS
clinical competence, clinical evaluations, dental hygiene education, live patient examinations, objective structured clinical examinations

1 | INTRODUCTION

Historically, health care education used live patients to assess the clinical competence of student practitioners, culminating in a final, clinical licensure examination. However, the efficacy of these practices has been scrutinized as unreliable, subjective, and in many cases, unethical.[1,2] The majority of health care professions recognized the significant limitations of live-patient examinations (LPE), and for decades have used alternative assessment models such as simulation to create clinical learning and testing experiences.[3] Furthermore, the United States (US) and Canadian medical and dental clinical professions now offer licensure examinations that are simulation-based. Simulation offers the unique opportunity to standardize learning and evaluation methodologies. DH education and clinical licensure examination processes have, until recently, continued to use LPE to assess clinical competence.

The Joint Commission on National Dental Examinations (JCNDE) formally recognized the limitations of LPE and called for the development of alternatives that no longer required the use of human subjects. In 2016, the Task Force on assessment of readiness for practice (TARP) released their report, recommending alternative and valid means of assessing the clinical competence of dental candidates for initial licensure.[4] One recommended alternative was the dental licensure objective structured clinical examination (DLOSCE), which was launched by the American Dental Association (ADA) Testing Services in 2020.[5] However, the DLOSCE was only offered as an option for initial licensure for dental candidates.

OSCE was first introduced by Harden et al. in the 1970s as an approach to replace the unstructured and often unpredictable clinical assessments traditionally used in health care education.[6] The OSCE format avoids many of the weaknesses and disadvantages of traditional clinical examinations and more importantly, does not require the use of live patients.[7] For decades, OSCEs have been universally accepted as the gold standard for assessing clinical competence in health care education.[8] The evidence consistently demonstrates the acceptance of OSCE by educators as a valid and reliable tool for the assessment of clinical competency.[9–15] However, increased utilization of OSCE has led to considerable debate within the literature about its appropriate use.

The coronavirus disease 2019 (COVID-19) pandemic heightened the need for alternative assessments thus significantly impacting DH education and licensure exam processes.[16] Dental education programs and licensure examination boards were forced to modify clinical competence assessments, making innovative virtual and simulation-based clinical teaching and evaluation methodologies necessary. Additionally, many states began accepting mannikin-based clinical licensure examinations as a viable substitute for initial licensure. After nearly a year of forced, modified educational and clinical licensure processes, the ADA announced in the spring of 2021 the development of the dental hygiene licensure objective structured clinical examination (DHLOSCE). An unofficial report by JCNDE on June 23, 2021, announced the approved development of the DHLOSCE.[17]

Conducting a successful OSCE requires advanced planning by an OSCE committee. The committee is responsible for developing key components of the OSCE, such as a blueprint, predetermined scoring system, and standardized assessment tools.[8] Developing an OSCE is labor-intensive and requires a deep appreciation of the course and program competencies being evaluated because OSCEs do not merely assess whether a student knows the material but rather if they can critically think while performing tasks.

Blueprints are the foundation of OSCE development. They are tools designed to outline competencies, learning objectives, and topics being assessed while organizing the evaluation tools and supplies required for the examination. OSCEs are timed, simulation-based clinical assessments composed of multiple standardized stations. Every station is unique, requiring the application of different skills and/or critical thought processes while utilizing calibrated instructors and predetermined grading criteria as a means to provide unbiased and reliable measures of clinical competence.[8] This testing method offers the highest level of standardization, delivering the exact same test of skills across all examinees. As a result, OSCE has been long recognized for its trusted validity and reliability and is widely used in health care education across the US and internationally.

OSCE utilization has been widely recognized in dental and allied health education for decades. OSCEs have been inserted in dental program curricula since the 1990s to evaluate several skills such as communications, patient education, clinical skills, and critical thinking.[14,18,19] In recent years, OSCE has also been used in nursing programs to evaluate students' clinical competence.[9,12,18,20,21] Lee et al. explored the development and validation of OSCE for assessing the clinical competency of student nurses before graduation, using blueprint setting, checklist development, and standard patient and examiner training.[20] The study found that OSCE is a reliable and valid method for assessing nursing students' clinical competence, except that it is costly, time-consuming, and requires substantial human resources.[20] Another study by Taala et al. concluded that OSCE is acceptable as an examination method

in nursing programs; however, several challenges must be considered as the need for a time frame when conducting the examination and assessing the quality of the examination.[21]

