



American
Dental
Hygienists'
Association

Journal of Dental Hygiene

October 2019 • Volume 93 • Number 5

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A pilot study
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Interprofessional Education: Preparing dental hygienists to practice in the evolving health care world

Kathryn Bell, RDH, EPDH, MS



The last twenty years have brought a plethora of changes in health care. The implementation of the Affordable Care Act (ACA) facilitated a paradigm shift from a focus on managing the consequences of diseases to a more preventive lens focused on primary health care and overall health maintenance. The Triple Aim, a framework for medicine based on improving population health, improvement of the overall patient experience, and controlling the per capita cost of care, was a key driver of this shift.¹ A number of recommendations have been made, including interprofessional collaborative practice (IPCP) to help achieve the Triple Aim. IPCP is defined as occurring when multiple health workers from different professional backgrounds work together with patients, families, and communities to deliver the highest quality of care.²

Federal policy changes have also shaped the landscape of health care. The ACA, along with the Children's Health Insurance Program Reauthorization Act (CHIPRA), established the foundation for medical-dental integration or MDI,³ a growing practice model in today's health care environment. MDI occurs when medical and dental services are intentionally linked to better serve patients and eliminate barriers to care. Several structural models have been identified as part of MDI; co-location when dental care is provided in the same location as primary health care services; integrated care when a dental hygienist is integrated directly into the medical team; and the virtual dental home using telehealth to provide coordinated services. Integration of medical and dental services is most commonly accomplished via colocation.^{4,5} MDI systems are quite efficient if they utilize shared electronic health records systems, allowing for messaging between units to identify gaps in care. The Veterans Administration (VA) and Kaiser Permanente (KP) are examples of successful and long-standing integrated MDI systems.⁶ Patient-centered medical homes (PCMHs) often utilize this model of integration, and are becoming a more common practice model.

As MDI has increased, so have opportunities for dental hygienists to practice in these non-traditional arenas.

Currently, 42 states allow dental hygienists to work in direct access settings,⁷ and 39 states specifically allow for dental hygienists to practice in medical settings.⁸ A robust example of dental hygienists working in MDI can be found in the Colorado Medical-Dental Integration (COMDI) Project where dental hygiene services are integrated into the medical home, creating a "health home."⁴ Participating practices include federally qualified health centers, school-based clinics, as well as private practices. There are a number of mechanisms for dental hygiene employment within COMDI including a model where the dental hygienist is directly employed by the primary care practice, an independent dental hygienist model in which the dental hygienist owns the practice and executes a business agreement with the primary care home, and the "hub-and-spoke" model with the dental or dental hygiene practice serving as the hub and the dental hygienist, practicing on site at the medical home as the spoke.⁴ In considering the various models, it is also important to note that under the Colorado dental practice act, dental hygienists can own independent practices. MDI presents a unique opportunity for dental hygienists to be leaders in collaborative health care while working in innovative models to better meet the needs of patients.⁹

As the scope of dental hygiene practice has evolved, along with the expansion of practice settings for dental hygienists, the needs for specific types of education experiences have also changed. The MDI model is founded on the principles of IPCP. However, interprofessional education is needed to provide dental hygiene students with the experiences required for them to graduate ready to practice. Interprofessional education (IPE) has been defined as occurring when students from two or more professions learn about, from and with each other to enable effective collaboration and improve overall health outcomes.² IPE experiences are now required by numerous accrediting bodies across the health professions, including the Commission on Dental Accreditation dental hygiene education standard 2-15.¹⁰ Graduates must be prepared to

demonstrate the necessary communication skills, teamwork, knowledge of roles and responsibilities, and ethics to work in interprofessional teams.¹¹ Dental hygiene programs will need to work within their own academic communities to develop opportunities for IPE and each educational institution will have its own unique challenges and resources. While a wide range of IPE activities have been reported in the literature, there is no single best model for IPE.

More education is also needed for practicing clinicians. Dental hygienists graduating prior to the emergence of IPE will need professional development courses to help them build the necessary skills required by the MDI settings. In order for dental hygiene to remain relevant within the health care delivery system, IPE must be embraced. The National Center for Interprofessional Practice and Education has a wealth of information and resources for developing, implementing, and assessing IPE (<https://nexusipe.org>). Educators looking for information on developing IPE, specifically in regards to accreditation, will find the Health Professions Accreditors Collaborative (HPAC) guidance document to be extremely useful.¹²

As a profession, we pride ourselves on serving our patients to the best of our abilities. With the evolution of health care systems, our abilities and skills need to grow and evolve as well.

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Influence of a Smartphone Application on the Oral Health Practices and Behaviors of Parents of Preschool Children

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Abstract

Purpose: Numerous oral health promotion programs are directed at reducing the prevalence of early childhood caries. Smartphone applications (app) may be beneficial in oral health promotion. The purpose of this study was to evaluate the effect of a smartphone app, based on the Theory of Planned Behavior (TPB), on the oral health behaviors of the parents of preschoolers.

Methods: A two-phase, sequential, embedded mixed methods design explored how the app influenced the attitudes, beliefs, perceived behavioral control, and intentions of parents of preschoolers. Phase 1 was a quasi-experimental, one-group pretest-posttest design. Parents of preschool aged children (n=26) participated in the 4-week intervention. Phase 2 consisted of qualitative interviews with a purposive sample of parents from Phase 1 (n=11).

Results: Parents' behavioral intentions or oral health behaviors with their preschoolers did not significantly change from pre- to post- intervention ($p>.05$). Social norms (SN) and perceived behavioral control (PBC) predicted behavioral intentions pre-intervention and behavioral change post-intervention. Thematic analysis revealed that parents' belief in the importance of establishing oral health habits and brushing reminders and videos delivered via a mobile application supported efforts to form oral health habits.

Conclusion: The use of TPB constructs in the development of oral health promotions aimed at parents of preschoolers was partially supported. Intention and behavior were not affected post-intervention, but SN and PBC emerged as significant predictors of intentions and behavior. A dental smartphone app may aid parents to make good oral health habits part of their preschooler's daily routine.

Keywords: early childhood caries, smartphone apps, mobile apps, oral health, health promotion, health behavior theories

This manuscript supports the NDHRA priority area **Client level: Oral health care** (health promotion: treatments, behaviors, products).

Submitted for publication: 10/8/18; accepted 3/29/19

Introduction

Dental caries is the most common chronic childhood disease in the United States (U.S.), with an estimated 14% of children suffering from untreated caries.¹ Race, ethnicity, and socioeconomic status (SES) have been shown to play a significant role in the prevalence of dental caries in the U.S.¹ The American Academy of Pediatric Dentistry also reports that the majority of children with early childhood caries (ECC), are low SES and qualify for financial assistance through Medicaid.² Although oral health professionals have attempted to reduce ECC prevalence, treatment alone is not sufficient, and additional preventative action is needed.³

Health promotion aimed at increasing parents' or guardians' oral health knowledge is an integral component of oral health programs aimed at reducing caries including ECC,⁴⁻⁶ and has been shown to be successful when implemented through computer-based programs.⁵

An estimated 3.4 billion smartphone users worldwide, have downloaded mobile health applications in 2018.⁷ Interventions delivered through technology offer frequent, prolonged exposure which has been shown to be essential for an effective intervention.^{8,9} Current research suggests mobile technologies, such as smartphone applications (app),

are a cost-effective approach to provide health information to large populations.¹⁰⁻¹³ Applications have the potential to improve the oral health behavior of parents and guardians of preschool-aged children. Interventions, based on the Theory of Planned Behavior (TPB), directed at mothers, have been shown to have a positive influence on children.¹⁴⁻¹⁶

The TPB was applied to a smartphone app, ToothSense,⁸ which was developed as a means to educate parents and guardians on the importance of good oral health behaviors for children.⁸ The app was designed using the Behavior Intervention Technology (BIT) model which accounted for the clinical aims and intervention strategies and their incorporation into the overall features of the app.¹⁷ The BIT model accounts for the “why, how, what and when” type questions that are documented in the design features integrated into the intervention strategies.¹⁸ The smartphone app included parental or guardian support in the form of documents and videos on oral hygiene instructions, timer videos, a journal to track tooth brushing times, tooth brushing reminders, and a social feed to share tooth brushing and flossing experiences with family and friends.⁸

There is a lack of research demonstrating how a smartphone app incorporating the TPB designed to influence parents and guardians, can impact children’s oral health. The goal of this pilot study was to explore the influence of a smartphone app on parents’ attitudes, subjective norms (SN), intentions, and perceived behavior control (PBC) of the oral health behaviors of their preschool-aged children.

Methods

This study was approved by the MCPHS University Institutional Review Board with the assigned protocol ID IRB082017L. Informed consent was received from the participants prior to beginning each study phase. A two-phase, sequential embedded mixed methods research design was used to test a smartphone app prototype (ToothSense) in an applied setting. The first phase of the research used quasi-experimental, one-group pretest-posttest design.¹⁸ In the second phase, qualitative data was collected via interviews to support and build on quantitative results.¹⁹ Phase one participants were recruited at two Head Start programs, two public preschools and local medical and dental offices throughout Rio Grande County, located in rural southwestern Colorado. Nearly 18% of the population in Rio Grande County lives in poverty²⁰ and the dental safety-net is at capacity due to a large number of Medicaid-eligible individuals and a lack of dentists accepting it.^{21,22} In addition, Rio Grande County’s municipal water supplies are not fluoridated.²³ Inclusion criteria for phase 1 were

parents of at least one preschooler who used an iPhone. The minimum number of phase 1 participants was determined by the medium effect power of 80% and calculated to be 26 participants.

Once participants provided consent (n=33), they received an email with instructions to download the smartphone app and create push notifications for brushing reminders, which also served as a reminder to use the app daily. After confirming the app was installed and working correctly, participants received an email to take the pre-intervention questionnaire using a web-based survey tool.

A 124-item validated questionnaire designed by Van den Branden et al.²⁴ to measure oral health behaviors in children and TPB determinants was used, with permission, prior to and following use of the app. Four TPB-components identified and explained 44% of the total variance of dietary habits.²⁴

The questionnaire consisted of 71 belief-based items related to three primary scales: dietary habits (24 items), oral hygiene (22 items), and dental attendance (25 items). The belief-based items included questions regarding attitude, intention, SN, self-reported behavior and PBC. There were additional questions to gather background information on dental care (14 items), children’s oral hygiene habits (7 items), nutrition (17 items), parents’ oral health (8 items), and demographics (4 items).

Upon completion of the pre-intervention questionnaire, participants were instructed to use the app twice a day for four consecutive weeks. The app was designed with push notifications to support usage.^{17,18} After four weeks, participants received instructions on completing the post-intervention questionnaire. Participants who completed the post-intervention questionnaire were sent an incentive and information about phase two.

Phase 2 consisted of semi-structured interviews using 13 open-ended questions based on previous research by Zoellner et al.²⁵ The questions asked how parents cared for their children’s oral health based on the TPB determinants including attitude, SN, intentions, and PBC following the use of the smartphone app (Figure 1). Responses were gathered using virtual interviews recorded and conducted using a video conferencing platform (Zoom Video Communications, San Jose, CA). Interviews were transcribed and coded to identify themes. Once no new themes emerged, it was determined saturation was reached.²⁶ Participants who completed the interview received an additional incentive.

Demographic information and variables of interest were reported using summary statistics. The independent variable

Figure 1. Qualitative interview questions

Questions About Caring for the Oral Health of Your Children	
Attitude	Tell me about the good things associated with brushing your child's baby teeth twice daily for at least 2 minutes.
	Tell me about the bad things associated with brushing your child's baby teeth twice daily for at least 2 minutes.
	Tell me about the good things associated with flossing your child's baby teeth daily.
	Tell me about the bad things associated with flossing your child's baby teeth daily.
Subjective norms	Tell me why it is or is not important for your family and friends to approve of your brushing your child's baby teeth twice daily for 2 minutes.
	Tell me why it is or is not important for your family and friends to approve of your flossing your child's baby teeth daily.
	What would it take for someone to convince you and/or your family and friends that it is important to care for your child's baby teeth?
Intentions	Tell me about your intentions to brush your child's teeth twice daily for 2 minutes.
	Tell me about your intentions to floss your child's teeth daily.
	What would your plan be to brush your child's teeth twice daily and floss your child's teeth daily? When and where would you complete these tasks? (If you already are meeting the recommendations, tell me your plan to continue to meet these recommendations?)
Perceived Behavioral Control	What makes it easy to brush your child's teeth twice daily for 2 minutes?
	What makes it hard to floss your child's teeth daily?
	How can <i>ToothSense</i> help you and/or your family and friends meet these recommendations?

time had two levels, pre- and post-use of the smartphone app. Differences in behavioral intention and reported behavior between the pre- and post-intervention were examined using repeated measures within a group t-test. Regression analysis was also used to explore whether any variables of interest predicted behavioral intention or reported behavior.

The recorded interviews were transcribed verbatim by the investigator. Participants were sent a copy of their transcribed interview to verify accuracy. Using an inductive process, the principal investigator and the creator of the app independently reviewed the transcripts for common words and phrases to identify initial key themes. Notes were compared to resolve any inconsistencies. The themes were organized into lists according to the TPB constructs used to create the app to answer the research question.²⁷

Results

Invitations to complete the pre-intervention questionnaire were emailed to 41 parents of preschool children (n=41). Of those, 33 participants completed the pre-intervention questionnaire (n=33). The mean age of the children was 3.48 years (SD 0.93). At the end of four weeks, 26 participants completed the post-intervention questionnaire (n=26). For the majority of the participants, this was their first child, and the child resided with both parents (Table I). Of the parents who completed both the pre- and post-intervention questionnaires (n=26), 54% reported that their child had been to the dentist within the past six months, and 42.4% reported their children had their teeth brushed at least once a day (Table II). Over half of the parents reported that their child eats sugary snacks between meals more than once a week but not every day; 39.4% reported that their child consumed sugary drinks between meals more than once a week but not every day (Table II).

The TPB survey was assessed and each of the scales (attitude, SN, PBC, short- and long-term consequences) showed acceptable reliability levels across the three domains of dietary habits, oral health behaviors, and dental attendance ($\alpha=.71-.83$) with belief in short term consequences for the dental attendance domain being the lowest (.71). To test the hypothesis that participant attitudes, SN, PBC, intentions or behaviors would change after using the smartphone app, paired-sample t-tests were conducted for each of the variables across dietary habits, oral health, and dental attendance. To compare the scores for the TPB, each subscale was computed by summing the items for each subscale based on the Van den Branden et al. findings.²⁴ Single items were entered for pre- and post-intervention (e.g., intention to limit sugary snacks) for all behavior and intentions outcomes. No changes were found in dietary habits, oral health practices, and dental attendance when tested across the TPB constructs of attitude, PBC, and SN. Parents' behavioral intentions or reported oral

Table I. Participant demographics (pre-intervention n=33, post-intervention n=26)

	Pre- frequency n=33 (%)	Post- frequency n=26 (%)
Smoking		
In the home currently	1(3%)	1(3%)
Mother during pregnancy	1(3%)	1(3%)
Child lives with		
Mother and father	28(84.4%)	22(66.7%)
One of the parents	3(9.1%)	2(6.1%)
Joint custody	1(3%)	3(9.1%)
Grandparents	1(3%)	-
Birth order of child		
First	19(57.6%)	16(48.5%)
Second	5(15.2%)	4(12.1%)
Third	4(12.1%)	4(12.1%)
Fourth	2(6.1%)	1(3%)
Seventh	1(3%)	1(3%)
Highest education completed by mother		
Other	1(3%)	1(3%)
Elementary	-	-
High school	-	-
Some college/associate degree	14(42.4%)	12(36.4%)
Bachelor degree	8(24.2%)	8(24.2%)
Graduate/post-graduate degree	8(24.2%)	5(15.2%)
Highest education completed by father		
Other	-	-
Elementary	-	-
High school	10(30.3%)	8(24.2%)
Some college/associate degree	8(24.2%)	8(24.2%)
Bachelor degree	8(24.2%)	6(18.2%)
Graduate/post-graduate degree	5(15.2%)	4(12.1%)
Recruitment site		
Head Start	7(21.2%)	4(15.4%)
Preschools	15(45.5%)	11(42.3%)
Flyers	11(33.3%)	11(42.3%)
	Mean	SD*
Child's Age	3.48	.926

* Standard deviation

health behaviors used with their preschoolers did not change with the use of the app. Table III shows the mean of each subscale score for pre and post intervention measurements.

Linear regression was used to determine the predictive relationship of each TPB subscale on the domain matching intention and behavior (e.g., parent intention to limit sugar snacks for their children regressed onto dietary attitudes, SN, and PBC). Characteristics measured by the TPB survey predicting intention or behavior were examined. Three separate models were performed using dietary attitudes, SN, and PCB to predict the intention to limit sugary snack frequency for children (pre-intervention), the number of sugary drinks the child consumes between meals (post-intervention), and the number of sugary snacks the child consumes between meals (post-intervention). The dietary attitude model was a significant predictor of dietary intention ($R^2=.38$, $p=.004$) with dietary PBC emerging as the only significant predictor in the model ($\beta=.57$, $p=.002$). The model was also a significant predictor of sugary snack frequency ($R^2=.41$; $p=.007$) with dietary SN predicting behavior ($\beta=-.64$, $p=.006$) but not attitude or PBC ($p>.05$). Lastly, the model was not shown to be a significant predictor of the frequency of sugary drink consumption ($p=.22$).

Two separate models were performed with oral attitudes, SN, and PBC predicting intention to ensure the child brushes their teeth daily (pre-intervention) and the frequency that the child brushes their teeth (post-intervention). This model was shown to be a significant predictor of intention ($R^2=.40$; $p=.002$) with SN ($\beta=.46$, $p=.009$) and PBC ($\beta=.50$, $p=.02$) however, not attitudes ($p=.22$). The model was not a significant predictor of behavior post-intervention ($p=.90$).

Lastly, two separate models were conducted with dental attendance SN, PBC, short-term consequence beliefs, and long-term consequence beliefs predicting intention to take the child twice a year for a check-up (pre-intervention) and the last time the child had been to the dentist (post-intervention). Neither model was shown to be significant ($p>.05$). However, PBC was a significant predictor of intention ($\beta=.46$; $p=.02$).

Table II. Oral health behaviors of parents and children (n=26*)

	Frequency (%)
Child's last visit to dentist	
Has not been	3(9.1%)
More than a year ago	2(6.1%)
Less than one year ago, but more than six months ago	3(9.1%)
Six months ago or less	18(54.5%)
How often do your child's teeth get brushed	
Less than once a week	0
At least once a week but not every day	1(3%)
Once a day	14(42.4%)
Twice a day or more	11(33.3%)
How often does your child eat surgery snacks between meals	
Never	1(3%)
Less than once a week	2(6.1%)
More than once a week, but not everyday	19(57.6%)
Once a day	4(12.1%)
More than once a day	0
How often does your child drink sugar containing drinks between meals	
Never	2(6.1%)
Less than once a week	9(27.3%)
More than once a week, but not everyday	13(39.4%)
Once a day	2(6.1%)
More than once a day	0

*participants who completed both the pre- and post-intervention questionnaires

Table III. Pre- and post-intervention mean scale score (n=26)

	Pre- Mean(SD)*	Post- Mean(SD)
Dietary Attitude	19.07(2.90)	18.77(2.34)
Dietary Norms	56.58(10.11)	54.96(13.11)
Dietary PBC	15.27(2.24)	15.65(1.74)
Oral Attitudes	15.46(2.37)	16.08(2.12)
Oral Norms	54.96(13.11)	56.58(10.12)
Oral PBC	14.92(1.74)	15.00(1.60)
Dental Norms	27.85(5.08)	27.77(3.69)
Dental PBC**	15.81(1.79)	15.96(2.34)
Dental STC**	14.89(2.32)	15.04(2.01)
Dental LTC**	8.15(1.16)	8.23(0.86)

* SD=standard deviation

** PBC=perceived behavioral control, STC=short term consequences, LTC=long term consequences

A new change variable was created to investigate which subscale sets predicted change in intention or behavior from pre- to post-intervention. Change was calculated by dichotomizing whether a participant changed a response from pre- to post-intervention (1) or not (0). Table IV shows the frequency of parents who either changed or did not change from pre to post intervention. The new variable (their response) was used in a logistic regression model to determine the predictive relationship of each subscale set (dietary, oral, and dental attendance) on the odds someone would change self-reported behavior or intention between pre- and post-intervention. Each model had subscales for the set predicting intention and behavior change for the matching items (e.g., dietary subscales to dietary behavior and intention). The oral subscales were significant predictors of the likelihood of changing intention to have the child brush daily (either direction) between pre- and post-intervention ($\chi^2(3, 26)=10.34, p=.02, R^2=.50$) with a one unit increase in the SN scale predicting 1.2 times higher odds of changing ($p=.04$). Dental attendance subscales predicting change from pre- to post-intervention in intention to take the child for a check-up twice a year was not a significant model ($p>.05$) however a one unit increase in the PBC scale predicted 2.43 times increase in the likelihood of changing between pre- and post-intervention ($p=.02$). All other models were not significant ($p>.05$). All models regressing outcome variables on demographic variables were not found to be significant ($p>.05$).

