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Journal of Dental Hygiene

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- Work Experiences of Male Dental Hygienists: A qualitative study
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- 2021 ADHA Annual Conference Poster Abstracts

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The Journal of Dental Hygiene is the refereed, scientific publication of the American Dental Hygienists' Association. The JDH promotes the publication of original research related to the profession, education, and practice of dental hygiene and supports the development and dissemination of a dental hygiene body of knowledge through scientific inquiry in basic, applied and clinical research.

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Mentoring the Next Generation of Leaders in Dental Hygiene



Amy E. Coplen,
RDH, EPDH, MS

The longer I have been in the field of dental hygiene, the more I realize that the profession provides endless opportunities. Beyond traditional clinical practice roles, dental hygienists can seek opportunities in public health settings, education, advocacy, industry, and potentially becoming a midlevel provider. Yet, many choose a career in dental hygiene with the ultimate goal of becoming a practicing clinician. I know that was my intention over twenty years ago when entering dental hygiene school. Although this begs the question; how can we mentor the next generation of leaders from within our profession, and how can we get dental hygienists to envision themselves in roles beyond the cubicle? A recent study on the employment patterns of dental hygienists revealed an estimated 8% reduction in the dental hygiene workforce during the COVID-19 pandemic,¹ making mentorship for the future more important than ever.

Born between 1995–2012, the newest generation entering the workforce have been labeled “Generation Z” and their oldest members are now 26 years old.² Just like every generation before them, they have been greatly influenced by historical events that have taken place during their lifetime. Significant events for Generation Z are the 9/11 attacks and now a global pandemic. They were also raised by Generation X parents who endured the economic hardships of the great recession. As a result, this generation has developed determination, grit, and sense of responsibility as well as a realistic outlook on life inherited from their Generation X parents. This generation is committed to those around them and motivated to make a difference. Not only do they want to change the world, but they have the work ethic to actually get it done.

Naturally, Generation Z individuals are fearful of their economic futures.² Generation Z wants to pursue

education that will be useful and relevant in getting a job after graduation.³ However, they also want their work to be meaningful. These qualities make this generation particularly well suited for the dental hygiene profession because it is the perfect combination of a stable and successful career where there are numerous opportunities to make a difference. Generation Z believes in equality and they have a great deal of passion for social justice.³ We must seize the opportunity to mentor a generation with a strong work ethic and a commitment to doing good in society. I can’t think of a better profile for a future leader in dental hygiene.

One of the most important things a mentor can do is tell you the truth. This can be incredibly humbling as most of us yearn to hear the words “well done” from our mentors, but for this generation to reach their full potential, it is vital that we tell them how they can improve and grow. The good news is that Generation Z is highly driven to succeed, and they can handle the truth. For myself, as a member of Generation X and a woman, I have always been eager to be seen as a hard worker, someone who puts in the effort for the sake of being a team player, without a personal agenda, or expectation of receiving something in return. However, somewhere in my mid-career, a mentor told me something that had a deep impact. She said, “Don’t ever apologize for being ambitious.” Her words had a lasting impact for me and my career trajectory as a dental hygiene educator and program director. Members of Generation Z are already ambitious and might not need to hear that type of message to move forward outside of their comfort zones. Rather, all they may need is to be connected to the right cause that fits their passions. Isn’t that what a good mentor does? They take time to get to know their mentees as individuals, build a trusted and authentic

relationship, and then connect them with opportunities that help them grow and reach their full potential.

Finally, another important characteristic of Generation Z is that they are the most diverse generation in history and the last generation who will be primarily white.⁴ They have no patience for inequality based on gender, race, or sexual orientation.² Over the past several years, I noticed that I was migrating toward mentoring students and faculty who reminded me of myself, either as a student or a young faculty member. Although this is a natural tendency and has been known to happen across professions, we also know now that heterogeneous teams consistently outperform homogeneous teams. Now, more than ever before, we need new leaders in dental hygiene that reflect the diversity of the population at large. By mentoring mini versions of ourselves, we prevent progress within our discipline.

Wouldn't you want to mentor someone who will far surpasses you professionally? I have recently shifted my mentality to intentionally seek out mentees who look and think differently than I do. I have found no greater satisfaction than watching someone I have mentored succeed in discovering their potential. If the future dental hygiene profession lies in the hands of Generation Z, I believe that future will be exceedingly bright.

I would like to extend special thanks to some important mentors in my life. You inspired me to grow and envision my potential.

Wendy Kerchsbaum, RDH, MS
Christine Klausner, RDH, MS
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Work Experiences of Male Dental Hygienists: A qualitative study

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Abstract

Purpose: The percentage of men entering the dental hygiene profession has increased from less than 1% of the workforce in 1999 to 6.1% in 2020. However, little is known about the experiences of male dental hygienists. The purpose of this study was to explore and better understand the experiences of male dental hygienists.

Methods: A qualitative phenomenological research design was used with a purposive sample of male dental hygienists (n=19) recruited via social media groups. Virtual focus groups were conducted and participants were asked open-ended questions to assist in data collection. The data analysis was conducted both manually and with qualitative analysis software. Two investigators independently identified emergent themes and a sub-set of participants participated in member checking of the themes identified.

Results: The following major themes were identified: stereotype, “not just because I’m a guy, I’m a dental hygienist,” discrimination, reverse discrimination/special treatment, and bringing balance to the work setting. In addition to the major themes, there were also several minor themes identified with the most common being the need for increased male representation in the profession.

Conclusion: The findings of this study were consistent with nursing literature regarding the experience of males in female dominated professions. These findings may serve to enhance the positive experiences of being a male in dental hygiene and highlight the need to address the negative experiences such as discrimination to encourage more men to join the profession. Minor themes suggested the need to enhance male representation to make the profession more appealing to men.

Keywords: dental hygienists, male dental hygienists, gender stereotypes, gender bias, gender discrimination, role-models

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Introduction

Traditional female dominated professions such as nursing, teaching, library science, and social work are highly gender segregated, with the number of men entering these professions remaining low dating back to 1975.¹ Nearly twenty years later, fewer than 1% of dental hygienists identified as male.^{2,3} However by 2020, there had been an increase to 6.1%, suggesting that more men are entering the profession.²⁻⁴ In spite of this trend, the overall number of men entering the dental hygiene profession remains low. Drawbacks reported by men who work in traditionally female dominated professions have included gender discrimination and negative stereotypes surrounding their male sexuality.¹ However on a more positive note, men tended to have higher wages; and have been viewed as being more competent and better leaders in female dominated

professions.¹ Within the healthcare professions, nursing has documented negative experiences for men that mirror what is found in other female dominated professions including gender discrimination and gender stereotypes.⁵⁻¹⁰ Men in the nursing profession also reported identity issues, isolation, lack of role models, and salary gaps.⁵⁻¹⁰

Literature regarding the experiences of male dental hygienists is limited. Darr conducted qualitative research to explore the barriers to men entering dental hygiene programs and found discrimination, stereotypes, and lack of role models were issues as well as the perception that males entering the profession were using it as a stepping stone to becoming a dentist.¹¹ Faust also conducted a qualitative study to explore the experience of male dental hygienists in the profession which revealed four themes

that included: no job search difficulty, feelings of discrimination, mixed feelings about acceptance, and career satisfaction.⁴ Research conducted by both Darr and Faust identified issues such as discrimination, stereotypes, public perception and lack of role models which are consistent with research in other female dominated professions.^{1,4-11} While male dental hygienists remain a minority in the profession, the number is slowly increasing and little is known about their experiences.^{3,4,11} The purpose of this study was to explore and understand the experiences of male dental hygienists in the workplace.

Methods

This study was approved by the MCPHS University Institutional Review Board (IRB) and was awarded “exempt” status and assigned protocol number IRB040820BD. A qualitative phenomenological research design was used with a purposive sample of male dental hygienists (n=19). This design was chosen because qualitative phenomenological research seeks to understand the perspective of a specific population as well as a more in-depth and meaningful understanding of a phenomenon.¹²

Participants

A purposive sample of male dental hygienists was recruited to participate, with a minimum of 12 participants set as the target sample size. Literature suggests data saturation is reached after 12 interviews, however, to ensure saturation this was set as the minimum sample size.¹³ The inclusion criteria for participation were male dental hygienists who graduated from an accredited dental hygiene program; and who had been providing clinical dental hygiene patient care or working in dental hygiene education for a minimum of one year.

Instrument

The data collection instruments included a demographic survey (8 items) to gather the characteristics of the participants. The interview guide consisted of five open-ended questions developed based on the literature review of the experiences of men in nursing.^{8,14} The focus groups were held via a video conferencing platform (Zoom; San Jose, CA) which is web-based and allowed for the recruitment of a national sample. A pilot focus group was conducted with three expert male dental hygienists to obtain feedback on the virtual focus group process and clarity of the open-ended questions. The principal investigator (PI) served as the facilitator of the focus group; each session lasted approximately one hour. No revisions were made to the procedure or interview guide based on feedback from the pilot focus group.

Procedures

Participants were recruited via social media platforms (Facebook, Instagram, and LinkedIn) and through dental

hygiene professional associations. Interested participants who met the inclusion criteria provided their email to the PI via an electronic survey platform (Qualtrics; Provo, UT) and were emailed a link to an anonymous poll to select dates and times to participate in a focus group. Once a time and date were established, each of the focus group participants were emailed information about logging into the assigned session in addition to reminders regarding the session. Participants were able to choose to opt-out of using their webcam and join with audio only and could also choose a pseudonym when joining the focus group session for confidentiality.

Informed consent was obtained prior to beginning the focus group session. Participants also completed a short demographic survey and were given a participation number to maintain confidentiality and the PI reviewed the ground rules before starting the session. The PI then asked five open-ended questions, one at a time, allowing each participant the opportunity to respond without interruption. Probing questions were used to encourage participants to elaborate on their answers as needed. Each focus group lasted approximately one hour and was audio recorded. All audio recordings were transcribed within 24 hours, whenever possible.^{12,15}

Analysis

The PI prepared the data for analysis by transcribing each audio recorded session verbatim. Each recording was listened to multiple times to check for accuracy. The transcribed data was read and re-read multiple times to identify ideas, themes, and tones and notes were taken by the PI. When available, audio-visual data was also analyzed.¹⁶ Recurring themes, tones, and ideas were grouped together and coded. The coding process organized the data in chunks and used a word or short phrase to describe the category identified.¹⁶ A second investigator independently analyzed and coded the data using a qualitative data analysis software (MaxQDA, VERBI GmbH, Berlin, DE). Discrepancies were reviewed, and agreement reached before finalizing the themes. Two participants reviewed the transcript to confirm the focus group data themes were correctly captured, to aid in validity (trustworthiness) of the findings.¹⁶ The identified themes were used to generate a description of the major findings. Quotations from participants were used to strengthen and present the findings.

Results

Data saturation was achieved with 19 participants and a total of five focus groups. The participants included an international sample of male dental hygienists, with the majority from the Western United States (47%, n=9). Of the 19 participants, 45% identified as White, 30% identified as Asian, 10% as Black or African American, and 15% identified

as other. The year of graduation ranged between 1992 and 2018, with 2011 as the median graduation year. A majority of participants reported holding a bachelor's degree or higher (n=16). Two participants reported holding a doctoral degree and six participants reported a master's degree. Most participants were employed exclusively as clinicians (n=12). Sample demographics are shown in Table I.

Table I. Participant demographics (n=19)

Demographic category	n
Location	
West	9
Midwest	3
South	5
Northeast	0
United Kingdom	2
Race	
White	8
Asian	5
Black or African American	2
White & Asian	1
Other	3
Entry-level dental hygiene degree	
Diploma	1
Certificate	1
Associate	7
Bachelor	10
Highest level of education completed	
Associate	3
Bachelor	8
Masters	6
PhD/Doctoral	2
Professional license	
Registered Dental Hygienist	17
Registered Dental Hygienist in Alternative Practice	1
Dental Therapist/RDH	1
Practice Type	
Private practice (individual or group)	9
Corporate (Dental service organization)	3
Educator/ private practice	2
Educator/FQHC	2
Community health clinic/FQHC	1
Other and/private practice	2

The qualitative data analysis generated themes related to the research question: "What are the experiences of licensed male dental hygienists?" and the specific focus group questions (Table II). Five major themes, 1) stereotype, 2) "not just because I'm a guy, I'm a dental hygienist", 3) discrimination, 4) reverse discrimination/special treatment, and 5) bringing balance to the work setting, emerged from data associated with the experiences of male dental hygienists. Major themes and illustrative quotes are shown in Table III.

Table II. Focus Group Questions

Tell me why you chose to pursue dental hygiene.
Describe your experiences entering the dental hygiene profession.
Tell me about positive attributes of being a dental hygienist, particularly as it relates to being a male in a female-dominated profession.
Tell me about negative attributes of being a dental hygienist, particularly as it relates to being a male in a female-dominated profession.
Share any suggestions you have to make the dental hygiene profession more inviting for males.

Theme 1: Stereotype

The data revealed shared sentiments about stereotypes in dental hygiene. The expectation of a dental hygienist being female was conveyed to participants by not only the patients but also the dentist or potential employer. Participants shared experiences in which they were deliberately asked a question, or a comment was made suggesting the "expectation of a female hygienist." Two participants shared a strategy that their front office staff used to emphasize male pronouns for the provider to the patient over the phone when scheduling an appointment. Quotes to illustrate this theme included:

"I think the stereotype it's kind of hard to break. Like majority of the patients typically see a female hygienist." (P11)

"I remember when I was at a job interview and a male dentist, his first question to me, like, why don't you become a dentist? And I was like I went to school to become a hygienist." (P2)

"And then I had one lady who didn't want to see me because she felt like before she even saw me that I was going to have big hands..." (P9)

Theme 2: Not just because I'm a guy, I'm a dental hygienist

Participants in the study shared their feeling that there are no specific differences between being a male or a female dental hygienist. The data revealed that participants felt they

Table III. Major themes and additional illustrative quotes

Theme	Quotes
Stereotype	<p>"I had a patient, a male patient. He had told me that he would he don't feel comfortable with a man's hands in his mouth;"</p> <p>"Oh, so you're a hygienist, but you're a guy" (P12)</p> <p>"Then you get some questions just from patients and things about being a male hygienist and never having them and whether you're going to know anything, because you're a guy, just like, like negative stereotypes towards male hygienists from certain patients" (P13)</p> <p>"You know, some patients will make a comment, 'oh, I've never seen a male hygienist before' or even act as if they don't want to see you when they haven't given you a chance yet." (P19)</p>
Not just because I'm a guy, I'm a dental hygienist	<p>"I had a lot of opportunity to grow and do like volunteerism and work on boards and do a lot of things not because I'm a guy, but just because I'm a hygienist and then I stepped in to try to make a difference in patient's lives" (P3)</p> <p>"But again, my thought process is that we shouldn't identify those individuals as male or female." (P6)</p>
Discrimination	<p>"He just doesn't want to see you because you're a guy" (P5)</p> <p>"Some offices may, because of the culture of their office, they may not want a male hygienist, because you know there's some dentists that like to have all female staff that are all cute, you know, wear makeup" (P9)</p> <p>"I called the agency and they said my application had been turned down because they are looking for female hygienist" (P6)</p> <p>"I've had patients walk out before" (P13)</p> <p>"A staffing agency and the lady she had told me straight up off the bat, I'm going to be honest with you. They are not looking for males, it's a slim chance that I will call you back." (P2)</p>
Reverse discrimination/ special treatment	<p>"If I asked for something, the dental assistants or any of the office staff, I see them providing me with what I asked for a lot faster than my hygiene co-workers." (P5)</p> <p>"I feel like we do get a little special treatment when it comes to applying for a job because we're so rare and far between" (P16)</p> <p>"I'm not sure if it's because I'm a male because I see that the office manager, she gives me more respect than others and other people have told me this and I've noticed." (P2)</p>
Bringing the balance to the work setting	<p>"I've been told by the staff they like to tell me, I don't know what it is but you bring like a different vibe- and they credit to me being a male." (P2)</p> <p>"So, I feel like we as a male, we kind of help to bring it all together." (P15)</p>

were "good" or "successful" as oral health care professionals because they possessed "a skill" set and not because they were a "guy". Examples of this theme included:

"I wouldn't say that being a male, you know, brings anything special, positive or negative." (P1)

"It's not about male or female, in my opinion, like it's about how you work, how you manage your time and how you manage your patients." (P8)

Theme 3: Discrimination

Discrimination was a common theme discussed in the focus groups. There was a notable finding that this discrimination was based on gender. Participants expressed being told by temporary agencies that dental offices were "not

looking for males". Gender discrimination was also made by patients who refused to be seen by a male dental hygienist. Participants who had patients refuse to see them did not take it "personal" or feel "offended." Sample quotes from participants included:

"There was one temp job that I was initially appointed to and the morning I was supposed to drive to the office I was told not to bother going in. The dentist said to the temp agency owner that he would never let a male dental hygienist work for him." (P1)

"When I walked in the first thing the dentist told me she looked at me and she said, I'm going to give you a try, I don't hire males, you're the first male worker in this office, I said okay. So I worked there, the patients loved me blah

blah blah, and so at the end of the day, we sat in her office and she was like, I'm gonna be honest with you, I don't hire males because patients see you as the dentist and it takes the power away from me." (P2)

Theme 4: Reverse discrimination/ special treatment

The participants also reported male dental hygienists may be treated better by the office staff. Participants referred to this as "reverse discrimination" or "special treatment". Some participants reported having their requests met much faster as compared to their female counterparts. The following are sample quotes associated with this theme:

"Since I'm the only guy I feel like I get special treatment because I don't know, when I ask for things they get done pretty quick and when she asks for the same things, it takes longer to accommodate her." (P4)

"So I don't know if its reverse discrimination or but, yeah, it actually worked to my advantage and the dentist and the office staff were both excited to give a male an opportunity." (P19)

Theme 5: Bringing balance to the work setting

Several participants reported bringing "more balance" or a "different vibe" to their work environment. This was often seen as a positive aspect by the participants. This balance to the work setting was perceived not just by the participants but also communicated to the male dental hygienists by their co-workers. Quotes to illustrate this theme included:

"One of the biggest things of being a male in a female dominated career, is that we break up the norm." (P9)

"As males we're able to bring just a different dynamic to the office." (P17)

Minor Themes

Additionally, several minor themes emerged including the need for male representation in the profession, a positive work experience, increased sensitivity to treatment of female dental hygienists, a lack of role models, role identity issues, concerns about long-term stability, a lack of mentorship, the ability to connect with male patients, camaraderie with male dentists, and/or staff, and positive attributes surrounding physical strength. Sample quotes to illustrate these themes are displayed in Table IV.