While the utilization of OSCEs in dental and health education has been widely explored, research is scarce regarding utilization trends in DH education. In 2009, Navickis et al. investigated the use of various standardized clinical examinations in DH curricula.[11] At the time of the study, 59% of respondents used OSCEs, and 46% felt that OSCEs were effective tools for verifying clinical performance; however, 37% cited time as a barrier to implementation.[11] A 2015 study by Fleckner and Rowe reported that 73% of DH program directors felt that LPE could not be standardized due to patient variability.[15] In 2020, Nieto et al. surveyed DH program directors' attitudes toward and utilization of OSCEs across the US.[4] The study found that while most program directors were in favor of eliminating LPE in favor of an OSCE for licensure, more than half did not employ OSCEs for clinical assessments.[4]

With the introduction of the mannikin-based clinical licensure exam and the impending development of a DHLOSCE, DH programs must be ready for such a paradigm shift, specifically as it relates to their preparedness to prepare DH candidates via the implementation of valid and reliably constructed OSCE in the curriculum. Currently, there is a gap in the literature regarding DH educators' attitudes toward OSCEs; more specifically, how DH educators' formal education, knowledge, and understanding of the proper construction, components, and delivery of OSCE to evaluate students' clinical competence. Therefore, the purpose of this study was to assess DH educators' knowledge of the proper construction, components, and delivery of OSCE.

2 | MATERIALS AND METHODS

The University of Michigan Institutional Review Board (IRB) determined this study was exempt from IRB oversight (HUM00197514). The survey was designed with the consultation of the University of Michigan Survey Center to ensure question reliability and validity. The survey was then pilot tested by four DH program directors in differing institutional settings to further determine content validity. Modifications were made based on feedback. Email addresses of 328 US DH program directors were obtained from the American Dental Hygienists' Association (ADHA) Entry-Level DH Program Directory and were cross-checked with the listing on Commission on Dental Accreditation (CODA) website. Recruitment emails were sent to all 328 DH education program directors. Directors

were invited to participate and forward the survey to the clinical faculty at their institutions.

The final electronic survey consisted of 21 questions including yes/no, multiple-choice, Likert scale, and open-ended questions. The electronic survey explored descriptive demographic information, including years as a DH educator, educational role, the program's institutional category, and the highest degree offered at the respective institution. The survey also assessed program educators' knowledge and understanding of the implementation of the OSCE in DH programs. The electronic survey was disseminated using Qualtrics survey software. A recruitment email/invitation introducing the purpose of the study, informed consent, and a link to the survey was included.

The survey was open for six weeks; three reminder notifications were emailed at two-week intervals. Data was collected and analyzed using Statistical Package for the Social Sciences (SPSS) Version 27. Descriptive statistics included frequency distributions, means, percentages, and standard deviations were calculated to summarize findings. Inferential statistics such as independent t-tests and correlation matrix were used to provide inferences about the sample population. Statistical significance was set at ($p < 0.05$).

3 | RESULTS

At the time of this study, there were 328 degree-granting, accredited DH programs in the United States. Eight emails were returned as undeliverable, and two declined to participate for a final N of 318. A total of 144 consented to survey participation. One subject consented but did not start the survey (0.3%). Eventually, 143 out of 318 DH program educators consented and completed the survey in its entirety, with a completion rate of (45%). Because of the widely variable number of faculty at each institution, the intention was to have at least one respondent from each institution, understanding the potential for each institution to give more than one response.

Study demographics reported in Table 1 are reflective of DH educators nationally. The majority of respondents (76%) were DH educators for twenty years or less and employed as full-time faculty (28%). Nearly two-thirds of DH programs (58%) reported offering an associate degree at their learning institution, with the majority indicating their program was housed in a community college (49%).