Qualitative data from the second phase of the study resulted in five emergent themes organized across the TPB constructs for attitude, SN, intentions, and PBC.

Attitude

When asked about the good or bad aspects associated with caring for their children's teeth, the majority reported positive associations corresponding to having strong teeth and developing good habits in addition to the prevention of caries and gingivitis.

“It'll help with cavities and bad breath; and teach them to brush their teeth when they're older.”

The child's cooperation and fear of improper technique were the most mentioned negative attitudes.

“They're not interested in doing it. It just is it takes a lot of work to make them do it, and sometimes maybe I'm worried that they are not doing it correctly or long enough.”

Table IV. Frequency of parents whose scores changed from pre- to post-intervention (n=26)

	Frequency(%**)
Attitude	
<i>Dietary</i>	
No change	6(23.1)
Change	20(76.9)
<i>Oral (no change)</i>	
No change	8(30.8)
Change	18(69.2)
Perceived Behavioral Control	
<i>Dietary</i>	
No change	9(34.6)
Change	17(65.4)
<i>Oral</i>	
No change	9(34.6)
Change	17(65.4)
<i>Dental Attendance</i>	
No change	10(38.5)
Change	16(61.5)
Intention Change	
<i>Sugary Snacks</i>	
No change	19(73.1)
Change	7(26.9)
<i>Brushing (no change)</i>	
No change	20(76.9)
Change	6(23.1)
<i>Dental attendance (no change)</i>	
No change	21(80.8)
Change	5(19.2)
Behavior Change	
<i>Snacks (no change)</i>	
No change	19(73.1)
Change	7(26.9)
<i>Sugary Drinks (no change)</i>	
No change	16(61.5)
Change	10(38.5)
<i>Brushing frequency (no change)</i>	
No change	17(65.4)
Change	9(34.6)

* Change=at least a one-point increase in the scale score from pre to post-intervention.

** %=percentage of n.

Several parents reported an improvement in attitude with the assistance of the “goal setting” to set their own personalized brushing reminders and the “brush along” and educational videos.

“The app made us start brushing his teeth twice a day because normally we just did it at night. I would say he did better with it. It was more like three to four days a week instead of none. He liked watching some of the videos, and that kept him brushing longer.”

Subjective Norms

When asked if it was important for family and friends to approve of caring for baby teeth, a majority felt family and peer approval was important, especially from other parents and caregivers such as grandparents. Family and friend influences were also important in promoting oral health among their children.

“So, when they’re spending the night with grandma or granddad then they are following through and brushing teeth while we’re away and that’s comforting.”

The participants motivation to comply with professional oral health recommendations stemmed from the prevention of caries and gingivitis.

“I think my wife and I both had issues in our late teens with cavities and root canals and our parents were not adamant about brushing.”

Several participants felt restorative dental care cost was a motivation to comply with oral health recommendations.

“I put so much money into my own mouth that I think it’s very important. I don’t want to spend lots of money because they won’t brush their teeth.”

Intentions

When asked about intentions to meet oral health recommendations, a majority of participants had positive intentions to meet the recommendations for their child. Oral health promotion measures, such as keeping oral health practices part of a daily routine, helping their children maintain healthy teeth and good oral habits, and finding motivators for the child, such as a new toothbrush, were identified as the most common plans for parents to continue to meet oral health recommendations.

“I’d like to be more like intentional for the morning one [brushing].”

Some parents felt the “brush along” videos improved their intentions to brush their child’s teeth for two minutes and one parent felt that the brushing reminder would aid in their intention to brush their child’s teeth in the morning.

“I think about the app, you know in the back of my mind I’m like oh I want to put that on. I feel like the reminders in the morning, and at night, seemed like they helped keep us on track. You should be brushing his teeth at this time, and we can get him in bed by this time. It helped to keep the routine...”

Perceived Behavioral Control

In response to what made it easy to brush twice per day for 2 minutes and floss once per day, most felt promoting oral health through a daily routine made meeting the recommendations easier. Some parents felt using motivators for their child made it easier.

“You know once it’s a habit, it’s not an issue. If we start to forget the kids remind us.”

A vast majority revealed a lack of cooperation from the child was a hindrance when attempting to meet these recommendations.

“Yeah just if she’s battling me. Toddlers are just on the go all the time. Sometimes she just refuses to sit still.”

Some parents felt the “brush along,” and the “educational” videos improved their PBC in brushing their child’s teeth for two minutes two times a day.

“I think having that video reinforcing you know we need to brush the same time that the video’s going has helped make sure that we’re brushing for an adequate amount of time every day.”

Smartphone oral hygiene applications

In response to how the smartphone app could help with oral health recommendations, 90% of parents interviewed for phase 2 reported that the app aided in supporting oral health recommendations for their child. Most parents reported the “goal setting” (45%) and the “brush along” videos (72%) were beneficial. Twenty-seven percent reported the “educational” videos and 18% reported the “tracking the happy teeth” in the “mouth journal” helped support their care for their children’s oral health. Two parents mentioned the kid-orientated design of the app was another helpful feature.

“The reminders and timer are helpful; the app and little videos are fun. I’m not sure what else it would need. I think it meets all the things needed and it reminds you to do it and helps you make it fun.”

Discussion

The low mean change score in this study suggests the changes in behavioral intention and reported behavior were random and not associated with this particular smartphone

app. However, previous research has demonstrated the efficacy of health information technology in delivering health interventions and health promotion to a large population through the use of apps.^{10,13} Findings from this study are similar to those of Bueller et al., whose research did not show significant changes in behavior intentions when utilizing a smartphone health app.¹² The smartphone app, Toothsense, piloted in this study has the potential to be used as a tool to aid parents in meeting the oral health needs of their preschool-aged children. The data from this study demonstrated the TPB constructs significantly predicted the oral health behaviors and intentions of oral hygiene, dietary habits, and dental attendance. Social norms, including approval from the child’s pediatrician and the family dentist, were shown to be a significant predictor of oral hygiene intentions and dietary behaviors. Although PBC and SN demonstrated the strongest correlations in this study, attitude and intentions have been demonstrated to have the strongest associations in other studies.^{15,16} This difference could be attributed to the high attitude scores of this study population as shown in the pre-intervention questionnaire.

A portion of the study population was recruited from Head Start programs which offer oral health support to parents.²⁸ In addition, a majority of the parent participants had education past the high school level. Both factors may have influenced the high attitude scores on the pre-intervention questionnaire. Castilho et al. identified a link between children’s oral health and parents’ knowledge, attitude, SES, level of education and maternal age.⁴ While studying a population already educated on the importance of oral health did not demonstrate improvement in attitude and intention, increasing parental knowledge has been shown to be an important component in changing behaviors and attitudes.^{4,6,29}

Although Phase 1 data did not demonstrate that use of the smartphone app changed behavioral intentions and behaviors in the study population, qualitative data gathered from Phase 2 suggested a perceived value for the use of the app. A majority of participants from Phase 2 felt that the app aided them in meeting the oral health recommendations for their children and supports an association between PBC and behavior as described by McDermott et al.¹⁵

There were limitations to this study. The sample population was not representative of the general population of Rio Grande County, Colorado.²⁰ The smartphone app was only available in English and on an iPhone platform. This may have limited potential participants who were more representative of the general population. A larger sample size for phase 1 would have been beneficial to increase the study’s statistical power.

Also, parents may have given socially acceptable responses, creating bias. Future studies would require the smartphone app to be available on an android platform, in multiple languages, and utilize a larger sample population.

Conclusion

Although the results from this study did not support the use of a smartphone app to improve attitudes, SN, intentions, and PBC of the parents of preschoolers, it can be concluded that PBC is a significant predictor of dietary, oral hygiene, and dental attendance intentions and should be considered when developing oral health promotion. Social norms were shown to be significant predictors of dietary behaviors and oral hygiene intentions and the use of TPB can support oral health goals in developing oral health promotions aimed at parents of preschoolers. Although the qualitative data suggest that a smartphone app supports parents' efforts to make oral health recommendations part of their preschooler's daily routine, more quantitative data needs to be collected to establish the use of TPB in developing oral health interventions.

Acknowledgements

The authors would like to acknowledge S. Van den Branden, S. Van den Broucke, R. Leroy, D. Declerck, and K. Hoppenbrouwers for granting permission to use their survey. Sara Nolen is the creator and owner of the free smartphone application "Toothsense" available from the App Store (iOS).

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Color-Blind Racial Attitudes in Dental Hygiene Students: A pilot study

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Abstract

Purpose: Color-blind racial attitudes and biases have been linked to racial prejudice which may potentially affect dental hygiene care to diverse patients. The purpose of this pilot study was to determine the color-blind racial attitudes of dental hygiene students.

Methods: A 20-item, Color-Blind Racial Attitudes Scale (CoBRAS) electronic survey was sent to a convenience sample of 41 first-year and 30 second-year dental hygiene students (n=71) in a dental hygiene program in Virginia. The CoBRAS instrument measures contemporary racial attitudes and stereotyping in three subcategories: Unawareness of Racial Privilege, Institutional Discrimination, and Blatant Racial Issues. CoBRAS scores range from 20-120, with higher scores indicating elevated levels of denial of racism. Descriptive statistics were used to analyze the data.

Results: Of the 71 students invited to participate, 70 completed the survey (n=70) for a 98.6% response rate. The majority of respondents were White females (70%, 98% respectively), aged 18-29 (90%). Results indicated an overall average CoBRAS score of 64.89. No statistically significant findings were identified between the two groups in regards to overall scores ($p>0.05$).

Conclusion: A majority of the participants in this pilot study possessed moderate levels of color-blind racial attitudes, suggesting rejection of the concept of racism. Color-blind racial attitudes and biases have been linked to a lack of awareness of White privilege. Further education in this area may foster improved interactions with diverse patient populations.

Keywords: color-blind racial attitudes, stereotyping, racial prejudice, racial privilege, dental hygiene students, cultural competency

This manuscript supports the NDHRA priority area **Professional development: Education** (educational models)

Submitted for publication: 2/10/19; accepted 6/18/19

Introduction

Health care services including dental hygiene care, should be delivered impartially, regardless of race, age or cultural differences. A 2017 report from the National Healthcare Quality and Disparities Agency showed that African Americans, Asians, Pacific Islanders and Hispanics continue to receive poorer health care than Whites.¹ The report also suggests that implicit or unconscious bias, a type of racism and stereotyping, contributes to health care delivery disparities in the United States.¹ Unconscious biases may operate unintentionally and may be activated quickly and unknowingly by situational cues such as a person's skin color or accent.^{2,3} Because implicit bias may operate without a person's intent or awareness, controlling it is often difficult.²⁻⁴ Many health care professionals may not be aware of their own racist attitudes or stereotyping which may play a role in the impartial delivery of care.⁵⁻¹³

The percentage of racial minorities in America is projected to increase to approximately 50% of the population by the year 2050.⁵ Further estimates, depending on geographic location or type of practice, suggest that in some urban settings, 84% of caregiver/patient pairings will likely be in cross-racial/cross-cultural dyads.⁶ Multicultural competence is necessary to provide effective oral health care to increasingly diverse patient populations. The importance of this competence is underscored by Standard 2-15 of the Commission on Dental Accreditation (CODA) Standards for Dental Hygiene Education Programs that requires graduates to be competent in delivering safe and effective provision of oral health care to diverse populations.^{7,8}

Multifactorial racial and ethnic disparities in health care delivery have been well documented.¹⁵⁻¹⁹ The need for

culturally competent health care delivery systems, including oral health care, has become more critical in light of the future population shift. Cultural competence has been defined as the ability of systems to provide care to patients with diverse values, beliefs and behaviors, including tailoring delivery to meet patients' social, cultural and linguistic needs.¹⁴ Diverse cultural beliefs and norms may impact a patient's recognition of signs and symptoms of disease, thresholds for seeking care, preferences for diagnostic and therapeutic procedures and adherence to treatment recommendations.¹⁵⁻¹⁹ Language differences can present a significant barrier to the provision of effective health care.¹⁵⁻¹⁹ Trust between the provider and patient may suffer without proper communication. Variations in beliefs and norms may be a barrier to the provision of care and ultimately contribute to health disparities.²⁰⁻²³

The United States (U.S.) Surgeon General's Report on Oral Health in America identified race and ethnicity as playing a major role in lack of access to oral health care.²⁴ Following the report, the Department Health and Human Services (HHS) department established action plans to identify racial and ethnic health disparities and develop cultural competence models to improve the delivery of care to these populations. Improving access to oral health care remains a top priority for HHS as identified in the Healthy People 2020 documents depicting an oral health environment that meets the needs of all people.^{25,26}

One aspect of cultural competence requiring further exploration involves the concept of color-blind racial attitudes.⁹ A color-blind attitude refers to an individual's denial of the social significance of race and the dismissal or depreciation of the existence of racism and its impact on equality.^{10, 11} Individuals exhibiting color-blindness claim a belief that everyone has equal opportunities, preventing them from seeing the historical causes of racial inequality and its persistence in contemporary society. Multiple research studies have indicated that color-blindness is negatively correlated with multicultural knowledge and awareness.^{9,11-13,27-30}

Health care research studies suggest the quality of care in the U.S. varies according to race and ethnicity, with Hispanic and African American populations receiving lower quality health care than the White population.^{30,31,34,39} Results from a study conducted by Green et al. found that while health care providers might not display outright racism, their decisions on prescribing medical treatment to minorities may be unconsciously affected by inherent racial biases.³⁰ Cooper et al. examined attitudes and stereotypes about the race of physicians in regards to medical visit communication and patient ratings of care and found more racial bias was

associated with Black patients in the form of more clinical verbal dominance, lower patient positive affect, and poorer ratings of interpersonal care.³¹ Blair et al. also explored whether clinicians' explicit and implicit biases were related to Black and Latino patients' perceptions of their care and found clinicians with greater implicit bias were rated lower in patient-centered care by their Black patients as compared to White patients.³³ Implicit racial attitudes were even shown to impact patient communication during genetic counseling. Shaa et al. found genetic counselors with stronger pro-White bias used less emotionally responsive communication when counseling minority clients; when counseling White clients.³⁵

Color-blind racial attitudes have been researched in the psychological sciences as well as dental education.^{9,11,36-40} Chao et al. assessed the multicultural competence (MCC) and color-blind racial attitudes of school counselors and identified that both White and racial/ethnic minority school counselors had the lowest MCC scores and highest color-blind attitudes when they had limited cultural competency training.¹² The findings suggest a further need for research and professional development related to color-blind attitudes and cultural competency. Burkard et al. found psychologists with high levels of color-blindness had significantly less empathy for their African American clients' conditions/situations compared to European American clients. In addition, psychologists who were less color-blind and were willing to acknowledge that race matters in people's lives showed more empathy than those who were more color-blind.²⁷ Bray et al. found that post graduate counseling students who believed individuals were responsible for their own poverty had lower multicultural competence and higher color-blind racial attitudes suggesting an inability of the students to relate to clients and their disparities.²⁸ In dentistry, Su et al. explored color-blind racial attitudes among dental students and faculty using the color-blind racial attitudes scale (CoBRAS) to determine a baseline.⁹ Results demonstrated faculty and students possessed moderate levels of color-blind racial attitudes.⁹ Behar-Horenstein et al. examined the impact of curriculum interventions on student outcomes associated with ethical sensitivity, stereotypes, cultural competence and color-blindness. Results on the CoBRAS were similar to Su et al., with students possessing moderate levels of color-blind racial attitudes,⁴¹ suggesting the need for increased opportunities to assess the role of these beliefs and their potential impact on oral health care.

There is a gap in the literature regarding the color-blind racial attitudes found in dental hygiene students. Awareness of implicit biases, including a color-blind ideology, found

within the dental hygiene student population may assist educators in addressing these concerns early in the curriculum. Moreover, awareness of implicit biases found with dental hygiene faculty members, may be an important factor in the unbiased cultural education of future oral health care providers. The purpose of this pilot study was to investigate color-blind racial attitudes in a dental hygiene student population and identify whether dental hygiene students were aware of inherent biases and their potential impact on oral health disparities.

Methods

This cross-sectional study was approved by the Old Dominion University Institutional Review Board. Forty-one first and thirty second-year dental hygiene students in the entry-level, baccalaureate degree dental hygiene program at Old Dominion University, in Norfolk, Virginia, received an email invitation to participate in the voluntary, online survey. Informed consent was implied with the completion of the survey as detailed in the invitation and survey instructions. Qualtrics survey software (Provo, Utah) was used to deliver the survey; either a computer or mobile device could be used to complete the questionnaire.

Survey Instrument

The Color-Blind Racial Attitudes Scale (CoBRAS), a validated and reliable survey instrument for measuring contemporary racial attitudes and stereotyping developed by Neville et al.¹⁰ was used with permission for the study. CoBRAS is a 20-item instrument scored on a six-point Likert scale with higher scores signifying unawareness of how racial attitudes influence social justice and beliefs that an individual's status is due to merit, not discrimination or bias.¹⁰ Contemporary racial attitudes and stereotyping are measured in three subcategories: Unawareness of Racial Privilege, Institutional Discrimination, and Blatant Racial Issues. Scoring the CoBRAS instrument is based on total scores ranging from 20 to 120 along with overall scores for each sub-scale; higher scores indicate a respondent's higher level of unawareness of denial of racism. Overall scores ranging from 20–53.3 indicate low unawareness, 53.4–83.7 moderate unawareness and 83.8–120 high unawareness. Additionally, CoBRAS measures racial attitudes and stereotyping on three subscales: unawareness of White racial privilege (7 items), unawareness of institutional racism (7 items), and unawareness of blatant racial issues (6 items). Scoring for the subscales range from 7 to 42 with 7-18.6 indicating low unawareness, 18.7–30.3 moderate unawareness and 30.4–42 high unawareness.

Participants used a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6) to determine their level of agreement with the survey statements. Four demographic items were added to the instrument pertaining to the respondents' age, gender, race and year in the dental hygiene program.

Descriptive statistics were used to evaluate the means between the groups. ANOVA and t-tests were used to determine statistically significant differences ($p>0.05$) among the dental hygiene students based on age, race, gender, and year in the program.

Results

Of the 71 students invited to participate, 70 completed the entire survey (n=70) for a 98.6% response rate. Demographic data revealed that the majority (97%) of respondents were women, 90% were between the ages of 18-29, and 70% were White (Table I). Results revealed an overall average score of 64.89 on the CoBRAS questionnaire. When comparing the first and second-year student groups, there were no statistically significant differences between the student groups for their overall scores ($p>0.05$). Overall scores and scores broken down by year in the program indicated that the students in general possessed moderate levels of color-blind racial attitudes regardless of their year in the program.