Discussion

The major themes found among male dental hygienists in this study mirror the nursing literature regarding gender stereotypes and gender discrimination.^{6-9,10} Sayman's find-

ings of negative stereotypes experienced by male nurses from doctors and their patients were also found among dental hygienists in this study.⁶ Younas et al. found that discrimination was reported in various countries among male nursing students as it was also seen with male dental hygiene students.^{9,11} This was also a finding in the 1999 Faust study which suggested the need to for dentistry and dental hygiene to address the discrimination issues.⁴

The major theme of "not just because I'm a guy, I'm a dental hygienist" was also found by Younas et al. which took into account various countries in which the male nursing students preferred to be referred to simply as a nurse rather than a "male nurse."⁹ Reverse discrimination or special treatment among male dental hygienists mirrors the findings cited by Younas et al. of the nursing educational experience.⁹ In the nursing literature, reverse discrimination/special treatment was referred to as "tokenism" by Kleinman in which a male nurse, as the minority, stands out and is viewed positively by others.¹⁷ Meadus and Twomey identified male nurses as being both visible and invisible,¹⁰ which was also reflected in comments from the focus group participants. However, in the study of male nurses, they felt that standing out amongst their colleagues in the workplace was a negative aspect.¹⁰ The major theme of "bringing balance to the work setting" was similar to research conducted by Cheng et al. which found that female nurses were pleased to assist male nurse colleagues.¹⁴ Themes of "reverse discrimination/special treatment" and "bringing balance to the work setting" bring new knowledge to the male experience in the dental hygiene profession as these concepts have not been previously identified in the literature.

Several minor themes emerged from the focus groups. One minor theme was the need for more male representation in the profession which was also reported in the nursing literature.^{7,9} Another minor theme was related to lack of male role models in dental hygiene which was also described by Hodges et al¹⁸ regarding the need for a better facilitation of the educational pathway for men in nursing. The male dental hygienists in this study identified the need to make the profession more inviting for males by increasing visibility of men in the profession and general awareness about dental hygiene as a career choice. Younas et al. identified role identity as an issue among male nursing students who were sometimes mistaken for medical students,⁹ similar to the participants in this study who were mistaken for the dentist. Physical strength was another minor theme, with male dental hygienists viewing their physical strength as a positive aspect of their clinical abilities. This differed from the findings of Meadus and Twomey in which men in nursing felt that their strength was exploited in their

Table IV. Minor themes and related quotes

Minor themes	Quotes
Need for male representation	"The way you're going to make dental hygiene more inviting for males is for there to be more male representation, period." (P9)
Positive work experience	"It's positive. It's a great profession. I'm happy. I would not change it. It's a great profession on many, many levels." (P10)
Increased sensitivity to treatment of female dental hygienists	"So, I think that you realize as a guy the crap that women go through in life, you know what I mean?" (P12)
Lack of role models	"I think several times during my career, being a male was a symbol for our colleagues that that our profession is growing, becoming less gender dependent and more science dependent." (P1)
Role identity issues	"The only thing I want to add for your question is probably maybe a role identity. Like when I first started, they always thought I was a dentist..." (P18)
Long-term stability	"Also have to think financially where's my stability going to be? How does that look? You know, when I want to start a family, am I going to be fingers crossed, I still have a job next week. So that's some of my hesitations with hygiene." (P5)
Lack of mentorship	"It's still growing, I believe, but it still needs more motivation for men and more involvement in the organizations." (P8)
Ability to connect with male patients	"And then for my patients, a lot of them told me, especially the men, they said man with you, we could talk about different things and we could talk about sports we can talk about this, video games..." (P2)
Camaraderie with male dentists/staff	"Kind of creating an opportunity for camaraderie where you're probably the only other male in the office." (P5)
Physical strength	"I always joke with the interviewer and office manager saying, I could carry the boxes when you order something." (P11)

patient care assignments.¹⁰ Cheng et al. identified both positive and negative experiences related to the male's physical strength in the nursing profession.¹⁴

Participants in this study also shared their experiences with discrimination based on their male gender reflecting the similar themes of gender discrimination previously reported in the dental hygiene literature.^{4,10} Participants shared that patients made comments about never having seen a male hygienist and at times patients refused to be seen by them because of their gender, as reported in the Faust study conducted over twenty years ago.⁴ It is interesting to note males experienced some of the same issues with discrimination and stereotypes prior to entering the profession and as they did once they were engaged in the dental hygiene profession as licensed clinicians. These issues need to be a focus throughout the continuum from identifying dental hygiene as a career, through the educational experience and into clinical practice.

The male participants in this study chose to pursue dental hygiene as a career for reasons similar to men in nursing.¹⁰ Having a relative in the healthcare profession appears to play an important role in career choice regardless of the specific career. Some participants in this study also reported having had prior dental experience as a dental assistant or dental technician which influenced their career choice.

Findings from this study support previous research regarding gender discrimination by employers, dental staff, and patients. While many of the findings in this study have been previously reported in nursing literature, there were new findings specific to the dental hygiene profession. Results from this study expanded on the experiences of male dental hygienists regarding their identity as a dental hygienist; reverse discrimination or special treatment; and the ability to bring balance to the work setting. One unique finding was the increase in "sensitivity" that male dental hygienists reported while working in a female-dominated profession. The development of empathy for women and their experiences in the workplace, particularly as dental hygienists, is a topic for further research. Minor themes added to the understanding of men in the profession and included positive work experiences and the need for more male representation which may help encourage other men to pursue dental hygiene. Issues of long-term financial stability should be addressed profession wide, not just for male dental hygienists.

A limitation of this study was that the PI/moderator of the focus groups was a female, this may have influenced how the participants answered the focus group questions. Every effort was made to manage bias or assumptions of the researchers during the focus groups and analysis. Another limitation was that the majority of participants were from the Western US and possessed a bachelor's degree or higher which may not be representative of all dental hygienists who are male. Participants in this study were self-selected and shared their personal experience, which leaves room for personal bias and limits generalizability of the findings.

The findings of this study provide an opportunity for further research on gender pay disparities. As discussed in the nursing literature, as it is common for men to out-earn women in predominately female-dominated professions.¹⁹ Another topic for further research is the perception of the patient about care by male dental hygienists, as well as the dentist's perspective on hiring and working with male dental hygienists. Further research about gender discrimination is key for the dental hygiene profession to begin to identify prevention strategies and promote more males entering the profession.

Conclusion

Results of this study parallel the positive and negative experiences of nurses who are male. Accentuating the positive experiences of dental hygienists who are male may encourage other males to enter the profession, but it will be important to develop strategies to support them in overcoming the negative aspects such as gender stereotypes and discrimination. The themes also suggest a need to be more inclusive of men as dental hygienists by creating a new norm with more faces of men in clinical practice; marketing and advertising strategies; dental hygiene education; and representation in leadership within the dental hygiene professional associations.

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Inappropriate Patient Sexual Behavior in the Dental Practice Setting: Experiences of dental hygienists

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Abstract

Purpose: Workplace violence (WPV) and inappropriate patient sexual behavior (IPSB) have become increasingly prevalent in the United States. Previous research has shown health care professionals are at a 16-times higher risk of experiencing WPV and IPSB than other occupations, however, there is a lack of research in the field of dental hygiene. The purpose of the study was to examine the experiences of dental hygienists with IPSB in the workplace.

Methods: A cross-sectional survey research design was used with a purposive sample of clinical dental hygienists recruited through social media sites (n=471). The validated survey was comprised of demographic and IPSB-related questions, with one open-ended question to expand on experiences with IPSB. Descriptive statistics, Pearson's correlation, t-tests and multiple regression analysis were used to analyze the data.

Results: The survey completion rate was 49% (n=232). Career occurrence of IPSB was 85.8% and occurrence within the last 12-month period was 63.5% among the respondents. Participants who experienced all three categories of IPSB severity had the lowest median number of years in clinical practice (Md.=5.0) as compared to those who reported two categories (Md.=7) and those with only one category (Md.=10), $p=0.01$. Themes from the open-ended questions included types of patient perpetrating IPSB; type of IPSB behavior; and approaches to management of the IPSB.

Conclusion: The high prevalence of IPSB events among dental hygienists in this study warrants increased practitioner education, improved workplace policy and support for management of IPSB.

Keywords: dental hygienists, workplace violence, inappropriate sexual behavior, sexual harassment, professional-patient relations

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Introduction

According to the National Institute for Occupational Safety and Health (NIOSH), 71% of workplace violence (WPV) reported in the US has occurred in health care and social assistance settings.¹ In a 2018 study of WPV in health care settings, Rosenthal et al. found that over one third (34.4%) of physicians, nurses, physician assistants, nurse practitioners and nurse assistants reported being victims of WPV within the last 12 months.² Workplace violence can be perpetrated in multiple ways. The Centers for Disease Control and Prevention (CDC) has categorized WPV into four categories, Type 1: criminal intent, occurring when the attacker has no association to the business or staff; Type 2: occurring between a customer and client, between two

workers, or in a personal relationship; Type 3: committed by one employee towards another employee; and Type 4: ill-treatment occurring in a personal relationship that a staff member brings to the workplace.¹ Type 2 violence is the most prevalent form of WPV occurring in the health care setting, and is often carried out by patients directed towards health care professionals.¹

Previous research on WPV in health care found US physical therapists and nurses were at 16-times higher risk of being exposed to non-life threatening acts of violence as compared to other non-health care occupations.³⁻⁵ These non-threatening acts of violence can be sexual in nature and have been identified as inappropriate patient sexual behavior

(IPSB), i.e., any acts of explicit verbal, physical or sexual acts that are objectionable in a professional work environment.⁶ Inappropriate patient sexual behavior may include glaring, sensual remarks, premeditated fondling, exposure, and sexual assault.³ In addition, research shows that health care professionals were more likely to have IPSB perpetrated by individuals with cognitive impairments.³ Although the occurrence of IPSB has been found to be rising in health care settings, under reporting of this behavior has made it difficult to measure the actual prevalence of the ISP directed towards health professionals.^{2,3, 6-8, 10,13, 15-18}

In addition to a lack of knowledge regarding prevalence of IPSB, research has revealed there is an absence of policies or guidelines available to health care workers regarding the prevention and management of IPSB and this has contributed to the lack of reporting this type of WPV.⁶ A heightened awareness of workplace violence in healthcare settings may provide an opportunity to implement policy change and reveal the need for education among clinicians regarding IPSB.^{3,6-9}

Although research on IPSB has been limited in the health care professions, the fields of physical therapy and nursing have conducted research in this area.^{2,3,6,10} This research has revealed IPSB may lead to significant repercussions related to functioning in the workplace, and identified the need for more education of IPSB to improve policies, and support for health care providers who have experienced IPSB.^{3, 7,11-13} In addition, the studies highlighted the need for collaboration among managers, staff, and patients to prevent WPV and IPSB events, and revealed the importance of providing strategies to protect health care workers' safety.^{6,7} Although previous research has provided evidence of IPSB occurring among health professionals in the field of physical therapy and nursing, the occurrence of IPSB in the dental setting, and with dental hygienists, has not been explored.³ The purpose of this study was to gain an understanding of the experiences of dental hygienists in the US regarding IPSB and explore their responses to IPSB in clinical practice settings.

Methods

This cross-sectional research design survey study was deemed exempt by the MCPHS Institutional Review Board in accordance to revised Common Rule at 45 CFR 46.104 d (2) (ii) and assigned the study with protocol # IRB092719S. A purposive sample of dental hygienists was recruited through social media websites. Inclusion criteria included registered dental hygienists who held an active dental hygiene license in the US and had provided clinical care for at least 12 months. A power analysis (G*Power) for the most conservative

planned statistical test (chi-square test of independence, two-tailed, $df=7$) using a medium effect size $w=.3$, $\alpha=.05$, and 80% power, suggested a minimum sample size of $n=122$ for the study. Adjusting for expected attrition of 30% the final recommended sample size was $n=229$.

Survey Instrument

The instrument was a validated survey used previously in a study conducted with physical therapists investigating their experiences with IPSB.³ Permission was received from the authors to use and modify the instrument for dental hygiene participants. The only modifications made to the survey was the replacement of the term physical therapist (PT) with the term dental hygienist (DT). The original survey was validated using test-retest reliability with a total of 92.8% questions having Cohen's kappa values greater than 0 ($k>0$ indicating similarity in rater scores).³ The test and re-test outcomes resulted in the final version of the PT survey being comprised of 71 questions.

The survey was comprised of demographic questions (6 items), as well as 65 questions related to IPSB risk and experiences, and used both dichotomous and multiple-choice responses. A pilot test was conducted with three volunteer participants to ensure there were no issues with clarity of the questions or with completing the survey in the web-based platform (Qualtrics; Provo, UT). Changes to the survey were made based on the feedback received from the pilot study participants. Opportunities to complete the survey multiple times was prevented by use of an option available within the survey administration platform which recognizes previous participants and prevents multiple responses being included in the survey results. In addition, a forced response design was used in the survey.

An invitation to participate was posted on 10 Facebook (FB) dental hygiene group pages, with permission secured from the FB website administrators. Participants who chose to join the study were provided a link directing them to the electronic survey. Informed consent was secured prior to participants beginning the survey. The survey link was re-posted in the second and third week of data collection. The target sample population was achieved by the end of the third week.

Data analysis

Cumulative frequencies were used for categorical variables for the descriptive portion of this study. Appropriate measures of central tendency (mean, median) and variance (standard deviation, Inner Quartile Range) were calculated for continuous and ordinal variables. Distributions for all variables were analyzed for statistical assumptions including normalcy

and co-linearity. Variables were assessed for transformation to address issues of non-normal distributions or a non-parametric alternative. Outliers were identified and considered for removal ($1.5 \times \text{IQR}$). Surveys found to have less than 80% complete responses were not included in the data analysis.

Correlation was used for continuous variables (Pearson or Spearman); while chi-square tests of independence, and multiple regression (linear, logistic, ordinal, multinomial) were used for categorical variables. Logistic regression was used specifically to analyze the demographic data. To test differences in means between categorical variables a t-test or ANOVA was employed, and the non-parametric equivalent (Mann-Whitney U, Kruskal-Wallis) was used in the cases where the distribution did not meet assumptions for the Normal model. Adjustments to family wise error (e.g. Bonferroni) were made for multiple statistical tests whenever appropriate. The acceptable alpha level was set at .05.

The qualitative analysis of the open-ended comments was conducted independently by two investigators. Common words, phrases, patterns were identified to identify emerging themes. One investigator conducted analysis manually and one used a qualitative data management software. Examples of the comments were selected to illustrate each major theme.

Results

A total of 471 participants began the survey, with 232 finishing it, for a 49% completion rate ($n=232$). Demographic data for the participants revealed the majority of participants were female (96.1%, $n=223$) and the median number of years in clinical practice was 7 with the majority (91.8%, $n=213$) continuously treating patients over the past 12 months. Over one half of the participants (55.2%, $n=128$) held an associate degree and over three quarters of the participants provided clinical care in the private practice setting (78%, $n=121$). Sample demographic information is shown in Table I.

Responses regarding IPSB training and clinical practice environments revealed that a majority of participants worked in private (closed) treatment rooms (69.8%, $n=162$) and that most participants (77.6%, $n=180$) did not work with patients identified as cognitively impaired. Most of the participants had not received training on IPSB (69.3%, $n=161$) nor had employers who had developed an office protocol on the management of IPSB events (71.6%, $n=166$). Of the respondents who had received training ($n=42$), in-service sessions were the most common source of training (33.3%, $n=14$). Descriptions of IPSB training sessions and practice settings are shown in Table II.

Responses to the items related to the incidence of IPSBs revealed that a majority of participants (85.8%, $n=199$) had experienced an IPSB event at some point during their career, with (69.2%, $n=146$) participants reporting that an event had occurred within the last 12 months. A common form of IPSB reported was of a patient staring at the participant's body parts in a manner which made the clinician uncomfortable (career: 82.3%, $n=191$; past 12 months: 60.8%, $n=141$). Other types of IPSB events experienced by the participants included: patients requesting a date, patients making overtly sexual remarks/jokes, patients purposively touching or grabbing, and patients making sexually suggestive gestures. Participants also reported patients had made physical overtures including masturbating during their session, (6.5%, $n=15$), exposing their genitals (7.3%, $n=17$), and being watched or harassed outside of their workplace (14.2%, $n=33$) at some point in their career. In general, fewer IPSB events had occurred over the past 12 months for the participants (63.5%, $n=146$), as compared to the span of their careers (85.8%, $n=199$). The majority of the patients demonstrating IPSBs were male (90%, $n=298$). While none of the participants reported that they had been forced to submit to sexual activity, 12.1% ($n=28$) said they had been propositioned. Participant experiences with IPSB over the span of their career and over the past 12 months are shown in Table III and Table IV.

The most commonly used methods of dealing with IPSB were distracting the patient (85.2%, $n=196$) or ignoring/pretending that the behavior did not happen (75.9%, $n=173$). More than half of participants (53.9%, $n=125$) said redirecting the patient made the situation better. Fewer than half (45%, $n=103$) of the participants documented the patient behavior in their chart, and only 16.5% ($n=17$) stated that documentation helped with the situation. Most (69.6%, $n=158$) reported the IPSB situation to the practice setting administration and 21.5% ($n=50$) indicated reporting the incident made the situation better. Only 2% ($n=3$) participants stated that they had contacted law enforcement to report an IPSB incident.

Relationships between experience, type of method used to address IPSB, and success of the method were evaluated. The reported IPSBs were categorized into levels of severity; mild (staring at body parts, sexually flattering or suggestive remarks, asked on a date, gave a romantic sexual gift), moderate (overtly sexual remark or joke, propositioned for sexual activity, sexually suggestive gestures), and severe (exposed his or her genitals or breasts, masturbated, touched or grabbed in private area, harassed inside or outside of workplace, threatened to force sexual activity, forced sexual activity) experience.