Most respondents (64%) reported being unaware of the ADA's announcement to develop the DHLOSCE (Table 2). Sixty-six percent of DH programs reported currently utilizing OSCEs in their curricula, while 34% did not. Seventy-six percent of the DH programs had used OSCEs before the COVID-19 pandemic (Table 2). When asked how

TABLE 1 Demographics (n = 143)

	n (%)
Years as a dental hygiene educator	
1<	4 (3)
1–5	25 (17)
6–10	33 (23)
11–20	47 (33)
21–30	24 (17)
31–40	6 (4)
40+	4 (3)
Dental hygiene educators' role[1]	
Entry-level Program Director	35 (25)
Full-time faculty	40 (28)
Part-time faculty	14 (10)
Didactic adjunct	1 (1)
Clinical instructor	22 (16)
Clinical coordinator/director	11 (8)
Degree completion bachelors program director	1 (1)
Master's degree program director	11 (8)
Other	6 (4)
Degree types conferred at institution[2,3]	
Associate[4]	83 (58)
Bachelor's degree completion	29 (20)
Baccalaureate	48 (34)
Master's	12 (8)
Educational institution setting[5–7]	
University/4-year college/ DH programs in a dental school	53 (38)
Community college/vocational programs/others	69 (49)

[+]Descriptive statistics

Legend:

[1]*Note* that n = 141 in this question.

[2]Respondents were able to choose more than one-degree type.

[3]Multiple degrees are conferred per institution.

[4]Associate Degrees and Certificates are grouped together.

[5]Universities, 4-year colleges, and dental hygiene programs in a dental school are grouped together.

[6]Community college, vocational school/programs, and others are grouped together.

[7]*Note* that n = 122 in this question.

long OSCEs had been utilized in their curricula, of the 78 respondents, 53% reported using them for 5 years or less, while 28% of respondents had utilized OSCEs for more than six years.

When asked how OSCE assessments were used in their curricula, 34% of respondents reported using OSCE in their programs for formative and summative assessments, while 17% reported using them to reinforce learning objectives/outcomes. Only 13% reported using OSCE to meet accreditation standards. In addition, practical skills, and

TABLE 2 Objective structured clinical examination (OSCE) in dental hygiene programs

	n (%)
Awareness of the development of the DHLOSCE	
Yes	44 (37)
No	78 (64)
OSCE utilization in dental hygiene programs	
Yes	80 (66)
No	42 (34)
OSCE utilization prior to the COVID-19 pandemic	
Yes	60 (78)
No	17 (22)

patient assessment together (30%) were the most reported area for OSCE assessment. An independent *t*-test was conducted to compare mean ratings of institutional setting type and OSCE utilization. The results showed that there was a statistically significant difference between institutional setting types ($p \leq 0.001$). A Pearson's correlation coefficient was computed to assess the relationship between how educators received their OSCE methodology knowledge and their development and use of OSCE assessments. The relationship was statistically significant ($p \leq 0.001$).

Table 4 illustrates the components of OSCE development and the structure used by DH programs. Even though 22% of respondents reported developing OSCEs to assess specific learning objectives and outcomes in their programs, only 2% of respondents (n = 3) used blueprints and station circuits to do so. Calibrated faculty was also ranked as one of the main components in programs' OSCE development and structure (17%). Surprisingly, only 4% (n = 5) of respondents stated their DH programs employed station briefs to prepare and inform students prior to and on the day of the OSCE.

Table 5 illustrates how respondents reported obtaining their knowledge about OSCE development and delivery methodologies (n = 138). Almost one-third of respondents reported their learning from colleagues/peers sharing existing OSCE knowledge. Only 3% of respondents indicated that they learned about OSCE development and delivery during their graduate/doctoral education (3%).

Table 6 illustrates the courses and areas that incorporate OSCE assessment. Respondents predominately used OSCE in preclinical (17%) and clinical environments (30%). Respondents stated that OSCE was not used as frequently in areas such as biomaterials (3%), pain management (6%), and mid-term and final exams (12%). Furthermore, when comparing training to OSCE development & structure components, a statistical significance was found ($p \leq 0.001$).

TABLE 3 The perceived challenges and barriers in dental hygiene (DH) programs who did and did not utilize objective structured clinical examination (OSCE)[+]

