

Training Dental Hygiene Students to Care for Patients with Disabilities

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ABSTRACT

Purpose The purpose of this study was to evaluate the impact of a novel training program on dental hygiene students' knowledge, attitudes and beliefs about caring for individuals with disabilities.

Methods A mixed methods approach was used. Students from five dental hygiene programs based at community colleges completed a two-hour didactic training session to supplement their existing special care dentistry coursework. Students completed an original 14-item pretest and posttest before and after the training that assessed attitudes and beliefs, and two validated posttests that assessed knowledge. Afterwards, students completed a clinical rotation in an advanced care dental clinic at a local academic institution gaining hands-on experience with equipment and patient treatment. Descriptive statistics were used to report training scores, types of services rendered and modifications to treatment. Student comments about their experiences were assessed using thematic analysis.

Results Two hundred and ninety-four students completed didactic training and 261 completed clinical rotations. Posttest scores indicated positive improvements in knowledge, attitudes and beliefs. All students provided direct patient care. Sixty-nine percent treated patients with intellectual and developmental disabilities; 75% placed silver diamine fluoride or fluoride varnish. Altered patient positioning was used by 70.5%. Most students (95.4%) reported that their experience positively changed their attitudes towards caring for patients with disabilities in the future. Eight themes emerged, notably increased comfort and confidence, a willingness and desire to treat patients, the acquisition of new skills, and clinician behaviors of empathy and compassion towards others.

Conclusion Training can help prepare dental hygiene students with the confidence and skills to address the oral health needs of individuals with disabilities.

Keywords dental hygienists, dental hygiene education, academic training, people with disabilities, special health care needs, access to care

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INTRODUCTION

In the United States (US), sixty-one million people, or one in four adults, have a disability.¹ Globally, disability affects over one billion people.² Rates of disability are expected to continue to rise, due to increased life expectancy, the aging population, and the survival of long-standing illnesses. Disabilities may be congenital, developmental, related to injury, or associated with chronic disease.³ Some disabilities may be visibly apparent, while others are not. Individuals with disabilities may present with more complex conditions that require additional services, or modifications to care delivery. They are often described as ‘people with special needs’ or ‘individuals with special healthcare needs.’⁴

People with special healthcare needs and the frail elderly disproportionately carry a higher burden of oral disease and face the greatest barriers to accessing regular preventive and other dental care services.^{5,6} Oral health status among adults with intellectual, acquired and developmental disabilities is worse as compared to that of the general population, with higher rates of periodontal disease, missing teeth and untreated caries.^{5,7-9} Craniofacial defects, malocclusion, anomalies in tooth development and delayed eruption patterns may also be observed.¹⁰ Affected individuals often present with poor oral hygiene which increases their susceptibility to dental disease. A variety of contributing factors increase the risk of poor oral health in older adults, including chronic dry mouth. In this population, musculoskeletal (e.g., arthritis) and neurological (e.g., stroke) disabilities, and cognitive impairments (e.g., dementia) all contribute to difficulty with performing oral hygiene.¹¹

The World Health Organization’s (WHO) International Classification of Functioning, Disability and Health (ICF) describes eight categories of activities and participation in which individuals with disabilities may experience limitations or participation restrictions.¹² Among these categories, four may directly impact an individual’s ability to maintain or improve their oral health: difficulties with learning and applying knowledge, managing tasks and demands, handling and moving objects, and managing self-care tasks.¹²

Individuals with disabilities are often dependent on others for assistance with daily self-care, including performing general and oral hygiene.¹³ Communication challenges may make alerting a caregiver about the need for oral hygiene difficult. As caregiving demands increase, other general healthcare needs may become prioritized over oral hygiene care.¹⁴

Social determinants of health significantly contribute to poor oral health among people with disabilities.^{5,6} Challenges related to access to dental care include lack of a support system, lack of transportation, inadequate or lack of dental insurance and other financial concerns.^{5,13-15} However, lack of access to care may also be attributed to the availability of providers who are geographically close, have adequate facilities to accommodate those with special needs, and have training and a willingness to care for these vulnerable populations.^{13,14,16} There is an urgent need to address the lack of provider knowledge and related skills that are necessary to address the oral and comprehensive healthcare needs of individuals with disabilities.¹⁷

The FDI World Dental Federation and the International Association for Disability and Oral Health (IADH) encourage training in special care dentistry at all academic levels and through continuing education for all dental disciplines.⁴ Training providers to care for those with special needs is essential to overcome barriers and reduce oral health inequalities.¹⁸ To date, there is a gap in the literature regarding the use of training programs for dental hygiene students with related outcomes, including students’ perceived level of preparation and attained skillsets for caring for individuals with special healthcare needs. There is no literature to document whether training promotes a desire to care for these populations after graduation or whether graduates seek employment opportunities in the fields of geriatrics and/or special care dentistry.