Table I. Demographics (n=232)

Characteristics	Participants n (%)	95% Lower CL	95% Upper CL
Sex			
Male	9 (3.9%)	1.9	7.0
Female	223 (96.1%)	93.0	98.1
Trans	0 (0.0%)	–	–
Other	0 (0.0%)	–	–
Years in clinical practice as a dental hygienist			
0-10 years	144 (62.1%)	55.7	68.1
11-20 years	49 (21.1%)	16.2	26.7
21-30 years	29 (21.1%)	8.7	17.2
31-40 years	7 (3.0%)	1.4	5.8
<40 years	3 (1.3%)	0.4	3.4
Months actively seeing patients in the last 12 months			
0-2 months	2 (0.9%)	0.2	2.7
3-6 months	5 (2.2%)	0.8	4.7
7-9 months	11 (4.8%)	2.6	8.1
10-12 months	213 (92.2%)	88.2	95.1
Highest earned degree in dental hygiene			
Associate degree (ASDH)	128 (55.2%)	48.7	61.5
Baccalaureate degree (BSDH)	93 (40.1%)	33.9	46.5
Master's degree (MSDH)	11 (4.7%)	2.5	8.1
Doctorate degree (PhD)	0 (0.0%)	–	–
Practice Setting			
Private dental office	181 (78.0%)	72.4	83.0
Corporate dental office	27 (11.6%)	8.0	16.2
Dental Hygiene School	5 (2.2%)	0.8	4.7
Federally Qualified Health Center (FQHCs)	11 (4.7%)	2.5	8.1
Mobile dental clinic	0 (0.0%)	–	–
Patient's home/home care	0 (0.0%)	–	–
School system (preschool/primary/secondary)	0 (0.0%)	–	–
Community health center	4 (1.7%)	0.6	4.0
Hospital emergency departments	0 (0.0%)	–	–
Other	4 (1.7%)	0.6	4.0
Full time vs. Part time status			
Full time	161 (69.7%)	63.6	75.4
Part time	71 (30.3%)	24.6	36.4
Retired	0 (0.0%)	–	–
Unemployed or not seeking work	0 (0.0%)	–	–
Gender of patients involved in IPSB			
Majority male	211 (94.2%)	88.4	95.4
Nearly equal parts	13 (4.9%)	2.6	5.4
Majority female	8 (2.7%)	1.1	5.4

A fourth variable was created to sum the mild, moderate, and severe variables, to give a total number of severity categories a participant had experienced. Results showed the number of severity categories experienced was related to whether several different methods were used to address IPSB, and the perceived success of the methods. Results also showed those experiencing one severity category were the least likely to use distraction to address IPSB (67%, n=31) while those experiencing two categories were the most likely (90%, n=135), $\chi^2(2) = 14.6$, $p = 0.001$, $\phi = 0.25$). Those experiencing two categories were also most likely to use laughing or joking (42%, n=63), $\chi^2(2) = 6.6$, $p = 0.04$, $\phi = 0.17$) as a distraction method. Participants experiencing three or more categories were most likely to use a chaperone (31%, n=11), $\chi^2(2) = 6.9$, $p = 0.03$, $\phi = 0.20$) and report the behavior within the facility (91%, n=32), $\chi^2(2) = 9.3$, $p = 0.009$, $\phi = 0.20$).

The relationship with number of categories experienced, and the perceived effectiveness of each method (distraction, laugh or joke about situation, using a chaperone, and reporting the behavior), was tested using chi-square tests of independence. A total of 62% (n=89) participants experiencing two severity categories reported the use of distraction made the situation better, while similarly those who experienced three categories reported it made the situation better (13, 38%) or did not have an effect (13, 38%), $\chi^2(2) = 16.1$, $p = 0.01$, $\phi = 0.27$). Fifty percent of participants (n=126) experiencing three severity categories were more likely to state ignoring the situation had no effect and 13% reported it

Table II. IPSB training and practice setting descriptions (n=232)

IPSB TRAINING and Practice Environment	Participants n (%)	95% Lower CL	95% Upper CL
Received training on IPSB			
Yes	42 (18.1%)	13.6	23.4
No	161 (69.3%)	63.3	75.1
Unsure	29 (8.7%)	8.7	17.2
Location of IPSB training			
In-service training	14 (33.3%)	31.8	34.8
Entry-level RDH education	9 (21.4%)	19.9	22.9
Continuing education seminar	6 (14.3%)	12.8	15.8
Home study or online module	7 (16.7%)	15.2	18.2
Other	6 (14.3%)	12.8	15.8
Office Protocol for IPSB events			
Yes	27 (11.6%)	8.0	16.2
No	166 (71.6%)	65.5	77.1
Unsure	39 (16.8%)	12.4	22.0
Patient sex			
Mostly Women	8 (3.4%)	1.6	6.4
Mostly Men	10 (4.3%)	2.2	7.5
Equal numbers	214 (92.2%)	88.3	95.2
Routinely worked with patients who were cognitively impaired			
Yes	16 (6.9%)	4.2	10.7
Yes, from some events	36 (15.5%)	11.3	20.7
No	180 (77.6%)	71.8	82.5
Worked in the clinic alone			
0%-25%	211 (91.0%)	87.7	94.8
26%-50%	8 (3.4%)	1.4	5.9
51%-75%	3 (1.3%)	0.2	2.8
76%-100%	10 (4.3%)	2.3	7.6
Treated in private treatment rooms			
0%-25%	53 (22.8%)	17.9	28.7
26%-50%	8 (3.5%)	1.7	6.4
51%-75%	9 (3.9%)	1.9	7.0
76%-100%	162 (69.8%)	63.6	75.4

made the situation worse (n=4), $\chi^2(2) = 17.3$, $p = 0.008$, $\phi = 0.28$). Similarly, 33% (n=27) said laughing or joking had no effect ($\chi^2(2) = 14.5$, $p = 0.03$, $\phi = 0.27$) as well as reporting the situation within the facility (9, 33%; $\chi^2(2) = 14.5$, $p = 0.04$, $\phi = 0.26$).

Non-parametric methods were used to examine the relationship between demographic variables and IPSB experiences. Three Mann-Whitney U median rank tests with mild, moderate, and severe variables as the independent categories, and number of years in the field as the dependent variable. Results revealed

those who did not experience a mild event in the last 12 months had a higher median number of years in practice (Md.=10) compared to those who had experienced at least one mild event (Md.=5), $p = 0.007$. All other Mann-Whitney U comparisons were non-significant with $p > 0.05$. The Kruskal-Wallis test was used with the sum of severity categories as the independent variable and number of years in practice as the dependent variable and compared to participants who had experienced at least one IPSB event. Participants who had experienced all three severity categories had the lowest median number of years in practice (Md.=5.0) as compared to two categories (Md.=7) and one category (Md.=10), $p = 0.01$.

To examine the relationship between categorical demographic variables and IPSB variables, chi-square tests of independence were calculated. Participants who had attended a workshop or training on IPSB were more likely to state they had experienced a moderate event in the last 12 months (65%, n=103) compared to those had not attended additional education (79%, n=61), $\chi^2(2) = 4.0$, $p = 0.04$, $\phi = 0.17$. Training was not related to any other severity categories or the sum of severity categories. In addition, no other categorical demographic variables were related to individual severity categories or the sum of categories ($p > 0.05$).

Open-ended responses provided additional data on the specific IPSB events participants had experienced. The three major themes in the open-ended comments included: the type of patient who perpetrated the IPSB, type of IPSB behavior experienced by the provider, and approaches to management of the IPSB. The type of patient exhibiting IPSB included older men, developmentally or intellectually disabled, and patients with cognitive impairment (e.g. traumatic brain injury, dementia). Examples of this theme included:

“Most patients with inappropriate sexual behaviors were men over 60.”

“Patient had developmental disability, with chaperone patient did not make any more gestures towards his genitals.”

“Most of patients I see are Alzheimer and dementia, so behavior is often in the moment and transitory.”

The type of behaviors experienced by participants included staring, touching, stalking, verbal, remarks/joking, and masturbation/erection. Examples of this theme included:

“I had a lesbian patient who would stare at my breasts when I spoke with her.” “I have had a few older men touch my hips and thighs.”

“An elderly woman with dementia pinched my butt.”

“Patient was a male who refused to make an appointment until he was added on my Facebook page and could contact me directly- stalking type behavior.”

“Most of what I encountered had to do with inappropriate sexual jokes or mentions.” “I have had a young man get an erection.”

Many participants had uncertainty on how to manage the IPSB and ignored or avoided treating the patient. Many reported the lack of support received from the dentist/supervisor, although some participants reported that the patient who had displayed IPSB was dismissed. One participant reported taking out a restraining order. Samples of the responses included:

“At times I just pretend to not hear it or change the subject quick.”

“I always told the office manager and doctor and assistant about his behavior, and it was mostly laughed off as in ‘that’s just how he is’.”

The lack of support reported by one participant was a result of the offender being a relative of the dentist:

“It was the doctor’s father in-law and the doctor told me to keep it quiet.” Significant action taken by the dental hygienist, or the employer was also reported by participants:

Table III. Career IPSB experiences (n=232)

Behavior		Participants n (%)	95% Lower CL	95% Upper CL
Patient stared at you or your body parts in a way that made you uncomfortable	YES	191(82.7%)	77.4	87.1
	NO	41 (17.3%)	12.9	22.6
Patient made a sexually flattering or suggestive remark about you	YES	199 (85.8%)	80.8	89.8
	NO	33 (14.2%)	10.2	19.2
Patient asked you for a date	YES	123 (53.0%)	46.6	59.4
	NO	109 (47.0%)	40.6	53.4
Patient gave you a sexual or romantic gift	YES	21 (9.1%)	5.9	13.4
	NO	211 (90.9%)	86.8	94.1
Patient made an overtly sexual remark or joke, asked you questions about or commented on your sex life, or shared a sexual fantasy about you	YES	168 (72.4%)	66.4	77.9
	NO	64 (27.6%)	22.1	33.6
Patient propositioned you for sexual activity	YES	28 (12.1%)	8.4	16.8
	NO	204 (87.9%)	83.2	91.6
Patient made sexually suggestive gestures	YES	95 (41.3%)	35.1	47.7
	NO	137 (58.7%)	52.3	64.9
Patient deliberately exposed his or her genitals or breasts to you	YES	17 (7.3%)	4.5	11.2
	NO	215 (92.7%)	88.8	95.5
Patient masturbated during a dental hygiene session	YES	15 (6.5%)	3.8	10.2
	NO	217 (93.5%)	89.8	96.2
Patient purposefully touched or grabbed you in a private area (thighs, genitals, breasts) and/or in a clearly sexual manner	YES	56 (24.1%)	19.0	29.9
	NO	176 (75.9%)	70.1	81.0
Patient repeatedly followed, watched, or harassed you inside or outside the workplace	YES	33 (14.3%)	10.3	19.3
	NO	199 (85.7%)	80.7	89.7
Patient threatened to force you or attempt to force you to submit to sexual activity	YES	2 (0.9%)	0.2	2.7
	NO	230 (99.1%)	97.3	99.8
Patient forced or coerced to submit to sexual activity	YES	0 (0.0%)	—	—
	NO	232 (100.0%)	—	—

Table IV. IPSB experiences over the past 12 months (n=232)

Behavior		Participants n (%)	95% Lower CL	95% Upper CL
Patient stared at you or your body parts in a way that made you uncomfortable	YES	141 (61.3%)	54.9	67.4
	NO	91 (38.7%)	32.6	45.1
Patient made a sexually flattering or suggestive remark about you	YES	146 (63.5%)	57.1	69.5
	NO	86 (36.5%)	30.5	42.9
Patient asked you for a date	YES	61 (26.5%)	21.1	32.5
	NO	171 (73.5%)	67.5	78.9
Patient gave you a sexual or romantic gift	YES	6 (2.6%)	1.1	5.3
	NO	226 (97.4%)	94.7	98.9
Patient made an overtly sexual remark or joke, asked you questions about or commented on your sex life, or shared a sexual fantasy about you	YES	113 (48.9%)	42.5	55.3
	NO	119 (51.1%)	44.7	57.5
Patient propositioned you for sexual activity	YES	11 (4.7%)	2.5	8.1
	NO	221 (95.3%)	91.9	97.5
Patient made sexually suggestive gestures	YES	46 (20.0%)	15.2	25.5
	NO	186 (80.0%)	74.5	84.8
Patient deliberately exposed his or her genitals or breasts to you	YES	2 (0.9%)	0.2	2.8
	NO	230 (99.1%)	97.2	99.8
Patient masturbated during a dental hygiene session	YES	3 (1.3%)	0.4	3.4
	NO	229 (96.7%)	96.6	99.6
Patient purposefully touched or grabbed you in a private area (thighs, genitals, breasts) and/or in a clearly sexual manner	YES	19 (8.3%)	5.2	12.3
	NO	213 (91.7%)	87.7	94.8
Patient repeatedly followed, watched, or harassed you inside or outside the workplace	YES	17 (7.4%)	4.6	11.4
	NO	215 (92.6%)	88.4	95.4
Patient threatened to force you or attempt to force you to submit to sexual activity	YES	1 (0.4%)	0.0	2.0
	NO	231 (99.6%)	98.0	100.0
Patient forced or coerced to submit to sexual activity	YES	0 (0.0%)	–	–
	NO	232 (100.0%)	–	–

“If I am grabbed I immediately let my doctor know and he handles it with dismissal.”

“Once I got a restraining order against a patient for inappropriate behavior and stalking.”

Discussion

There is a gap in the literature regarding the incidence of IPSB in dental hygiene and dentistry. Clinical dental hygienists in this study reported a high prevalence of IPSB, consistent with the results among physical therapists previously reported in 2017 by Boissonault et al.³ In this study, the occurrence of IPSB events throughout the participant's career was 85.8% with 63.5% reporting occurrences over the past 12 months, similar to the physical therapists' career exposure of 84%, and 47% over a 12- month period.³

Results from this study also confirmed previous research conducted by Baig et al. and Nowrouzi-Kia et al. which reported that health care providers had not received previous training regarding IPSB and management strategies.^{11,15} Over two-thirds of the participants in this study indicated they had not received any training regarding management of IPSBs. The responses of the dental hygienist participants in this study reflected their uncertainty regarding successful management of patients' IPSB. When asked regarding actions taken to manage the IPSB incident, the participants responses indicated they were “unsure” if some of their actions has been successful which was reflected in the analysis of their perceived success strategies which ranged from simple distraction and ignoring the behavior to using a chaperone and transferring care to another provider.

Similarly, Shafran-Tikva et al. conducted research in a hospital setting and found 90% of respondents had never

participated in a WPV workshop, or were not aware of a protocol for violence in their workplace.¹² Other studies have highlighted the incidence of WPV and IPSB among health care workers with repercussions related to work functioning, including negative emotional and physical effects.^{7-9,11} Research, conducted in the nursing profession revealed the need for health professionals to feel protected, and safe while working.¹⁷ These findings were reflected in this study by the open-ended responses from the participants in this study, “bosses don’t always back you up for fear of losing business, or money, this compromises our comfort and/or safety for fear of job loss.”

This study established gender as a factor in perpetration of IPSB, similar to the findings of Boissonnault et al.³ In the study of physical therapists, women reported significantly higher rates of IPSB compared to men in 8 of the 13 categories of IPSB.³ However, since dental hygiene is a female-dominated profession and the majority of the participants were women (96%, n=223), this may explain the significance of gender as a factor for the prevalence of IPSB among DHs in this study.

Results from this study also revealed that the years of experience was a factor associated with the occurrence of IPSB; dental hygienists with 10 years or less were more likely to experience IPSB events (62.1%, n=144) as compared to their more experienced peers over the age of 40 years (1.3%, n=3). This finding was in parallel to the research outcomes of Cambier et al. which found that IPSB was more likely to occur among less experienced physical therapists (75.2%), than those with more years of practice (60.5%).⁶

Most events of IPSB, identified in previous studies, particularly those identified in hospital settings by Pompei et al., occurred in patient exam rooms (72.4%).¹⁶ These settings were similar to what was identified in this study which found that IPSB occurrences with dental hygienists were most likely to occur in private dental treatment rooms (69.7%, n=161). A study by Shafran-Tikva et al. also revealed a lack of management support to employees who experienced IPSB.¹² This lack of support was also reflected in some of the open-ended comments in this study. For example, a participant stated, “After reporting to the doctor and front office they laughed. I made it clear I did not find any of it humorous, and that I felt threatened, and that it was unacceptable behavior. It became an office joke anyway.” Perhaps with a greater focus on workplace sexual harassment in general, there will be more interest on the part of employers to protect their employees from IPSBs in the future.

This is the first study to assess the occurrences of IPSB among dental hygienists in clinical practice settings in the

US. However, these outcomes may not be directly comparable to previous research in this area since most of the WPV studies conducted in the health professions were not specific to the issue of IPSB.^{2,3, 6-9, 11-19} Other limitations of this study include researcher bias, recall bias, the self-reporting nature of the survey instrument, and the use of a purposive, non-probability sampling technique. Future research should investigate the effectiveness of workplace policies and training for dental hygienists and their role in managing IPSB in clinical practice settings.

Conclusion

The high prevalence of IPSB events among dental hygienists in this study warrants increased practitioner education and improved workplace policies for management of IPSB. Individuals who have experienced IPSB occurrences in the workplace may need additional support. Emphasis needs to be placed on strategies to protect health care workers safety. The prevalence of IPSB events reported by dental hygienists, along with its management challenges, has identified the need for providers to develop skills in the use of effective intervention strategies for IPSB in the dental practice setting.

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Orofacial Manifestations of Lyme Disease: A systematic review

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Abstract:

Purpose: Orofacial manifestations of Lyme disease can affect head and neck anatomical structures that are frequently examined by dental professionals. The purpose of this systematic review was to examine the literature for types and frequencies of orofacial manifestations documented in populations in the United States (US) with Lyme disease.

Methods: Four electronic databases (Dentistry and Oral Sciences, PubMed, Cinahl Plus, and Medline) were systematically searched during the summer of 2019 using keywords and MeSH terms to identify relevant studies. Search term alterations and synonyms were cross-checked using the US National Library of Medicine Unified Medical Language System Metathesaurus. Full-text, English language studies were included if they reported on US populations with Centers for Disease Control and Prevention confirmed cases of Lyme disease. The review followed guidelines set forth in Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Quality was assessed with a modified version of the Cochrane Data Collection Form for Randomized Control Trials and Non-randomized Control Trials. Extracted data was organized by themes of manifestations and the frequencies were calculated.

Results: An initial search extracted 217,381 articles; 43 met the inclusion criteria and were further reviewed for quality. Twelve articles published from 1992-2017 were deemed appropriate for inclusion. All were from non-dental journals and fewer than half (n=6) reported on Lyme disease endemic states. Eight incidences of orofacial manifestations within head/neck regions were documented in Lyme disease patients (n=951) and included: headache (39.5%), facial palsy (42.5%), temporomandibular joint arthralgia (42.0%), altered taste (11.0%), stiff neck (13.6%), sore throat (3.0%), neck pain/arthralgia (7.5%), and erythema migrans rash (5.2%).

Conclusion: Eight orofacial manifestations of Lyme disease were revealed by this systematic review. Future research regarding the orofacial manifestations of Lyme disease is needed so this medical condition can be better understood by oral health care providers and result in improved health outcomes for infected patients.

Key words: Lyme disease, orofacial manifestations, oral care, dental hygienists, oral health care providers, systematic review
This study supports the NDHRA priority area of: **Population level: Health services** (epidemiology).