	DH programs who did utilize OSCE ($n = 49$) Likert-Scale 1–5 Mean ± SD	DH programs who did not utilize OSCE ($n = 36$) Likert-Scale 1–5 Mean ± SD	Lower CI	Upper CI	*p*-value
Lack of OSCE developing committee	2.61 ± 0.88	3.58 ± 1.15	−1.41	−0.53	**<0.001**
Unsure of the validity of an OSCE	2.59 ± 0.97	3.14 ± 1.09	−0.996	−0.097	**0.018**
Lack of institution/unit support	2.69 ± 1.06	3.22 ± 1.09	−0.999	−0.057	**0.028**
Funding	2.97 ± 1.14	3.36 ± 0.96	−0.849	0.086	0.109
Lack of physical space (not due to COVID, but under regular operating conditions)	2.93 ± 1.08	3.17 ± 1.13	−0.711	0.255	0.351
Lack of resources	2.93 ± 1.12	3.14 ± 1.19	−0.705	0.305	0.433
Lack of faculty experience	3.43 ± 0.97	3.58 ± 1.15	−0.616	0.306	0.507
Lack of formal education/training	3.46 ± 0.95	3.33 ± 1.21	−0.0334	0.606	0.566
Lack of faculty manpower	3.2 ± 1.04	3.28 ± 1.18	−0.555	0.408	0.762
Lack of awareness about the OSCE development/delivery	3.04 ± 1.15	3.08 ± 1.05	−0.528	0.443	0.862
Lack of faculty support	3.00 ± 1.06	3.03 ± 1.11	−0.499	0.444	0.907
Time Constraints	3.55 ± 0.95	3.56 ± 0.99	−0.43	0.421	0.983

[+]Independent samples *t*-test

Legend: Responses ranged from 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Those who reported incorporating OSCEs in their programs were asked to rate their perceived attitude, confidence, and knowledge of OSCE, from 1 (strongly disagree) to 5 (strongly agree). Of the 50 participants that responded to this, (86%) indicated they "agreed/strongly agreed" that OSCE is a valid and reliable assessment tool that impacts student learning outcomes. Interestingly, when comparing training type and educators' attitude, confidence, and knowledge of OSCE, no statistical significance was found ($p = 0.838$).

These same participants were asked to rate their level of agreement regarding perceived barriers on a scale of, 1 (strongly disagree) to 5 (strongly agree). The two most frequently reported barriers were time constraints (50%), and lack of faculty experience (48%). Those respondents who reported not using OSCE assessments in their curricula reported a lack of OSCE developing committee (36%) and lack of faculty experience (44%) as the two most challenging barriers. Table 3 demonstrates a comparison of perceptions between the two groups. An independent t-test revealed lack of OSCE developing committee, OSCE validity, and lack of institutional/unit support had statistically significant differences ($p = <0.001$).

A majority of respondents (76%) reported their program did not have a designated OSCE development committee,

with close to half of respondents (45%) indicating implementing key components of OSCE assessments including checklists, individual station scoring, and cumulative scoring. Respondents indicated a variety of tasks related to the development and delivery of OSCE assessments were assigned to individual faculty members. Individual faculty were assigned roles including; station examiners (16%), developing individual OSCE stations (14%), briefing students on OSCE directions (14%), and/or directing students between circuits and stations (13%). Additionally, 68% of respondents reported that students received feedback after OSCE completion, and OSCE performance feedback was given to students individually on scoresheets.

4 | DISCUSSION

Prior to the COVID-19 pandemic, the use of OSCEs was common in dental education, and the DLOSCE was just being launched as an alternative for clinical licensure examinations in dentistry. The pandemic forced the acceptance of alternative means of licensure examinations such as the use of manikins by state boards, marking a seismic shift for initial licensure in the dental professions. The pandemic and these shifts also resulted in significant

TABLE 4 Components of objective structured clinical examination (OSCE) development and structure Used by DH programs[+] (n = 143)

Components of DH programs' development and structure	n (%)
Specific learning objectives and outcomes to be assessed	32 (22)
Calibrated faculty	24 (17)
Purpose of the OSCE	23 (16)
Scope/range of competence (overall, or procedure-specific)	23 (16)
Time for each station	20 (14)
Determination of question stations	18 (13)
Determination of procedure stations	17 (12)
Remediation	15 (11)
Curriculum mapping	8 (6)
Standard setting	8 (6)
Screening OSCE	5 (4)
Station briefs	5 (4)
Circuits	3 (2)
Blueprints	3 (2)
Determination of linked stations	3 (2)
Reliability related to the number of stations	3 (2)
Other	1 (0.7)

[+]Descriptive statistics

Legend: Respondents were able to select all that applied

TABLE 5 Ways in which DH programs learn about OSCE development and delivery[+] (n = 138)

Ways to learn about OSCE development and delivery	n (%)
Colleague/peer shared existing OSCE	40 (29)
Continuing education programs	29 (21)
Peer-reviewed journals	23 (17)
Own experience with OSCE in undergraduate education	21 (15)
No formal educational methods in OSCE development and delivery	10 (7)
Textbooks	8 (6)
Graduate or doctoral education	4 (3)
Other	3 (2)

implications for DH education. Aerosol limitations and restrictions on live patient treatment imposed significant barriers to traditional clinical learning and assessment, requiring DH educators to find alternative means of assessing students' clinical competence for both education programs and for preparing their students for initial licensure board examinations.