Early research focused on dental hygiene students’ attitudes towards people with disabilities, and their perceived comfort and confidence with planning care.^{19,20} More recent studies continued to examine

student attitudes after exposure to a special care curriculum, citing positive attitude changes, but also revealed a lack of adequate didactic and clinical curricula to prepare students for actual practice with treating these patients.²¹⁻²³ In 2004, the American Dental Association Commission on Dental Accreditation (CODA) adopted a new standard that directed U.S. dental hygiene programs to prepare students to care for people with special healthcare needs.²⁴ Standard 2-12 required that accredited programs ensure that graduates were competent in “assessing treatment needs” for patients with special needs.²⁴ In 2019, CODA revised its definition of patients with special needs as “those patients whose medical, physical, psychological, cognitive or social conditions make it necessary to consider a wide range of assessment and care options in order to provide dental treatment for that individual. These individuals include, but are not limited to, people with cognitive and/or developmental disabilities, complex medical conditions, significant physical limitations, and vulnerable older adults.”²⁵ Further, Standard 2-12 was revised to require that programs ensure that graduates “must be competent in providing dental hygiene care for all patient populations including... geriatric and special needs.”²⁵ Academic programs must now provide opportunities for students to provide treatment to these patients and conduct assessments to measure competency prior to graduation.

The purpose of this educational research project was to evaluate a novel educational training model on dental hygiene students’ knowledge, attitudes, and beliefs about caring for individuals with special needs; and to examine the impact of the training program on student clinical learning experiences and their willingness and desire to treat individuals with special needs after graduation.

METHODS

Study Population

Purposive sampling was used for subject selection. All second-year dental hygiene students from five area community college programs participated in

the program. All students enrolled in these programs completed the training as part of their regular academic coursework.

Study Design

The project used a mixed methods approach over two study phases: a didactic phase (Phase 1) and a clinical phase (Phase 2). The training program was incorporated into each college’s existing special care dentistry course with the consent of the dental hygiene program directors over a period of 3 years. The dental hygiene investigators described the program to the students at the start of each training period, including their expertise and reasons for conducting the project. Each student was assigned a unique identification number (UIN) to protect their identities and ensure the confidentiality of their responses on all documents related to training activities. UINs included a code to identify the program where each student was enrolled. Performance metrics for training activities were not included in the final course grade. The training program was included as part of the students’ coursework and participation did not affect their course grade, so the study was deemed to be minimally risky. The university Institutional Review Board deemed this study Exempt in accordance with the Federal Policy for the Protection of Human Subjects (‘Common Rule’) (A.T. Still University IRB Exempt #2014-129).

Phase 1

In Phase 1 of the study, dental hygiene students participated in a two-hour didactic training session delivered by one of two calibrated dental hygienist investigators, both of whom hold fellowship status in special care dental hygiene. Prior to the start of each session, students completed an original pretest that contained 14 supplied-response items with a four-point Likert Scale (4 = Strongly Agree to 1 = Strongly Disagree) to assess their knowledge, attitudes, and beliefs about caring for patients with special needs.

The didactic training included a lecture that reviewed the history of special care dentistry, an introduction to different types of disabilities, and modifications

used during treatment for patients with disabilities and complex medical conditions. Students viewed a six-minute video entitled, “The Direct Caregiver” which is part of a caregiver training program entitled, “Overcoming Obstacles to Oral Health: A Training Program for Caregivers of People with Disabilities and Frail Elders” (OOOH), to illustrate oral hygiene techniques used for self-care as well as techniques used by caregivers who assist others with oral care. Students then completed the accompanying validated post-test consisting of 21 supplied response items (multiple choice and true/false).²⁶

Next, students reviewed and discussed a module entitled, “Practical Oral Care for People with Developmental Disabilities” (POCPDD) created by the National Institute of Dental and Craniofacial Research (NIDCR) of the National Institutes of Health (NIH).²⁷ Module content concerned general and oral health challenges in people with intellectual and developmental disabilities (IDD) and related strategies for care. Afterwards, students completed the accompanying validated posttest consisting of 25 supplied response items. The OOOH and POCPDD post-tests were used to assess knowledge gained from the corresponding training materials. At the end of the didactic training session, students completed the original 14-item posttest to assess changes in attitudes, beliefs and knowledge associated with the overall didactic training exercise.