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Introduction

Lyme disease, the most common vector-borne disease in the United States (US), is transmitted by ticks infected with *Borrelia burgdorferi* sensu stricto (Bbss) or *Borrelia mayonii*.¹ Carriers of the pathogen include *Ixodes scapularis* (commonly known as the deer tick or blacklegged tick), and *Ixodes pacificus* (commonly known as the western blacklegged tick).² The Bbss spirochetal bacterium is transferred to human hosts during the blood meal of an infected tick, with the incubation period in humans, prior to symptom onset, ranging from three to thirty days.^{3,4} First recognized in Connecticut in the 1970s, Lyme disease was added to the National Notifiable Disease

Surveillance System in 1991.^{1,5} Since then, the number of reported cases and geographical distribution of the disease has quickly spread across the country and is now considered endemic in 14 states including Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and Wisconsin.^{1,5} States that share a border or are located between high endemic states, are classified as “neighboring states” and are also showing an increased incidence of confirmed cases.⁵ Over 275,000 cases of Lyme disease were reported to the Centers for Disease Control

(CDC) from 2008-2015.⁵ Currently, state health departments report 30,000 new cases of Lyme disease to the CDC each year;² however, the number of reported cases is estimated to be much lower than the number of diagnosed cases – potentially by ten-fold.^{1,6} The increasing incidence of this infectious disease is of growing concern, and as members of interdisciplinary health care teams oral health care professionals need to be aware of the signs and symptoms.

Lyme disease affects multiple body organs, and if left untreated can potentially be life threatening; obtaining an early diagnosis through interprofessional care is critical. The CDC is asking all health care providers to educate themselves about the full range of the presenting signs and symptoms of Lyme disease to minimize the morbidity of the disease.^{3,4} When diagnosed and treated early, patients can be successfully cured and report fewer residual complications.⁵ However, obtaining an early diagnosis for this complex disease is difficult in many cases due to the limitations of serological tests coupled with the onset of signs and symptoms that can vary significantly from person-to-person and also mimic a multitude of other ailments depending on the dissemination stage.^{3,4,6}

The localized early stage may appear within 3-30 days after an infected tick bite and typically begins with an expanding skin lesion, erythema migrans, commonly known as the bull's eye rash.⁴ Erythema migrans is considered to be a critical sign of Lyme disease and is often used to make a clinical diagnosis. However, the rash only appears in 70-80% of cases and may be missed if it presents on the back half of the body, on darker skin tones, or has an atypical appearance.⁴ Early stages may also include fever, chills, headache, fatigue, muscle and joint aches, and lymphedema.⁴ During the disseminated stage, seven days to several months after the initial infection, signs and symptoms may include severe headaches, neck stiffness, additional erythema migrans lesions, arthritis, and facial palsy.⁴ Individuals may also experience nerve pain, problems with short-term memory, irregular heartbeat, inflammation of the brain and spinal cord, shooting pains, numbness, and/or tingling in the hands or feet.⁴ The signs and symptoms may appear atypical or not at all, further complicating the ability to obtain a timely diagnosis. Orofacial manifestations of Lyme disease have appeared in the health care literature, but they have not been a research focus despite reports indicating that orofacial manifestations may be the first signs and symptoms to appear.⁷ The possibility of Lyme disease should be a consideration for oral health care professionals when patients present with unexplained facial paralysis,⁸⁻¹⁷ neck stiffness,^{11,13,15,18} headache,^{8-13,15-19} TMJ pain,^{10,13} altered taste,¹⁹ sore throat,¹² and neck pain,^{10,12,13,17,19} when a clinical examination fails to identify a specific oral health pathology.

The orofacial manifestations of Lyme disease affect head and neck anatomical areas that are routinely examined by oral health care professionals. A 2014 study found that 46% of surveyed health care providers had encountered a Lyme disease patient, and the researchers concluded that health care providers in general required more education about Lyme disease in order to promote an early diagnosis.²⁰ This also points to the possibility that many dental professionals may be unaware of the orofacial manifestations linked to Lyme disease. This missed opportunity for making a timely diagnosis may allow the disease to progress to later stages characterized by chronic suffering and life-threatening conditions that are difficult to treat, negatively affecting the patient's quality of life. Furthermore, patients often experience frustration when seeking a diagnosis due to health care professionals who may be disrespectful and dismissive because of not being well educated in the signs and symptoms of Lyme disease.²¹ It is important for dental professionals to be aware of the orofacial manifestations of Lyme disease and to have a referral and follow-up plan with primary care physicians to achieve the best possible health outcomes for their patients. The purpose of this systematic review was to examine the literature to identify the frequencies of orofacial manifestations documented in Lyme disease patients in the US to help inform oral health care providers of the orofacial manifestations of the disease.

Methods

This systematic review followed the guidelines set forth in PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).²² An electronic search of the literature was conducted by a university health and life sciences librarian from May 2019 until October 2019 and included the following databases: Dentistry and Oral Sciences Source (EBSCO), PubMed (first search), Cinahl Plus with Full Text (EBSCO), and Medline (first search) for articles published from January 1990 to October 2019. Several search term alterations were used and synonyms for the key search terms were cross-checked using the United States National Library of Medicine Unified Medical Language System Metathesaurus.²³ The search strategy used keywords and MeSH terms that included terminology and synonyms for Lyme disease, vector, pathogen, head/neck anatomical landmarks, and orofacial manifestations. The search was limited to peer-reviewed journals, articles which included populations of Lyme disease patients diagnosed in accordance with CDC protocol in the US, and full-text articles in the English language. Articles were included if they met the following criteria: 1) Studies that include populations from the US, 2) available in full-text and in the English language, and 3) confirmed CDC diagnosis of Lyme disease. Exclusion criteria

included: 1) studies of non-US populations, 2) studies involving animal subjects, 3) tick-borne diseases other than Lyme disease, and 4) studies that did not confirm a Lyme disease diagnosis.

A citation managing system (EndNote X9; Clarivate Analytics, Philadelphia, PA) was utilized to organize identified articles. There were no limits on study designs, but grey literature and letters to editors were excluded. Retrieved articles were independently reviewed for appropriateness based on titles and abstracts by two researchers (BB and KJ). Meetings for discussion were held to resolve disagreements that were settled by consensus. Risk of bias was assessed independently by BB and KJ, and data extraction was completed using a modified version of the Cochrane Data Collection Form for Randomized Control Trials and Non-randomized Control Trials and meetings were held to resolve disagreements by consensus.

Results

An initial search of the databases produced a total of 217,381 results after filters and limits based on inclusion/exclusion criteria were applied. The titles and abstracts were further filtered based on exclusionary criteria, resulting in 744 articles to be reviewed. Ninety-five were removed due to duplication, yielding 649 articles. Two reviewers (BB and KJ) independently screened each of the 649 articles by titles and abstracts to identify additional articles that should be excluded due to a lack of relevancy; disagreements were settled by consensus, resulting in the removal of 441 articles. Exclusions based on titles and abstracts were made for the following reasons: published before 1990, orofacial manifestations were not addressed, articles were not accessible, letters to editors, not peer-reviewed, full text not available, only available as a research poster, and non-human research. The remaining full-text articles (n=208) were further independently reviewed based on inclusion/exclusion criteria and risk of bias, resulting in the removal of 196 articles after disagreements were settled by consensus. Articles were rated as poor, fair, or good based on the risk of bias tool (Table I). Articles removed due to risk of bias (n=31) included case studies, and literature reviews that did not report data collected from human subjects. Items determined to be “fair” or “poor” were included if relevant data was reported. Articles removed for not meeting the inclusion criteria (n=165) included those that were foreign, did not follow CDC serological protocol, and articles that did not report results of Lyme disease from patients with orofacial manifestations. Clinical trials meeting inclusion/exclusion criteria were not identifiable.

A total of twelve articles were judged as being acceptable for inclusion in the systematic review for synthesis. Seven (58%) of the included studies were from the 1990s,^{10-13,16,17,19}

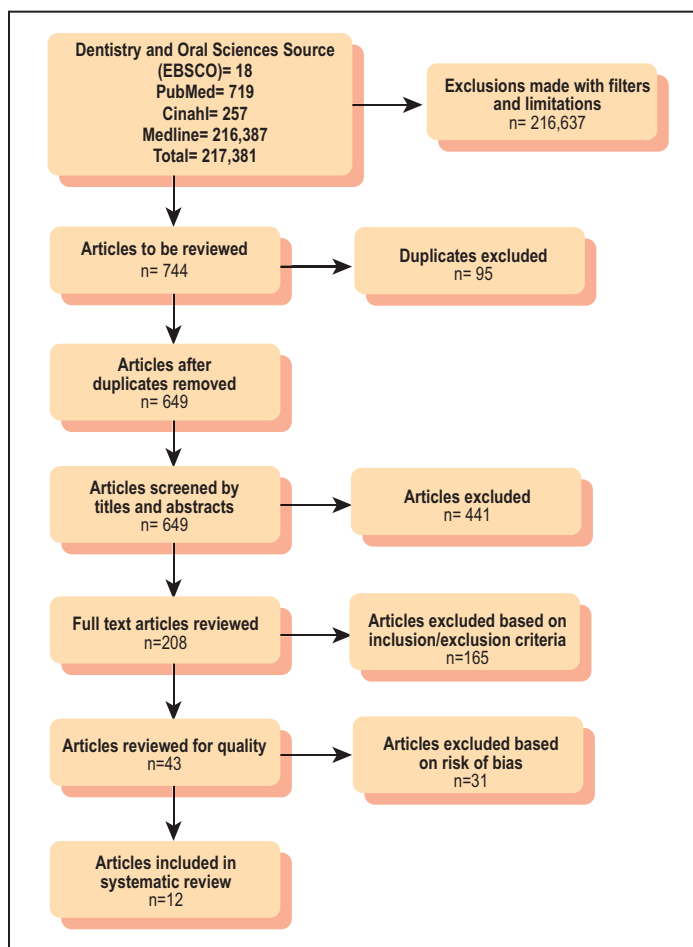
Table I. Risk of bias ratings for 12 included articles

Article (year):	Risk of bias rating:
Avery (2006) ⁸	Fair
Cohn (2012) ⁹	Good
Dattwyler (1997) ¹¹	Good
Gerber (1996) ¹²	Good
Liveris (2002) ¹⁸	Good
Nadelman (1996) ¹³	Good
Payder-Darian (2017) ¹⁴	Fair
Peltomaa (2004) ¹⁵	Poor
Smouha (1997) ¹⁶	Fair
Belman (1992) ¹⁷	Poor
Cook (1997) ¹⁰	Poor
Jain (1996) ¹⁹	Fair

three (25%) from the 2000s,^{8,15,18} and two (17%) were from the 2010s.^{9,14} Publication sources for the twelve articles included several journals: *The Journal of Clinical Microbiology* (2),^{18,19} *The New England Journal of Medicine* (2),^{11,12} *Pediatrics* (2),^{8,9} *The American Journal of Otolaryngology* (1),¹⁶ *Otolaryngology & Neurotology* (1),¹⁵ *The Journal of Pediatric Infectious Diseases Society* (1),¹⁴ *The American Journal of Medicine* (1),¹³ *Neurology* (1),¹⁷ and *The American Journal of Otolaryngology* (1).¹⁰ The PRISMA flow chart of the results of included and excluded studies is shown in Figure 1.

Data extraction of the included articles was completed independently by BB and KJ to include the first author, year, demographic information of the study populations, confirmation of Lyme disease, and presence of orofacial manifestations. Articles included for synthesis documented orofacial manifestations of Lyme disease in human patient populations in the endemic states of Delaware (25%, n=3),⁸⁻¹⁰ Massachusetts (33%, n=4),^{9,11,14,15} Pennsylvania (17%, n=2),^{9,10} New Jersey (8%, n=1),¹⁰ Connecticut (25%, n=3),^{12,15,19} and New York (42%, n=5).^{13,16-19} Demographic characteristics of the patient populations varied in the twelve studies. All articles included both males and females, however nine included mostly males (75%, n=9),^{8-13,15-17} only two articles were predominately of female populations (17%, n=2),^{18,19} and one article did not make a clear distinction.¹⁴ The age ranges of the studied populations also varied. Six articles included a mixture of ages from childhood to adulthood (50%, n=6),^{10-13,15,16,19} four included children and adolescents (33%, n=4),^{8,9,14,17} and one focused only on adults (8%, n=1).¹⁸ Six of the studies were retrospective (50%, n=6),^{8-10,14-16} five were prospective (42%, n=5),^{11-13,18,19} and one followed an

Figure 1. PRISMA Flowchart of article retrieval and study selection



observational design (8%, n=1).¹⁷ In half of the articles (50%, n=6), the number of times orofacial manifestations appeared was more than that of the number of total patients;^{10,11,15-17,19} in one article they appeared the same number of times (8%, n=1),¹⁴ and in five articles they appeared only slightly less (42%, n=5).^{8,9,12,13,18} Patient demographics and the frequency of orofacial manifestations by article are shown in Table II.

Eight orofacial manifestations were reported among the included articles: headache,^{8-13,15-19} facial palsy,^{8-17,19} temporomandibular joint arthralgia,^{10,13} altered taste,¹⁹ stiff neck,^{11,13,15,18} sore throat,¹² neck pain/arthralgia,^{10,12,13,17} and erythema migrans rash on the head or neck.¹² The frequencies of orofacial manifestations per study are shown in Figure 2. Among the twelve included articles, there were a total of 951 confirmed cases of Lyme disease. The frequencies of the eight orofacial manifestations among those confirmed cases were reported as follows: headache (39.5%, n=376),^{8-13,15-19} facial palsy (42.5%, n=404),^{8-17,19} temporomandibular joint arthralgia (.42%, n=4),^{10,13} altered taste (.11%, n=1),¹⁹ stiff neck (13.6%, n=129),^{11,13,15,18} sore throat (3.0%, n=29),¹² neck pain (7.5%,

n=71),^{12,13,17,19} and erythema migrans rash on the head or neck (5.2%, n=49).¹² The frequencies of orofacial manifestations per study are shown in Table III.

Discussion:

The scientific literature was systematically reviewed to synthesize information regarding the orofacial manifestations of Lyme disease that would be most relevant to oral health care providers. Studies that met the inclusion criteria from 1992-2017 were published in journals that do not target the dental professional audience. There is a need for this timely research to appear in dental and dental hygiene journals so that the oral health care community is informed regarding the various ways this growing infectious disease may be manifested within their patient populations. Additionally, none of the included research studies discussed clinical assessments or scales that could be used to quantify the severity of Lyme disease related orofacial manifestations. Such diagnostic tools along with recommendations on how to best manage the orofacial manifestations to ease discomfort, improve function, and track recovery or relapse would be beneficial to oral health care professionals.

Fewer than one half (n=6) of the US endemic states (n=14) were represented in the included studies. More studies are needed in the literature from other endemic and neighboring states, especially since the CDC Morbidity and Mortality Weekly Report concluded that incidence rates are increasing in neighboring states.⁵ Oral health care providers who practice in those geographic areas need to have evidence-based information regarding how to care for affected patient populations. The literature also does not report orofacial manifestations evenly across demographics. Since disease transmission does not discriminate between genders, studies are needed to fully represent both males and females. An underrepresentation of females in the literature may be of concern especially for those residing in low incidence states, since Lyme disease has been found to be more common among females in states with low incidence rates.⁵

A total of eight orofacial manifestations were documented in the included studies. Half of the studies reported higher frequencies of these manifestations than the total number of study participants likely due to participants who experienced multiple oral manifestations. Regarding patients who present with orofacial symptoms of unknown origin, oral health care providers should carefully document their findings following a thorough health history interview and extra/intraoral examination. Questions that may assist dental hygienists and dentists while conducting a health history interview when Lyme disease infection is suspected could

Table II. Number of patients with Lyme disease per article compared with frequencies of orofacial manifestations in the sample populations

Author (Year)	Age Range (years)	Age Mean (years)	Male n(%)	Female n(%)	Confirmed Lyme disease patients n	Frequencies of orofacial manifestations n
Reported as Lyme disease only; excludes orofacial manifestations						
Avery (2006) ⁸	2.7 - 13.1	9.4	18 (67.0)*	9 (33.0)*	27*	25
Cohn (2012) ⁹	7.2 - 13.1**	-	81 (69.0)*	36 (31.0)*	117*	113
Dattwyler (1997) ¹¹	7 - 85	42.6	87 (62.0)*	53 (38.0)*	140*	147
Gerber (1996) ¹²	1 - 21	7.8	131 (65.0)*	70 (35.0)*	201*	187
Liveris (2002) ¹⁸	21 - 72	46.6	23 (46.0)*	27 (54.0)*	50*	44
Nadelman (1996) ¹³	16 - 76	43	49 (62.0)*	30 (38.0)*	79*	71
Reported as Lyme disease and orofacial manifestations combined						
Payder-Darian (2017) ¹⁴	7.2 - 13.1**	9.8	unclear	unclear	204	204
Peltomaa (2004) ¹⁵	4 - 74	-	25 (53.0)	22 (47.0)	47	104
Smouha (1997) ¹⁶	5 - 69	32	30 (60.0)	20 (40.0)	50	55
Belman (1992) ¹⁷	4 - 14	8.2	5 (71.4)	2 (28.5)	8*	9
Cook (1997) ¹⁰	3 - 18	10	18 (72.0)	7 (28.0)	25	49
Jain (1996) ¹⁹	6 - 60	26.3	1 (33.0)	2 (67.0)	3	6

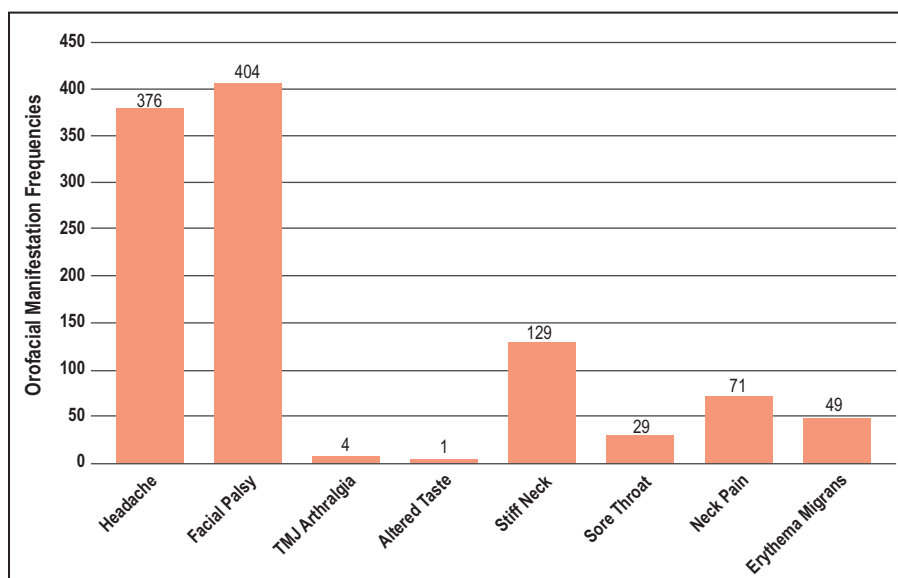
*Number includes those with Lyme disease, does not exclude on the basis of whether or not an OM was present.