Table I. Demographics for student participants (n=70)

Gender	n (%)
Female	68 (97.14%)
Male	2 (2.86%)
Age Range	n (%)
18-29	63 (90%)
30-44	6 (-8.6%)
45-59	1 (-1.4%)
Race	n (%)
White	49 (70%)
Black or African American	4 (5.71%)
Hispanic	2 (2.86%)
Asian	11 (15.71%)
Other	4 (5.71%)

CoBRAS subscales were compared between the first and second-year student groups using t-tests. No statistically significant differences were found between the first and second-year students for the three subscales ($p>0.05$). Average overall scores and subscale scores of

racial privilege, institutional discrimination and blatant racial issues broken down by year in the program and respondent age are displayed in Table II.

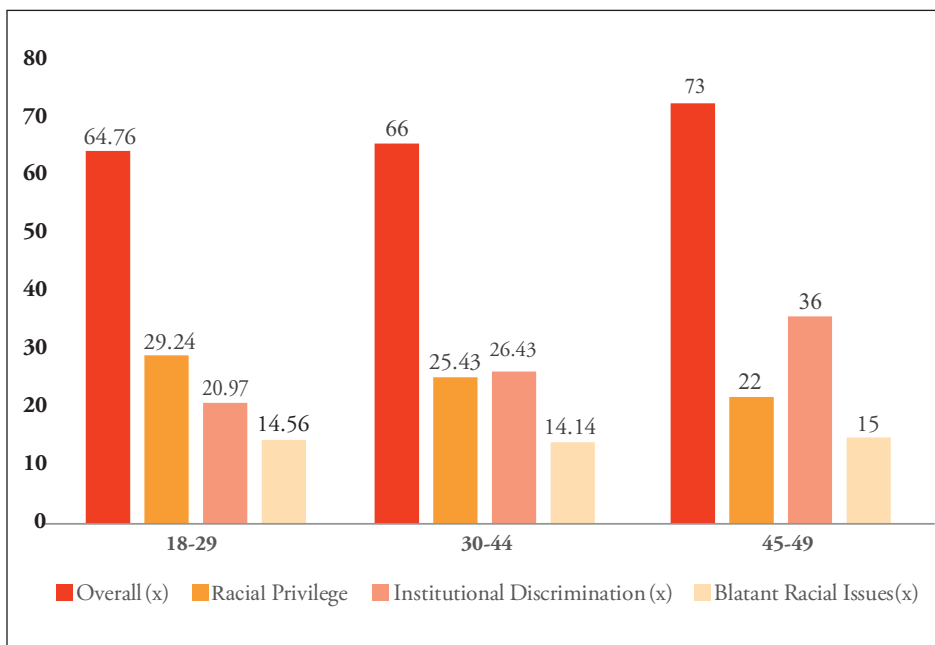
Table II. Average overall scores of three subscale scores based on year in the dental hygiene program and age.

Year in Program	Overall Score (x)	Racial Privilege (x)	Institutional Discrimination (x)	Blatant Racial Issues (x)
First	66.74	30.13	21.64	14.97
Second	62.55	27.26	21.35	13.94

Age	Overall Score (x)	Racial Privilege (x)	Institutional Discrimination (x)	Blatant Racial Issues (x)
18-29	64.76	29.24	20.97	14.56
30-44	66.00	25.43	26.43	14.14
45-59	73.00	22.00	36.00	15.00

Scores for the subscales of unawareness of White racial privilege, unawareness of institutional racism, and unawareness of blatant racial issues range from 7–42. The average score among both groups students was 28.86 for the first subscale, indicating moderate levels of unawareness of White racial privilege. Both groups of students had a combined average score of 21.51 for the second subscale, demonstrating moderate levels of unawareness of institutional racism or discrimination. The average scores from the third subscale, unawareness of blatant racial issues was 14.5 for both groups, indicating low levels of unawareness in this subcategory (Figure 1).

Figure 1. Average overall scores and three subscale scores based on age for all students

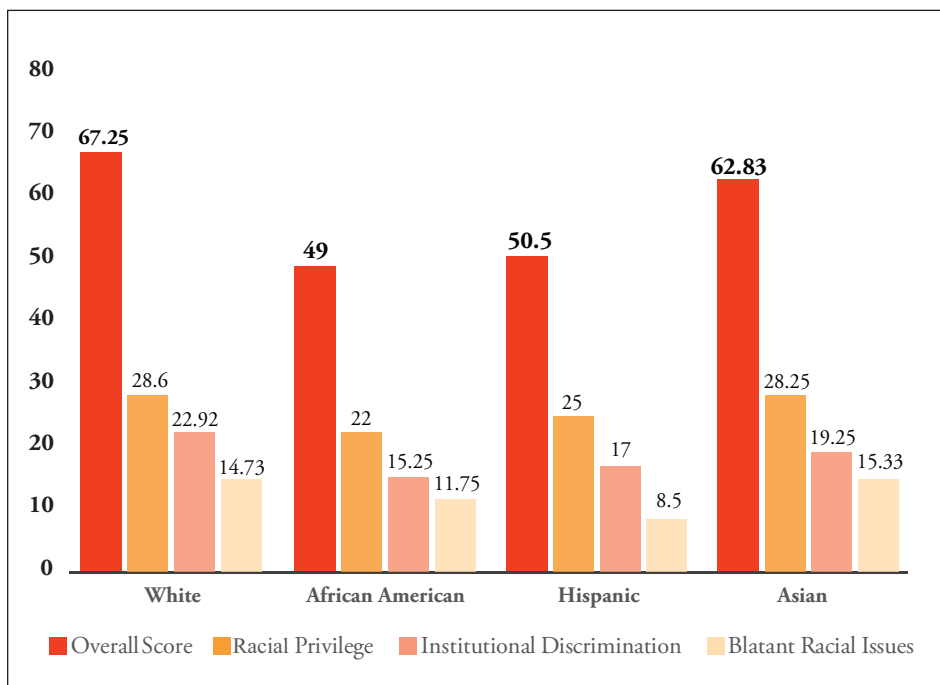


No statistically significant differences were found when comparing the means among the group demographics of age, race, and gender ($p>0.05$). Mean overall scores broken down by race were White ($x=67.25$), African American ($x=49$), Hispanic ($x=50.5$), and Asian ($x=62.83$). These scores indicate that both White and Asian student groups had moderate levels of overall unawareness of denial of racism as compared to low levels in African American and Hispanic student groups. White and Asian student groups scored highest on all three subscales when compared to African American and Hispanic student groups, although the small number of participants in these sub groups limit validity of these findings (Figure 2).

Discussion

Research suggests implicit bias and color-blind racial attitudes, impact clinician competency and the delivery of health care.^{13,27-39} In contrast to overt racism, which implies racial superiority and social inequality, color-blind attitudes represent denial about the existence of racism. High levels of color-blind beliefs and pro-White ideals may ultimately impact patient communication and the quality of patient care.^{9,12,27,29} Dental hygienists will encounter diverse populations in increasing numbers as the landscape of the American population continues to diversify.^{5,7,8} Therefore, they must be prepared to effectively work with this diversity in patients. Results of the CoBRAS questionnaire indicate moderate levels of denial of racism among the dental hygiene students surveyed in this study. Overall mean scores and the average scores for two of the subscales (unawareness of White racial privilege and unawareness of institutional discrimination) indicate moderate levels of unawareness among the participants. However, it is noteworthy that the third scale, measuring awareness of blatant

Figure 2. Average overall scores of three subscales based on race



racial issues, had an average score in the low range. These results suggest that participants were more aware of overtly obvious acts of racism rather than inherent biases associated with White privilege and institutional discrimination. Findings from this study are similar to the research Su et al. and Behar-Horenstein et al. conducted among dental students, with overall moderate levels of unawareness and low scores in the subcategory of blatant racial issues.^{9,41}

In this study nearly three-quarters of participants identified as White. Ancis et al. studied student perceptions of campus climate by race and found that White students experienced less racial biases and lacked a recognition that interracial conflicts even existed among students of differing races.⁴³ White students were described as being immune from hostile climates associated with racial tension and conflict.⁴³ This concept could explain the findings of moderate levels of unawareness related to racial privilege and institutional discrimination among these White dental hygiene student respondents.

Participants demonstrated moderate levels of unawareness on the first subscale assessing White privilege indicating that most of the student participants were unaware of the advantages White people hold in society.⁴⁴ This finding is of concern as it can influence the delivery of care from these future oral health professionals. It has been well documented in literature that there are disparities in overall health care due to race and these social determinants are also applicable to oral health care.^{39,45-47} Dudzinski addressed White privilege and its implications on bioethics in health care and stressed the importance of health care faculty members to openly discuss implicit biases with students and create discussion on how racial bias is a factor in the delivery of clinical care.⁴⁸ These same teaching principles could also be applied in the dental hygiene curriculum.

The second CoBRAS subscale addressed unawareness of institutional racism. This type of racism has been described as operating at a societal level;⁴⁹ the

structures, policies, practices and norms resulting in differential access to goods, services and opportunities of society by race.⁵⁰ Both respondent groups scored moderately on this subscale indicating a lack of recognition regarding the ways Institutional racism can result in differential access to health services, resulting in poorer well-being for ethnic minorities.⁵⁰⁻⁵³ Because oral health care services may be impacted by institutional racism, dental professionals should be aware of these societal biases and their potential impact on oral health care. In addition, dental hygiene students themselves can be negatively affected by institutional discrimination.⁵²

The final subscale, blatant racism, in contrast to color-blind racial attitudes, is racism conducted in a more obvious and offensive manner. Within this subscale the CoBRAS survey includes the statement, “Racial problems in the U.S. are rare, isolated situations,” which is indicative of overt racism. Respondents’ average scores for this subscale were low, indicating a awareness of such racial issues and their impact on society. The lower scores could be attributed to wording of the statement and its explicitness related to racism, rather than inherent bias. Subscale results from this study were similar to those found among dental students.^{9,41}

Incorporating curricular interventions aimed at reducing health disparities due to race and ethnicity, including color-blind ideology and awareness of cultural bias, are important in fostering cultural competence in dental hygiene students. Training modules and workshops incorporated into dental hygiene curriculum and development of continuing education courses on color-blindness may help dental hygienists recognize color-blind racial attitudes and unconscious bias. The color-blind racial attitudes scale (CoBRAS) may be an excellent tool for faculty and students

as well as practitioners to determine their personal levels of inherent bias. Dental hygiene educators could consider using this tool to bring awareness to these issues and provide interventions early in dental hygiene students' education. Fostering strategies that promote cultural competence via an understanding of color-blind racial ideology might improve culturally sensitive communication and play an important role in addressing oral health disparities.

This pilot study had several limitations. The convenience sample included dental hygiene students from a single program, located in the Mid-Atlantic region of the U.S., limiting the generalization of the results. The lack of ethnic and racial diversity among the participants is also a limiting factor. Also, the majority of students fell into the age range of 18-29 which may have influenced the results based on the number of experiences they may have had with racial tension and conflict.⁴³ A larger sample size using students and practicing clinicians from various locations throughout the United States may demonstrate significant differences among the various groups. Further research is needed with a larger sample size from more varied geographic locations, representing a broader population with greater variation in age, gender, ethnicity.

Conclusion

Results from this pilot study suggest dental hygiene student participants were unaware of their inherent biases as measured by the Color-Blind Racial Attitudes Scale; denial of the existence of racism was common in participants. Participants, regardless of their year in the dental hygiene program, were moderately unaware of the advantages of White racial privilege and institutional discrimination. Findings underscore the need for more research to better understand colorblind ideology in dental hygienists as well as how color-blind racial attitudes affect multicultural competence in dental hygiene students. Further research with a larger and more diverse pool of participants is recommend to enhance understanding of the role of color-blind attitudes in dental hygienists and improved delivery of oral care to diverse populations.

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Research

Motivations and Challenges Towards Research Activities Among Undergraduate Dental Hygiene Students

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Abstract

Purpose: Research is integral to dental hygiene practice, graduate education, and the advancement of the dental hygiene profession. The purpose of this study was to identify the motivations and challenges toward participation in research activities as perceived by undergraduate dental hygiene students.

Methods: A nonprobability sample of undergraduate dental hygiene students from across the United States was used for this cross-sectional, electronic survey. Inclusion criteria were students entering their final year of their dental hygiene education program. Descriptive and inferential statistics were used to analyze the data.

Results: A total of 333 respondents met the inclusion criteria ($n=313$). The most frequently cited motivations for participation in research were a good method to contribute to patient care, to improve understanding of medical/academic terms, an interest in developing transferable skills, and a necessary competency a future clinical career. The most frequently cited barriers were lack of time, lack of funds to conduct research projects, lack of formal research courses in curriculum and a lack of interest in research. Significant relationships were found between participation in research activities and education in research ($p<.001$) and the type of dental hygiene degree program and participation in research activities ($p<.01$). Students with previous research experience were significantly more likely to be encouraged by previous participation in research experiences than students without previous research experience ($p<.01$).

Conclusion: Understanding the perceived motivations and challenges for research among undergraduate dental hygiene students, can help direct efforts to foster interest and overcome barriers to pursuing future research activities.

Keywords: dental hygiene education, dental hygiene students, dental hygiene research, graduate education, evidence-based research

This manuscript supports the NDHRA area **Professional development: education** (educational models).

Submitted for publication: 5/14/18; accepted: 4/26/19

Introduction

Research is integral to dental hygiene practice, graduate education, and the advancement of the dental hygiene profession. As biomedical scientific knowledge and technological advances improve the delivery of patient care, it becomes critical that dental hygiene students gain the skills to critically appraise and utilize high quality research to guide their clinical decision-making process. Concurrently, research specific to the dental hygiene discipline is necessary for the advancement of the profession.¹ However, anxiety regarding thesis research has been cited as one of the top barriers to pursuing graduate education among practicing dental hygienists.² Understanding the motivations and challenges regarding the research process among undergraduate dental

hygiene students may help overcome the barriers to the pursue graduate education and advance the profession.

The curricular research requirement as outlined in Committee on Dental Accreditation (CODA) standard 2-22, states that dental hygiene “graduates must be competent in the evaluation of current scientific literature”, which encompasses life-long learning and evidence-based practice.³ In dental hygiene practice, evidence-based decision making is defined as the systematic process combining the use of the best available scientific evidence, along with the clinician’s judgment and expertise, the patient’s preferences, and the patient’s clinical circumstance.⁴ In undergraduate dental hygiene education, this standard emphasizes the clinical application of research

and not the generation of new knowledge acquired through participation in novel research activities.⁵

Predocutorial dental programs in various countries have incorporated research opportunities within the dental curriculum. Although challenges existed with their compulsory research experiences, South African dental students were shown to have gained an understanding of the scientific literature, support from their research mentors, and interest to continue further research studies.⁶ By allowing Swedish dental students to select their topics and identify the practical applications of their research findings, the students maintained interest and motivation in gaining a deeper understanding of their research topics.⁷ In a Turkish dental program, participation in a voluntary Student Research Club (SRC) led to higher GPA's, increased acceptance into PhD programs, and student transitions into academia.⁸ Participants in the Student Research Program (SRP) at a dental program in the United States were more shown to be more likely to complete specialty training and pursue full-time educators roles.⁹ Despite the positive outcomes demonstrated from research participation, many barriers exist in engaging in research.¹⁰

Fear of thesis research has been identified as one of the top five barriers to pursuing graduate education for dental hygienists.² In addition, Smith et al. found that a lack of motivation as one of the top challenges to pursuing graduate education.¹¹ If dental hygiene undergraduate students are not exposed to, or receive opportunities to conduct original research, this cycle of fear and a lack of motivation may persist in graduate education.¹² Insight into the perceived influential factors and the perceived barriers toward participation in original research in undergraduate dental hygiene programs is needed to increase the pursuit of future research activities. The purpose of this study was to identify the motivations and challenges toward participation in research activities as perceived by undergraduate dental hygiene students.

Methods

This study was given a status of exempt by the Institutional Review Board of The Ohio State University (2017E0446). A quantitative, cross-sectional survey research design was used on a non-probability sample of undergraduate dental hygiene students attending entry-level dental hygiene programs in the United States. Inclusion criteria were final-year, undergraduate dental hygiene students; first-year undergraduate dental hygiene students were excluded due limited knowledge and exposure to undergraduate research activities.

The survey consisted of demographic and attitudinal questions modeled after two existing surveys that measured

medical student attitudes towards research.^{13,14} Both authors granted permission to modify questions to apply to dental hygiene students. The survey consisted of 42 questions: 8 demographic questions including a question regarding participation in undergraduate research; 16 items regarding research motivations; and 18 questions regarding research barriers. Motivating factors influencing attitudes regarding research were evaluated by the students' responses to 16 Likert-style rating scale statements; barriers affecting student attitudes were evaluated by responses to a total of 18 Likert-style rating scale statements. The following Likert-style rating scale was used: 1. strongly disagree, 2. disagree, 3. neutral, 4. agree, and 5. strongly agree.

Both of the original surveys had been tested for validity and reliability.^{13,14} The revised survey was reviewed by a panel of dental hygiene educators and students. No changes were made to the survey based on the feedback from the panel. A web-based software system, Qualtrics®, Inc. (Provo, UT), was used to create and administer the online survey.

An invitation to participate e-mail was sent to 228 undergraduate dental hygiene program directors in August 2017. Program director contact information was obtained from the American Dental Hygienists' Association and the individual dental hygiene program websites, program directors without publicly available contact information were not sent invitations to participate in the survey. Therefore, the sample represents a non-probability sample. Program directors were informed that they would receive two separate e-mails: one for informational purposes and the other to forward directly to their final-year, dental hygiene students. A set of reminder emails were sent after two weeks. The survey remained open for a total of 28 days. Participants were provided with information regarding the purpose, risks, benefits, data privacy, and confidentiality of their responses prior to beginning the survey. Respondents had the opportunity to opt-in for a drawing of two gift cards as an incentive to participate.

Descriptive statistics were used to identify the most common motivations and challenges toward participation in research experiences among undergraduate dental hygiene students. Chi-squared tests of independence were used to determine relationships between participation in research experiences and dental hygiene students' characteristics (gender, GPA, research interest, education in research, degree pursuing). Mann Whitney *U*-tests were conducted to determine any differences in the motivations and barriers to research among dental hygiene students with and without prior research experiences.

Results

A total of 456 surveys were returned and responses from 361 were analyzed (n=361) for a completion rate of 79.1%. Ninety-five surveys were excluded because respondents were identified as first-year dental hygiene students or the respondents completed less than half of the survey. Since the program directors were not asked to provide the number of final year students in their programs, a response rate could not be calculated. According to the 2016-2017 Survey of Allied Dental Education Programs, there were approximately 8,107 dental hygiene students in their final year.¹⁵ Most respondents were female (98.4%), self-reported greater than 3.0 GPA (95.8%), expressed interest in research (72.2%), had taken a research course (48.2%), were enrolled in an associate degree program (54.9%), and had not participated in undergraduate research activities (57.5%).

Chi-squared tests of independence were used to determine relationships between participation in undergraduate research activities and dental hygiene students' characteristics (gender, GPA, research interest, education in research, degree pursuing). No significant relationships were found between participation in undergraduate research activities and gender ($\chi^2(2)=4.326$, $p>.05$), GPA ($\chi^2(1)=0.090$, $p>.05$), and research interest ($\chi^2(3)=1.663$, $p>.05$). Significant relationships were found between participation in undergraduate research activities and education in research ($\chi^2(2)=22.276$, $p<.001$) and the type of degree being pursued ($\chi^2(2)=12.826$, $p<.01$). Students who had not taken a research course and were enrolled in associate dental hygiene programs were less likely to have participated in undergraduate research activities than students in bachelor programs and students who took or were currently taking a research

course. Respondent demographics and relationships in regards to participation in undergraduate research are shown in Table I.

Respondents' perceived motivations toward participation in research activities are shown in Table II. The top four motivations were: "good method to contribute to patient care" (n=328/352, 93.2%); "improve understanding of medical/academic terms" (n=311/360, 86.4%); "interest to develop transferable skills" (n=300/354, 84.7%); and "necessary competency for my future clinical career" (n=284/354, 80.2%).