TABLE 6 Areas and ways in the curriculum that incorporate objective structured clinical examination (OSCE) assessment

Curricular content areas that incorporate OSCE assessments	n (%)
Clinic	44 (30)
Preclinic	25 (17)
End of semester clinical competency	16 (11)
Final exams	11 (8)
Requirement for course advancement	11 (8)
Pain management	8 (6)
Patient education	8 (6)
Mid-term exams	6 (4)
Requirement for advancement or graduation	6 (4)
Biomaterials	4 (3)
As a requirement for graduation	4 (3)
Other	2 (1)

These shifts may therefore be driving the change in DH educators' attitudes towards and utilization of OSCEs in DH education. DH educators perceive OSCEs to be valid and reliable tools to assess clinical competence, which is reflective of past studies.[4,17] Two-thirds of respondents in this study reported utilizing OSCEs in their curricula, which is in line with trends reported in previous studies denoting an increase in the integration of OSCEs in DH education.[4,11]

The increased implementation of OSCEs in DH education has become even more relevant with the ADA approving the development of the DHLOSCE in 2021 as an alternative to the initial DH clinical licensure examination.[17] At the time of this study, 64% of respondents reported not being aware of the ADA approving the development of the DHLOSCE. The most important skills for health professions students to develop are critical thinking skills. In order to deliver competent patient care, health care providers must be competent in interpreting data from medical histories and clinical assessments, problem-solving, and communication.[22] An appropriately designed OSCE is the gold standard in assessing these and other higher-order thinking as opposed to assessing skills that only require memorization or technical skills.[22] It will therefore become even more imperative for DH educators to be knowledgeable in the best practices for the appropriate development and delivery of OSCEs.

In light of these changes, this survey aimed to assess the current knowledge of DH educators in regard to best practices in the development and delivery of a valid OSCE assessment. While the vast majority of respondents reported using OSCEs in their curricula, over half were fairly new to the OSCE process, utilizing OSCEs for 5 years or less. While OSCEs have been a mainstream and integral

part of dental education for decades, their use has not been a standard part of DH education, making it important to assess how DH educators are learning about OSCE development and delivery. When asked to identify how they obtained their knowledge, over 40% reported from continuing education courses and peer-reviewed journals. However, almost one-third of respondents reported learning about OSCE development and delivery by a colleague sharing an OSCE they had developed themselves, while another 15% reported their only knowledge of OSCE was from their own undergraduate education. Additionally, only 3% reported receiving any formal educational methodology in OSCEs during their post-baccalaureate studies, jeopardizing the validity of OSCE assessments.

In order to further explore DH educators' knowledge of OSCE development and delivery, those respondents that reported currently utilizing OSCE in their curricula were asked to indicate if their OSCE development and delivery included key elements such as development committees, blueprints, calibration, circuits, station briefing, and the assessment of specific learning objectives. Concerningly, only 22% of respondents in this study reported developing OSCEs for the evaluation of specific learning objectives and outcomes, where OSCEs should be specifically designed to assess clinical performance based on curriculum competencies or course learning objectives.[7] Failure to evaluate specific learning objectives defeats the purpose of an OSCE as a valid and reliable instrument to assess clinical competency. This highlights the imperative nature of an OSCE blueprint and a committee to oversee its proper construction and delivery. The blueprint is the map or vehicle by which learning objectives are translated into the set criteria for competency assessment with an OSCE. While OSCEs can be used in tandem with other assessments, OSCE blueprints remove the variability, subjectivity, and bias inherent in clinical examinations by ensuring standardized criteria and faculty calibration.[22]

These resources are necessary to maintain the validity and reliability of the OSCE assessment. However, three-quarters of respondents reported not having a committee and only 2% of respondents indicated the use of blueprints in OSCE development. While DH educators reported utilization of various components, there was no consistent trend in their incorporation. Unfortunately, this ala carte approach to OSCE assessments does not align with the gold standard of assessing clinical competence originally introduced by Harden.[8] The key structural components of OSCE development include the use of blueprints that gives OSCE its validity and reliability, making it the gold standard for clinical competency assessment. In short, without proper construction, validity and reliability are compromised. In light of the eventual launch of the DHLOSCE, it is imperative for DH educators to have the knowledge and

resources to construct and deliver valid and reliable OSCE assessments.