**IQR=reported as interquartile range

include: “Have you noticed a red, circular skin rash?”, “Have you worked or played outdoors within the last month?”, “Do you recall a recent insect bite?”, “Have you recently traveled to states known to be endemic for Lyme disease?”, and “Have you been tested by your medical physician for Lyme disease?”.⁴ Occurrences of these orofacial manifestations should be taken into consideration for any type of differential diagnoses when the typical oral pathologies of trauma or infections cannot be identified. This is particularly important since these presenting signs and symptoms can occur during the localized early stage of Lyme disease when serology testing may fail.

Eight of the included studies reported headache, neck pain/arthritis, sore throat, facial paralysis, stiff neck, altered taste, and TMJ arthralgia as orofacial manifestations appearing during the early stage of disease,^{11-15,17-19} and two studies reported headache, neck pain, and sore throat during the late stage of disease.^{12,17} Four included studies did not specify early or late dissemination for disease stage of the sample populations.^{8-10,16} While the majority of reported orofacial manifestations appeared during early dissemination among these studies, it is difficult to say this is enough evidence to generalize that all orofacial manifestations primarily occur during early dissemination of

Figure 2. Frequencies of orofacial manifestations



the disease. Future research should include specific details about the timeframe of when signs and symptoms appear in the disease process so that a pattern of correlation may be identified over time. Oral health care providers with a keen awareness of the role of these oral manifestations could refer a patient for medical examination when Lyme disease is suspected, increasing the chances of making a timely diagnosis.

A total of 951 patients were confirmed to have Lyme disease across the twelve studies. Headache and facial palsy were reported most frequently while temporomandibular joint arthralgia and altered taste were reported the least. Low frequencies of neck stiffness and temporomandibular joint arthralgia

Table III a. Reported orofacial manifestations in confirmed cases of Lyme disease per article

Manifestation:	Avery ⁸	Cohn ⁹	Cook ¹⁰	Dattwyler ¹¹	Gerber ¹²
Headache	n=16 (59%); >3 days duration	n=56 (52.0%)	n=14 (56.0%)	n=43 mild n=27 moderate n=25 severe	n=55 (23%) early stage n=39 (19%) early stage n=4 (2%) late stage
Facial palsy	n=9 (33.0%); 1 was bilateral	n=57 (70.0%)	n=4 (56.0%) right side; n=11 (44.0%) left side; Duration was 2-20 weeks; average was 5.24 weeks	n=10 (7%)	n=6 (3%) early stage
TMJ arthralgia			n=2 (8.0%)		
Altered taste					
Stiff neck				n=28 mild n=19 moderate n=5 severe	
Sore throat					n=16 (8.0%) early stage n=11 (5.0%) early stage n=2 (1%) late stage
Neck pain/ arthralgia			n=8 (32.0%)		n=34 (17.0%) early stage n=19 (9.0%) early stage n=1 (.5%) late stage
Head/neck erythema migrans (EM) rash					Of the 188 patients with a single EM rash, 26.0% (n=49) had it on the head or neck EM rash on head/neck occurred significantly more in younger patients (mean age of 5.9, $p<0.01$)

Table III b. Reported orofacial manifestations in confirmed cases of Lyme disease per article

Manifestation:	Jain ¹⁹	Liveris ¹⁸	Nadelman ¹³	Paydar-Darian ¹⁴	Peltomaa ¹⁵	Smouha ¹⁶	Belman ¹⁷
Headache	n=1	n=19 (38.0%)	n=33 (42.0%)		n=33 (70.0%)	n=5 (10.0%)	n=6 (75.0%)
Facial palsy	n=3; 2 were unilateral; 1 was bilateral		n=1 (1.0%)	n=204 (100%)	n=41 (87.0%) unilateral; n=6 (13.0%) bilateral	n=46 (92.0%) unilateral; n=4 (8.0%) bilateral	n=1 (12.5%) unilateral; n=1 (12.5%) bilateral
TMJ arthralgia			n=2 (2%)				
Altered taste	n=1						
Stiff neck		n=25 (50.0%)	n=28 (35.0%)		n=24 (51.0%)		
Sore throat							
Neck pain/ arthralgia	n=1		n=7 (9.0%)				n=1 (12.5%)
Head/neck EM rash							

was a surprising finding since the review process revealed several articles and case studies which reported those two symptoms as primary orofacial manifestations.^{7,24-34} However, case studies were excluded from this systematic review, due to the high for risk of bias. Considering that neck stiffness and temporomandibular joint arthralgia appeared in several case studies and have been recognized by the CDC as Lyme disease symptoms,² they may merit further study.

Avery et al, devised a statistical model to help predict Lyme meningitis and stated that odds ratios for headaches can serve as an independent predictor of the condition and found that headache duration was an independent predictor of Lyme meningitis in children in an endemic region.⁸ This model allowed practitioners to calculate the probability from .01 to .99 of children having Lyme meningitis.⁸ Each additional day of headache duration increased the odds ratio of having Lyme disease by 0.136.⁸ The Avery prediction model was compared against a “rule of 7’s” prediction model devised by Cohn et al. This prediction model classifies suspicious cases as “low risk” when 3 of the following criteria are met: “<7 days of headache, <70% cerebrospinal fluid mononuclear cells, and absence of seventh or other cranial nerve palsy.”⁹ Cohn et al reported that both the Avery model and the rule of 7’s performed well when applied to a sample population of children. However, the rule of 7’s model had higher sensitivity (96% [95% CI: 90%-99%]) compared to the Avery model (83% [95% CI: 75%-89%]); and fewer misclassifications when assessing patient risk for Lyme disease.⁹

Smouha et al applied a researcher-designed clinical probability scale compared against serology test results to determine if clinical signs and symptoms could accurately assess Lyme disease probability.¹⁶ The researchers defined clinical probabilities of Lyme disease signs and symptoms including orofacial manifestations: “definite” probability (erythema migrans rash), “high” probability (headache and stiff neck), “intermediate” probability (arthralgias), and “possible” (headache alone).¹⁶ However, they concluded that the majority of disease predictors could not be made solely based on clinical data, which contrasts findings from Avery’s prediction model and Cohen’s rule of 7’s model.¹⁶ Risks or odds ratios for orofacial manifestations should be investigated by validated prediction models to determine whether they can assist health care providers who encounter suspicious cases. Since patients presenting with orofacial manifestations are considered medical emergencies, the ability for oral health care providers to apply risk prediction models until serology test results are available, and may help reduce unnecessary antibiotic prescriptions, invasive medical procedures and support timely referrals.

Generalizability of this systematic review is limited because studies of populations outside of the US were not included as Lyme disease variants in other countries may differ from those found in the US. Additionally, the Cochrane Data Collection Form for Randomized Control Trials and Non-randomized Control Trials was modified as there were few randomized control trials identified in the literature that met the inclusion criteria.

Future research focused on the eight orofacial manifestations associated with Lyme disease as presented in oral health care settings is needed. Additionally, there were other less common orofacial manifestations of Lyme disease reported as case studies that were not included in this review. A systematic review of case studies could be helpful to investigate the phenomenon of these less common manifestations. Case-control studies of integrated electronic medical and dental records could be conducted to investigate the frequencies of orofacial manifestations of confirmed Lyme disease cases against healthy cases from endemic states to support evidence-based decision making for all health care providers. Future studies should also investigate the efficacy of integrated electronic medical and dental records to improve the interprofessional collaboration of health care professionals for the management of patients with Lyme disease.

Conclusion

This systematic review researched orofacial manifestations of Lyme disease that could be recognized by oral health care providers. Eight orofacial manifestations of Lyme disease have been well documented in the literature. Ongoing research regarding the orofacial manifestations of Lyme disease is needed so that this medical phenomenon can be well understood by dental professionals in order to best serve their patients.

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Dental Hygienists' Interprofessional Education and Collaboration Experiences: A survey of current behaviors and attitudes

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Abstract

Purpose: Interprofessional collaboration in health care is needed for comprehensive patient care and improved health outcomes. The purpose of this study was to assess dental hygienists' attitudes and behaviors on past interprofessional education experiences to determine how those experiences influence the ways they collaborate with other health care professionals.

Methods: Licensed dental hygienists in the United States were recruited to participate in this mixed methods study via social media sites and through the constituents of the American Dental Hygienists' Association. The survey instrument consisted of 23 items incorporating quantitative Likert-style, multiple-choice and qualitative open-ended questions designed to measure participants' attitudes towards interprofessional collaboration (IPC) and interprofessional education (IPE), IPC behaviors in practice and previous IPE experiences.

Results: Of the 184 participants who opened the survey, 165 respondents met the inclusion criteria and completed the survey (n=165). Most of the participants indicated the belief that IPC was important (90%, n=147) and felt confident collaborating with other health care professionals (81%, n=133). While two-thirds of the respondents did not report previous IPE experience (66%, n=109), the majority reported collaborating with other health care professionals within the past six months (63%, n=102). Respondents who reported prior IPE, collaborated with other health care professionals more frequently, on average, than those without IPE experience. Most IPE experiences were case studies and on- and off-campus clinical rotations.

Conclusion: Findings suggest dental hygienists appreciate the importance of IPC and collaborate with other health care providers based on those attitudes, regardless of prior IPE experiences. Further research examining the best practices of IPE experiences could enrich the value of future collaborations between dental hygienists and other health care providers.

Keywords: dental hygienists, health care providers, interprofessional collaboration, interprofessional education, dental hygiene education

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Introduction

Over the last twenty years, public and private health initiatives have reviewed the extensive barriers that prevent positive patient health outcomes.¹⁻⁴ Due to the complexity of chronic conditions such as diabetes, cardiovascular disease, and obesity, collaborative teams of health care providers are needed to provide comprehensive patient care.⁵ Limited access to care, inadequate quality of care, patient health and safety concerns, and the overall cost of health care have been key

drivers for the integration of interprofessional education (IPE) and the push for collaborative practices between healthcare providers.^{3,6} Interprofessional collaboration (IPC) is defined as health care providers from different professional backgrounds working as a team to deliver comprehensive care for patients.^{2,7} Increased awareness and active participation in interprofessional collaboration between dental hygienists and other health care providers are key to achieving optimal patient health. Dental

hygienists have expertise in oral health combined with knowledge of the oral-systemic connection and have the ability to incorporate and monitor oral and systemic outcomes within dental hygiene care plans, to achieve common goals.⁸

Interprofessional Education Experiences

Interprofessional education is recognized worldwide for fostering teamwork and collaboration for members of the health care team as it enables students from differing professions to learn with, from, and about each other to improve collaboration and the quality of care.² Interprofessional experiences have been shown to significantly improve providers' attitudes and behaviors to prevent medical errors and improve patient outcomes.^{9,10} Common IPE methods used in dental hygiene programs include case studies, on- and off- campus clinical activities, patient simulations, service learning, standardized patients, health mentors, or a combination of methods.¹¹ One study of dental hygiene programs revealed that IPE was taught between one to four hours per week, and often in conjunction with nursing, occupational therapy, physical therapy, and dentistry programs.¹¹ In dental schools, IPE designs included small groups from multiple professions, engaging students, and fundamentals introducing first-year students to IPE.¹² Early interprofessional learning experiences have been shown to help students establish effective and collaborative working relationships within the health care team.¹³

Increased knowledge from interprofessional education experiences has been shown to lead to better skills and positive attitudes towards collaboration between health care providers.¹³⁻¹⁵ Physician assistant and pharmacy students increased collaborative behaviors after a year-long interprofessional clinical case study course.¹⁶ Nurse practitioner students increased confidence in oral assessment skills after IPE activity with dental students.¹⁷ Dental hygiene and physician assistant students advanced knowledge, communication, and confidence after participating in an IPE activity centered on the oral manifestations of menopause.¹⁸ IPE experiences lead to positive interprofessional communication skills and further understanding of the roles and responsibilities of other health care professionals.¹⁹⁻²¹ James et al. found IPE between physician assistant students and audiology students led to increased awareness of roles and responsibilities, provided opportunities to reflect on the benefits of IPC, and fostered interprofessional relationships.²² Dental, medical, and nursing students highlighted an increased knowledge of oral health from an IPE experience promoting teamwork, communication, and role and responsibility recognition.²³ Interestingly, while both American and Canadian researchers found confidence and perceptions towards collaboration are

increased by IPE, the findings on the long-term benefits of educational experiences have been inconclusive.^{24,25}

Collaborative educational experiences are enhanced through exploration of the link between oral health and systemic disease. The 2000 Surgeon General's Report on Oral Health stresses the importance of all health care providers evaluating oral health as an indicator of overall well-being.¹ The framework of the oral-systemic link serves to increase health care providers' comprehension of the roles and responsibilities within a health care team and enhances communication between providers.^{19,26} However, the curricula of non-dental health professionals does not adequately address oral conditions.^{1,17} Oral health care providers must work in conjunction with the patient and other health care professionals to reach the goal of improving oral health.

Interprofessional Collaboration in Practice

Effective collaborative health care teams, including dental hygienists, recognize members' roles and responsibilities within the group while respecting the specific support each profession provides in treating the patient.^{27,28} In a study of oral health awareness among nephrology nurses, it was discovered that nurses lacked knowledge of the effects of oral health on kidney disease.²⁹ Munz et al. found while medical students are aware of oral conditions, they lack the necessary skills to diagnose oral diseases and furthermore exhibit an overall lack interest in oral care.¹⁵ In contrast, in a study by Luebbers et al. physicians recognized the value of the oral-systemic link and collaboration with dental hygienists as part of an interprofessional team.³⁰ Kanji and Laronde found that dental hygienists collaborate most frequently with general dentists, dental specialists, physicians, pharmacists, and nurses.³¹ Internationally, a German study showed that collaboration between medical and nursing students contributed to improved clinical outcomes of patients.³² Collaboration between healthcare disciplines has also been shown to highlight missed treatment opportunities and increase referrals between providers.^{30,33} Collaborative clinical practices such as daily briefings, case presentations, and continuing education courses can result in better communication between providers and improved health for high-risk patients.³⁴

Historically, health care professionals were taught and later practiced in silos – clusters of professionals in isolated groups within their institutions. This seclusion creates a health care system which provides care for patients in a poorly organized and complex manner.³ Over the last twenty years, multiple organizations have attempted to address this poor organization with IPE and collaborative practice

recommendations.^{1,2,6,7} Dental hygienists are in a unique position to detect a multitude of oral and systemic diseases, contact necessary health care providers to communicate the health needs of the patient, and participate in creating a custom care plan as part of a collaborative team.¹

The National Dental Hygiene Research Agenda of the American Dental Hygienists' Association has prioritized research on the ways IPE and collaboration are understood and carried out within the profession.³⁵ Changes made to include interprofessional education in the dental hygiene education curricula can be complex.^{36,37} Investigating the ways IPE experiences influence the way clinical dental hygienists collaborate may lead to more effective teaching methods and improve collaborative efforts between health care professionals. The purpose of this study was to assess dental hygienists' attitudes towards IPE experiences and investigate how these experiences influenced collaboration with other health care professionals.

Methods

Survey instrument

The University of Bridgeport Institutional Review Board (IRB) approved this study and granted permission to send the survey electronically. A mixed-method approach using both qualitative and quantitative data was employed. Responses were based on the participants' perceptions; therefore, a blended approach was used to decrease response bias. The 23-item survey instrument included demographics, present collaborative behaviors, and IPE experiences. There were two open-ended items, two fill-in-the-blanks, six Likert-style questions and thirteen multiple-choice questions. Three of the Likert-style items were from the Readiness for Interprofessional Learning Scale (RIPLS) and were chosen to specifically address the hypothesis.³⁸ The RIPLS was developed by Parsell and Bligh and has been used as a measuring tool to assess participants' attitudes towards interprofessional learning.^{18,26,39} However, IPE assessment scales been shown to have a range of questionable psychometric integrity.⁴⁰⁻⁴² Due to the fallibility of the assessment tool, the RIPLS was modified. Four subject matter experts in research and IPE pilot-tested the modified RIPLS for functionality and clarity of the questions. Feedback was incorporated into the survey design prior to distribution. Qualitative questions allowed participants to further elaborate on feelings and knowledge towards IPE and IPC and verified the quantitative data. The survey instrument avoided evaluating IPE curricula and prior IPE experiences were not part of the inclusion criteria.

Sample population and data collection

Dental hygienists licensed in the United States (US) were recruited to participate from social media sites and constituent websites of the American Dental Hygienists' Association (ADHA). Health care professionals outside of dental hygiene and dental hygiene students were excluded from participation. Forty-nine states and the District of Columbia received an independent request to distribute the survey link, and five states complied. Members of the ADHA were emailed a letter of introduction and an invitation to participate. Sixty-seven dental hygiene related Facebook groups were contacted and agreed to distribute the survey through group posts. Consent to participate was implied when the participants opted into the survey. An electronic survey platform (SurveyMonkey; San Mateo, CA) was used to collect data. To protect privacy, date of response and IP address were removed when exporting data.

Statistical analysis

Descriptive statistics were used to determine means, frequencies of responses, and ranges of responses from demographics, years of practice, and type of employment. A 2-sample t-test yielding *p*-value for inference determined the association between the attitudes and behaviors towards IPE and presence of IPE experiences. Non-parametric statistics Mann-Whitney U test evaluated the attitudes towards IPC against the presence or absence of IPE experiences. A Chi-square test evaluated the correlation between the number of IPE experiences with participants' IPC behaviors within the last six months.

A content analysis was conducted on the qualitative data derived from the open-ended response items. Two researchers reviewed the data and identified common themes. After agreement was reached on the response themes, two alternate researchers independently reviewed and confirmed the findings to increase interrater reliability. Inconsistencies were resolved by majority vote between the five researchers. Themes were coded and frequency of occurrences were calculated.

Results

A total of 184 participants completed the survey. However 19 respondents did not meet the inclusion criteria and were excluded from the data analysis for a sample of 165 licensed dental hygienists (*n*=165). A power analysis was conducted on the sample, and yielded a power of 90% ($\alpha=0.05$). The majority of participants were employed in private practice settings (84.0%, *n*=137) and had graduated from a two-year program (76.0%, *n*=125). Half of the respondents came from the Northeastern US (*n*=83) and had between 16-25 years of clinical experience (*n*=81). Sample demographics are shown in Table I.

Table I. Demographics (n=165)

Category	n	%
Highest degree earned		
Associate	93	56.0
Bachelor	43	26.0
Masters	27	16.0
Doctorate	1	0.6
Current Position		
Clinical	119	75.0
Educator	22	14.0
Independent practice	3	2.0
Public health	4	2.0
Other	11	6.0
Practice Setting		
Private practice	137	84.0
Community centers	6	3.0
Public health centers	8	5.0
Hospital/nursing facility	6	4.0
College or university	24	15.0
Mobile clinic	10	6.0
Type of degree program		
2-year	125	76.0
4-year	31	19.0
Degree completion	4	2.0
Graduate program	6	4.0

Category	n	%
Age		
Under 25	3	2.0
25-34	44	27.0
35-44	27	17.0
45-54	42	26.0
55-64	39	24.0
65+	9	5.0
Years in practice		
0-5	4	2.0
6-10	43	26.0
11-15	27	16.0
16-20	42	25.0
21-25	39	23.0
More than 25	9	5.0
Region of practice		
Northeast	83	50.0
Southwest	3	1.0
Midwest	30	18.0
Southeast	5	3.0
Pacific	26	15.0
Rocky Mountain	17	10.0
Alaska/Hawaii	1	0.6

Of the 56 respondents who reported IPE experience, two-thirds agreed or strongly agreed (66%, n= 37) that the IPE provided the necessary confidence to collaborate in a professional setting. Sixty-one percent (n=97) of all respondents felt communication skills with patients and other professionals were increased with IPE experiences regardless of whether they had IPE experiences while in school. Interprofessional education experiences and IPC behaviors are shown in Figure 1.