Descriptive statistics were used to report students’ performance on the OOOH and POCPDD post-tests. Categorical data were compared using a Monte Carlo simulation for the Fisher-Freeman-Halter Exact Test. Responses from the original pre-test and post-test assessing attitudes, beliefs and knowledge were compared using the Wilcoxon Signed Ranks Test, with a significance criterion of $p = 0.05$.

Phase 2

In Phase 2 of the study, students participated in a clinical orientation session at a university-based advanced care dental clinic for medically complex patients and individuals with disabilities. During the orientation, students were introduced to the

equipment and management strategies used in the dental setting and were taught about modifications that may be necessary during the provision of care. Afterwards, students were assigned to complete a one-day clinical rotation where they gained hands-on experience providing dental hygiene care to individuals with disabilities. Two students from the same college were assigned to treat patients on the same day. The same calibrated faculty members who taught the didactic portion of the course provided the clinical orientation session and supervised the students during their clinical rotation.

At the end of the rotation, students completed a brief questionnaire about their clinical experience, documenting the number of patients treated, the types of disabilities that their patients had, the dental hygiene services provided, and any modifications made during the delivery of care. Descriptive statistics were used to report these data.

At the end of the clinical rotation, students were invited by the investigators to provide comments about their learning experience via an open-ended item that appeared at the end of the questionnaire. This qualitative aspect of the study was conducted using grounded theory methodology. Thematic analysis was used to interpret these data using the following qualitative methods.²⁸ First, the lead dental hygiene investigator created a worksheet to use as a guide during analysis, which was used to compile students’ comments into one document. This guide was disseminated to the other two dental hygiene investigators for review. Open coding was used to deconstruct the data into words and/or brief phrases representing the students’ experiences. Similar words and phrases emerged from this analysis. During axial coding, these open codes were grouped together into themes that were used to interpret the meaning of the data. Validity was established through investigator triangulation, because each of the three dental hygiene investigators reviewed students’ comments independently, then through a discussion, found comparable results and reached consensus on identified themes.

RESULTS

A total of 294 students completed the training. Most students self-identified as females (n=280; 95.2% compared to males (n=13; 4.4%) and one student chose not to respond. The majority of students were between the ages of 21 and 25 years (n=127; 43.2%). Most had no previous personal (n=161; 54.8%) or professional (n=199; 67.7%) experience with individuals with special needs. There were no differences among students enrolled across the five colleges by age, X^2 (n=290) = 24.505, $p=0.174$; gender, X^2 (n=293) = 5.296, $p=0.216$; previous personal experience, X^2 (n=293) = 4.845, $p=0.306$ with individuals with disabilities; or previous professional experience X^2 (n=293) = 4.873, $p=0.296$ with individuals with disabilities. One program had eight students who reported being enrolled as first year students (2.7%), which was the only significant difference among students across the five colleges, X^2 (n=293) = 11.087, $p=0.004$. Demographic data are presented in Table I.

Statistically significant differences between the pretest and posttest ($p=0.000$) were observed for 11 of the 14 items, indicating that the didactic training portion of the program produced a positive shift in knowledge, attitudes, and beliefs. Pretest and posttest comparison data are presented in Table II.

Students performed well on the OOOH posttest. The average score on the OOOH posttest was 86.5 percent. Student performance data on the OOOH are presented in Table III. Student scores on the POCPDD posttest were lower than scores on the OOOH posttest. The average score on the POCPDD posttest was 79.7 percent. Student performance data on the POCPDD are presented in Table IV.

A total of 261 students completed the clinical rotation and completed procedures on patients. The majority of students treated one patient while on rotation (n=148; 56.7 percent), while 25.3 percent treated two patients (n=66) and 18 percent treated three patients (n=47). Students treated patients with a wide variety of disabilities while on rotation. Sixty-nine percent of students (n=181) treated individuals with intellectual and developmental disabilities (IDD); 166

TABLE I. Demographic data (n=294)