In light of these findings, it is important to understand the barriers to proper OSCE implementation for DH educators. All respondents were asked to rate perceived barriers to OSCE development and delivery. The barriers reported in this study correspond with previous literature in that the greatest barrier to implementing the OSCE and assessing the quality of the examination was time constraints.[4,11] Additional barriers reported both by programs that did and did not utilize OSCEs included lack of faculty experience and manpower. Furthermore, a lack of knowledge about OSCE development/delivery, education/training, and institutional support were reported, further highlighting this critical gap for DH educators. The lack of institutional support may become an even more significant barrier in the future in light of the pending development of the DHLOSCE. More importantly, these have the potential to impact student learning outcomes, experiences, and preparation for such alternative assessments. Lastly, this study highlights key insight into OSCE development practices in DH educational programs.

5 | LIMITATIONS

This study had several limitations. One such limitation was the time of data collection. Data collection took place during the COVID-19 pandemic and during the spring/summer semester when many hygiene programs were not in session. Both factors could significantly influence the response rate. Additionally, the survey was sent to DH program directors, who were then asked to forward it to their faculty. Therefore, some institutions may have multiple respondents, while others have none. However, the response rate is reflective of DH education programs nationally in regard to demographics.

Additional limitations are associated with the study design itself. Study length may have decreased compliance. For example, the Likert scale questions contained many statements, possibly contributing to the number (14%) of subjects that failed to complete the survey. Finally, self-reported surveys increase the risk of data, response, and recall bias.

6 | CONCLUSION

OSCEs are the gold standard in health professions education due to their ability to reliably assess higher order clinical skills in a valid, fair, and standardized manner. This study provided key insight into the US DH education programs' knowledge regarding the development

and delivery of OSCE assessment. Despite the positive attitudes toward OSCEs utilization, DH educators are not following best practices in developing and implementing OSCEs that contribute to the validity and reliability. A significant segment of DH educators reported implementing OSCE utilization over the course of the pandemic, yet a majority of DH educators are not using OSCEs to assess specific program competencies or course learning objectives. These components are integral to assessing the higher-order thinking and problem-solving skills required of licensed health care professionals and must be implemented appropriately. This may be due to the fact that a majority of respondents reported not having any formal educational methodology or training in the development and delivery of OSCE assessments, which could result in improperly constructed OSCEs, reducing their validity.

DH educators reported significant additional barriers to implementing OSCEs in DH education programs including lack of faculty experience, time, and institutional support. At the time of the study, the majority of participants reported not being aware of the pending development of the DHLOSCE and its anticipated launch in 2024. DH educators need to be able to assess the higher order clinical skills of their students consistently and validly in order to prepare them for initial licensure. OSCEs are the gold standard in this arena, making it imperative to find solutions to the barriers reported to appropriate OSCE development and implementation for DH educators. Further research is needed to assess how DH educators are assessing higher order skills in their pre-licensure students. Additionally, more evidence is needed to learn how to best support DH educators in implementing OSCEs using best practices in their curricula, and graduate DH education programs should be assessed on the inclusion of OSCE content and resources in their curricula.

CONFLICT OF INTEREST
The authors declare that they have no conflict of interest.

REFERENCES

1. Chu T-MG, Makhoul NM, Silva DR, et al. Should live patient licensing examinations in dentistry be discontinued? Two viewpoints. *J Dent Educ*. 2018;82(3):246-251.

2. Gambacorta JE, Glick M, Anker AE, et al. The buffalo model: shifting the focus of clinical licensure exams in dentistry to address ethical concerns regarding patient care. *J Dent Educ*. 2016;80(6):641-647.