Mann Whitney *U*-tests were conducted to determine any differences in the research motivations among dental hygiene students with and without prior research experiences (Table II). Students with previous undergraduate research experience were significantly more likely to perceive encouragement from previous participation in UR experiences ($M=142.54$) than students without previous undergraduate research experience ($M=172.97$, $p<.01$).

Respondents' perceived barriers towards participation in research activities are shown in Table III. The top four barriers cited were: "lack of time" (n=286/344, 83.1%); "lack of funds to conduct research projects" (n=174/342, 50.9%); "lack of formal research courses in curriculum" (n=152/345, 44.1%); and "lack of interest in research" (n=148/340, 43.5%).

Table I. Relationships between demographic characteristics of survey respondents and participation in research experiences (n=313)

Variables	Participation in research experiences (n=133)	No participation in research experiences (n=180)	<i>p</i> -value*
Gender			<i>p</i> >.05
Male	0	4	
Female	132	176	
Non-conforming	1	0	
GPA			<i>p</i> >.05
≥3.0/4.0	128	172	
<3.0/4.0	5	8	
Research interest			<i>p</i> >.05
Very interested	16	27	
Somewhat interested	82	101	
Somewhat not interested	25	33	
Not interested	10	19	
Education in research			<i>p</i> <.001‡
Course taken	76	75	
Course not taken	12	56	
Currently enrolled	45	48	
Degree pursuing			<i>p</i> <.01‡
Bachelor degree	73	62	
Associate degree	58	114	
Certificate	2	3	

* Chi-squared tests were used to determine relationships between participation in research experiences and dental hygiene students' characteristics (gender, GPA, research interest, education in research, degree pursuing)

‡ Statistical significance, *p*-value <.01

Table II. Perceived motivations toward participation in research experiences.

Motivations toward research experiences	All Respondents						Respondents with research experiences Mean rank (n)	Respondents without research experiences Mean rank (n)	p-value ***
	Disagree % (n)*	Neutral % (n)*	Agree % (n)*	n	M**	IQR			
Good method to contribute to patient care	3.1% (11)	3.7% (13)	93.2% (328)	352	4.0	4.0-5.0	149.35 (131)	159.15 (178)	.282
Improve understanding of medical/academic subjects	6.1% (22)	7.5% (27)	86.4% (311)	360	4.0	4.0-5.0	150.53 (132)	160.88 (180)	.57
Interest to develop transferable skills	4.5% (16)	10.7% (38)	84.7% (300)	354	4.0	4.0-5.0	149.76 (132)	159.76 (178)	.280
Necessary competency for my future clinical career	5.4% (19)	14.4% (51)	80.2% (284)	354	4.0	4.0-5.0	161.98 (132)	150.70 (178)	.223
Develop transferable skills e.g., communication skills	6.7% (24)	13.4% (48)	79.9% (286)	358	4.0	4.0-5.0	150.35 (132)	160.17 (179)	.299
Specific research field or medical topic	9.8% (35)	20.9% (75)	69.3% (248)	358	4.0	3.0-4.0	153.61 (131)	156.89 (179)	.727
Improve curriculum vitae (CV)	8.2% (29)	23.4% (83)	68.4% (242)	354	4.0	3.0-4.0	155.89 (130)	152.61 (177)	.730
Facilitate entry to a graduate program	18.6% (66)	20.9% (74)	60.5% (214)	354	4.0	3.0-4.0	153.36 (131)	156.21 (178)	.773
Good method to fulfill leisure time	18.1% (64)	22.9% (81)	59.0% (209)	354	4.0	3.0-4.0	153.06 (132)	157.31 (178)	.667
Motivation from parents/faculty/senior students involved in scientific research	16.4% (58)	25.1% (89)	58.5% (207)	354	4.0	3.0-4.0	163.53 (131)	148.72 (178)	.128
Facilitate entry into competitive residency training programs	16.2% (58)	25.8% (92)	58.0% (207)	357	4.0	3.0-4.0	159.77 (132)	153.22 (179)	.506
Develop research competencies	23.1% (83)	29.2% (105)	47.8% (172)	360	3.0	3.0-4.0	155.5 (133)	158.09 (180)	.794
Encouragement from previous participation in research experiences	22.3% (79)	35.2% (125)	42.5% (151)	355	3.0	3.0-4.0	172.97 (132)	142.54 (178)	.002‡
Present research findings in scientific meetings	32.5% (115)	26.0% (92)	41.5% (147)	354	3.0	2.0-4.0	159.23 (132)	151.84 (177)	.457
Commence a research-focused career	33.3% (118)	27.1% (96)	39.5% (140)	354	3.0	2.0-4.0	159.08 (132)	152.85 (178)	.532
Publish articles in peer-reviewed journals	41.2% (146)	22.3% (79)	36.4% (129)	354	3.0	2.0-4.0	155.3 (132)	154.78 (177)	.958

* Responses were based on a 5-point Likert-scale and were grouped into three categories: Agree (5-strongly agree and 4-agree), Neutral (3-neutral) and Disagree (2-disagree, 1-strongly disagree).

** The calculations for the median and IQR were based on the 5-point Likert rating scale.

*** Two-tailed Mann Whitney U-tests were used to compare the median 5-point Likert-scale responses between respondents with and without research experiences.

‡ Statistical significance, p-value <.01

Table III. Perceived barriers toward participation in research experiences

Barriers toward research experiences	All Respondents						Respondents with research experiences Mean rank (n)	Respondents without research experiences Mean rank (n)	p-value***
	Disagree % (n)*	Neutral % (n)*	Agree % (n)*	n	M**	IQR			
Lack of time	7.0% (24)	9.9% (34)	83.1% (286)	344	4.0	4.0-5.0	146.68 (126)	152.42 (173)	.529
Lack of funds to conduct research projects	16.4% (56)	32.7% (112)	50.9% (174)	342	4.0	3.0-4.0	149.19 (126)	150.59 (173)	.886
Lack of formal research courses in curriculum	25.8% (89)	30.1% (104)	44.1% (152)	345	3.0	2.0-4.0	127.36 (126)	167.26 (174)	<.001‡
Lack of interest in research	27.9% (95)	28.5% (97)	43.5% (148)	340	3.0	2.0-4.0	149.85 (126)	150.11 (173)	.979
Lack of research mentors	31.7% (109)	27.9% (96)	40.4% (139)	344	3.0	2.0-4.0	134.06 (126)	162.40 (174)	.004‡
Lack of effective Undergraduate Research Committee	25.9% (89)	37.3% (128)	36.7% (126)	343	3.0	2.0-4.0	138.02 (126)	158.72 (173)	.032‡
Lack of support to participate in research activities	31.2% (106)	35.9% (122)	32.9% (112)	340	3.0	2.0-4.0	142.29 (126)	155.62 (173)	.171
Lack of on-campus basic science research laboratories	33.5% (115)	35.3% (121)	31.2% (107)	343	3.0	2.0-4.0	141.56 (126)	156.15 (173)	.135
Lack of research opportunities	38.2% (128)	34.6% (116)	27.2% (91)	335	3.0	2.0-4.0	144.77 (124)	152.03 (173)	.454
I hate the scientific complexity of research	48.5% (163)	27.1% (91)	24.4% (82)	336	3.0	2.0-3.0	158.71 (124)	142.04 (173)	.088
Lack of effective team work with research mentors and/or co-authors	38.9% (131)	38.0% (128)	23.1% (78)	337	3.0	2.0-3.0	148.36 (125)	150.32 (173)	.839
Lack of research publishing in peer-reviewed journals	39.1% (133)	42.6% (145)	18.2% (62)	340	3.0	2.0-3.0	150.43 (126)	149.69 (173)	.938
Lack of research presentation in local/international scientific conferences	34.4% (117)	47.9% (163)	17.6% (60)	340	3.0	2.0-3.0	147.18 (126)	152.05 (173)	.604
Lack of "credited authorship" when I participate in research projects	36.2% (123)	48.2% (164)	15.6% (53)	340	3.0	2.0-3.0	142.35 (126)	155.58 (173)	.159
I had previous bad research experience(s) with projects/mentors/ co-authors	60.0% (201)	28.7% (96)	11.3% (38)	335	2.0	2.0-3.0	155.57 (124)	143.40 (172)	.206
Lack of finding same-gender research mentor	52.4% (178)	37.4% (127)	10.3% (35)	340	2.0	2.0-3.0	147.19 (126)	152.05 (173)	.612
Research is NOT important for clinical careers	80.0% (268)	15.2% (51)	4.8% (16)	335	2.0	1.0-2.0	153.19 (123)	145.16 (173)	.391
I'm afraid from sexual harassment in research environments	81.4% (272)	16.5% (55)	2.1% (7)	334	1.0	1.0-2.0	158.49 (124)	141.30 (172)	.059

* Responses were based on a 5-point Likert-scale and were grouped into three categories: Agree (5-strongly agree and 4-agree), Neutral (3-neutral) and Disagree (2-disagree, 1-strongly disagree).

** The calculations for the median and IQR were based on the 5-point Likert rating scale.

*** Two-tailed Mann Whitney U-test were used to compare the median 5-point Likert-scale responses between respondents with and without research experiences.

‡ Statistical significance, p-value <.01

Mann Whitney *U*-tests were conducted to determine any differences in the research barriers among dental hygiene students with and without prior research experiences (Table III). Students without previous research experience ($M=127.36$) were significantly more likely than students with previous research experience to lack formal research courses in their curriculum ($M=167.26$, $p<.001$). Students without previous research experience ($M=134.06$) were significantly more likely than students with previous undergraduate research experience to lack research mentors ($M=162.40$, $p<.01$). Students without previous research experience ($M=138.02$) were significantly more likely than students with previous undergraduate research experience to lack effective undergraduate research committees ($M=158.72$, $p<.05$).

Discussion

The purpose of this study was to identify the motivations and challenges toward participation in research activities perceived by undergraduate dental hygiene students. Regarding perceived motivations, connections with clinical practice and transferable skills were rated highest. Students with previous research experience were significantly more likely than those without any experience to receive encouragement from previous participation in research experiences. In regards to research challenges, lack of time was cited by all respondents, regardless of whether they had research experience or not. Students without previous research experience were significantly more likely than students with experience to perceive the lack of formal research courses in their curriculum, lack research mentors, and lack effective undergraduate research committees as barriers.

Less than half of the respondents (42%) had participated in undergraduate research activities. This percentage is lower than the 63% of dental students who reported participation in undergraduate research activities prior to matriculation into dental school¹⁶ and slightly higher than the percentage of medical students who participated in undergraduate research in the United Kingdom (38%)¹⁷ and Portugal (39%).¹⁸ Outside of the U.S., dental and medical education is often completed at the baccalaureate level whereas dental and medical education in the U.S. is completed at the post-baccalaureate level. Students in the U.S. have more opportunities for research experiences prior to entry in dental or medical school. In addition, prospective applicants of professional graduate programs tend to engage in research activities to bolster their applications, which may not be as prevalent worldwide.

No significant relationships were found between gender, GPA, or research interest and participation or non-participation in research activities. Since the dental hygiene profession is predominately female, it was not surprising that most of the survey respondents were female. In this study, 1.3% of respondents were male, which is less than the 2.9% of male dental hygienists reported by the US Department of Labor.¹⁹ This contrasts the existing worldwide gender bias for higher percentages of males to be involved in research activities.¹⁴ Due to the lack of similar numbers of female and male respondents in this study and the general dental hygiene profession, it remains difficult to compare the data from the present study to previous research demonstrating a higher percentage of males than females involved in research activities.¹⁵ Although increased participation in research activities among high achievers versus low achievers has been shown,^{14,18} nearly all of respondents in the present study reported greater than 3.0 GPA. Over two-thirds of respondents reported to be interested in research regardless of past participation or non-participation in research activities. This may indicate that merely participation in research activities may not influence an overarching interest in research. Future research using qualitative research designs should explore this phenomenon.

Significant differences were found between education in research or degree program and participation or non-participation in research activities. Of the respondents with research experiences, almost all had taken or were currently enrolled in a research course and over half of the respondents were enrolled in a bachelor-degree program. Of the respondents without any research experience, about two-thirds had taken or were currently enrolled in a research course and about two-thirds were enrolled in an associate-degree program. This may indicate that a formal research course within the dental hygiene curriculum may promote a general interest in engaging or participation in research activities. However, the lack of statistical difference in research interest between the students with and without actual research experiences indicates that participation in research does not significantly increase the extent of interest already experienced by the non-participants. With more formalized research courses, students enrolled in bachelor-degree programs may be more likely to participate in research activities. The trend in undergraduate education in the sciences is moving towards the incorporation of course-based research projects to increase active learning and expose students to different aspects of the research process.²⁰ For this study, it was unknown whether dental hygiene students had course-based research projects. CODA standards for both dental and dental hygiene students, require the curricula

to emphasize the application of research in evidence-based practice. However, emphasizing evidence-based practice as part of the research course content may not prepare students for research activities. Despite taking designated research courses, dental students perceived they felt inadequate in their understanding of biostatistics and research methodology.¹⁶

Patient care and the transfer of skills were indicated most highly in regards to respondents' perceived motivations towards research activities. Involvement in clinical research studies may allow students to have a better understanding of the relevance of their research work as dental hygiene professionals. Students with previous research experience were significantly more likely to perceive encouragement from their participation, than students without previous research experience, to be a motivating factor. The literature has shown that previous participation in research activities has been directly linked to positive outlook on scientific research in general and increased likelihood to pursue research activities in the future.^{14,21-23} Boyd et al. identified fear of thesis research as a barrier to graduate education among dental hygienists;² however, increased participation in undergraduate research activities may help overcome this barrier. In addition, undergraduate students with research experiences are more likely to receive encouragement from faculty mentors to pursue future research and graduate education. Faculty members play an important role in identifying students with the potential for advanced education and in mentoring them through the process.

In regards to perceived challenges towards research experiences, respondents without previous research experience were significantly more likely to lack a formal research course in their curriculum, lack research mentors, and lack effective undergraduate research committees as compared to students with previous research experience. Current accreditation standards require dental hygiene programs to prepare dental hygienists to be able to evaluate scientific literature and evidence-based practice.³ A formal research methods course is less likely to be included in the dental hygiene curriculum of an associate degree program; research concepts and terminology are more likely to be included in a community dental/oral health course.¹⁵ Associate-degree dental hygiene programs faculty may lack research mentoring experience and the academic reward structure does not incentivize mentoring or training undergraduate researchers.^{24,25}

This study had several limitations. The topic of undergraduate research may have elicited a response bias from students in baccalaureate degree programs. Greater numbers of students in baccalaureate programs may have responded due to a greater interest in research and a selection bias of

baccalaureate degree program directors may have existed based on the publicly available contact information. The response rate was relatively low compared to the estimated current enrollment of final-year dental hygiene students, limiting the generalizability of the results. Undergraduate research activities were not explicitly defined, therefore the interpretation of the term was dependent upon the survey respondent. Research activities may have been interpreted as searching the literature, literature reviews, critical analysis of research articles, or participation in an original research project. Future studies on this topic should include an explicit statement of the intended definition. Due to the timing of the survey at the beginning of the academic year, attitudes of students engaged in undergraduate research activities over the course of the academic year were not considered. There may have been self-reporting bias, inherent in survey research. Closed-ended questions may also have limited the responses.

Conclusion

Dental hygiene programs should engage students with opportunities to support the perceived student interest associated with research activities. Formal research courses in the dental hygiene curriculum, research mentors, and effective undergraduate research committees are needed to overcome the challenges to conducting research. Dental hygiene programs should focus on identifying students with research interests, match students with faculty research mentors, and provide financial resources to support research interests as well as overcome the challenges associated with research activities and graduate education. Future studies should include qualitative methods to better understand dental hygiene student attitudes as well as the motivations and barriers of dental hygiene faculty in regards to mentoring research activities among undergraduate dental hygiene students.

Acknowledgments

The authors would like to thank The Ohio State University, Division of Dental Hygiene for their continued research support and The Ohio State University, College of Dentistry, Student Research Program for awarding the student scholarship and providing the travel funds to present the research findings.

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Practice Patterns and Attitudes of Expanded Function Dental Auxiliaries in the State of Maine

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Abstract

Purpose: Various workforce models, including the expanded function dental auxiliary (EFDA), have been created as a means to address the crisis in oral health access. Limited assessments have been conducted regarding the effectiveness of the EFDA. The purpose of the study was to assess the implementation, geographic practice patterns and attitudes regarding the education of EFDAs in the state of Maine.

Methods: Licensure information on the Expanded Function Dental Auxiliaries (EFDA) in Maine was obtained from the Board of Dental Practice. A 19-item survey consisting of closed and open-ended questions pertaining to practice demographics, settings, procedures and attitudes towards basic and ongoing continuing education was sent both via email and traditional mail to all EFDAs licensed in Maine (n=75). Descriptive statistics were used to analyze the data.

Results: A response rate of 59% (n=43) was achieved. A majority of EFDAs (60%, n=26) were employed in private dental practices; 12% (n=5) practiced in a community/public health setting. Regarding access to care, 51% (n=22) stated that their practice did not accept Medicaid coverage. However, over half indicated feeling that they were making moderate to significant impact on increasing access. A little more than one third (35%, n=17) reported working in Penobscot County, which is not a designated provider shortage area. A majority of respondents reported less than half of their continuing education courses were relevant to EFDA practice.

Conclusions: EFDA practitioners are providing needed oral health care services, however they may not be providing access to care for the intended at-risk and underserved populations in designated geographic areas. Practice patterns of EFDAs in Maine should be assessed in greater depth.

Keywords: access to care, dental workforce models, expanded function dental auxiliaries, allied dental personnel, dental health care delivery, dental team

This manuscript supports the NDHRA priority area **Population level: Health services** (vulnerable populations).

Submitted for publication:12/10/18; accepted: 5/28/19

Introduction

Oral health is integral to overall health and wellness. Unfortunately, many children and adults in the United States (U.S.) suffer from poor oral health and a lack of access to oral health care. Nearly twenty years ago, “Oral Health in America: A Report of the Surgeon General”, changed the landscape of oral health care by highlighting the profound disparities in oral health across the U.S. and firmly asserting that oral and systemic health are interrelated.¹

Oral Health Disparities and Access to Care:

Children are five times more likely to have dental caries than asthma, and more than half of children aged 5-9 in the

U.S. have a carious lesion.¹ The prevalence of carious lesions increases with age; by the age of eighteen or older, 84% have had caries or a restoration.¹ While dental caries is the most common chronic disease of childhood, low-income children experience a disproportionate incidence and prevalence.¹ Dental sealants reduce the risks of carious lesions by up to 80%, yet only one-third of high-risk children have had sealants placed.² Consequences of dental disparities extend beyond poor oral health; caries and dental disease have been correlated with lower school performance, and psychosocial wellbeing.³ Results from a North Carolina study showed that while a low percentage

of absenteeism was due to dental pain or infection, parental reports of poor school performance was higher in children who had experienced dental pain or infection.⁴

Oral health and access to care are also a significant issue for the adult population. An estimated 90% of adults in the U.S. have a carious lesion and at least 25% have untreated carious lesions.³ In addition, nearly half of adults over the age of 30 have some form of periodontal disease.³ Poor oral health in adults also has wider social implications. A recent study estimated that adults lost 92.4 million hours due to unplanned emergency dental care.⁵ Younger adults 20-29 years of age are increasingly relying on emergency departments (ED) for toothaches. An estimated 1.27 million ED visits have been for toothaches from this age group, accounting for 42% of all dental pain visits.⁶ Adults aged 65 and older face even greater oral health disparities. A reported two-thirds of all older adults, and more than 75% of those considered to be low-income, have not had a dental visit in any given year; 20% have untreated caries.⁷⁻⁸ Access to oral health care is needed for people of all ages. Research has shown that providing oral health care to people with chronic illnesses reduces other medical costs, including hospitalizations and emergency room visits.⁹⁻¹⁰

While advances have been made to improve oral health in both adult and pediatric populations, significant disparities remain, particularly for low income groups. In addition to socioeconomic issues, Healthy People 2020 also identified barriers for all population groups including dental anxiety, cost of care, low health literacy, and limited access to dental providers.¹¹ A variety of oral health care workforce models have been developed as a means to removing these barriers.