Participants were asked to identify types of IPE activities they had experienced from a given list. The most common experiences were case studies (n= 80), on- and off- clinical rotations (n=70), patient simulations (n=37), and service-learning activities (n=37). One third of the respondents (34%, n=56) reported learning alongside students in other health professions during their education. Respondents who experienced interprofessional learning activities valued IPE more than respondents who had no previous exposure to interprofessional education ($p<0.001$). No association was found between the number of interprofessional education experiences and presence of collaborative behaviors within a six-month period ($X^2=3.567$, $p=0.468$). Similarly, the Mann-Whitney U test did not identify significant differences between respondents' attitudes towards IPC and the presence or absence of IPE experiences ($p=0.16$). Relative frequency of IPE experiences was highest in the 0-5 (54%, n=19), 6-10 (42%, n=10) and 16-20 (42%, n=5) years of practice groups, respectively.

Participants' attitudes towards interprofessional collaboration adapted from the RIPLS scale³⁸ are shown in Table II. Most respondents (90.0%, n=147) indicated that they believed collaboration between dental hygienists and other health care professionals was important. Over half of the participants (52%, n=85) strongly agreed providing collaborative care makes the dental hygienist a more effective team

Figure 1. Interprofessional education experience and IPC behaviors (n=165)

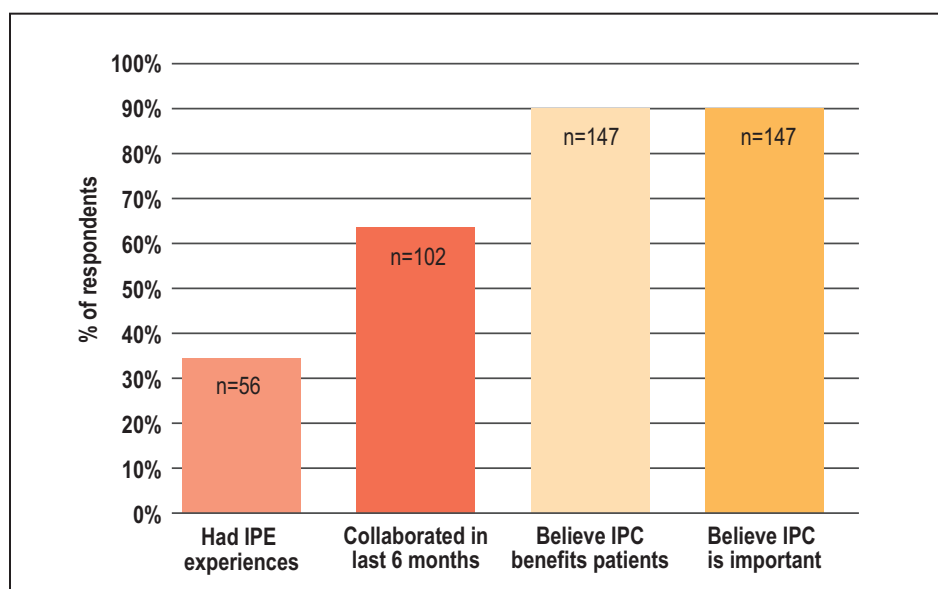
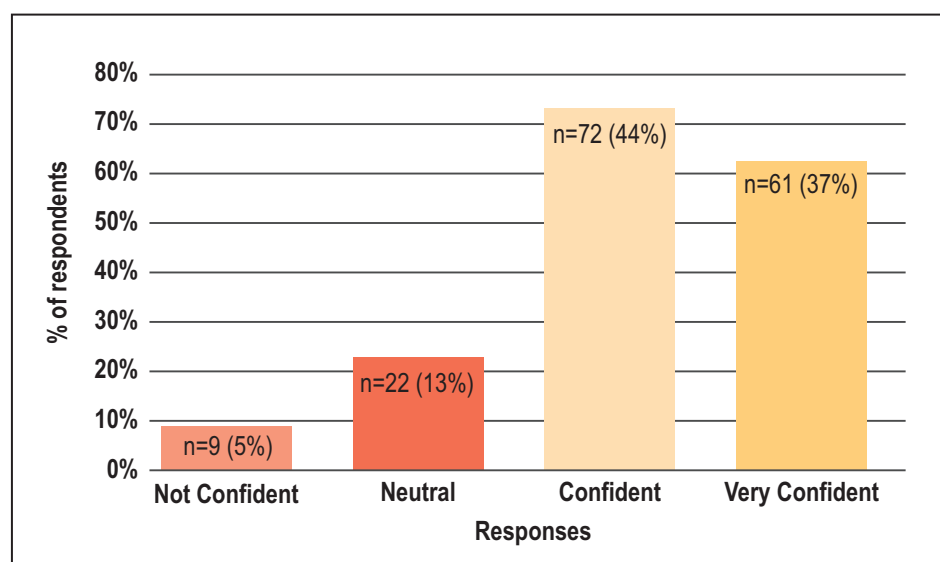


Table II. Items modified from the Readiness for Interprofessional Learning Scale³⁸ (RIPLS) (n=165)

Question	n	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	NA
Providing collaborative care makes me a more effective team member in my patient's overall healthcare.	165	24	0	9	47	85	
Patients would ultimately benefit if dental hygienists and healthcare professionals worked together.	165	17	0	1	42	105	
Do you feel collaboration between other healthcare professionals is important?	165	14	0	4	47	100	
Interprofessional education experiences with other health professionals have helped me to communicate better with patients and other professionals.	159	10	2	50	56	41	
Learning to interact with students from other healthcare professions during my educational experience proved me with the confidence to collaborate in a clinical setting.	159	5	8	22	39	23	62
Question	n	Not confident	Neutral	Confident	Very Confident		
How confident do you feel collaborating with other health professionals?	164	9	22	72	61		

Figure 2. Confidence in collaborating with other health care providers (n=164)*



* one respondent left this item blank

member in overall patient care and two thirds of participants (63%, n=105) strongly agreed that patients would ultimately benefit if dental hygienists and health care professionals worked together. Most respondents (82%, n= 133) felt confident or very confident in collaborating with other health care professionals as shown in Figure 2. The relative frequency of collaborative encounters with other health care professionals was highest among participants who have been working for 11-15 years (80%,n=13), followed by those who have worked for 6-10 years (70%, n=16) and those who worked for more than 25 years (63%,n=38).

Linear regression correlation revealed a significant relationship between respondents IPC attitudes and corresponding IPE attitudes ($t=3.922$, $p<0.001$). Participants who had positive attitudes towards IPE also showed positive attitudes towards IPC ($r=0.301$). Fewer than ten percent of the observed variation of

collaborative attitudes were explained by the relationship between IPC and IPE attitudes, suggesting attitudes towards IPC were largely related to variables other than attitudes related to IPE experiences ($r^2= 0.091$). Data was then limited to respondents with previous IPE experience to further analyze the correlation between attitudes of these experiences and the frequency of IPC within a six-month period. IPE attitude scores of respondents who had previous IPE experiences showed a positive but weak correlation to the number of IPCs with other health care professionals within a six-month period ($r=0.172$, $r^2=0.03$).

Measurements of IPC showed over one half of respondents (63%, n= 102) had collaborated with one or more health care professionals within the last six months; four times per month was the average frequency of collaboration. Frequency of collaborations were also analyzed in relation to the presence of IPE experiences. Respondents with IPE experiences tended to collaborate more on average (median 3.75) than respondents without IPE experiences. Participants who indicated a lack of IPC activities were asked to choose

from a list of reasons for not collaborating with other health care professionals. Reasons cited as barriers to IPC included a “lack of need” (n=26), “lack of time” (n=13) and “not in the job description/not allowed” (n=7).

There were 133 responses to the open-ended question, “What is the most important factor for a dental hygienist to practice IPC?” Over one third of the respondents (37.0%, n=49) focused on patient care and better health outcomes as the most important factor for IPC. One participant mentioned confidence, communication, and patient care were particularly significant.

“To feel confident about my own knowledge concerning oral health and be able to communicate information to another healthcare professional concerning patient care situations in search of optimal patient health outcomes.”

Respondents also mentioned respect (n=13) as a health care provider and the role of IPE as critical factors.

“For the dental hygiene profession to promote the strength of their education/knowledge so that they will be respected as serious health care providers. Furthermore, for dental hygiene programs to create more collaborations between their students and other medical professions’ students so that they can understand the benefit of that collaboration.”

Regarding the skills gained from previous IPE experiences the value of collaboration and teamwork were recurring themes.

“Understanding each professional disciplines’ unique specialized contribution to the overall positive patient outcome”

“I gained an understanding of what my role was, and what questions to ask the other students from different healthcare backgrounds. Knowing more about how oral health affects the overall health of patients helps me daily.”

Discussion

Findings from this study revealed that most dental hygienists surveyed were enthusiastic about collaborating with other health care professionals to provide comprehensive patient care. Data revealed more than half of the participants already collaborate with other health care professionals, regardless of a history of formal interprofessional education experiences. Most respondents indicated confidence in collaborating with other health care professionals, suggesting that dental hygienists recognize the immense value of collaborative teams of professionals and act based on those attitudes, independent of formal training.

A closer look at IPE teaching methodologies could expand on the qualities important to collaboration such as knowledge,

values, communication skills, and resources. Since 2009, the Interprofessional Education Collaborative (IPEC) has focused on creating competencies to guide collaborative education experiences with a focus on engaging students of different health professions. The Interprofessional Education Collaborative divides collaborative practice into four domains used to assess effectiveness of IPE activities and foster healthcare teams; enhancing patient care and improving population health.⁷ More than half of dental hygiene schools in the US have indicated offering a form of IPE that meets the current accreditation standards.³⁷ However, a survey of dental hygiene program directors showed that one quarter of dental hygiene programs in the US failed to incorporate interprofessional activities in the curricula.¹¹ In addition, the IPE activities included in curricula may not meet the definition of IPE created by the IPEC.^{7,12} Students may not understand the value of interprofessional collaboration if the education received does not align with the IPEC competency model. Results from this study showed that two thirds of participants who had collaborated with other health care providers at a rate of five or more times within a six-month period, held bachelor’s degrees or higher. Further research is needed to determine a correlation between level of education and the frequency of IPC.

Participants who had experienced IPE in a collaborative setting presented higher positive attitudes towards IPE compared to those without interprofessional experiences. A significant relationship was found between respondents’ IPC attitudes and corresponding IPE attitudes, suggesting as IPE attitudes increase, attitudes regarding collaboration with other health care providers increases. The statistical correlation may partially be due to greater understanding of IPE and IPC through the educational experience provided. Findings are consistent with research that noted students who experience IPE gain appreciation of roles and responsibilities in collaborative experience, teamwork, communication skills, and a greater value of collaborative efforts.^{11,43} However application of linear regression as a statistical analysis provided a relatively weak way to predict IPC attitudes from the reported IPE attitudes. Approximately 9% of the observed variation of IPC attitudes is explained by the relationship to IPE attitudes. These findings suggest attitudes related to collaboration with other health care providers are largely related to variables outside of this study.

Nearly one quarter of the respondents who reported not collaborating with other health care providers indicated a lack of perceived need. Whether this lack of need means that the respondents do not value IPC as a means for improved patient outcomes or if they do not see the need to communicate with another health care provider in managing patient care is

unknown. Future research could expand on this topic and further explore the correlation between IPC attitudes and patient health.

This study had limitations. While a representative sample of dental hygienists licensed in the US was sought, there were challenges. The invitation to participate that was distributed to the ADHA constituents was limited to those states who opted to forward the survey to their members. Additional participants were recruited through social media sites; however, users of social media are not representative of all demographics. While the generalizability of the results is limited, the power analysis deemed the sample size to be sufficient for statistical analysis. The modification of the RIPLS tool may have affected the validity. The retrospective nature of the survey items may be subject to self-report bias in the responses. Future research is necessary to explore the various of collaborative behaviors of dental hygienists along with previous IPE experiences.

Conclusion

Findings from this study show dental hygienists feel strongly about using IPE efforts to benefit patient health and are confident in interacting with other health care providers. While many dental hygienists were found to be collaborating with other health care professionals without formal IPE experiences, those with IPE experiences were found to collaborate at a higher frequency than those without previous IPE experiences. Promotion of the need and value of interprofessional collaboration could encourage increased collaborations between healthcare providers. Further research examining the best practices of interprofessional education could enrich future interactions between other healthcare providers and dental hygienists.

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Oral Care Experiences of Young Adults with Autism Spectrum Disorder

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Abstract

Purpose: Individuals with autism need oral health care providers who understand their sensitivities and are responsive to their oral health care needs. The purpose of this study was to understand the oral health care experiences and needs of young adults with autism spectrum disorder (ASD).

Methods: A qualitative descriptive research design was used and young adults with ASD were recruited through purposive and snowball sampling. Semi-structured interviews with open-ended questions were conducted and audio-recorded. Pseudonyms were used to protect confidentiality. Interviews were transcribed and data were analyzed simultaneously at the time of data collection. Open coding and axial coding were used to create common categories. Validity was established using investigator triangulation and member checks.

Results: Fifteen individuals (ten males and five females) met the inclusion criteria and participated in the study. Participants revealed a range of feelings related to their oral care experiences from positive to neutral to negative. Participants identified likes and dislikes in regard to dental hygiene and dental treatment as well as daily self-care practices. Individuals reported that improvements in communication were needed; some indicated not wanting to disclose their ASD diagnosis with their oral care providers. Multiple auditory, visual, and tactile sensory challenges were experienced while waiting in the reception area and during the provision of oral health care treatment. Participants made recommendations to improve oral health care experiences.

Conclusions: Results from this study offered insight into the oral care experiences of young adults with ASD and the challenges they encounter. Additional research is needed to further explore this phenomenon from the perspective of non-verbal individuals with ASD and from the standpoint of oral health care professionals who are working with young adults with developmental disabilities.

Keywords: autism spectrum disorder, young adults, oral care, dental hygiene care, access to care, perceptions, qualitative research

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Introduction

Over the last 30 to 40 years the number of diagnosed autism cases has been rising globally, as well as in the US.¹ This increase in occurrence is thought to be a result of better diagnostic practices using broadened diagnostic criteria and children being identified at younger ages.¹⁻³ Another factor is increased parent awareness; in many cases the cause of autism is linked to genetics and the tendency it has to run in families.^{4,5} In 2018, the Centers for Disease Control and Prevention Autism and Developmental Disabilities Monitoring Network reported the prevalence of autism was 1 in 59 children over the previously reported 1 in 68.² The predominance continues to be 5 times higher in males than

females.² As the reported incidence of autism rises, individuals with autism will need to find oral health care providers who understand their sensitivities and are responsive to their oral health care needs.

In the fifth edition of its *Diagnostic and Statistical Manual (DSM-5)*, published in 2013, the American Psychiatric Association (APA) described autism as having previously been represented by four individual diagnoses consisting of autistic disorder, childhood disintegrative disorder, pervasive developmental disorder-not otherwise specified (PDD-NOS) and Asperger's syndrome.⁴ In 2013, the APA merged these four categories into one diagnostic term of autism spectrum

disorder (ASD). Autism spectrum disorder is a persistent neurodevelopmental disorder with an early onset beginning in childhood and developmental delays appearing as early as 18 months or even younger. Most diagnoses are established between year 2 and 3 and last throughout life.⁶

Individuals with ASD often appear physically normal, yet generally lack socialization abilities.⁶ They frequently have difficulty with communication including an inability to initiate or continue conversations or to answer questions.⁴ Additionally, individuals with ASD may misunderstand jokes, sarcasm, or teasing.⁶ They generally speak in flat, robot-like, or sing-song speech.⁶ Also characteristic are social issues of avoiding eye-contact and resisting physical contact, extreme reaction to invasion of personal space, and unusual sensory interests or sensitivities.^{4,6}

Individuals with ASD experience challenges within the course of their daily lives; however, oral care involves extreme sensations associated with visual, auditory, tactile, olfactory, or gustatory stimuli.⁷ Studies have shown that individuals with ASD have behaviors that put them at higher risk for oral diseases.⁸⁻¹¹ These behavioral impairments include difficulty with communication, impaired social interactions, restricted interests and eating habits, resistance to oral care, and repetitive and stereotyped behaviors.⁴ Even though many individuals with ASD have dental visits, many do not receive the level of care essential to maintain good oral health.¹²

Investigations have studied sensory processing issues, communication techniques, and behavioral management for children with ASD when faced with oral health care visits.¹³⁻¹⁵ Glaring fluorescent lights, moving back in the chair, touching in the mouth especially the tongue, and tasting and smelling oral care products are regular sensory characteristics of the oral health care visit, however these stimuli can trigger children with ASD to react with anxiety and uncooperative behaviors.¹⁵ Consequently, the simple behavior guidance techniques such as tell-show-do, distraction, positive reinforcement, and voice control, as well as relationship building strategies that are successful with typically developing individuals, may not be successful for individuals with ASD.^{13,16,17} Non-traditional methods of behavior guidance, such as book-based visual pedagogy,¹⁸ social stories, video modeling and desensitization¹⁶ have had greater effectiveness for individuals with ASD than traditional approaches alone.

In one study, sensory processing techniques were proposed as strategies to mitigate obnoxious sensations for children and young adults with ASD during oral health care visits.¹⁹ In another study researchers addressed desensitizing the environment to achieve a similar effect, of lessening

anxiety and decreasing uncooperative behaviors exhibited by individuals with ASD in the oral health care setting.²⁰ Oral health care providers need to be aware of the many stimuli that occur during oral health care visits and be prepared to make individualized adaptations for each patient.^{19,20}

Recommendations to diminish sensory stimuli for patients with ASD in oral health care settings include: verbally preparing the patient by describing what will take place to prevent startling them and offering alternative products with tastes and smells consistent with patient preferences. Other techniques include using firm deep touch rather than light touch and making as little contact as possible with the face and tongue, avoiding direct eye contact, wearing transparent face shields, and blocking as much light as possible by providing sunglasses and dimming the overhead lights.^{21,22}

Research to date has largely been conducted from the oral health care providers' and parents' perspective. No original primary research has been reported in the literature related to young adults with ASD and their oral care experiences. There is also a need to determine whether the oral health needs of children with ASD are the same as the oral health care needs of young adults with ASD. The purpose of this qualitative study was to better understand the oral health care experiences and needs of young adults with ASD.