3. Durham CF, Alden KR. Enhancing patient safety in nursing education through patient simulation. In: Hughes RG, editor. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses [Internet]*. US Agency for Healthcare Research and Quality; 2008.Available from: http://www.ncbi.nlm.nih.gov/books/NBK2628/

4. Nieto VK, Eagle I, Mishler S, et al. Utilization of objective structured clinical examinations (OSCE) as an assessment for clinical competency and licensure: A survey of dental hygiene director's knowledge and attitudes. *J Dent Hyg*. 2020;94(6):65-71.

5. Solana K. *New Clinical Dental Licensure Examination to Launch in June [Internet]*. American Dental Association; 2020. Available from: https://www.ada.org/en/publications/ada-news/2020-archive/april/new-clinical-dental-licensure-examination-to-launch-in-june

6. Harden RM, Stevenson M, Downie WW, et al. Assessment of clinical competence using objective structured examination. *Br Med J*. 1975 Feb 22;1(5955):447-51.

7. Harden RM, Lilley P, Patricio M. *The Definitive Guide to the OSCE: The Objective Structured Clinical Examination as a performance assessment*. 1st ed. Elsevier Health Sciences; 2015. Available from: https://www.elsevier.com/books/the-definitive-guide-to-the-osce/harden/978-0-7020-5550-8

8. Harden RM. Revisiting "assessment of clinical competence using an objective structured clinical examination (OSCE)." *Med Educ*. 2016;50(4):376-379.

9. Aronowitz T, Aronowitz S, Mardin-Small J, et al. Using objective structured clinical examination (OSCE) as education in advanced practice registered nursing education. *J Prof Nurs*. 2017;33(2):119-125.

10. Gerrow JD, Murphy HJ, Boyd MA, et al. Concurrent validity of written and OSCE components of the Canadian dental certification examinations. *J Dent Educ*. 2003;67(8):896-901.

11. Navickis MA, Bray KK, Overman PR, et al. Examining clinical assessment practices in US dental hygiene programs. *J Dent Educ*. 2010;74(3):297-310.

12. Solà M, Pulpón AM, Morin V, et al. Towards the implementation of OSCE in undergraduate nursing curriculum: a qualitative study. *Nurse Educ Today*. 2017;49:163-167.

13. American Dental Education Association. *ADEA Dental Hygiene Clinical Licensure Survey Summary and Results [Internet]*. American Dental Education Association; 2016. Available from: https://www.adea.org/uploadedFiles/ADEA/Content_Conversion/Allied/Clinical-Licensure-Survey-Summary-and-Results.pdf

14. Graham R, Bitzer LAZ, Anderson OR. Reliability and predictive validity of a comprehensive preclinical OSCE in dental education. *J Dent Educ*. 2013;77(2):161-167.

15. Fleckner LM, Rowe DJ. Assuring dental hygiene clinical competence for licensure: a national survey of dental hygiene program directors. *J Dent Hyg*. 2015;89(1):26-33.

16. Tan C-K, Chua W-L, Vu CK-F, et al. High-stakes examinations during the COVID-19 pandemic: to proceed or not to proceed, that is the question. *Postgrad Med J.* 2021;97(1149):427-431.

17. Joint Commission on National Dental Examinations. *JCNDE Unofficial Report Major Actions [Internet].* Joint Commission on National Dental Examinations; 2021. Available from: https://www.ada.org/~/media/JCNDE/pdfs/JCNDE_UnofficialReportMajorActions_2021.pdf?la=en

18. Rushforth HE. Objective structured clinical examination (OSCE): review of literature and implications for nursing education. *Nurse Educ Today.* 2007;27(5):481-490.

19. Park SE, Kim A, Kristiansen J, et al. The influence of examiner type on dental students' OSCE scores. *J Dent Educ.* 2015;79(1):89-94.

20. Lee K-C, Ho C-H, Yu C-C, et al. The development of a six-station OSCE for evaluating the clinical competency of the student nurses before graduation: A validity and reliability analysis. *Nurse Educ Today.* 2020;84:104247.

21. Taala W, Waggas D, Teresa PHS. Utilization of objective structured clinical examination (OSCE) in ensuring clinical competence of nursing students: a case of FCMS. *Open Access Lib J.* 2019;6(3):1-12.

22. Puryer J. Dental undergraduate views of objective structured clinical examinations (OSCEs): a literature review. *Dent J.* 2016;4(1):6.