Workforce Models

Dentists have customarily employed various combinations of allied personnel including dental assistants and dental hygienists within the traditional brick and mortar setting of the private practice/small business. However, decreasing numbers of dentists and factors including geographic location have resulted in areas of low dentist-to-population ratios. Identification of oral health care provider shortage areas has also contributed to the development of alternative workforce models.¹² Remote and rural areas have been shown to more significantly impacted than metropolitan areas as dental providers age out and reach the end of their professional careers.¹³ As dentists retire from clinical practice however, the number of dental hygienists continues to increase across the U.S.¹³

Many states have implemented alternative workforce models, some based on well-established models from other industrialized countries, expanding the scope of practice

of dental hygienists with the intention of expanding access to care.¹⁴ The expanded function dental auxiliary (EFDA), has been shown to be an effective workforce model; general practices utilizing EFDAs have been shown to be more productive and efficient, treat more patients, and have higher gross billings and net income.¹⁵ Currently, fifteen states allow expanded functions in some form, with the majority under the direct supervision of a dentist¹⁶ and sixteen states allow EFDAs to place and finish amalgam and/or composite resin restorations following the dentist's preparation.¹⁶

Access Challenges

According to the Maine Department of Health and Human Services Department, the top five contributors to poor health are poverty, lack of access to behavioral and mental health services, transportation, health insurance and employment.¹⁷ Nearly one quarter of the population depends on the state sponsored Medicaid program;¹⁷ including two-thirds of infants, 40% of children, and nearly 67% of nursing home residents.¹⁸ However, very limited dental coverage is available, particularly for those over the age of 21. Lack of dental coverage is compounded by the low number of Medicaid providers, creating significant barriers to care. Furthermore, the dentist to population ratio in rural areas of the state is lower than the national average, with the majority of the state's sixteen counties designated as oral health care provider shortage areas.¹⁹ Despite these limitations, state agencies report that advancements have been made towards improving oral health care, particularly by providing access to care through dental and dental hygiene education programs.²⁰ Typically, dental schools and allied dental health education programs act as safety nets, by providing low cost services and community outreach programs. Maine is one of 36 states offering safety nets through dental and allied health education programs.²¹ However, the two academic institutions in Maine are located in the areas with a highest dentist-to-population ratio and geographic barriers remain a significant concern.

Legislative Measures

Legislation has been passed in recent years in Maine to allow for a variety of alternative workforce models, including EFDAs, to reduce oral health disparities. Individuals interested in becoming a EFDA must be either a licensed dental hygienist or a dental assistant certified by the Dental Assisting National Board and must complete a board of dental practice approved EFDA education program to be eligible for licensure. EFDA duties include placing and contouring of amalgam and composite restorations, fabricating and removing temporary crowns and bridges, applying pit and

fissure sealants and topical fluorides, applying cavity liners and bases, bonding orthodontic bands and brackets, and supra gingival polishing.²² However, these EFDA duties must be performed under the direct supervision of the dentist. In contrast, direct access is defined as the ability to initiate treatment based on assessment of the patient's needs without the specific authorization or physical presence of a dentist.²³

Limitations on direct access to care can significantly limit the effectiveness of the EFDA and other alternative workforce models. There is a gap in the literature regarding the effectiveness of the EFDA workforce model first established in 2011 in Maine. However, legislation was passed in 2014 in Maine establishing the Dental Hygiene Therapist (DHT) midlevel provider model. While the intent of increasing access to oral care mirrors that of the EFDA, the direct supervision requirements for both models is the same. In order to effectively assess patient outcomes related to these new workforce models, it is necessary to first assess the practice patterns, effectiveness and challenges of the existing model.

While assessments at the state level are a critical component to program planning and evaluation, they are seldom executed.¹ The purpose of this study was to assess the implementation of the EFDA into dental practices within the state of Maine, analyze the geographic practice patterns of EFDAs and evaluate the attitudes regarding EFDA preparatory and continuing education requirements.

Methods

This survey research project was a collaboration between the University of Michigan School of Dentistry and the University of Maine at Augusta and was given exempt status by the University of Maine at Augusta IRB (HUM00121000).

An investigator created, online survey was designed using Qualtrics[®] (Provo, UT). The survey consisted of 19 questions including the EFDA practice demographics, skills performed, population served, and continuing dental education courses related to EFDA skills. The University of Michigan Survey Research Center was consulted prior to the distribution of the survey to validate the content. The survey was pilot tested online by 14 practitioners and faculty members who were not participating in the study. A roster of the Licensed Expanded Function Dental Auxiliaries (EFDA) including names, email addresses, and mailing addresses was purchased from the Maine Board of Dental Practice. Two of the investigators were eliminated from the subject population, resulting in a total of 73 potential respondents. Inclusion criteria were having an active EFDA license in the state of Maine. Recruitment emails were sent to the licensed

EFDAs with a link to an electronic survey. In an attempt to increase the response rate, paper surveys were also mailed to all EFDAs. The paper surveys were coded to avoid respondent duplication. A follow-up email was sent to non-respondents after two weeks. An additional, follow-up email was sent two weeks after the first reminder, asking subjects to either complete the electronic survey, or the paper survey.

Results

Thirty-eight electronic surveys and five paper surveys were completed for a response rate of 59% (n=43). Nearly three-fourths of the respondents (74%, n=32) had been actively practicing within the previous 12 months and a majority (67%, n=29), had been practicing as an EFDA between one and five years. Credentials of the respondents varied; a majority of respondents (60%, n= 26) reported holding only the Dental Assisting National Board, Certified Dental Assistant (CDA) credential. The remaining respondents (40%, n=17) were licensed dental hygienists with 10% (n=4) also holding a CDA credential (Table I). Over two-thirds of the respondents (70%, n= 23) reported performing EFDA duties daily, 21% (n=7) of the respondents performed EFDA duties two to four days per week, and 9% (n=3) of the respondents performed EFDA duties only a few times per month, if at all (Table II).

Table I. EFDA licentiate demographics

Demographic	n	%
Gender		
Male	0	0%
Female	43	100%
Actively Practicing (previous 12 months)		
Yes	32	
No	11	
Years in Practice		
<1 year	6	14%
1-5 years	29	67%
6-10 years	7	16%
10+ years	1	3%
Practitioner Type		
RDH only	13	
CDA only	26	
RDH with CDA	4	
Practice Accepts Medicaid		
Yes	21	49%
No	22	51%

Table II. Frequency of utilization of EFDA duties

Frequency of use	N=33	%
Routinely (Daily)	23	70%
Often (twice or more / week)	7	21%
Rarely (few times / month)	3	9 %

The most frequently reported EFDA duties were restorative services and topical fluoride application (72%, n=31), sealants (65%, n=28), and pediatric prophylaxis (40%, n=17). Regularly provided EFDA functions are shown in Table III.

Only 12% (n=5) of respondents reported practicing in a community/public health setting, while 60% (n=26) practiced in private dental offices (Table IV). Over one-third of the respondents (35%, n=17) reported working in Penobscot County, which is not designated as a dental provider shortage area (Figure 1). In regards to access to care, over one-half (51%, n=22) indicated that their practice did not accept Medicaid. In the county with the highest number of EFDA respondents (Penobscot), one-fourth (25%, n=4) were employed in practices accepting Medicaid. However, over one-half of the respondents 58% indicated feeling that they were making a moderate to significant impact on access to care; individuals working in practices accepting Medicaid felt more strongly regarding their impact on access to care

Table III. EFDA practice settings

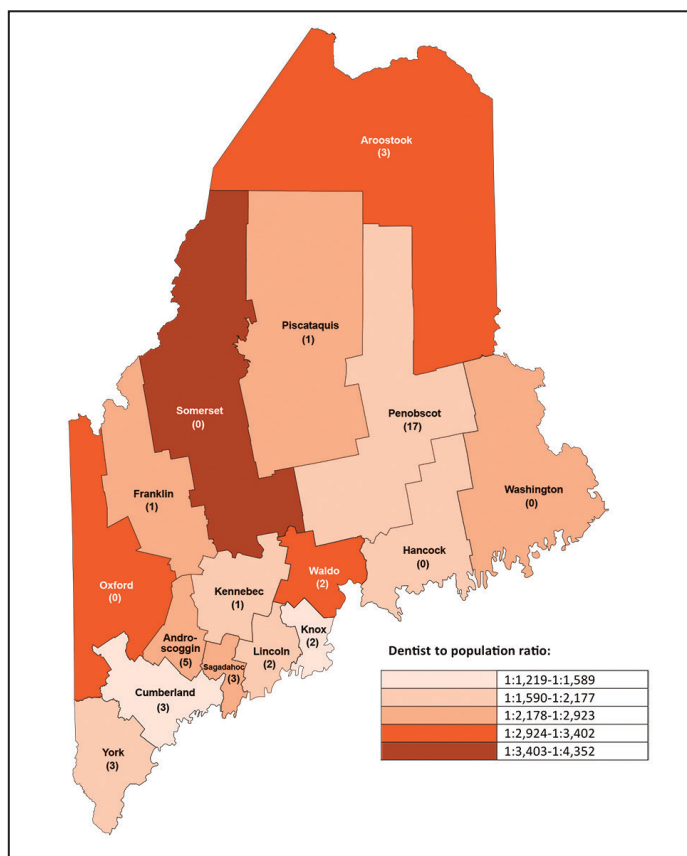
Setting	n	%
Traditional private practice	26	60%
Public health/Community practice	5	12%
Pediatric dentistry practice	6	14%
Periodontal practice	3	7%
Educational setting	2	5%
Corporate dental practice	1	2%
Prosthodontic practice	0	0%
Endodontic practice	0	0%
Government (Veteran's Administration, state)	0	0%
Hospital	0	0%
Oral surgery	0	0%

A majority (80%, n=34) of respondents reported that less than half of their continuing education courses were relevant to EFDA practice. However, 20% (n=9) indicated that additional topics including dental assistant EFDAs being licensed in local anesthesia and nitrous oxide analgesia,

Table IV. EFDA regularly provided duties

Service	n	%
Restorative functions (placing and finishing amalgam/composite restorations)	31	72%
Fluoride	31	72%
Sealants	28	65%
Pediatric prophylaxis	17	40%
Retraction cord (placement/removal)	21	49%
Orthodontic functions (sizing/selecting/cementing bands and brackets)	9	21%

Figure 1. EFDA provider distribution and dentist to population ratio map



general supervision, and being able to prepare teeth as part of the EFDA preparatory education could increase access to care. Respondents had the opportunity to answer an open-ended question regarding what would make them more effective as an EFDA. Of the respondents (n=23) who opted to respond, 39% (n=9) felt that preparatory education and certification in local anesthesia and nitrous oxide for CDA certified EFDAs would help increase access to care. Of the EFDA respondents suggesting preparatory education

and certification in the administration of local anesthesia and nitrous oxide, all of the respondents were credentialed exclusively as CDAs. The administration of local anesthesia and nitrous oxide are already within the scope of practice for Maine dental hygienists who have completed the educational requirements and hold a permit. Educating both dentists and the public regarding the scope of practice for EFDA was a concern for respondents (22%, n=5).

Discussion

Ever since “Oral Health in America: A Report of the Surgeon General” was published in 2000¹, many individual states have moved forward in creating rules or legislation for a wide variety of workforce models including the EFDA, and dental therapists.²⁴ Currently, there are eleven states that have passed some type of mid-level provider legislation with a least six more pursuing dental therapy legislation.²⁴ While data is continuously being collected on dental therapists and advanced dental therapists licensed in Minnesota, little to no assessment has been conducted on the effectiveness of other workforce models, particularly the EFDA. The lack of needs assessment and program evaluation was a key finding of the Surgeon General’s report from 2000¹ and is particularly evident in Maine, where workforce models including independent practice dental hygienists, public health supervision dental hygienists, and EFDA practitioners were created. These existing workforce models have not been assessed for their impact, however, Maine moved forward and enacted legislation for dental hygiene therapy in 2014.

It is important to know how workforce models such as EFDA are being integrated into practice, and the geographic practice patterns. This information can assist states, safety net providers, and other stakeholders to better advocate for, and strategically implement midlevel providers such dental therapists to effectively address access to care issues. The state of Maine has 15 out of 16 counties designated as dental health care provider shortage areas. Results from this study indicate the vast majority of EFDA providers are practicing in counties that are not considered shortage areas (Figure 1).

A majority of EFDAs in Maine are employed in private practices rather than public health or community settings and fewer than one-half of those private practices accepted Medicaid reimbursement. This finding is particularly concerning considering that an estimated 38% of children in the United States have public dental insurance (Medicaid and/or the Children’s Health Insurance Program), and 12% are completely without coverage.²⁵ The literature indicates that the number of children covered by Medicaid for dental

care has doubled since 2000, almost reaching parity with private insurance utilization.²⁶ The disparity in practices accepting Medicaid patients may still be a significant barrier to accessing oral health care for many children as well as adults. Some respondents in this study noted that the EFDA was more beneficial in public health settings than private dental practices. Multiple respondents also noted that in private practice, patients come to see that dentist specifically not another provider.

Only 20% of procedures performed by the EFDA respondents were restorative in nature. This may be due to the incidence and prevalence of caries within their patient population, however it could also be related to the private practice setting and the non- acceptance of public insurance (Medicaid). According to the literature, in the general population 25% of adults have untreated carious lesions, 37% of children aged 2-8 have caries in primary teeth, while 21% of children aged 6-11 and 58% of adolescents aged 12-19 have caries in permanent teeth.⁷

In 2010, the Centers for Medicare and Medicaid set a target of 52% of children enrolled in Medicaid or Children’s Health Insurance Program utilizing preventive services.²⁵ Despite these increased efforts through new workforce models, this national target has not been met and socioeconomic status remains a significant barrier. Higher socioeconomic status has been shown to be directly associated with decreasing caries incidence.²⁶ Positive findings in this study relate to the national preventive care goal; respondents reported that almost two-thirds of the procedures they performed were preventive in nature. Fluoride and sealant application were both equally provided at 22%, while pediatric prophylaxis was 14% of the reported procedures. However, these findings should be further examined, as they could be due to the number of EFDA respondents (40%) who were also licensed dental hygienists; these procedures are already a part of regular dental hygiene practice. It could be that the majority of the EFDA providers in Maine (60%) may not be performing preventive procedures.

EFDA providers in Maine may be encountering challenges to providing care to the populations they were intended to serve. In addition to types of practice settings and acceptance of public insurance reimbursement, limitations surrounding direct supervision for EFDA duties presents a significant challenge. Barriers related to supervision requirements underscores the necessity of including direct access in any alternative workforce model. Direct supervision requirements restrict EFDAs in Maine to practicing in geographic areas with dentists available and willing to employ them, thus limiting their overall impact in providing access to care for

underserved populations. The majority of EFDA's licensed in Maine practice in Penobscot County, which is not a designated provider shortage area.

Currently, nearly 40 states allow some form of direct access to dental hygienists, but this does not necessarily apply to other oral health workforce models.²⁷ While licensed hygienists in Maine may provide direct access if licensed as an independent practice dental hygienist or have public health supervision authority; they are not permitted to perform EFDA delegable duties without the direct supervision of a dentist employer. Direct access has been shown to improve access to care and reduce oral health disparities where it is available.²⁷⁻²⁸ However, there are several limitations to EFDA duties related to providing direct access to care. EFDA practitioners may only perform reversible procedures, and require a dentist for restorative tooth preparation before placing the amalgam or composite restoration.

Adjustments to the EFDA scope of practice to allow for direct access to preventive procedures including pediatric prophylaxis and sealants could potentially expand access to care. Several states allowing for direct access to dental hygiene care require additional education and practice beyond the entry level to ensure competent practitioners with a wider base of knowledge for less supervised practice. Requirements for direct access procedures in Oregon include 500 hours of clinical practice in a community setting during dental hygiene education, or an additional 2,500 hours of clinical practice if already licensed for the Expanded Practice Permit.²⁹ Additionally, 12 hours of continuing education is required in addition to the hours required for dental hygiene licensure per renewal cycle.²⁹

The state of Maine has both preparatory education and additional continuing education requirements for EFDA licensure. Practitioners interested in becoming an EFDA must complete a formal education program approved by the Maine Board of Dental Practice, and complete a total of 50 hours of continuing education during each five-year renewal cycle.²² Respondents from this study indicated an average of 35% of the total number of continuing education courses per renewal cycle were directly related to EFDA practice. This finding is concerning as the content of continuing education coursework is a critical for licensure and maintaining competency. The Commission on Dental Accreditation requires that dental hygiene educators routinely complete continuing education in their course content areas to remain current and competent.³⁰ Continuing education requirements for EFDA's should also be reflective of their range of duties.

A number of EFDA/CDA respondents (21%) indicated a desire to learn to administer local anesthesia and nitrous oxide and oxygen sedation in order to improve their impact on the access to care. The scope of practice for such functions would require significant increases in basic preparatory education and continuing education content for CDA/EFDA's as well as for licensed dental hygienists not holding a local anesthesia permit. This presents a significant challenge to increasing delegable duties as the majority of respondents were EFDA/CDAs with limited formal educational background. Certification by the Dental Assisting National Board indicates minimum, entry level competency, there are no formal education requirements to become a CDA, or to be a dental assistant in Maine. In addition, Maine does not recognize dental assistants in the practice act unless they have earned the EFDA credential.

There were limitations to this study including self-reporting bias inherent in survey research. Another limitation was that respondents were not asked to indicate whether the EFDA procedure was performed on a pediatric versus an adult patient. Additionally, respondents were not asked to indicate what percentage the EFDA delegable duties comprised with respect to the overall practice. Finally, the response rate (59%) was not indicative of all EFDA's licensed in Maine.

Conclusion

Consistent and regular assessments of alternative dental workforce models intended to decrease disparities in access to oral health care are needed to determine the impact of these models and improvement areas. EFDA practitioners in Maine routinely provide restorative and preventive care. However, the majority of EFDA's practice in locations not identified as provider shortage areas, and may not be providing access to care for the intended populations. Consideration should be given to the existing barriers including direct supervision requirements when implementing alternative workforce models intended to increase access to care. Future studies should focus on the specific patient populations of EFDA providers, assessments of patients' perceptions of access to EFDA services and the care provided.

Acknowledgements

This project received funding from a University of Maine at Augusta Presidential Research Grant.

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Research

Patients' Perspective Regarding the Administration of Local Anesthesia by Dental Hygienists

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Abstract

Purpose: Local anesthetics have been used in dentistry to aid patients in pain control during a wide range of surgical and non-surgical procedures. The purpose of this study was to explore the perspectives of patients regarding the administration of local anesthesia (LA) by dental hygienists.

Methods: This qualitative study used an exploratory, online, focus group design. Four online focus groups were held with 18 participants recruited through purposive sampling. Pseudonyms were used to protect participants' confidentiality. A questioning route was established for the groups and validated by focus group experts and pilot testing procedures. Each focus group session was recorded and transcribed. Themes were analyzed using classic analysis strategy. Validity was established using investigator triangulation, saturation and member checks.

Results: Three major themes were identified regarding the administration of local anesthesia by dental hygienists. The first theme identified was the patients' experience and the value participants placed on patient-centered care. The second theme was the participants' unclear perceptions regarding the dental hygienists' educational qualifications to administer LA and complete a dental hygiene diagnosis. The third theme revealed future suggestions for dentists and legislators from the participants.

Conclusion: This qualitative study offers insight into the patient's perspective of dental hygienists administering LA. Participants supported dental hygienists administering LA and appreciated the aspects of patient-centered care that this practice provided. Patient participants were unclear on educational requirements and training, but supported legislation allowing dental hygienists to administer LA.