Demographic Variable	n (%)
Year of Enrollment	
First year	8 (2.7)
Second year	285 (96.9)
Missing data	1 (0.3)
College	
School 1	58 (19.7)
School 2	31 (10.5)
School 3	46 (15.6)
School 4	63 (21.4)
School 5	96 (32.7)
Age	
< 20 years	10 (3.4)
21–25 years	127 (43.2)
26–30 years	74 (25.2)
31–35 years	41 (13.9)
36–40 years	23 (7.8)
>40 years	15 (5.1)
Missing data	4 (1.4)
Gender	
Male	13 (4.4)
Female	280 (95.2)
Chose not to report	1 (0.3)
Previous personal experience with individuals with special needs	
No	161 (54.8)
Yes	132 (44.9)
Missing data	1 (0.3)
Previous professional experience with individuals with special needs	
No	199 (67.7)
Yes	94 (32.0)
Missing data	1 (0.3)

students (63.6 percent) treated patients with cognitive disabilities, and 159 students (61%) treated patients with neurological disorders. Types of disabilities among patients treated by dental hygiene students are presented in Table V.

TABLE II. Pretest and posttest scores assessing dental hygiene students' knowledge, attitudes and beliefs^a

Question	Mean Pretest (SD) n	Mean Posttest (SD) n	Z Score	p-Value
I am anxious about treating patients with special needs.	2.49 (0.779) n = 293	2.22 (0.765) n = 291	-6.242 ^b	p<0.001*
I feel prepared by dental hygiene school training to treat patients with special needs.	2.48 (0.720) n = 292	3.04 (0.564) n = 92	-10.718 ^c	p <0.001*
I feel patients with special needs can best be treated in a special setting (i.e., hospital or clinic)	2.94 (0.714) n = 293	2.73 (0.831) n = 292	-4.022 ^b	p<0.001*
The majority of patients with special needs require some type of sedation prior to dental treatment.	2.15 (0.585) n = 291	1.83 (0.768) n = 292	-6.580 ^b	p<0.001*
I am familiar with the armamentarium used in special care (i.e., papoose board, mouth prop, lap belt).	1.96 (0.881) n = 293	2.91 (0.706) n = 292	-12.104 ^c	p<0.001*
I am comfortable with wheelchair transfer techniques.	2.32 (0.911) n = 292	2.67 (0.802) n = 291	-7.984 ^c	p<0.001*
I understand the difference between developmental and acquired disabilities.	3.05 (0.741) n = 293	3.44 (0.581) n = 291	-7.799 ^c	p<0.001*
A patient's abilities and disabilities, including behavior and level of function, are important factors in developing a treatment plan.	3.68 (0.543) n = 293	3.72 (0.471) n = 292	-0.991 ^c	p=0.322
Treatment plans for patients with special needs should not be as complicated as those for other dental patients (e.g., implants).	2.42 (0.776) n = 291	2.75 (0.877) n = 290	-6.340 ^c	p<0.001*
It is important to understand all aspects of a patient's social history (e.g., housing situation, work, and family) when formulating a treatment plan.	3.65 (0.531) n = 292	3.77 (0.428) n = 291	-4.176 ^c	p<0.001*
Most patients with special needs can be seen in a private dental office.	3.02 (0.483) n = 292	3.24 (0.640) n = 289	-5.207 ^c	p<0.001*
With more practical (i.e., hands-on) training, I would be willing to treat patients with special needs in my practice.	3.61 (0.522) n = 293	3.59 (0.546) n = 291	-0.431 ^b	p=0.667
Patients with special needs cannot be their own guardian.	2.36 (0.829) n = 291	2.35 (1.973) n = 292	-1.940 ^b	p=0.052
I feel comfortable discussing patient concerns with caregivers and family.	3.44 (0.586) n = 292	3.58 (0.535) n = 290	-4.188 ^c	p<0.001*

^a Likert scale scores: 4 = Strongly Agree, 3 = Agree, 2 = Disagree, 1 = Strongly Disagree.

^b Wilcoxon Signed Ranks Test based on positive ranks.

^c Wilcoxon Signed Ranks Test based on negative ranks.