Methods

This study was reviewed by the University of Idaho's Human Subjects Committee and received Institutional Review Board approval (IRB-FY2020-117). A qualitative descriptive approach was used to facilitate an in-depth exploration of the oral health experiences and needs of individuals with ASD. This qualitative study design has been shown to be appropriate when exploring phenomena where little theoretical or practical knowledge exists.²³

Purposive sampling, as used in this study, is often utilized as the sampling procedure for a descriptive qualitative study.²³ Participants were initially recruited through personal networking by the principal investigator (PI) posting a brochure at a non-profit human service organization serving communities with special needs in southeast Alaska. The snowball sampling was then used to gain referrals of other individuals with ASD who could be recruited for the study.^{24, 25} Inclusion criteria consisted of young adults diagnosed with ASD between the ages of 18 and 35, who were able to communicate verbally in English, who were willing to participate for up to an hour of interview questioning, and who had an oral healthcare visit within the last two years. Preference was given to participants who had not been patients in the PI's dental practice setting

to promote maximum variation and decrease bias. A screening questionnaire was completed to verify that inclusion criteria were met. The questionnaire included demographic information, living arrangements, type of ASD diagnosis, identification of the consent form signer, date of last oral health care visit, and preferred pseudonym. The forms indicating informed consent to participate in the study were explained to potential participants and/or parent/guardians by the PI.

Six research questions directed the development of the interview guide. These research questions focused on interviewees' experiences related to oral health care visits; their likes/dislikes of techniques used by oral health care providers in the delivery of oral health care; their experiences of communication techniques provided by oral health care providers; their likes/dislikes related to oral self-care recommendations; the challenges they have encountered when seeking oral health care; and their recommendations to improve their oral health care experiences. The interview guide and consent form were developed with an individual who had early childhood development and special needs expertise. This guidance help ensure that participants would understand the consent form and interview questions.

A series of in-depth, semi-structured interviews utilizing open-ended questioning was conducted by the PI to gain richly descriptive data.^{25, 26} Interviews were conducted either in a private room, by telephone, or over an Internet video conferencing platform (Zoom; San Jose, CA) to maintain anonymity and minimize sensory distractions. The interview questions were pilot-tested with one individual with ASD following the study's protocol for data collection to verify participant understanding of the questions. Interview questions were distributed in advance of the scheduled interviews. Interviews were audio recorded. Participant pseudonyms were utilized during the interviews and on the transcript to protect confidentiality and ensure anonymity. Each interview was transcribed directly following the session; the PI listened to the audio-recording to verify the transcriptions were accurate.

Data regarding the oral health care experiences of young adults who have ASD were analyzed simultaneously with data collection.²⁵ After the first interview was completed the transcript was reviewed by the co-investigators and compared to the research questions to ensure the data were aligned with the purpose of the study, and then used to guide the next interview. Data analysis began with open coding, a procedure to deconstruct the data into words or brief phrases representing the participants' experiences relevant to answering the research questions.²⁵ As open coding of multiple interviews was completed, similar open codes

emerged from the analysis. During axial coding, open codes were grouped together to create a common category which provided an interpretation of the meaning of the data.²⁵ Each researcher coded the same interview and discussed findings until consensus was reached.

Validity was established through investigator triangulation with the three investigators individually evaluating data separately and finding comparable results.²⁵ Respondent validation occurred in which a summary of the transcript was offered to each interviewee for review as part of the peer debriefing process to aid in establishing the accuracy and validity of the qualitative data.²⁵ Lastly, 11 of 15 participants performed member checks, evaluating the preliminary findings and verified the accuracy of the researchers' interpretation of the data. These participants confirmed responses to support data analysis. Four participants chose not to respond. Demographic data were analyzed using descriptive statistics. Frequencies and percentages were used to report information for the fifteen participants.

Results

Data saturation was achieved after fifteen interviews. No new categories were identified to answer the research questions.²⁵ A total of 15 individuals, ten males and five females, participated in this study. Ages of the participants ranged from 18 to 35 years; the average age of the interviewees was 25 years. Participants resided in eight states from the Northwestern region of the United States. Twelve (80%) lived at home while three (20%) had independent living arrangements. Participants' descriptions of their own ASD were based on diagnoses received before the publication of the DSM-5. Three (20%) described themselves as having autistic disorder, 3 (20%) described themselves as having pervasive developmental disorder-not otherwise specified (PDD-NOS) and 9 (60%) described themselves having Asperger's Syndrome. The following results are presented in relation to the major research questions of the study.

Experiences Related to Oral Care Visits

Participants were asked to describe their own experiences related to oral health care visits. A range of responses were provided which demonstrated a continuum of emotions in three categories, ranging from feelings that were positive to neutral to negative. For instance, Link described being happy stating, "Because I know I can take care of myself. I know when they get done with your teeth, I feel happy." An example of a neutral expression was reported by Evans, "I feel, to be honest, pretty neutral when I go. It's like another thing in my life to do." On the other hand, Rose had a more

negative response to her visits and shared, “I don’t know if they’re going to hurt me or if they’re not going to hurt me and I have to play it in my head that nothing’s going to happen, but there’s always that fear that’s there.”

Participants were asked to describe how they felt when they encountered a different oral health care provider than the person they were used to seeing. Responses included cautious, apprehensive, inconvenienced, and agreeable. Additional key quotes representing these emotions are shown in Table I.

Table I. Emotional experiences related to oral health care visits

Positive emotions or feelings
“I’m pretty happy when I visit there. There’s a slight bit of nervousness, but it’s nothing to make me panic or anything like that. I’m generally calm. I’m still pretty happy when I visit the hygienist, but the only difference is that there’s zero nervousness when it comes to dental hygienists. That’s way more relaxed. I was a weird kid. I loved the dentist. I’m generally very calm, very happy going.” (Kevin)
Neutral emotions or feelings
“I feel all right. I just feel like it’s what has to be done. They’re just checking me out, not doing anything bad. And so I just follow it. Because I can’t do this by myself. I’m sure my teeth are okay but there’s always professionals doing it, making sure I don’t get cavities and they point out what I may need some help with.” (Elaine)
Negative emotions or feelings
“I’m usually really scared and then that turns into anger. I get mad after being in the situation for a little while, but at first I’m just scared. It’s a situation where I’ve had a lot of negative experiences in the past, and I don’t really have a lot of trust for dentists because there’s really poor communication there, even when I try to make it clear what my needs are. Then if that’s just reinforced then I get angry when I don’t feel like I have any control in the situation.” (Sophia)
Feelings towards a different oral health care provider
“It’s easier for me especially getting a new person the second time. Once I know them after the first time I know what to expect. The second time is easier than the first time. It’s less anxiety for me. The one thing I don’t like is when they keep switching people on me. I like to keep the same person.” (Polar Express)

Likes and Dislikes Related to Oral Health Care Delivery

Study participants were asked to identify what they liked or disliked about strategies dentists and dental hygienists used to improve oral health care delivery. A variety of responses were provided. For example, Evans stated, “The fact that they treat me like I’m a person and not like a patient,”

while Bob reported, “Well, if my teeth were clean, I like the compliments that I receive, and the general, amicable atmosphere afterwards.” Journey Boy enjoyed “getting a toothbrush,” but indicated that “it’s just painful and I don’t like them picking around in my teeth; if they’re poking in my mouth, it hurts.” Some participants were uncomfortable getting injections or found other procedures unpleasant, while others were apprehensive of the anticipation of an experience. Sophia explained her concern:

“In the moment I’m just thinking, okay when the dentist comes I have no idea what they’re going to do. The part I hate the most is not when the dentist comes, it’s everything before that, not knowing what’s going to happen.”

Table II provides supplementary key quotes expanding on the categories of likes and dislikes about dental and dental hygiene treatment approaches.

Table II. Participant feelings towards oral health care treatments/providers

Dental hygiene care	
Liked	Disliked
“The thing I like the most is that once it’s done your teeth are clean and you know what you’re supposed to do to improve if you’ve been lacking in a certain area. Also, the people there are always nice. They give you a bag of stuff. I remember one time I got this tongue scrubber thing that you put on your tongue and it removed debris from your tongue.” (Ethan)	“Those scrapers, those small metal hooks that scrape the teeth for any plaque. It kind of gives me goosebumps, if it gets to a bad area almost close to my gums, so that’s why I have to use my tongue to make sure it doesn’t get there. I don’t think I could say I dislike it. I just don’t want a scraper hurting me.” (Elaine)
Dental treatment	
Liked	Disliked
“My dentist that I go to is really kind. He really knows how to take care of me and make me feel comfortable. He does give me support and encouragement to keep up the good work on my brushing. I like him. I just like his smile. He has a pretty jovial attitude. He’s very kind, very friendly and the people that work with him are very nice as well.” (Quinn)	“I don’t like the shots. And the weird sounds of the instruments they use. I don’t like that at all. When they take molds of my mouth. It feels like there is something foreign in my mouth. It’s a really uncomfortable feeling, so it just makes my anxiety goes up when they do those types of things.” (Rose)

Communication Techniques

Communication was a phenomenon explored with the participants. Categories of communication that emerged from the data analysis included positive and negative verbal experiences, positive and negative nonverbal experiences, and communicating ASD diagnosis. David provided an example of a positive verbal communication experience, stating that “a good hygienist anticipates your needs.” Participants encountered negative communication at times. Bob reported “If I didn’t do a good job cleaning my teeth, [I would be] scolded by the dentist or dental hygienist afterwards.” Additional examples of communication experiences, including non-verbal representations, are provided in Table III.

When discussing communication issues, participants also discussed whether or not they disclosed their ASD diagnosis with their oral health care providers. The PI pursued further questioning asking participants if they would want their provider to know more about their condition. For example, Rose explained:

“No, only because I don’t want to be looked at as more different than any other patient that comes through. So, I don’t really disclose anything that could be traumatic or could have myself looked in a different way than anybody else in there.”

However, Quinn felt differently, expressing:

“I would rather they did know, mostly because they want to be able to get more experience on working with people like me so they’ll know how to treat others that have autism, PDD-NOS and other symptoms such as that.”

Finally, Polar Express stated:

“I think it’s something people should be trained to identify. They should treat everybody the same; treat everybody like they might have spectrum. Just have the sense of caring. They shouldn’t treat anybody any different just because you have autism.”

Table III. Participant responses to communication practices

Positive communication experiences
<p>“Their attitude, they’re very nice, and then they make me relaxed. They say, are you comfortable in your chair? I’m like, all right. And also they’re like, Hey, you need to spit, when they filling your mouth up with whatever they are filling it up with. They make me relaxed and comfortable because they know it’s kind of a long and thorough process for them to clean your teeth.” (David)</p> <p>“I talk to them like they’re another person. Usually, I’m not really the best at starting conversations. They meet me, they welcome me. We have a little conversation. Like, how are you doing? Hi, how’s your day been? And then we get into the process of cleaning up our teeth. Maybe if I don’t feel comfortable with something they’re doing within my mouth, I’ll make a noise or I’ll ask for something, they’ll usually provide it. If something feels painful, they’ll try and lighten it a bit, so that there’s not as much pressure being put on it, so that it doesn’t hurt as much.” (Evans)</p>
Negative communication experiences
<p>“It’s just once a rapport is established, I think more conversation can occur. But on the initial, I would say alleviating that stress of a new experience is probably the most productive thing someone can do. Experiencing something new with autism is far more stressful than other people. I actually have physiological panic attacks. My heart rate would go up, my blood pressure will increase. I release adrenaline and I actually... if it culminates, I will have a panic attack where I will have to escape or I will become strangely violent potentially, but that it takes a lot of duress for that to culminate.” (Karl)</p>
Positive non-verbal communication
<p>“My current dentist, who I’ve seen a couple times, I really like. She’s the only one I’ve ever met who takes the conversations that happen behind you and moves them in front of you. She’s talking with the dental hygienist, she’s getting everything ready within my field of vision, and she’s explaining things to me. She’s doing the things that I appreciate about my dental hygienist that I think come from having more time, not being as rushed. I really like when she engages me instead of just opening my mouth and sticking stuff in there.” (Sophia)</p>
Negative non-verbal communication
<p>“I don’t like that I can’t read their faces as well because they have a mask on, or they’re somewhere where I can’t really see their face. That makes it hard, because then I don’t feel like I’m getting any non-verbal communication from them really. In the past they’ve had me do hand signals. Just to tap my stomach if I need to step back for a second. We come up with little codes like that, but that hasn’t always worked out in the past. If we come up with the code, and it seems clear, and then in the past I’ve had dentists not really be onboard with that, even if it’s well communicated. I don’t know maybe they just forget or this takes all of their attention being in my mouth.” (Sophia)</p>
Communicating ASD diagnosis
<p>“No, they don’t know that I have an autism spectrum disorder. I don’t put it on the health history. I don’t want to be treated differently. People treat you weird.” (Polar Express)</p> <p>“Yes, the most recent one [dentist] does. I think it probably would’ve been helpful. Definitely would’ve been helpful in the past if I had the knowledge myself to be able to communicate that to dentists, or try to find one who had a specialty. But unfortunately, I didn’t realize until the past year and a half. But it’s been good information to be able to share since then”. (Sophia)</p> <p>“I don’t really care if they know or if they don’t. I’m pretty sure it’s on my health history. It doesn’t matter to me either way, but to know, because if I act weird, then they’ll know.” (Ray)</p>

The various perspectives regarding self-disclosure of an ASD diagnosis are shown in Table III.

Oral Self-Care Recommendations Likes and Dislikes

Participants were asked to describe what oral self-care recommendations they liked or disliked. Responses were on the continuum of three categories: likes, neutral and dislikes. Participants agreed that they liked to brush; however, many pointed out how they forgot to brush a second time during the day as evidenced by David who stated, “I brush my teeth at least once a day, I know I’m supposed to do it twice a day. I try to do it twice a day. I like the feeling of having a clean mouth.” While Sophia felt differently about brushing explaining,

“I don’t like a toothbrush in my mouth. I don’t like thinking about my mouth. If I draw any attention to it then I’m feeling everything, and it’s really unnerving. It didn’t used to hurt, but now I have bad oral hygiene because now it does hurt to brush my teeth. But mostly it’s just the pressure on my teeth.”

Responses to flossing and other self-care procedures were similarly divided by the participants and are shown in Table IV.

Table IV. Participant attitudes towards oral self-care recommendations

Like
“I have the little tiny toothbrush. It’s a round head. Maybe a third of the size of a regular toothbrush head. It lets me do it more one place at a time, and it lets me clean probably better than a regular toothbrush without it becoming too much of a sensory experience as it normally would. Having that little tiny toothbrush has been a lifesaver. It’s still hard, and so I don’t do it as often as I need to, obviously. But it means I can handle it at all.” (Sophia)
“I like doing the floss, because it gets my teeth cleaned. That’s the thing I liked the most and that tongue scraper.” (Ethan)
“I use fluoride rinse and some kind of fluoride toothpaste. I put it on my toothbrush and brush my teeth with that twice a week, or at least I try to.” (Bob)
Neutral
“I never liked nor dislike it [daily oral hygiene], I know it’s just something that I have to do.” (David)
Dislikes
“I don’t like how the toothpaste always gets bubbly and fills up my mouth.” (Ethan)
“Flossing hurts and I don’t like doing it.” (Rose)
“I don’t like mouthwash. I don’t like using it. I don’t like the taste of it, well, except cinnamon. Cinnamon that is the only exception. I do not like using mouthwash at all.” (Kevin)
“I do grind my teeth a lot, so we got a mouth guard. I really wish I could use it, because I wake up with little chips all the time, and it would be great if I could use it. But I couldn’t. I couldn’t handle the feeling of it in my mouth.” (Sophia)

Sensory Challenges during Oral Health Care

Another aspect studied related to the sensory challenges participants experienced during oral health care. These experiences could have occurred while waiting in the reception area or during dental and dental hygiene treatment. Types of challenges included auditory, visual and tactile sensory experiences. When waiting in the reception area, Elaine explained the difficulty she senses noting,

“I’ve been to a lot of places where many people are, so I would just stay there and wait and try to at least get some bubble space around me so I wouldn’t get crushed and try to block out some noise to make sure I can at least get some hearing.”

Another example of an auditory sensory challenge was expressed by Karl:

“If there’s multiple people and they’re having two different conversations at once that can be extremely disorienting. When there’s just copious amounts of acoustic linguistic stimuli, I actually experience aphasia, with all that stimuli. If I’m trying to actually absorb it all at once, analyze every single detail, but that’s impossible.”

Tactile sensory challenges were discussed by several participants. Rose indicated that she preferred moderate pressure when being touched stating, “Light [touch] is irritating. I don’t like being touched lightly by anybody. So a pressurized touch is a lot better. It’s more of a soothing feeling than being lightly touched.” Polar Express described how soothing touch was to him especially during a comprehensive head and neck examination. “When they’re doing this, [palpating his neck] the more pressure makes me feel like they’re actually doing the job right.” However Journey Boy felt differently, “I prefer real light pressure. Because it doesn’t hurt as bad.” Additional detailed responses regarding the categories of sensory challenges are listed in Table V.

Recommendations to Improve Oral Health Care Experiences

The last major concept explored with participants concerned recommendations to

Table V. Sensory challenges encountered when seeking oral health care

Auditory
<p>“It’s a fearful feeling of is that sound’s supposed to be making that sound or what instrument are they really using and how are they really using that and is that something that I could be able to cope with during my visit. I also have what they call is an auditory processing disorder. So I hear everything at the same level of sound. So whether it be down the hall or in the room that I’m in, it sounds the same pitch. There’s no drowning any other sounds out.” (Rose)</p> <p>“It’s both [the sound and the feel of all instruments and equipment]. Equally bad, I think it’s hard to separate them but I think it’s more the feeling. The sound of scraping is hard. I’ve tried to wear earplugs in the past, but that made the sound worse because it’s in your head. So you can hear. Headphones would make it worse only because then I wouldn’t know what is going to happen and what is happening because I wouldn’t be able to hear it.” (Sophia)</p> <p>“Pretty much both [the sound and feel of instruments] because sometimes you’ll hear the equipment in the other room and be like, no, I’m glad I’m not that guy. It’s going through my head right now, all the noise. It’s like nails on a chalkboard. You don’t like it, but they’re getting all the plaque and gunk out of your teeth. It’s not a very pleasant sound and it’s not very comfortable, but they got to do what they got to do.” (David)</p>
Visual
<p>“One thing I don’t like is how the light is always really bright. The light up above your head and you always have to close your eyes that is also when they’re working.” (Ethan)</p> <p>“The hardest thing is just the sensory experience with the lights.” (Sophia)</p>
Tactile
<p>“With other autistic people, I imagine they might experience this as well. It’s just being touched skin to skin can be disconcerting because it interrupts your thought process and you’re just trying to get through that experience, but then you’re interrupted by that and it can cause senses of panic.” (Karl)</p> <p>“Inside my mouth, the inside of my cheeks and my gums, it’s like this electric pain. It just makes me want to scream. But I get desensitized to it as it goes along. It’s not something that builds. Some of the things build, the tools that builds but just in general having this brushing inside of my mouth gets better as it goes. Outside it doesn’t. Outside doesn’t bother me too much but my lips and my gums on the inside of my mouth.” (Sophia)</p>

improve their oral health care experiences. Two categories were identified: recommendations for oral health professionals and recommendations for individuals with ASD. Bob suggested that the oral care provider “keep their questions or comments until after they’re done with the procedure so that I could talk to them directly and have a conversation.” Karl was concerned that the provider ensure that the patient has “a positive experience the first time. It’ll make coming back easier, and then it actually becomes a routine.” Rose offered, “I’ve never been put in situations where other people had to accommodate me. I’ve always had to adapt to my surroundings. I could be more verbal about everything that I have going on.” Additional recommendations for oral health care professionals as well to individuals with ASD regarding ways to improve oral health care experiences are shown in Table VI.