Keywords: local anesthesia, pain control, delegation skills, dental hygienists, patient centered care

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

Submitted for publication: 3/14/19; accepted: 6/24/19

Introduction

Local anesthetics have been used in dentistry to aid patients in pain control during non-surgical periodontal therapy (NSPT), restorative care, surgical care, and cosmetic therapy. Washington became the first state in which dental hygienists were licensed in 1971 to administer local anesthesia (LA).¹ Forty-five states have added this pain control procedure to the dental hygiene scope of practice over the past 48 years. Currently, Texas, Delaware, Mississippi, Georgia, and North Carolina do not allow dental hygienists to administer LA.¹ Dental hygienists continue to lobby to add this duty to every state practice act and in addition to expanding the scope of practice to administer LA under less restrictive supervision levels.

Local anesthesia supervision laws for dental hygienists vary, with a few states requiring no supervision, while other states require direct supervision indicating that the supervising dentist must be physically present for the procedure.¹ Dental hygienists persist in advocating to change supervision levels for the administration of LA. Relaxing the supervision requirements would allow dental hygienists to practice in unsupervised settings that could increase patients' access to care. All oral health care professionals licensed to deliver LA (dental hygienists, mid-level providers, and dentists) are educated in its related theory and practice as part of an accredited educational curriculum, or in an approved LA education course as part of the licensure process.^{2,3}

However, while all states consider dentists to be competent as part of their educational curriculum, LA laws and statutes vary widely for dental hygienists. Half of the states require successful completion of a licensure examination that includes LA administration while the other half consider the completion of the LA coursework as evidence of mastery of the skill.¹⁻⁵

The safe administration of LA by dental hygienists has been consistently documented over the past 40 years.⁶⁻¹⁰ Even when a complication occurs, such as shock, burning, hematoma, syncope, or tachycardia, it is usually mild in nature, and temporary. Many of these types of complications are avoided by adhering to safe practices and utilizing the standard emergency protocols taught in professional curricula and continuing education courses.^{6,8,11,12}

When considering scope of practice issues regarding the administration of LA, it is important to explore the perspectives of all stakeholders. Perspectives of dental hygienists and dentists have been reported in the literature, however little is known of the patient's perspective. Researchers have found that dentists utilizing a dental hygienist to administer LA believed patients were more satisfied and comfortable during NSPT, and both the dentists' and dental hygienists' schedules ran more smoothly.^{13,14} Dental hygienists also reported that they were more efficient, thorough, and could provide a more comfortable experience for patients during NSPT.¹³⁻¹⁶

Patients' needs, concerns, comfort, and safety are a key to providing comprehensive, efficacious care. Optimal care influenced by the patient's opinions and values, is considered to be patient-centered.¹⁷⁻¹⁹ The Commission on Dental Accreditation (CODA) further clarifies patient-centered care as considering the patient's preferences, social, economic, emotional, physical and cognitive circumstances when determining appropriate treatment.² Walji et al. indicated person-centered care involves making dental patients equal partners when determining treatment and viewing patients as experts in their personal decisions. Health care providers and patient can agree on a treatment plan for the best outcome for the individual patient.¹⁷ The purpose of this study was to understand the patients' perspective regarding the administration of LA by dental hygienists.

Methods

Institutional Board Approval was received from the Human Subjects Committee, Idaho State University, for this qualitative, exploratory design study (IRB-FY2019-68). Exploratory design is used when there are few or no earlier studies to predict an outcome²⁰ as was the case regarding

patients' perspectives on the administration of LA by dental hygienists. Patient perspectives were explored through a series of online focus groups as a means to understand why these opinions were held, while allowing for follow up questions as necessary.²¹ The qualitative information gained can be used to guide policy development and ensure consumer satisfaction.²²

Patients over the age of 18, who had experienced a dental hygienist administering local anesthesia for NSPT within the last two years, were recruited for this study. Exclusion criteria included anyone who had worked in a dental setting or who had immediate family members employed in a dental setting. Additionally, the LA may not have been administered in an educational facility.

Focus groups usually consist of five to eight people with a common trait.²² This size is considered to be significant to ensure the group is small enough so all participants can be heard, but large enough that a variety of perspectives are collected. In this study, a purposeful sample of 20 patient candidates were recruited through social media and personal networking; relying on both a gift motivation (a \$30 gift card) and recommendations by others (dental hygienists) to participate. Once the potential sample population was identified, participants were given a pre-screening form to determine whether they met the inclusion criteria. Participants were given a written informed consent to sign. Pseudonyms were used to protect participant confidentiality.

An online video conferencing platform, Zoom (San Jose, CA), was used for the focus groups. Each focus group lasted 40 – 45 minutes and had a specific set of interview questions designed to evoke conversation and address the research questions. Saturation was considered complete when the range of ideas had been discussed and no new information was gained.²³ The questioning route included five elements: an opening question, introductory questions, transition questions, key questions, and an ending question;²² and was validated by two focus group experts.

The primary investigator (PI) moderated each focus group to keep the discussion on track, draw out quieter members of the group and limit dominant talkers. In order to limit PI bias, a bracketing interview was conducted. The following research questions were used to guide the focus group discussions:

- What do patients perceive as the benefits and disadvantages of dental hygienists administering LA?
- Do patients perceive a difference between dentists and dental hygienists administering LA?
- What are patients' understanding regarding the educational preparation of dentists and dental hygienists to be able to administer LA?

The interview questions were pilot tested and recorded with three individuals who fit the focus group profile, along with an experienced moderator to offer recommendations.²³ The pilot test verified participants understood the questions, and the secondary facilitator confirmed the questioning route was followed closely to ensure biases were not introduced. At the conclusion of each focus group, an ending question was asked to help identify key concepts from the discussion that the participants felt were important.²²

Each focus group session was recorded and saved. Access to the recording and transcription was limited to the PI, co-investigators, and a professional transcriptionist who prepared the transcript. The PI and co-investigators systematically studied the transcripts using the classic analysis strategy of placing statements of participants into categories under each question answered to identify themes.^{22,23} Themes were recognized based on frequency (how often something is said), specificity (statements that provide detail), emotion (when a participant uses passion or intensity), and extensiveness (many different people saying the same thing).²²

Validity was established through investigator triangulation with two or more investigators independently analyzing the data separately and obtaining similar results.^{22,23} The PI and two co-investigators analyzed the data independently and shared the findings with all researchers to determine common themes found. Saturation was reached when new focus groups did not add new information or repeated themes from previous sessions. Validity was also established with member checks within the groups by sharing themes discovered with the participants to determine agreement; considered to be a best practice in controlling personal biases and ensuring researchers understand what has been said.²³

Results

A total of 20 participants joined the focus groups. However, after one of the groups began, two participants left the session due to poor Internet connection and personal issues requiring immediate attention (n=18). Participant were from seven states including Wyoming, Indiana, Ohio, Alaska, Florida, Utah and Idaho, and consisted of 10 females and 8 males, with the majority being between the ages of 30-50 years (n=9). Demographics were dispersed across the focus groups providing a balance of geographic location, gender and age (Table I).

Three major themes along with subthemes in each category were identified regarding dental hygienists administering local anesthesia through the focus group sessions (Figure 1.) Participant quotes supporting the themes are shown in Table II.

Theme 1. Patient experiences

The overwhelming subtheme of patients' experiences was the value participants placed on their time. Patients appreciated the time saved when

their dental hygienist administered the LA; a subtheme mentioned 31 times in response to several different questions. One participant stated, "I work long hours, so I feel like my time's valuable and I like the fact that they get you in (and out quickly)." Several others mentioned the inconvenience of waiting for the dentist to administer the LA; "you don't have to wait for the dentist to finish with another patient and then come to you and then perform the same thing that the dental hygienist could do." Others elaborated by indicating that when the dental hygienist administers LA it saves the dentist time, freeing the dentist to perform other tasks only they can do.

Many participants mentioned they would prefer their dental hygienist administer the LA because of the trust, rapport, and comfort level they felt. Several participants mentioned rapport was built by the amount of time they spent with their dental hygienist, and others commented on the outgoing personalities of their dental hygienist. Focus group participants frequently expressed the LA experience was less stressful and more calming when administered by the dental hygienist than the dentist. Some participants attributed this to a general anxiety of being around dentists, while others commented on how they felt more at ease because of the relationships developed with their dental hygienist. One participant noted, "The disadvantage of (having) the dentist (give the injection) is the whole stigma of people feeling that anxiety when they see a doctor." Another indicated, "I was probably a little bit more relaxed. It felt more of a casual experience because I deal with her more often than my dentist."

A final subtheme was the majority of participants' felt their dental hygienist provided a more comfortable LA administration technique than

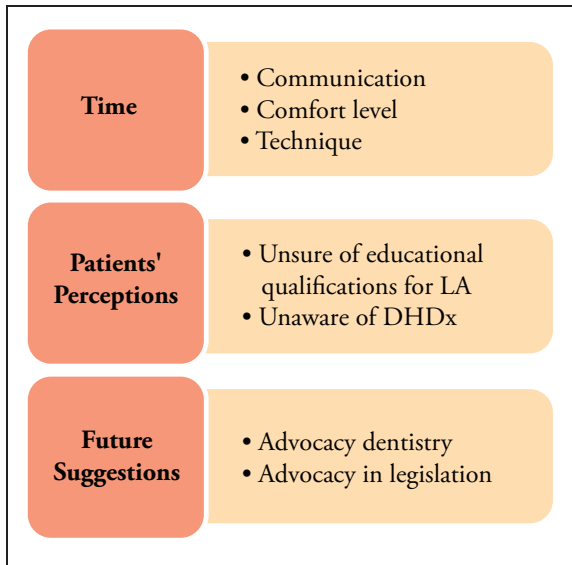
Table I. Focus group demographics (n=18)

Characteristic	n (%)
Gender	
Female	10 (56%)
Male	8 (44%)
Age	
18-30	2 (11%)
30-50	9 (50%)
50+	7 (39%)
Location of Participant	
Idaho	6 (33%)
Utah	4 (22 %)
Ohio	2 (11%)
Alaska	2 (11%)
Florida	2 (11%)
Wyoming	1 (6%)
Indiana	1 (6%)

Table II. Questioning route with selected responses

Focus Group Question	Selected Responses	Focus Group Question	Selected Responses
Share any differences you have noticed between the injections given to you by the dental hygienist and dentist?	<p>“I actually noticed that my hygienist was a little more gentle with me...I have noticed that the dentist is a little more rushed when giving me injection.”</p> <p>“The hygienist gave the injections. It’s a very similar technique as what the dentist used being very patient and I didn’t feel hardly anything.”</p>	If your dentist were not utilizing a dental hygienist to give injections, what would you say to him or her?	<p>“That they’re wasting that person’s education essentially and they’re putting more on their plate that they don’t need.”</p> <p>“...having had it done this way now and seeing the speed of service and the improved rapport, it definitely is something that I would look for when I went somewhere else.”</p> <p>“Typically, I’m trying to squeeze everything in on a tight schedule, so I’d probably just voice something to see if I can get a hygienist to help out, versus waiting for the dentist.”</p>
What benefits have you noticed by having the dental hygienist provide the injection for you?	<p>“...you don’t have to wait for the dentist to finish with another patient and then come to you and then perform the same thing that the dental hygienist could do.”</p> <p>“I definitely felt more comfortable with the hygienist.”</p> <p>“The hygienist is right there. She gets doing the deep cleaning and you find a sensitive area, she can give you another injection.”</p>	Dental hygienists are unable to administer local anesthesia and practitioners in five states, and they are trying to pass legislation to allow this practice. If you were talking to a legislator in these states, what would you say?	<p>“I would just say from my own experience, I haven’t found there to be any negatives to allowing dental hygienists to perform injections. And in fact for me it has been a more positive experience overall and I feel competent in their training and abilities.”</p> <p>“...allow them to do it because when I’m with the dentist, I don’t want the dentist rushed to be giving injections to somebody else. I would rather him be focused on my needs at that time where the hygienist is qualified to give those injections where he doesn’t need to leave and come back.”</p> <p>“I would just say that the states that are not allowing this at this time are behind on the times. Whereas this is the norm for most states that allow the hygienists to give these injections and it does make the patient feel more comfortable in the dentist office.”</p>
Are there any disadvantages to having the hygienist give the injection?	<p>“Maybe she wouldn’t spot a problem immediately like a dentist would while she’s cleaning or something.”</p>		
What benefits have you noticed by having the dentist provide the injection for you?	<p>“I don’t see any advantage with the dentist doing it over the hygienist.”</p>		
Are there any disadvantages to having the dentist give the injection?	<p>“Your hygienist is basically there through the whole procedure where the dentist, he’s got multiple patients so you feel like he’s being rushed, where your hygienist isn’t.”</p>	What else would you like the researcher to know about this topic?	<p>“...if they’re (hygienists) qualified to do the injections and everything, they should be allowed to do it. They shouldn’t have their skills hindered.”</p> <p>“You don’t just keep doing things the way we’ve always done them, because we’ve always done it that way, so if things are changing, it seems odd that five states aren’t doing it. If the history is shown and people are saying that it works just as good, it’s more efficient, they’re just as good at doing it. As long as they’ve got the training, it just seems logical.”</p> <p>“I would be a very strong advocate...If they have any questions, go experience it for yourself. Have the dentist give him a shot or have the hygienist and make your own decisions.”</p> <p>“The only thing that I would add is, whenever I make an appointment to go to my dentist, I always make sure that the hygienist that I see is working. I won’t make an appointment with him if she’s not there that...She’ll be 90 percent of the reason why I continued to go to this dentist.”</p>
Tell me what kind of training you think dental hygienists and dentists have to be able to give LA?	<p>“Honestly don’t know the answer to that question.”</p>		
Do you think dental hygienists or dentists have more supervised clinical experiences with local anesthesia in an educational setting?	<p>“To me it seems like they should both require the same training, but just in my head it seems that by practice, I think dentists would receive more practice.”</p>		

Figure 1. Themes and subthemes



their dentist. When asked what differences were noticed between the dental hygienist and dentist administering LA, participants either stated that there was no difference, or they had a better experience with their dental hygienist. One participant explained, “The dental office I go to is very busy and I notice that the dentist is a little more rushed when giving me injections. I did notice that the dental hygienist took her time a little bit more and was gentler.” Others appreciated the way the dental hygienist explained the procedure thoroughly and that injections were slower and felt more comfortable and not rushed. Overall however, patients were satisfied with dentists administering LA; over one-third (39%) did not see any disadvantage to having the dentist give LA. The majority (61%) of those indicating a disadvantage were primarily concerned about the waiting time or feeling like the dentist was rushed.

Theme 2. Patients’ perceptions

Focus groups addressed two questions regarding the LA educational requirements and clinical supervision of dental hygienists and dentists. In general, it became apparent that patients do not understand educational qualifications required when learning to administer LA. Two participants believed that assistants were giving injections, and almost all began their answers with “I don’t know”, “I think”, or “I’m guessing” indicating generalized uncertainty. Two-thirds of the participants believed dental hygienists and dentists had similar

education and training while the remainder believed that dentists had more education and clinical training. One participant stated, “I think dentists would have more training. It’s their office and the buck probably stops with them.” Others believed the dental hygienist had more clinical training due to their relationship with their dentist employers; “I think that your hygienists have a little more clinical (training) because the dentists work with them until they work up to feeling comfortable to be able to do that.”

Overall, participants identified few disadvantages to having the dental hygienist administer LA. However, two individuals mentioned that it would be better to have the dentist administer the injection because they might find decay or infection stating that, “maybe she wouldn’t spot a problem immediately like a dentist would.” When asked to clarify what was intended by a problem, this participant gave the example of finding a cavity.

Theme 3. Future suggestions

Although the majority of participants indicated a preference in having their dental hygienist administer LA, two-thirds of participants were uncomfortable questioning their dentist if the dental hygienist was not administering the LA for NSPT. However, some participants believed they would actually say something to the dentist or even switch dentists if their dental hygienist was not administering the LA. Several participants indicated they would make comment to the dentist because they valued the time saved when the dental hygienist administered the LA. One participant stated, “He’s (the dentist is) wasting his or her time... and pretty much undermining his hygienist. There is no point in not letting someone do what they’re educated to do if it makes things easier.” Others stated they would make comment to the dentist because of the rapport they have with their dental hygienist, or their ability to ease their anxiety.

Focus group participants unanimously believed legislators should allow for changes in the practice acts for dental hygienists to administer LA. One participant summed it up by saying, “It has been a more positive experience overall and I feel confident in their training and abilities.” Another recognized the similarity of the extensive skills required to provide LA and NSPT and stated, “I would tell them (legislators) that what my hygienist normally does in my mouth is a lot more complicated than giving a shot, and if I don’t trust them to give a shot, then what am I doing letting her do my cleaning?” While yet another explained, “I think it’s total patient care. I think they should allow it (dental hygienists administering LA) because... the dentists are rushed. If they had the hygienist do some of the workload, then it would just be better patient care for everyone.”

Discussion

The Institute of Medicine defines patient-centered care as “providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical

decisions.²⁴ The dental profession promotes providing high quality, patient-centered care to achieve optimal treatment results.^{2,3} Previous studies from the perspective of dental hygienists indicates clinicians perceived patients were more comfortable, appreciated the time saved and appreciated dental hygienists' skills when they administered LA.^{13,14} Results of this study confirm that patients value the time saved, decreased pain, and continuity when dental hygienists administer LA, but also revealed the value placed on their relationships with dental hygienists. Moreover, study participants indicated feeling less anxious when receiving LA injections from the dental hygienist versus the dentist. Previous research by Weintraub found that patients not only expect to have their needs and desires included in decision making about their treatment, but they will comparison shop and leave dental practices that are not offering patient-centered care.¹⁸ This same mind-set was validated in the focus group discussions.

Malamed, has anecdotally stated that when dental hygienists administer LA, patients "frequently comment on the lack of discomfort when the hygienists injects the local anesthetic. Be it a slower rate of administration, more attention to details of atraumatic injection technique, or greater empathy, it works."⁸ Results from this study confirmed this statement when all focus group participants reported injections administered by dental hygienists provided a similar experience to those administered by a dentist; half of the participants stated having a more positive experience when the dental hygienist administered the LA. From participants stating that they had a better experience with the dental hygienist, it was learned that patients value not being rushed, a slower injection technique, and being talked through the experience. This correlates with research indicating that injections are more comfortable when administered slowly.^{4,5,8} Additionally, findings from the focus groups support previous research indicating that patients appreciate it when clinicians respect their needs, listen to their concerns, and explain procedures before performing.¹⁷⁻¹⁹

All state licensing agencies allowing dental hygienists to administer LA within their practice acts require the completion of an education course either as part of their accredited dental hygiene education program or through a board approved post-graduate LA course.¹ Teeters et al. found that dental hygienists in the state of California are considered to be adequately educated in LA administration and have more supervised LA clinical experiences than their dental student cohorts.²⁵ However, focus group participants in this study clearly had little knowledge of the educational requirements, or what was involved in for clinical training.

Dental hygienists are educated to perform a comprehensive examination and assessments including a dental hygiene diagnosis (DHDx).²⁶ While a majority of participants believed there were no disadvantages in regards to dental hygienist administering LA; two individuals felt that the dentist might see decay while giving injections. However, since dental hygienists spend considerable time in the oral cavity while performing NSPT and are also educated to make a DHDx, it would be more likely that the dental hygienist would identify a problem area ahead of the dentist. It is important for dental hygienists to educate patients on their education and training particularly in the area of general and oral health evaluation and assessments and the DHDx.

Implications for Dental Hygiene Practice

Results from this study indicate that patients do not understand the scope of practice for dental hygienists or the educational requirements. Dental hygienists should introduce themselves providing their title and explain the educational training and qualifications for administering injections and performing DHDx throughout the care appointment. Additionally, dental hygienists can reinforce the practice of patient-centered care during the administration of LA by forming relationships with patients, respecting their time, giving injections slowly, and listening to patients' needs and concerns.

Implications for Dentists

Results from this study, indicate a theme of appreciation when dentists utilize dental hygienists to administer LA. Dentists should consider utilizing dental hygienists to administer LA as a means to decrease patient wait time, and provide more time to perform tasks that are exclusive to their scope of practice. Dentists practicing in states prohibiting the administration of LA by dental hygienists should take consumers' desires into consideration and work towards offering more patient-centered care by responding to the principles valued by the consumers. Dentists may be more likely to support legislation to allow dental hygienists to administer LA if they are able to acknowledge the positive impact dental hygienists who administer LA can have on their practices.