TABLE III. Student performance on the “Overcoming Obstacles to Oral Health: A Training Program for Caregivers of People with Disabilities and Frail Elders” (OOOH) Posttest (n = 293)

Question Topic	Answering Correctly n (%)
Q1 Methods to improve grip for toothbrushing	284 (96.9)
Q2 Obstacles to toothbrushing	277 (94.5)
Q3 Accepting assistance with toothbrushing	272 (92.8)
Q4 Sugar in medicines	262 (89.4)
Q5 Dry mouth	284 (96.9)
Q6 Partial participation in self-care	270 (92.2)
Q7 Location for performing mouthcare	100 (34.1)
Q8 Toothpaste and plaque removal	243 (82.9)
Q9 Mouth prop	288 (98.3)
Q10 Teaching toothbrushing	283 (96.6)
Q11 Planning a mouthcare session	271 (92.5)
Q12 Increasing success during a mouthcare session	79 (27.0)
Q13 Desensitization	241 (82.3)
Q14 Encouraging ownership of oral self-care	275 (93.9)
Q15 Initiating a mouthcare session	285 (97.3)
Q16 Improving communication	288 (98.3)
Q17 Desensitization	265 (90.4)
Q18 Reinforcing behavior	261 (89.1)
Q19 Rewarding behavior	288 (98.3)
Q20 Reinforcing behavior	271 (92.5)
Q21 Reinforcing behavior	238 (81.2)

TABLE IV. Student performance on the “Practical Oral Care for People with Developmental Disabilities” (POCPDD) Posttest (n = 293)

Question Topic	Answering Correctly n (%)
Q1 Impact of developmental disability	271 (92.5)
Q2 Mobility and wheelchair use	281 (95.9)
Q3 Uncontrolled body movements	264 (90.1)
Q4 Down syndrome and congenital heart disease	123 (42.0)
Q5 Toothbrush adaptations	278 (94.9)
Q6 Mental capacity	284 (96.9)
Q7 Oral health conditions in patients with developmental disabilities	279 (95.2)
Q8 Desensitization appointment	233 (79.5)
Q9 Gastroesophageal reflux disease	287 (98.0)
Q10 Managing seizures in the dental office	158 (53.9)
Q11 Visual impairment	131 (44.7)
Q12 Hearing impairment	282 (96.2)
Q13 Spina bifida	194 (66.2)
Q14 Caries in patients with developmental disabilities	271 (92.5)
Q15 Dental examination in children with developmental disabilities	240 (81.9)
Q16 Periodontal disease in patients with developmental disabilities	263 (89.8)
Q17 Obtaining patient information	258 (88.1)
Q18 Medical consultations	228 (77.8)
Q19 Malocclusion	195 (66.6)
Q20 Food pouching	275 (93.9)
Q21 Tooth eruption in children with Down Syndrome	275 (93.9)
Q22 Physical abuse in people with developmental disabilities	279 (95.2)
Q23 Habits in people with developmental disabilities	141 (48.1)
Q24 Oral trauma	132 (45.1)
Q25 Managing dental patients with developmental disabilities	216 (73.7)

TABLE V. Type of disability present among patients treated by dental hygiene students on clinical rotation (n = 61)

Type of Medical Condition and/or Disability	Students Treating Affected Patients n (%)
Cardiovascular	132 (50.6)
Respiratory	89 (34.1)
Gastrointestinal	92 (35.2)
Endocrine/Metabolic	83 (31.8)
Renal	34 (13.0)
Musculoskeletal	123 (47.1)
Neurologic	159 (60.9)
Immunologic	36 (13.8)
Hematologic	30 (11.5)
Cancer	43 (16.5)
Psychiatric	101 (38.7)
Cognitive	166 (63.6)
Infectious Disease	18 (6.9)
Substance Use Disorder	10 (3.8)
Intellectual and Developmental Disability (IDD)	181 (69.3)
Other	36 (13.8)

Students provided a wide array of services to patients while on rotation (n=255). The most frequent service was application of either fluoride varnish or silver diamine fluoride reported by 75% of students (n=191). Seventy-one percent of students (n=182) performed adult prophylaxis and 50% (n=128) performed a periodic examination. Types of treatment procedures performed by dental hygiene students are presented in Table VI.

Students reported the use of many different treatment modifications on their patients (n=227). The most common modification performed by 160 students (70.5%) was alternative patient positioning. Sixty-seven percent (n=151) used alternative operator positioning, and 66.1% (n=150) reported that they were unable to use an ultrasonic scaling while performing either

TABLE VI. Dental hygiene treatment procedures performed by dental hygiene students on clinical rotation (n = 255)

Type of Procedure	Students Performing Procedure n (%)
Periodic examination	128 (50.2)
Taking radiographs	120 (47.1)
Scaling and root planing	27 (10.6)
Adult prophylaxis	182 (71.4)
Periodontal maintenance	103 (40.4)
Full mouth debridement	12 (4.7)
Other (silver diamine fluoride, fluoride varnish)	191 (74.9)

an adult prophylaxis or periodontal maintenance procedure due to the high risk of aspiration. The types of treatment modifications used by dental hygiene students are presented in Table VII.

Most students (n=249; 95.4%) reported that their clinical rotation experience influenced how they felt about treating individuals with special needs in the future. Ninety-eight percent (n=257) of the students who completed the clinical rotation provided written comments about their experience. Qualitative data analysis of these comments revealed eight themes:

1. Students were *more confident, more comfortable, and less intimidated* with caring for patients with disabilities.
2. Students learned to apply *new skills, techniques, and modifications* needed for caring for patients with disabilities.
3. *Patient engagement and good communication* are critical components of caring for patients with disabilities.
4. *Learned clinician behaviors included patience, listening, compassion, empathy, and kindness.*
5. Caring for patients with disabilities was *rewarding, meaningful, and inspiring.*

6. Students were *grateful, thankful, and appreciative* for gaining hands-on experience with patients with disabilities.
7. Hands-on experience helped reduce students' *stress, nervousness, and anxiety* with caring for patients with disabilities.
8. The clinical rotation experience produced an *attitude change, and desire to work with individuals with disabilities* in the future.

Examples of student comments for each of the eight themes are reported in Table VIII.

TABLE VII. Modifications made to dental hygiene treatment performed by dental hygiene students on clinical rotation (n = 227)

Type of Modification	Students Making Modification n(%)
Alternate patient position	160 (70.5)
Alternate operator position	151 (66.5)
No ultrasonic use (aspiration risk)	150 (66.1)
Use of restraining/stabilization device	15 (6.6)
Oral sedation	7 (3.1)
Use of bariatric chair/room	8 (3.5)
Use of different blood pressure devices	30 (13.2)
Unable to take desirable radiographic images	25 (11.0)
Use of mouth prop	56 (24.7)
Use of support devices (pillows)	93 (41.0)
Use of wheelchair lift	21 (9.3)
Use of quiet room	128 (56.4)
Use of gurney/stretchers and/or different entrance	5 (2.2)

DISCUSSION

People with disabilities encounter many barriers to oral healthcare, including a lack of access to trained providers who have the skills and willingness to care for them.¹³ This study evaluated the impact of a novel two part training program on dental hygiene student knowledge, attitudes and beliefs about caring for patients with special healthcare needs, and how gaining hands-on clinical experience influenced their learning, and willingness and desire to treat these patients after graduation. This study is important to help identify a framework for training that can be used to support curriculum efforts to meet the dental hygiene CODA standard 2-12 and address international recommendations to create a dedicated workforce that is prepared to meet the oral healthcare needs of individuals with disabilities and special healthcare needs.^{4,5,25,29}

The didactic training was delivered using a combination of teaching strategies, including lecture, videos that illustrated concepts, and discussion guides from federal resources developed by experts in the field of special care dentistry to support different styles of learning.^{26,27} Assessment tools used to measure knowledge, attitudes and beliefs were validated tests that accompany training materials. The training was offered to enhance, not replace, traditional special care course content embedded within the curriculum.

Students performed well on the OOOH posttest with two exceptions. Students had difficulty identifying alternative locations, other than a bathroom, that a caregiver could use when performing mouthcare for an individual who requires assistance. They also could not correctly identify strategies to improve the caregiver's success with performing mouthcare for this individual. These findings may be explained by the students' lack of experience, and the fact that they were still completing traditional coursework to learn this information.

Students were more challenged by questions on the POCPDD posttest. Five items posed the greatest challenges. Students did not correctly identify that individuals with Down syndrome often have congenital

heart defects that increase the risk for infective endocarditis. However, this information is taught within the regular special care dentistry course, and students may not have had the opportunity to complete the lecture about Down syndrome at the time this training program was offered. Students were unsure about what to do when a person experiences a seizure in the dental chair, which is typically addressed in coursework related to medical emergencies. It is unknown whether students had exposure to this topic at the time of the training. Students also had difficulty selecting appropriate strategies to use when treating patients with visual impairments; identifying negative habits observed in individuals with developmental disabilities; and knowing what to tell caregivers when someone experiences oral trauma. An important limitation of this study was that the timing of the didactic training intervention was different for each of the colleges due to coordination of course scheduling. Scores on the OOOH and the POCRDD may have been different if the training was offered later in the special care dentistry course.