Implications for Legislators

Results of this study identify values constituents have in regards to legislation of LA administration by dental hygienists. In states allowing dental hygienists to administer LA, focus group participants overwhelmingly supported the practice, and felt that dental hygienists are adequately trained to perform this procedure. Participants explained that their experiences of a dental hygienist administering LA was

equal to or more positive than that of their dentist and that they enjoyed the continuity of having the dental hygienist throughout the whole experience. In general, participants agreed that legislation needs to keep up with the majority of states that allow for LA administration practices that have been shown to be safe over time.¹⁰

Limitations of this study include the purposive sampling and qualitative technique used to gather data which limits generalizations to entire populations of patients. Qualitative techniques however, are not intended to generalize, but rather provide the ability to learn about in-depth perceptions and opinions, as well as trends and patterns which may not be represented through survey research.²³ Another possible limitation was the PI served as moderator for the focus groups, however steps were taken to control for moderator bias. Additional research might include the perspective of patients regarding supervision levels and unsupervised administration of LA in populations unable to access dental care. Future studies may also include perspectives of dentists and dental hygienists regarding the administration of LA.

Conclusion

This qualitative study offers insight into the patient's perspective of dental hygienists administering LA. Participants supported dental hygienists administering LA and appreciated the aspects of patient-centered care this practice provided. Patients were unclear regarding the educational requirements and training, but supported legislation allowing dental hygienists to administer LA.

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Research Poster Abstracts

The following posters were presented during the American Dental Hygienists' Association Annual Conference held in Louisville, Kentucky, June 20 – 23, 2019.

Oral Health of Long-term Care Residents

Brenda Armstrong, RDH, MS

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Problem: Data is lacking in Utah to demonstrate to stakeholders and legislators the dental need of long-term care residents. Residents of these facilities experience barriers to accessing and receiving oral health care including financial, the priorities of caregivers, reduced access to professional dental providers, and even resistance from the residents themselves.

Purpose: The purpose of this study was to conduct a surveillance of the oral health status of long-term care residents receiving oral health care. IRB approval was obtained from Dixie State University.

Methods: A cross-sectional surveillance study was designed to determine the oral health needs of residents in long-term care. The study consisted of a convenience sample (n = 218) from a potential of 300 residents who qualified and requested oral health care through the grant. Recommended oral health indicators from the Association of State and Territory Dental Directors were utilized to collect the residents' oral health data and assessment of patient reported needs. Descriptive statistics were utilized to describe the findings. For consistency in data collection, all dental professionals involved in the project were trained and calibrated through an online training module.

Results: During the year of 2018, a total of 218 residents living in 13 certified nursing homes participated in the surveillance. 128 were females and 90 were males. The average age of the resident was 66.9 years with the youngest resident 25 years-of-age and the oldest resident 99 years-of-age. 98% of the sample reported an annual income of less than \$20,000. Among the residents examined, 31% reported it had been more than 2 years since their last dental visit, 26% reported sensitive teeth, and 47% reported current dental pain or discomfort. Dental indicators included 44% with substantial oral debris, 34% with severe gingival inflammation, 52% with untreated tooth decay, 29% with root fragments, and 72% were in need of periodontal care.

Conclusion: This study demonstrates oral health needs for long-term care residents living along the Wasatch Front in Utah. Providing access to professional oral health providers and curbing barriers to care must be addressed for a population that has limited resources and mobility to seek care. Collaborative practice dental hygienists with direct Medicaid reimbursement could be an avenue to deliver preventive care needed for this vulnerable population. Residents participating in the surveillance were provided dental hygiene and restorative services. Funding furnished by a grant from Civil Money Penalty Funds.

Re-evaluation Outcomes Following Nonsurgical Periodontal Therapy: A retrospective analysis

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Idaho State University, Pocatello, ID

Problem: Literature showing the integration of reevaluation procedures and stabilization phases of nonsurgical periodontal therapy (NSPT) is scarce. Reevaluation is considered a critical step following NSPT to determine patient response to treatment, but is often an overlooked aspect of individualized care. Research indicates therapeutic endpoints should be used as guidelines to determine control of disease activity, prognosis, recare intervals, and associated referrals.

Purpose: The purpose of this retrospective record review was to evaluate clinical outcomes measured at initial assessment and at reevaluation following NSPT. Specifically, the aim was to assess bleeding on probing (BOP) and clinical attachment levels (CAL) following NSPT as a means to direct prospective studies that may further define therapeutic outcomes and reevaluation procedures that enhance supportive periodontal care.

Methods: A secondary analysis of electronic dental records was conducted for patients who received NSPT followed by reevaluation at a university dental hygiene clinic from January through December 2018. For inclusion in the study, records specified a minimum of one quadrant of NSPT (indicated by CDT codes D4341/D4342) and post-therapy reevaluation.

Clinical outcomes were evaluated using frequency distributions and univariate analysis to identify changes in BOP and CAL at baseline assessment and again at reevaluation four to eight weeks post-therapy.

Results: A retrospective cohort of patient records were selected using student data from documented reevaluation appointments. From identified records (N=105), 61% (n=64) met inclusion criteria. Demographic data indicated 66% of patients were male (n=42), with 69% age 60 or younger (n=44). The majority of clinical reevaluations occurred at four weeks following NSPT (n=26; 41%). The majority of patients did not report smoking (n=57; 89%) or diabetes (n=55; 86%). Overall, results from pre and post treatment showed a 53% reduction in bleeding sites (N=2204; n=1031). A combined 60% of sites with 4-5mm CAL (N=2230; n=1840) and 6+mm CAL (N=633; n=387) showed a decrease in CAL. Sites with 1-3mm CAL showed a 17% increase (N=5293; n=6185) from pre and post treatment.

Conclusion: Consistent with the literature, findings indicate reductions in bleeding and CAL following NSPT. Due to limitations of the records review process, there was no means to assure calibration for recording CAL. Increases in 1-3mm CAL at reevaluation may be attributed to the reductions in 4-5mm and 6+mm CAL resulting in transition to the 1-3mm CAL range. Findings suggest integrating formalized reevaluation is an integral phase of NSPT. Further clinical research regarding reevaluation procedures, data collection methods, and clinical and therapeutic outcomes are needed.

Dental Hygiene and Nursing Students' Perceptions of the Significance of an Interprofessional Collaboration Experience

W. Gail Barnes, RDH, PhD

Sharon Jones, DNP, MSN, RN

Clayton State University, Morrow, GA

Problem: The benefits of interprofessional collaboration include improved patient-centered outcomes, fewer preventable errors, improved relationships with other disciplines, and reduced healthcare costs, for not only nurses, but also for other healthcare professionals and ultimately, the consumers.

Purpose: The purpose of this program was to ascertain the dental hygiene and nursing students' perceptions of the significance of interprofessional collaboration (IPC). The data from this program will be used to make any necessary revisions for future IPC experiences with other College of Health programs and/or university departments.

Methods: The IPC experience of the Clayton State University dental hygiene program occurred during the 2018 fall semester when the undergraduate nursing students visited the dental hygiene clinic to instruct the dental hygiene students on taking patients' vitals (blood pressure, pulse, respiration and temperature). This IPC experience occurred on a Tuesday with 13 dental hygiene students and 11 nursing students and again on the following Thursday with 14 dental hygiene students and 5 nursing students. Due to scheduling limitations, the dental hygiene students were unable to provide oral healthcare instructions for the nursing students.

A 16 item closed-ended questionnaire was developed and pilot tested by two faculty. IRB approval was not necessary as this was an educational experience (descriptive education IPC). After each IPC experience, the questionnaire was distributed to dental hygiene and nursing students and faculty. Based on the responses received by the convenience sample, the data will be used to prepare for future IPC experiences with other programs in the College of Health and/or across the campus.

Results: When asked if they thought IPC "contributes to integrating dental hygiene and nursing into the interprofessional care team", the response "agree/strongly agree" was 90.6% and 81.3% respectively. In regard to IPC "improving patient care for dental hygiene patients", 90.4% of the students indicated "agreed/strongly agree". However, in reference to IPC "improving patient care for nursing patients", only 60.5% indicated "agree/strongly agree". Finally, the responses for IPC "will improve the profile of dental hygiene as a member of the health care team" 95% of the responses indicated "agree/strongly agree".

Conclusion: During informal conversations, at the conclusion of the IPC experiences, students from both College of Health programs expressed their pleasure in participating in the IPC experience and felt it was a mutually professional learning experience. However, to better evaluate the process, this pilot program should be replicated because the dental hygiene students did not have time to teach oral health care to the nursing students.

Dental Hygiene Students' Preferences of Ultrasonic Instruments

Wanda Cloet, RDH, MS, DHSc

Central Community College, Hastings, NB

Problem: Previous research shows magnetostrictive ultrasonic instrumentation is widely used in dental hygiene education and is more prevalent than the piezoelectric ultrasonic instrumentation. However, there is no research study that shows dental hygiene students' preferences of ultrasonic instrumentation when presented with both options to use magnetostrictive and piezoelectric for treatment following didactic and clinical education.

Purpose: The objective of this study was to evaluate dental hygiene students' preferences of ultrasonic scaling instruments to include magnetostrictive or piezoelectric following didactic and clinical education.

Methods: A convenience sample of second year dental hygiene students from Central Community College (n=14) was used for the study. Both the magnetostrictive and piezoelectric ultrasonic instrumentation are taught in the dental hygiene curriculum didactically and clinically. In addition, students purchase both ultrasonic units. A cohort study collected data from August 2017 to December 2017 from the course, DENH 2250 Clinical Dental Hygiene II, which is taught the first semester of the second year of the curriculum. The total number of patients (n=1,022) were treated by the fourteen second year dental hygiene students. A clinical electronic evaluation form allowed clinical faculty to "click" on the electronic form if ultrasonic instrumentation was used as well as the type of ultrasonic instrumentation

Results: Descriptive statistics indicated of the total number of patients (n=1,022), an ultrasonic instrument was used 4.98% (n=205) following didactic and clinical instruction in the dental hygiene curriculum. The magnetostrictive ultrasonic was used 51% (n=105) and the piezoelectric ultrasonic was used 48.8% (n=100) in the cohort study.

Conclusion: Results indicate that dental hygiene students have no preferences between the magnetostrictive and piezoelectric ultrasonic instruments.

The Advanced Dental Hygiene Practitioner: An Exploration of the Patient Perspective of a Mid-level Dental Provider.

Deborah Dotson, RDH, PhD

East Tennessee State University, Johnson City, TN

Problem: Although Advanced Dental Hygiene Practitioners (ADHPs) are adequately educated and possess the skills to provide competent care, they cannot improve access to care unless patients are willing to take advantage of their services. The significance of this study is to provide information about the willingness among two diverse groups to receive services provided by an ADHP.

Purpose: The purpose of this study was to examine patient attitudes and opinions regarding the utilization of an ADHP.

Methods: This quantitative, non-experimental, cross-sectional study employed a descriptive group-comparison design by analyzing the differences between those with and without access to dental care and evaluated differences among respondents based upon their socioeconomic and demographic attributes. Convenience sampling was used to select participants. Data were collected from patients treated at an upscale family and cosmetic dental practice (n=40) in a large metropolitan area and at an inner-city safety net clinic (n=40) using a 17-item questionnaire. Differences between the two groups were evaluated based on their socioeconomic and demographic attributes. Independent samples *t*-tests, one-way ANOVA tests, and Chi-Square tests were used to analyze the data at a confidence interval of 95% ($\alpha=.05$). IRB approval was obtained through East Tennessee State University, approval number c0815.6e.

Results: An independent samples *t*-test determined no significant differences in perceptions regarding responsibilities and skills of an ADHP between genders ($p=0.219$ to 0.956). One-way ANOVA tests determined no significant difference in perceptions based upon each of the following: ethnicity ($p=0.239$ to 0.820), education level ($p=0.054$ to 0.612), and income level ($p=0.140$ to 0.658). No significant differences were found between patients with access to dental care and those without when asked if they would be willing to receive restorative care from an ADHP based on an independent samples *t*-test ($p=.307$). Further, a Chi Squared value was computed from a cross tabulation analysis of these two variables (overall willingness to receive care and willingness to receive restorative care) and no significant difference was found ($p=.643$). Despite diverse demographics, the data indicated overall positive support of the ADHP. Nearly 95

percent (94.9%) of the respondents indicated they would be willing to receive care from an ADHP if legislation permitted.

Conclusion: This research demonstrates a high level of support among potential patients from two diverse samples adding greater confidence in the future expansion and application of this role and its ability to impact the lives of those in need.

Dental Hygiene Program Directors' Knowledge and Implementation of Objective Structured Clinical Examination (OSCE) Testing

Iwonka Eagle, RDH, MS

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Problem: The Objective Structured Clinical Examination (OSCE) is universally recognized as the gold standard for the evaluation of clinical competence, often serving as a substitute for live patient examinations (LPE). Due to its proven reliability, the American Dental Association Board of Trustees voted to develop and adopt the Dental Licensure Objective Structured Clinical Examination (DLOSCE) in 2017, to replace LPE for dental licensure.

While the utilization of OSCE has been widely recognized in dental schools for nearly three-decades, there is a significant gap in literature specifically regarding the use of OSCE in dental hygiene programs. Additionally, little is known about the potential impact the DLOSCE might have on dental hygiene licensure examinations.

Purpose: The objectives of this study were to assess dental hygiene program directors' awareness of and attitudes about a DLOSCE, whether their curricula included OSCE assessments, and perceived barriers to utilizing OSCE assessments.

Methods: A cross-sectional study of 332 United States dental hygiene program directors obtained from the American Dental Hygienists' Association (ADHA) Entry-Level Dental Hygiene Program Directory was conducted. A 20-question, electronic survey was developed, analyzed by the University of Michigan Survey Research Center, and pilot tested. Descriptive statistics and chi square tests were employed to provide data. Significance was set at $p < 0.05$. The study was determined exempt by the UM Institutional Review Board (HUM00147564).

Results: A response rate of 36% ($n=121$) was achieved. Nearly 30% of respondents were unaware of the Task Force on Assessment of Readiness to Practice recommendations to develop an alternative to the single-encounter, live patient licensure exam; 80% were in favor of the decision. Nearly 75% considered OSCE assessments to be valid and reliable methods

to assess clinical competence. More than half of respondents reported not currently utilizing OSCE assessments in their curricula. Time (22%), perceived lack of best practices (21%), and lack of resources (18%) were reported as significant barriers. Program directors who currently implemented OSCEs in their curricula were more likely to agree that OSCEs were both valid and reliable assessments ($p=0.05$).

Conclusion: The majority of Dental Hygiene program directors were in favor of eliminating the single-encounter, live patient examination in favor of an OSCE. However, more than half do not currently utilize OSCEs. Further studies should explore implementation of OSCEs in dental hygiene education, and how the DLOSCE might impact the current educational curricula and licensure of dental hygienists in the United States.

New York State Dental Hygienist Perceptions of an Interdisciplinary Model of Care for Patients with Diabetes who have Periodontal Disease

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Problem: Dental hygienists (DHs) are well-positioned to work collaboratively with other healthcare providers in the early detection of diabetes, however, DHs' perception of their role working in the interdisciplinary model of care (IDMC) is not well-documented.

Purpose: The purpose of this study was to examine how New York State (NYS) DHs perceive their role in an IDMC. This study focused on how NYS DHs perceive the relationship between periodontal disease and overall health of patients with diabetes. In addition, this study explored NYS DHs' perception of including a diabetes risk assessment (DRA) in their dental hygiene process of care (DHPC).

Methods: Two instruments were used to collect data in this mixed-methods study. Quantitative data were collected through an anonymous 21-item original survey consisting of a 5-point Likert-type scale and demographic questions. Invitations were distributed via email to a cluster sample of 750 dental hygienist members of the New York Dental Hygienists' Association (NYDHA) LISTSERV. The Shapiro-Wilk test indicated the sample was not normally distributed; therefore, non-parametric tests were used. A Kruskal-Wallis test was used to measure the association between perception and the independent variables: age, years of experience, and primary practice settings. A Mann Whitney test was used to measure perception and the variable: including a DRA

with regard to personal experience with diabetes. Qualitative data were collected through face-to-face interviews using a convenience sample of three DH colleagues. All interviews were audio-recorded and transcribed. An inductive approach was used to code data and inform theme development.

Results: A total of 153 DHs completed the survey, a response rate of 19.6%. No statistically significant difference was found between age of DHs ($p=0.115$), number of years practicing as a DH ($p=0.077$), or a close relationship with someone with diabetes ($p=0.794$) and perceptions toward an IDMC for patients with diabetes. No statistically significant difference ($p=0.179$) was found between type of work setting and inclusion of a DRA as part of the patient assessment protocol. Analysis of the three face-to-face interviews revealed the following themes and sub themes: knowledge, roles (educator), and IDMC (support, qualities, and barriers).

Conclusion: Quantitative results were not statistically significant. However, qualitative results revealed DHs perceive their role as an educational resource for patients regarding the bidirectional relationship between periodontitis and diabetes. Given the positive views expressed by participants in this study toward an IDMC, it is likely DHs would include a DRA in their DHPC, given the time and support from their dentist-employer.

Implementing Inter-Professional Education: Dental Hygiene and Physician Assistant Activity

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Problem: Current Commission on Dental Accreditation (CODA) standards for dental hygiene graduates include emphasis on the ability to communicate and collaborate with other health care team members in the provision of safe and effective oral health services.

Purpose: This project was designed to assess the knowledge of dental hygiene (DH) and physician assistant (PA) students about one another's professions, education and training and to improve the students' knowledge in oral pathology and the head-and-neck (intra- and extra-oral) portion of a physical exam.

Methods: Pre- and post-activity surveys of Likert-type scale questions were administered to the participants using Survey Monkey® to determine changes in their knowledge of the opposite profession and confidence in performing examinations. On the day of the activity, faculty from both disciplines presented an overview of their professions

and shared information on systemic conditions with oral manifestations. Students were randomly assigned to groups which included both PA and DH students. The groups were given 2 case patient simulations to role play. The cases included both medical history information and physical signs. After completing the patient history and demonstrating their discipline's method of patient head-and-neck examination, the students were instructed to determine differential diagnoses for each case.

Results: The review of survey results was limited to the participants who completed both pre-and post-activity surveys (19 of 28 DH and 38 of 41 PA). Comparison of the surveys revealed an increase in knowledge about both professions' education and training. Additionally, each group reported increased confidence in engaging the opposite profession in the management of patients. PA students reported an increase in confidence in exam techniques when evaluating the oropharynx. DH student results, however, showed no change in this area. Both groups reported an increase in identifying the lesions commonly found in HIV positive patients. In the pre-activity survey, only 50% of PA students agreed with the question "I know when and who to refer my patients to when faced with different oral pathology." Post activity, 100% of these students reported they agreed/strongly agreed with this statement.

Conclusion: This activity showed inter-professional activities are an effective means of educating health care students about others' professions and roles in the health care team. IPE activities can be utilized to enhance student learning in common subject areas and to facilitate communication and collaboration between various professional disciplines.

Do Licensed Dental Hygienists Routinely Take Blood Pressure on Patients?

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Problem: In the United States over 103 million people have high blood (BP) pressure. The high prevalence of the disease among the American population is concerning and must be considered when treating dental patients. Dental practitioners can often be on the frontlines of prevention of hypertension by evaluating preoperative blood pressure readings, performing risk assessments, and knowing when to consider medical consultation of a hypertensive patient in a dental setting. Patients see their dental professional more frequently than their medical professional. Routine blood pressure screening in the dental practice could help identify patients at risk for

stroke and coronary artery disease.

Purpose: The purpose of this study was to assess the knowledge and practices of licensed dental hygienists in performing routine blood pressures (BP) screenings and pre/post BP when administering local anesthesia on their patients.

Methods: This cross-sectional study utilized a purposive sample of dental hygienists recruited through social media sites and RDH's attending the Massachusetts (MA) Dental Hygienists' Association Annual Conference (6772 RDH's in MA). The validated survey included 9 quantitative questions and 2 open-ended questions related to blood pressure practices and 7 demographic questions was electronically distributed through QualtricsXM™. Inferential statistics, using the Chi-square, were utilized for data analysis. Descriptive statistics were used for demographic questions. IRB approval, non-exempt status, was granted from MCPHS University.

Results: Of the 344 participants who completed the survey, 53.3% (n=187) of the participants reported routinely taking BP while 48.7% (n=158) do not. Statistical significance, with a high correlation, ($\chi^2(1, 264)=95.49, p<.001, \phi=.60$), was shown when comparing taking routine BP and taking preoperative BP when administering local anesthesia. Statistical significance, with a moderate correlation, ($\chi^2(1, 263)=22.92, p<.001, \phi=.30$) was shown on the following three criteria, when comparing taking a preoperative BP when administering local anesthesia and taking a postoperative BP when administering local anesthesia; the dentist taking BP at every visit and taking a preoperative BP when administering local anesthesia; and the relationship between the number of hygienists taking and not taking blood pressure with those that are or are not aware of the new blood pressure guidelines. Qualitatively, the two most common response for not taking BP were the dentist did not require it and not enough time.

Conclusion: Educational opportunities emphasizing the importance of routinely taking blood pressure and increasing dentist's awareness of the importance of routine BP could result in RDH's performing BP screenings more routinely.

Oral Health Education and Promotion Activities in Early Head Start: A systematic review

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Problem: Early head start (EHS) programs offer complete child development services and support to low-income children <3 years and their families. The promotion of healthy oral hygiene habits for children and their families is critical

during this time. Therefore, EHS programs should utilize oral health standards provided by the U.S. Department of Health and Human Services, Office of Head Start to promote oral health education and activities. Documentation in the literature of oral health education and promotion activities within EHS programs are scarce. Therefore, a systematic review was used to answer the question of, "What are the oral health education and promotion activities performed in EHS programs for staff, children, and caregivers?"

Purpose: The purpose of this study was to investigate oral health education and promotion activities performed in EHS programs for staff, children, and caregivers in the U.S.

Methods: A systematic review approach utilizing relevant databases such as CINAHL, PubMed, and Google Scholar with key terms: oral health, education, promotion, activities, early head start, and early childhood caries was performed. Inclusion criteria was peer-reviewed quantitative studies related to EHS oral health education and promotion activities from 2000 to 2018. Studies were assessed for eligibility using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram (PRISMA). Two researchers independently evaluated the quality of studies using the Quality Assessment Tool for Quantitative Studies of Effective Public Health Practice Project. The tool evaluates selection bias, research design, intervention integrity, and data analyses of each article.

Results: The initial search yielded 363 total articles screened for eligibility. Five studies (n=2 observational and n=3 quasi-experimental designs) remained after the screening process and received the following ratings: strong (1), moderate (3), and weak (1). Participants in these studies were EHS staff and parents. Main outcome measures were oral health knowledge, attitudes and behaviors, oral health promotion, and oral health activities. A majority of the studies investigated the effectiveness of oral health education and promotion interventions among EHS staff members and parents. Two studies examined oral health activities guided by EHS teachers for children and parents. These activities included oral health education, toothbrushing instructions, toothpaste use, dietary education, and assessment of dental health status.

Conclusion: Among the five studies evaluated, the interventions focused on increasing pediatric oral health knowledge and practice behaviors among EHS staff members and parents. Ongoing studies are needed to evaluate and document children-focused oral health activities within the EHS programs.

A Study of Color-Blind Racial Attitudes in Dental Hygiene Students

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Problem: The percentage of racial minorities in America is projected to increase to approximately 50% of the population by the year 2050. Many healthcare professionals may be unaware of their own racist attitudes or stereotyping. Color-blind racial attitudes and biases have been linked to racial prejudice which has the potential to affect dental hygiene care to diverse patients.

Purpose: The purpose of this cross-sectional pilot study was to determine the color-blind racial attitudes of dental hygiene students in an entry-level baccalaureate program.

Methods: After IRB approval, the 20-item, Color-Blind Racial Attitudes Scale (CoBRAS) survey was sent to a convenience sample of all dental hygiene students (n=71), 41 first-year and 30 second-year. Four demographic questions: age, gender, race, and year in program, were also included. The CoBRAS instrument measures contemporary racial attitudes and stereotyping in three subcategories: Unawareness of Racial Privilege, Institutional Discrimination, and Blatant Racial Issues. Participants used a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6), to determine level of agreement or disagreement with the statements. Total scores on CoBRAS range from 20-120. Higher scores indicate higher levels of denial of racism.

Results: Of the 71 students invited to participate, 70 completed the survey for a 98.6% response rate. Demographic data revealed most respondents were women (98%), aged 18-29 (90%) and White (70%). Results revealed an overall average score of 64.89 on the questionnaire. T-tests were used to compare first and second-year student groups (overall score, "racial privilege," "institutional discrimination," "blatant racial issues", age, race, gender), with no statistically significant findings for overall scores ($p>0.05$), or any other subscale. The average score among both years of students in the category unawareness of White racial privilege was 28.86. For the construct related to institutional discrimination the average score was 21.51. Finally, blatant racial issues had a score of 14.5.

Conclusion: The average CoBRAS scores indicate most participants possess moderate levels of color-blind racial attitudes, suggesting most participants rejected the idea of racism. As color-blindness comes from a lack of awareness of White privilege, training in this area may foster improved interactions with diverse patient populations.

Implications of cement-retained and screw-retained prostheses in dental implants and peri-implant disease: A systematic review

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Problem: In order to provide primary prevention of peri-implant diseases, it is imperative for the dental hygienist to understand the potential risk introduced by prosthetic type.

Purpose: The objective of this systematic review was to evaluate whether implant prosthetic type is a risk factor for peri-implant diseases.

Methods: MEDLINE (PubMed), COCHRANE and EMBASE were used to identify studies that assessed the impact on the role of cement-retained and screw-retained prostheses on peri-implant diseases. Key terms included cement-retained crowns, screw-retained crowns, peri-implant mucositis, peri-implantitis, and residual cement. Search limitations included human studies, comparison of the effects of cement-retained prostheses versus screw-retained prostheses, and articles published in the English language between 2011 and 2018. Exclusion criteria included study participants who had cardiovascular diseases, diabetes, or were smokers. Authors of studies that were unclear regarding the inclusion of participants with these conditions were contacted via e-mail for clarification. Duplicates were removed and 526 titles and abstracts were independently screened by three reviewers. Differences between the reviewers were discussed, and decisions were made to include or exclude the disputed articles. Articles with abstracts not relevant to the topic were removed.

Results: Sixty-three articles were identified; five were included in the analysis. A meta-analysis could not be performed due to the heterogeneity of the studies. Included studies focused on peri-implant diseases in relation to cement-retained prostheses versus screw-retained prostheses. Four articles suggested that there is no significant difference between cement-retained and screw-retained prosthesis for dental implants and their effect on the peri-implant tissues. One article suggested a slight correlation between cement-retained prosthesis and peri-implant disease.

Conclusion: Limited evidence exists that compares cement-retained prostheses and screw-retained prostheses as contributing risk factors to the etiology of peri-implant diseases. The studies included in this review suggested that cement-retained prostheses are not a significant contributing factor for peri-implant disease when compared to screw-retained prostheses. Further clinical studies are necessary to explore the impact of prosthetic type on peri-implant diseases.

Associations Between Dental Visit and Intake of Sugar-Sweetened Beverage and Plain Water Among United States High School Students

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Problem: Sugar-sweetened beverages (SSB), such as regular soda, fruit-flavored drinks, sweetened coffee/tea drinks, sports drinks, and energy drinks, are the leading sources of added sugars in the diet of U.S. youth. Frequent SSB intake is linked to adverse health consequences including dental caries, obesity, and type 2 diabetes. Drinking plain water (i.e., without caloric sweeteners) may improve diet and oral health and prevent weight gain, specifically when it is substituted for SSB. There is limited information on whether beverage intake is related to dental visit among U.S. adolescents.

Purpose: This cross-sectional study examined associations of SSB and plain water intake with dental visit among a nationally representative sample of U.S. high school students.

Methods: The 2017 national Youth Risk Behavior Survey data of 10,551 students (grades 9–12) were used. The outcome variable was dental visit during the past 12 months (seeing a dentist for a check-up, exam, teeth cleaning, or other work). Exposure variables were frequency of SSB (i.e., regular soda and sports drink) and plain water intake during the past 7 days. Covariates were age, sex, race/ethnicity, and smoking cigarettes/cigars or using smokeless tobacco/electronic cigarettes. Chi-square tests were used to test unadjusted associations between dental visit and beverage intakes (significant at $P < 0.05$). We used multivariable logistic regression model to estimate adjusted odds ratios (aOR) and 95% confidence interval (CI) for not seeing a dentist by SSB and plain water intake status after controlling for covariates.

Results: Overall, 23% of high school students reported not seeing a dentist for a check-up, exam, teeth cleaning, or other works during the past 12 months. Overall, 38% of students reported drinking SSB ≥ 1 time/day, and 18% drank SSB ≥ 2 times/day. About 25% of students reported drinking plain water < 1 time/day. Based on chi-square tests, intakes of SSB and plain water were significantly associated with dental visit ($p < 0.0001$). Based on multivariable logistic regression model,

odds of not seeing a dentist were significantly greater among students who drank SSB ≥ 2 times/day (aOR=1.43, 95% CI=1.17, 1.75) compared to non-SSB consumers, and among students who drank plain water < 1 time/day (aOR=1.64, 95% CI=1.38, 1.94) compared to those who drank plain water ≥ 4 times/day after controlling for covariates.

Conclusions: In the present study, higher SSB intake and lower plain water intake were associated with not seeing a dentist. These findings can inform adolescent-intervention efforts to decrease SSB intake and increase water intake to improve oral health and promote healthy lifestyles.

Project funding was provided by the Centers for Disease Control and Prevention.

Self-Assessment of Ergonomics Among Dentists and Dental Hygienists Utilizing Photography

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Problem: Due to the postural demands and manipulative precision required of dental professionals, oral health clinicians are at higher risk for developing work-related musculoskeletal disorders (WMSDs). Interventions to improve ergonomics have been suggested to help reduce the prevalence of WMSDs. Dental clinicians' awareness of their postures and the clinical application of ergonomic recommendations remains unsatisfactory. However, training that involved self-assessment using photography was shown to be effective with dental and dental hygiene students.

Purpose: The purpose of this study was to determine whether training utilizing self-assessment and photography would improve ergonomic scores and the accuracy of ergonomic self-assessments among dentists and dental hygienists.

Methods: Upon approval from The Ohio State University Institutional Review Board (#2018H0157), this study used a randomized control design and utilized a sample of 30 dentists and 20 dental hygienists. Participants were randomly assigned into one of two groups (control or training). A validated modified-dental operator posture assessment instrument (M-DOPAI) with 12 components was utilized for self-assessments and rater evaluations. At week-1 and week-4, all participants independently completed ergonomic self-assessments and were photographed. At week-2 and week-3, participants in the training group were photographed and used those photographs to complete an ergonomic self-assessment with the principal investigator. At week-2 and week-3, participants in the control group independently

completed ergonomic self-assessments. Four calibrated raters independently evaluated the week-1 and week-4 photographs. Mixed-design ANOVA was used to evaluate changes in ergonomic scores and the accuracy of ergonomic self-assessments from week-1 to week-4.

Results: The training involving self-assessment and photographs resulted in significant improvements in ergonomic scores for the dentists ($F(1)=6.295$, $p<.05$) and dental hygienists ($F(1)=8.535$, $p<.01$) and significant improvements in the accuracy of ergonomic self-assessments for the dental hygienists ($F(1)=4.806$, $p<.05$).

Conclusion: The continual use of self-assessment and photography may help increase awareness, lead to corrections in posture, and reduce the risk for WMSDs.

Interdisciplinary Collaboration Between Dental Hygienists and Cancer Treatment Facilities in Rural Illinois

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Problem: Access to care in rural Illinois is limited due to many constraints including a majority of the population that fall below the Federal Poverty Level (FPL). This is a concern due to the many oral complications that can arise during radiation treatment. These complications can ultimately affect the proposed course of treatment. Moreover, if the cancer treatment facility does not have a dentist or dental hygienist on staff, this can be a barrier to care. In the southernmost sixteen counties of Illinois, the population is 344,594 and covers 6,038 square miles. Currently, there is only one radiation oncologist providing treatment.

Purpose: The purpose of this project is to investigate how dental hygienists can be utilized in rural Illinois cancer care treatment facilities. The goal of this project is to determine if radiation oncologists currently collaborate with dental hygienists or if they feel the future partnership would be valuable to their patients. Current review of the literature does not show any connection between the two specialties in rural areas in Illinois.

Proposal: Theoretically, dental hygienists are involved prior to cancer treatment and are responsible for developing the most suitable oral environment for radiation treatment. After gathering data, it will be determined if radiation oncologists desire the need for collaboration between the two professions. The current disparity and high population

of individuals positioned in the lower 50th percentile shows a vast need for an alliance in rural Illinois. Preventing and controlling the potential complications will be vital for a successful partnership. Once the potential partnership forms, dental hygiene students would be able to utilize externship opportunities at cancer treatment facilities. This partnership will allow them to create “individualized treatment plans”, proper self-care and education for the patient and their families. In addition, the dental hygienist can provide referral sources or information to dentists or any specialists the patient would need to contact before, during or after treatment.

Evaluation Plan: Surveys will be administered to radiation oncologists (via Survey Monkey) who are on staff of cancer treatment facilities in rural Illinois (south of Interstate 74). Qualitative and quantitative data will be gathered to determine radiation oncologists’ attitudes about how dental hygienists can be utilized in cancer treatment facilities. Questions will be included to address collaborative treatment before, during and after radiation therapy.

The Additive Effects of Mobile Phone Use and Dental Hygiene Practice on Finger Strength: A pilot study

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Problem: Developing cumulative trauma disorders is an occupational risk factor for dental hygienists and can be attributed to repetitive motions. In the last 20 years, cell phone use has also been identified to cause strain due to repetitive motions with use. This study looked at additive effects of the repetitive motions of dental hygiene practice and cell phone use on the strength of muscles associated with instrumentation.

Purpose: The purpose of this pilot study was to determine muscular strength of muscles involved in scaling by dental hygienists and the additive effects of cell phone usage, as indicated by muscular force generation.

Methods: A convenience sample of 16 dental hygienists (experimental group) and 16 people that did not use tools repetitively for work (control group) participated in this experimental pilot study. Participants completed a modified Cell Phone Usage Questionnaire to determine cell phone use. Upon completion, participants’ force production was measured using a hand-held dynamometer.

Results: There were statistically significant differences between the experimental and control group for the abductor

pollicis longus ($p=0.045$) with the control group generating greater muscle force. There were significant differences found when comparing the differences between low cell phone users in experimental group and control group for the flexor pollicis brevis ($p=0.031$), abductor pollicis longus ($p=0.031$), and flexor digitorum ($p=0.006$). For all of these, the control group had higher muscle force generation. Finally, there was a significant effect of years in practice and cell phone use on muscular force generation for the flexor pollicis brevis ($F=3.645$, $df=3$, $p=0.020$) and flexor digitorum ($F=3.560$, $df=3$, $p=0.022$) with those who have practiced the longest producing the least amount of muscle force.

Conclusion: This study indicated no significant additive effects of cell phone use and dental hygiene practice on finger muscles used for both. However, results did indicate that dental hygiene practice had significant effects on muscular strength when compared to people who do not use tools repetitively for work. Future research should include type of cell phones, exact duration of use, and ways to reduce risk for developing musculoskeletal disorders. Future research may also want to evaluate the additive effects on forearm and wrist muscles because these have been indicated for repetitive motions in dental hygiene practice and may also be used repetitively with cell phone use.

Identifying Leadership Development Needs of Dental Hygienists Using an Online Delphi

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Problem: The roles of the dental hygienist as a part of an interdisciplinary team require a dental hygienist to have leadership skills to collaborate and carry the profession forward in a time when healthcare systems are transforming. A review of the literature strongly supports that there is a need to generate consensus on the leadership skills that dental hygienists should develop. Understanding the leadership needs of dental hygienists and preferences of how leadership skill should be developed, allows for the development of a leadership model/ framework for dental hygiene.

Purpose: The purpose of this online Delphi was to investigate the opinions of dental hygienists to understand leadership needs of dental hygienists and preference of how the leadership skills should be developed.

Methods: This qualitative study was conducted via an online Delphi using a crowdsourcing platform. There were 8-10 experts chosen from each of the seven areas of dental

hygiene ($n=54$). There were two rounds of Delphi questions in this study. Two questions were simultaneously presented in Round 1 for each of the seven break out groups: 1.) What are the most critical leadership skills needed by dental hygienists? and, 2.) How would dental hygienists prefer to develop leadership skills? Questions in Round 2 included ideas receiving more than 50% of the support from the separate seven crowds in Round 1. In Round 2, participants were all in one group, were not separated by occupational category, and users were presented with pairs of versions of ideas to assess ideas that were answered in Round 1. As votes were received, the versions receiving the most votes were ranked.

Results: Critical leadership skills identified by dental hygienists is the ability to work with other professionals at all levels including speaking, writing, listening, and also being able to compromise when necessary for the overall good. Dental hygienists preferred leadership development via a multi-prong approach including effective training modules, seminars, books/videos and collaboration with mentors, coaches, and role models while catering to an individual's learning style. The identification of leadership skills and development preferences is a starting point to address leadership, however developing sustainable leadership solutions should be a point of focus to intentionally plan leadership succession, improve leadership, and manage the process over time.

Conclusion: Sustainable leadership positions the dental hygiene profession within the hub of healthcare providers which creates interdependence of the profession. Pathways to operationalize sustainable leadership within dental hygiene are prioritized and proposed within this study.

Sexual Harassment: A study of Virginia dental hygienists

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of sexual harassment may be helpful in promoting awareness, prevention strategies and a healthier work environment leading to enhanced job satisfaction. However, more research is needed using a national sample of dental hygienists to determine the prevalence of workplace sexual harassment on a larger scale.

Problem: The #MeToo movement has increased awareness of systemic sexism and sexual harassment in the workplace. Dental hygienists' job retention and career satisfaction along with quality of patient outcomes can all be effected by sexual harassment. In order for dental hygienists to effectively recognize and manage this type of illegal behavior they must first recognize that it is occurring.

Purpose: The purpose of this study was to determine if dental hygienists in Virginia (VA) experience sexual harassment while employed in the oral health care setting.

Methods: A cross-sectional research design was used to generate information regarding the extent to which VA dental hygienists perceived experiencing workplace sexual harassment. The revised Sexual Experiences Questionnaire (SEQ-W), was used to survey a convenience sample of 230 VA dental hygienists attending a Continuing Education (CE) event in Virginia. Total registration for the event was 270. The SEQ-W survey is comprised of 17 items measuring 3 constructs: sexual coercion, unwanted sexual attention and gender harassment. The online survey was made available for the three days of the CE course. Descriptive statistics (frequencies and percentages) were used to analyze the data.

Results: An overall response rate of 70% was obtained. Most respondents were employed in a solo dental practice (44%) followed by a group practice at 33%. Data reveal 21% of those surveyed reported at least one experience of sexual harassment as measured by the SEQ-W in the past 24 months. Of the three constructs measured 25% of participants experienced gender harassment, 12% unwanted sexual attention and 4% sexual coercion. The most commonly reported items were being told offensive sexual jokes or stories (20%) and hearing someone make crude and offensive sexual remarks (16%). At the end of the survey, a definition of sexual harassment was provided and participants were asked "are you experiencing work-place sexual harassment" of which 10% indicated yes. These results suggest some participants were being sexually harassed at work but were unaware the behaviors experienced constituted sexual harassment.

Conclusions: Results from this study suggest 1 out of 5 Virginia dental hygienists responding to this survey experience workplace sexual harassment. Education to ensure identification