Findings from the original pretest posttest instrument revealed that participation in the didactic training program produced a positive shift in knowledge, attitudes, and beliefs. The literature strongly supports that exposure to didactic

TABLE VIII. Examples of dental hygiene student comments reported for eight identified themes.

Theme 1. Students were *more confident/more comfortable/less intimidated* with caring for patients with disabilities.

"It is not as intimidating as it seems. Glad I got the experience of using a wheelchair lift."

"I feel more comfortable and confident in my abilities to treat special needs patients."

"I really enjoyed this experience and feel moving forward, I will be more confident working with a similar population of patients."

"I have gained more confidence in working with patients with special needs."

Theme 2. Students learned to apply *new skills/techniques/modifications* needed for caring for patients with disabilities.

"Made treatment for a patient with multiple severe medical and cognitive difficulties seem more possible even with multiple modifications to treatment."

"I feel more confident because I learned new techniques."

"I became more aware of patient body language cues to the treatment I provided."

"It is important to be familiar with different kinds of medical conditions and also have good critical thinking about modifications."

"Being patient is very important while working with them. Calm them down and make them feel safe."

Theme 3. *Patient engagement and good communication* are critical components of caring for patients with disabilities.

"I feel like I was more prepared on communication with my patients and ways to get them to comply."

"I was concerned in the beginning, but after working with special needs patients today, I know that communication is key."

"I was able to really learn and listen to her needs."

"Take extra time and compassion while holding her hand and communicating directly. Keeping a positive conversation."

Theme 4. Learned clinician behaviors included *patience/listening/compassion/empathy/kindness*.

"Embrace every moment and treat every patient with love and respect."

"Be nice and understanding of their disabilities."

"I have more empathy for people with special needs."

"These individuals just need to be listened to and understood. These skills can be taught and need to be taught to ensure care is reached by all. A wonderful patient that contributed to my love for this profession."

"Gave me a clearer understanding of what it would be like to treat a special needs patient – a lot of praise and patience."

"I learned that patience and projecting positive energy will get you far with patient compliance; making a connection and continuity is important."

TABLE VIII. Examples of dental hygiene student comments reported for eight identified themes. (continued)

Theme 5. Caring for patients with disabilities was **rewarding/meaningful/inspiring**.

"It helped me understand how amazing and emotionally rewarding it can be to work with patients that truly need and appreciate your work."

"Just being able to help is such a rewarding experience and fun".

"I really learned a lot and realized how rewarding working with special care is."

"I learned more than I ever thought I would! It was so rewarding."

"It was a great experience and very rewarding. Coming into this I was nervous but felt so inspired to broaden my scope of practice when I finish school."

"This experience was inspirational!"

Theme 6. Students were **grateful/thankful/appreciative** for gaining hands-on experience with patients with disabilities.

"Found a new joy and appreciation for this area of dentistry."

"I'm very grateful for the experience today."

"I was less nervous than I imagined and feel way more comfortable in this setting. I am thankful for this opportunity."

"I would love to call this my job. Thank you for the experience."

"It was very challenging but taught me so much about my skills, attitude, and patience. It really opens your eyes to a whole world we do not get to see often. I am thankful for this experience."

Theme 7. Hands-on experience helped reduce students' **stress/nervousness/anxiety** with caring for patients with disabilities.

"Any fear that I had decreased by a lot."

"I am not as scared to work with people who have special needs after today."

"I am less worried about treating special needs in the future."

"It made me feel less anxious for future treatment on special needs individuals."

"I feel I will not be as apprehensive/nervous, and I have tools now that I can use to help modify their treatment."

"I'm not anxious about seeing patients with special needs with this experience."

Theme 8. The clinical rotation experience produced an **attitude change/desire to work with individuals with disabilities** in the future.

"It has left me with much more understanding, experience and positivity."

"Smile because your patient's experience depends on your attitude."

"This experience was really amazing; it opened up my heart, making me want to work more with special needs patients."

"This rotation showed me that I would love to work with special needs."

"My experience made me eager to work with special needs patients in the future."

coursework in special care dentistry improves knowledge, attitudes and beliefs in both dental and dental hygiene students.^{16,22,23,30-34} Only two studies reported no impact or negative effects of training on student knowledge, attitudes and beliefs.^{35,36} In this study, significant changes in scores from pretest to posttest were not observed for three items. First, students agreed that a patient's abilities and disabilities are important factors in developing a treatment plan (belief), but they likely had already learned about factors essential to consider in treatment planning in other dental hygiene coursework. Second, students' agreement with the statement about their willingness to treat patients with special needs after practical "clinical" training (attitude) was already high on pretest scores, and the level of agreement did not change on the posttest. Third, students disagreed that patients with special needs cannot be their own guardians (knowledge), with consistent scores on the pretest and posttest, suggesting that they may have already learned this concept in their special care coursework.

The inclusion of experiential learning in the clinic is widely advocated by special care dentistry organizations as an essential component of academic training programs.^{29,37,38} Clinical

training opportunities help overcome the lack of provider preparedness as a barrier to accessing care.¹⁶ Student experiences with individuals with disabilities, whether in a clinical or community setting, promote a positive attitude towards patients with special healthcare needs as well as a desire to care for their oral health.^{30, 31,34,39-41}

In the present study, most students had no personal or professional experience with individuals with disabilities, making their clinical experience even more valuable. They reported that their clinical experience positively changed the way that they feel about treating these patients in the future. Similarly, a program that included didactic training and clinical experiences in nursing homes produced positive attitudes in dental hygiene students towards caring for geriatric patients.⁴² Students also reported reduced anxiety and greater comfort with interacting with older adults after their experience.⁴²

In the present study, the clinical rotation experience reduced anxiety, and increased both comfort and confidence in caring for individuals with disabilities. This theme is well-documented in studies with dental and dental hygiene students.^{16,23,34, 39,41} Greater comfort and confidence lead to a sense of self-efficacy, a hallmark of experiential learning.³⁹ The present study also supports previous reports that clinical experience positively impacts students' willingness and desire to treat individuals with disabilities after graduation.^{16,41,43} Interest in and willingness to serve this population after graduation persists even among students who report that their training is inadequate.^{16,41, 43-45}

Studies with dental hygiene students in Ireland and Australia found that students valued clinical experiences in addition to didactic coursework and desired more clinical opportunities to treat these patients.^{23,46} However, incorporating adequate hands-on experiences for dental hygiene students has been challenging for many academic programs.²¹ Service-learning projects provide an innovative solution to this challenge, and have been shown to positively impact dental hygiene students' knowledge, attitudes, and confidence in caring for a variety of populations, affirming that any opportunity to engage students with patients promotes self-efficacy and a greater

awareness of the needs of vulnerable patients.^{47,48} The use of simulation may also benefit student learning about caring for people with disabilities.⁴⁹ Students in this study were grateful for their clinical rotation, and found their interaction with patients to be highly rewarding. They gained new skills with listening and patient communication as well as the treatment modifications that are often necessary when caring for patients with special needs. Further, students developed clinician behaviors, such as empathy, compassion, and kindness, which are important characteristics of emotional intelligence.

This study has several important limitations. An advantage of this program was that it was developed and taught by experienced dental hygienists who are educators and work full-time in special care dentistry. They hold fellowship status in special care dental hygiene, which is indicative of their expertise and ability to model the skills and behaviors required to successfully care for people with disabilities. Further, these faculty work in an advanced care clinic that is also a safety-net clinic devoted to caring for medically complex patients and those with special needs. This facility was the site of students' clinical orientation and rotation experience. Thus, students in this training program received unique exposure to highly qualified faculty, equipment, facilities, and a variety of patient populations. Unfortunately, these circumstances are not available to most students. Because this study was conducted using a purposive sample, student learning outcomes are limited to this training program only and are not generalizable. Given that most dental hygiene programs are located outside of the dental school setting, the opportunity for dental hygiene students to gain experience in a designated special needs clinic is highly unlikely.^{50, 51} Dental hygiene programs in the US must develop strategies to provide students with the hands-on experience necessary to gain competence. Additional research is needed to evaluate student learning outcomes associated with various curriculum models, to determine whether training influences engagement with providing care to vulnerable populations after graduation, and to identify what factors impact willingness to treat

these individuals as a career path. Further, the aging population and the number of individuals with disabilities highlights the need for additional trained faculty to develop and teach curriculum, a significant workforce challenge facing the dental professions.²⁹

CONCLUSIONS

In conclusion, training dental hygiene students to care for individuals with disabilities was successfully accomplished using a combination of didactic coursework and hands-on clinical experiences. Exposure to patients with a variety of medical conditions while using newly acquired skills and modifications during treatment improved students' confidence and comfort with caring for their patients. Students expressed a desire to continue to work with individuals with special needs in the future. Collectively, these outcomes support global initiatives to create a trained workforce willing to address the oral health needs of vulnerable populations.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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