Table VI. Recommendations for oral health care providers and other individuals with ASD

Oral health care providers
<p>“Just maintain that professional tactfulness when it comes to touch. Initial impressions are really important for people with autism spectrum disorder.” (Karl)</p> <p>“I’d meet the dentist and the hygienist at the same time, briefly, and then have the dentist leave. They’d only be there for a second, but at least be there, we’ve exchanged words before they come in for the second time so that there’s some layer of trust there. Kind of what to expect and they might know more what to expect, because I can be clear about my situation. But then not stay too long, because I am really afraid of dentists and then just talk to the dental hygienist for the rest of it.” (Sophia)</p> <p>“Probably letting me know the steps as a process going between each step. Now I’m going to do this, and then complete that step and then move on to the next one and let me know what’s going on as we go through the process.” (Rose)</p> <p>“The smell can be a little bit unusual. So, I would have scents like... more pleasant scents in the office, like a sweet lavender smell; and it would also help to calm someone down, especially if they’re a little less comfortable around being in the dentist’s office.” (Quinn)</p>
Other patients with ASD
<p>“I do deep breathing exercises. Just breathe through my nose, out my mouth. Going to a happy place mindset also helps.” (Kevin)</p> <p>“I have this medicine that I use called Lorazepam, and if anyone else has a prescription for it, I would recommend them taking one before they go to the dentist or the hygienist, if they need it, of course. It calms you down. It’s an anti-anxiety medicine. You take it as needed. It’s never like on a day to day basis, because it’s addictive.” (Bob)</p> <p>“Sit in my car for a while and calm down beforehand. I didn’t stay in the waiting room. They just got me from just outside the door, and then I went straight in. I avoid the waiting room as long as I can wait outside, or in a bathroom or something.” (Sophia)</p>

Discussion

Providing an opportunity for the voices of individuals with ASD to be heard revealed unique discoveries regarding their oral care experiences. First, while some participants felt comfortable reporting their ASD diagnosis to their oral care provider, many indicated they chose not to disclose that information. Having dealt with the stigma of being “different,” they were reluctant to be judged further by someone in health care and preferred to remain silent. Participants shared stories of being made fun of or thought of as weird and did not want to repeat that experience in the dental office setting. For these reasons, they chose not to disclose their ASD diagnosis in their medical history. Huws and Jones²⁷ described how the autism label can be associated with several forms of stigmatizing including enacted stigma or actual prejudice and experiences of discrimination, or felt stigma, in which a person has a perceived fear of prejudice or discrimination whether or not such actions actually occur. Their study of individuals with autism indicated that the boundaries between felt and enacted stigma can become blurred.²⁷

Considering the disclosure of an ASD diagnosis as part of the assessment process, the researcher team examined the American Dental Association (ADA) Health History Form, a standard form available for dental practice settings.²⁸ No category is given for ASD or any other developmental disorders. “Mental health disorders” is listed on the form, but individuals with ASD might not consider themselves to have a mental health issue. The only other item on the ADA health history that might be applicable is: “Do you have any disease, condition, or problem not listed above that you think I should know about?” A recommendation would be to add the category “Developmental Disorders” to health history forms and list several examples including ASD. Electronic health history forms can be customized as can paper forms to include contemporary information such as ASD, making it easier for patients to provide information that would allow providers to be informed of relevant health information. For individuals who choose to share their diagnosis/condition, reporting this information on the health history is most appropriate.

Many of the participants shared that their oral care experiences in dental settings were difficult. While the literature reports on behavioral challenges^{13,14,29} and multiple management strategies during oral care for children with ASD,^{13,16,17} there is no discussion regarding the effects of these experiences on young adults with ASD. Qualitative results from this study demonstrated that young adults often suffer from the time they enter the reception area until the end of their dental or dental hygiene appointment. The sounds,

sights, smells, and actual treatment can be overwhelming for an individual with ASD. Some individuals feel vulnerable based on the practitioner’s capacity to inflict pain and the their loss of control when the practitioner enters their personal space during care. Oral health care professionals may assume that as a child with ASD matures to a young adult they “get over” or that they can accommodate the treatment process. It appears that for many of the young adults with ASD, this is not the case. Their experiences are more than anxiety alone, it is sensory laden and emotionally charged. If dental professionals are to provide person-centered care, it is apparent that specific adaptations for individuals with ASD need to be learned in order to foster an environment where practitioners adapt to the patient’s needs rather than the patient adapting to the provider.

In addition, communication was a skillset that many participants expressed difficulty with. It was made clear to the researchers that some individuals with ASD do not like asking questions regarding their dental care, whereas others still had the desire to know what was going to happen throughout the visit. The literature supports socio-behavioral interventions for children using picture cards, video technology and mobile applications as a way to reduce dental anxiety and increase communication between the patient and the provider.¹⁴ However, limited literature is available to support the communication needs of the young adult. A recommendation for dental practitioners would be to provide preparation information in advance of the appointment, throughout the delivery of treatment, and after completion of procedures to anticipate and address needs, respond to questions and concerns, reduce negative emotions and feelings, and improve patient-provider relationships.

This study had limitations. The small sample of young adults with ASD precludes generalization to all adults with ASD. However, the small sample was indicative of the purpose of a qualitative study, which was to yield rich, detailed data and an understanding of a unique cohort.²⁵ Individuals who did not have oral health care treatment within the past two years were not represented. These individuals could have had profound oral health care experiences, making their stories another element to consider. Lastly, the experiences of non-verbal individuals with ASD could not be included.

Additional research related to young adults and adults with ASD is warranted. Future studies could include considerations related to those individuals who have not sought oral health care for significant periods of time and the factors that would encourage them to participate in the oral health care system. Other studies could examine oral health care professionals’

knowledge and experiences working with adults with ASD as well as skill preparation for assessing and treating patients to mitigate their oral health care sensory challenges. While the voices of verbal adult population with ASD can be readily heard, the non-verbal ASD adult population has yet to be studied. Learning their perspective about oral care experiences may be challenging, yet equally important.

Conclusion

A qualitative descriptive study was performed to investigate the oral health care experiences of young adults with an ASD diagnosis. Findings revealed that participants experienced a range of emotions related to oral health care visits. Multiple auditory, visual and tactile sensory challenges exist for the young adult ASD participants while in the reception area of the dental office as well as during treatment. Communication strategies between oral health professionals and young adults with ASD needs further development and refinement. Additional research is indicated to continue to explore the phenomenon of oral health care experiences of individuals with ASD as well as oral health care professionals' knowledge and skill preparation in delivering person-centered care to individuals with developmental disabilities.

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Community Awareness and Oral Cancer Screening in Rural Wisconsin

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Abstract

Purpose: Oral cancer risks have been shown to be modified by improving public awareness and reducing barriers to preventive care. The purpose for this study was to assess oral cancer knowledge and awareness and provide oral cancer screenings and education to a population of rural farmers in Wisconsin.

Methods: Attendees 18 years of age and older at a rural farming exposition in Wisconsin were invited to complete a 12-item oral cancer awareness paper survey and to receive a visual and tactile head and neck examination/ oral cancer screening. Completing both the survey and the screening were optional. Participants also received educational materials on oral cancer. Individuals with abnormal lesions were provided with dental referrals.

Results: A total of 236 attendees consented to participate either the survey or oral cancer screening (n=236). Most (72%) reported seeing a dentist in the past six months regardless of insurance status. In spite of having had recent dental encounters, only 28% of women and 46% of men were able to identify at least one risk factor associated with oral cancer. Among participants consenting to the oral cancer screening (n=194), 17% (n=33) presented with oral lesions requiring additional assessment and were recommended for follow-up care.

Conclusions: Knowledge and awareness of oral cancer risk factors, signs and symptoms was low among the participants in this rural population despite high rates of dental care access. Oral cancer screenings and education provided in varied settings could improve oral cancer knowledge and awareness and early detection of malignant oral lesions in rural communities.

Keywords: oral cancer, public health, preventive oral health care, oral cancer prevention, rural health care

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Introduction

Head and neck or oral cancers rank sixth as the most common cancer, worldwide.¹ According to the International Statistical Classification of Diseases and Related Health Problems (ICD CM-10) definition, oral and oropharyngeal cancers are grouped based on their site of occurrence which includes cancers of lip, tongue, buccal mucosa, alveolar ridge and gingiva, floor of mouth, tonsils, hard and soft palate, oropharynx and/or other unspecified parts of mouth.² The American Cancer Society estimated that 53,260 new cases of oral and oropharyngeal cancers (OC) were diagnosed in the United States in 2020 with over 10,750 deaths.³ The 5-year survival rate of OC in the United States is 60%, with significant improvement for survival with early detection.⁴ In the state of Wisconsin, an estimated 990 new cases of OC were projected for 2019 with 200 deaths due to OC.⁵ Tobacco use

is considered a common risk factor for oral cancer⁶ along with alcohol consumption, combined use of alcohol and tobacco use, and human papilloma virus (HPV).⁷⁻⁹ Disease severity, complications of treatment, length of recovery, and prognosis of survival can be influenced by a patient's insurance status or ability to pay for oral health care at the time of OC diagnosis.¹⁰ Individuals who are uninsured or underinsured are less likely to receive preventive health care and early detection of OC compared with individuals who have health and or dental insurance.¹⁰ Studies have shown that oral cancer risks can be modified by targeting factors that include improving public awareness and reducing barriers to care surrounding oral cancer.^{7,9,11} Shimpi et al surveyed patients at a large medical-dental health system serving a rural population located in central, northern and western Wisconsin and found that while

94% of patients were aware that tobacco use increases OC risk, 79% were unable to correctly identify other oral cancer risk factors.¹¹ Furthermore, participants in these rural settings demonstrated low knowledge surrounding additional signs and symptoms of OC including an abnormal mass/lump in mouth, sore that does not heal, white/red patches, difficulty chewing/swallowing and gradual change in voice quality.¹¹

Although the American Dental Association (ADA) recommends routine visual and tactile examinations for oral and oropharyngeal cancer for all patients during a dental visit,¹² individuals living in rural areas are less likely to receive routine OC preventive education and screenings due to a lack of health and dental resources compared with individuals residing in urban areas.^{13–15} Screening and education programs surrounding oral cancer at public events have the potential to reach individuals who might not routinely receive preventive head and neck examinations and oral cancer screenings such as those who reside in rural areas.^{16,17}

Approximately one in every nine jobs in the state of Wisconsin are related to agriculture.^{18,19} The purpose of this study was to collect information related to oral cancer awareness, offer education and provide oral cancer screenings at an educational farming event in the state of Wisconsin.

Methods

This study was granted exempt status by the Marshfield Clinic Research Institute's Institutional Review Board. Participants were recruited among a convenience sample of attendees at the 2018 Wisconsin Farm Technology Days (WFTD) Exposition, an educational farming event held annually at different dairy farms throughout the state. The 2018 WFTD took place in Wood County, a designated Dental Health Professional Shortage Area (DHPSA).²⁰ Flyers were distributed among Marshfield Clinic Health System (MCHS) employees and at various community locations to notify the public of the opportunity to participate in this study and have an oral cancer screening. The study was also advertised in the official WFTD program distributed at the event.

Instruments and data collection

Members of the study team randomly invited WFTD attendees, 18 years of age and older, to complete a voluntary, anonymous paper-based survey and to participate in an oral cancer screening examination. Participants had the option to only complete the survey or only have the oral cancer screening or to complete both aspects of the study.

The investigator produced survey was written at a 5th grade readability level and consisted of 12 items. The survey instrument was pilot tested by ten random MCHS staff

members unfamiliar with professional dental terminology and a statistician and dentist conducted face validity of the survey instrument. The survey items included socio-demographics, knowledgeability, and social practice behaviors surrounding oral cancer. The socio-demographic questions captured study participants farming status, age, gender, level of completed education, and oral cancer history. The two questions related to oral cancer knowledge consisted of identifying risk factors associated with oral cancer and identifying signs and symptoms of oral cancer. Social practice behaviors included professional dental-care frequency, dental/health insurance status, and historic behavioral habits surrounding alcohol and tobacco use. Pilot testing demonstrated that a non-dental professional could complete the survey in 5 to 7 minutes.

Oral cancer screenings and recording instrument

Six licensed dental hygienists were calibrated by the research team for performing oral cancer screening to ensure uniform data collection. During calibration, each dental hygienist identified photographs of healthy oral tissue or oral lesions according to guidelines provided by the National Institute of Dental and Craniofacial Research (NIDCR) and ADA oral cancer screening guidelines.^{22,23} A video available from ADA demonstrating oral cancer screening methodologies and protocols was also used as a training and calibration tool.²⁴ The dental hygienists performed two separate oral cancer screenings and documented the findings on three volunteers to achieve inter and intra-rater reliability score of 100%.

Participants read and signed a waiver providing an explanation of the OC screening process. The screenings consisted of visual and tactile examination of twelve areas of the oral cavity including: the submandibular lymph nodes, lips, labial mucosa, buccal mucosa, gingiva, tongue (dorsum, ventral, and lateral borders), floor of mouth, hard and soft palates, and oropharynx as per NIDCR and ADA clinical guidelines.^{22,23} An oral cavity graphic on the oral cancer screening form served as a mouth map to document oral lesions along with a table containing each of the twelve oral cavity locations under the graphic. For each location in the oral cavity, the screening instrument contained a box to mark for "normal" indicating no oral lesion was present at that anatomic location. If an oral lesion was present, a research assistant would mark the size ($\leq 2\text{mm}$ or $\geq 3\text{mm}$); color (red or white); contour (ulcer, raised, smooth, rough); and duration of lesion (≤ 2 weeks or ≥ 3 weeks).

Each screening participant received one of three pre-determined written follow-up recommendations. The survey instrument and oral cancer screening forms had corresponding

numbers for each study participant in order to establish relationships between the survey instrument data and the OC screening data. No identifiers were collected to link individual participants to consent forms, personal information or screening outcomes. Upon completion of the screening, participants received a copy of the signed waiver form; a follow-up recommendation form; pertinent oral health literature; and a complimentary toothbrush.

Oral cancer education

An informational poster board displayed at the oral cancer booth provided information regarding oral cancer risk factors, oral cancer prevention, and oral cancer signs and symptoms. Dental hygienists explained the screening process and recommended annual visual and tactile head and neck examinations as additional opportunity to educate study participants on OC. Printed material from the National Institute of Dental and Craniofacial Research on signs, symptoms, and prevention of oral cancer,²³ as well as, information on Wisconsin tobacco Quit Line (WIQuitLine.org)²⁵ were available. In addition, information regarding Wisconsin's free and reduced cost dental clinics was also provided for individuals who did not have a dental home.²⁶

Data analysis and reporting

Responses to the surveys and the screening results were manually entered into a REDCap database.²⁷ A 10% validation was performed by second data entry personnel to validate the accuracy of the data entered. Data was then converted into statistical software formatted datasets (SAS Windows 9.4, SAS Institute Inc., Cary, NC).²⁷ Rates of missing data were reported for each question and number of actual responses for each question was represented in the denominator to indicate that missing data elements were not included in final analysis. For the purpose of this study, tobacco use included cigarettes, cigars, pipes, e-cigarettes, vaping, smokeless tobacco, snuff, and snus.

Descriptive statistics (for any categorical measurements: percentage and corresponding 95% confidence interval (CI); for continuous variables: mean, standard deviation, median, and range) were reported for data surrounding measurements (e.g., alcoholic drinks consumed per week) as well as categorical measurements including participants sociodemographic descriptors (e.g., age, gender, education level). Education levels were categorized as I=(less than 1 year of schooling, completed grades 1-8, and/or completed grades 9-12 with no diploma), II=(High school diploma or equivalent, some college with no degree, and/or associate degree), III=(bachelor's degree, master's degree, professional degree, and/or doctorate degree).

Fisher's Exact test was performed to compare the difference in percentages of reported responses; (a) actively farming (defined as yes versus no), (b) categories of patients' age groups (18-40 years, 41-60 years, 61-89 years), (c) gender, (d) education level, (e) duration since last dental visit, (f) previous oral cancer diagnosis, (g) insurance status, (h) OC knowledge, (g) tobacco status, (h) type of tobacco products used,

(i) reported frequency of alcohol use. In addition, Chi square test and odds ratio (ORs) with 95% CI were estimated to examine knowledge concerning specific risk factors in association with OC (defined as 'yes' versus 'no') by using unconditional univariate logistic regression analysis. *P*-values were derived and values of <0.05 were considered statistically significant.

Results

Demographics

A total of 236 individuals participated in this study with 82% (n=193) also consenting for oral cancer screening; with 43% of the participants (n=102) were male and 55% (n=130) were female. Over three-fourths of the participants (78%, n=186) were between the ages of 51-80 years old and nearly one-quarter (24%, n=56) identified themselves as farmers. Less than half (46%) reported having dental insurance and they majority (82%) reported paying 'out of pocket' for dental care. Eleven percent reported having private or group health (medical) insurance, 22% qualified for Medicare, and 4% had Medicaid. Participant demographics are shown in Table I.

Table I. Participant demographics (n=232)

Category	n (%)
Age	
18-40 years	19 (8.0)
41-60 years	81 (35.0)
61-89 years	132 (57.0)
Gender	
Males	102 (44.0)
Females	130 (56.0)
*Education Level (n=223)	
Education Level I	11 (5.0)
Education Level II	161 (72.0)
Education Level III	51 (23.0)

*I = <1 year of schooling, completed grades 1-8, and/or completed grades 9-12 with no diploma

II = High school diploma or equivalent, some college with no degree, and/or associate degree

III= Bachelor's degree, master's degree, professional degree, and/or doctorate degree

Most study participants (96%, n=226) did not have a previous history of oral cancer and frequently sought routine dental care as evidenced by (84%, n=198) seeking oral care services within the last year. Seventy-two percent (n=169) had seen their dental provider for routine care within the last six months with only 4% reporting a dental visit more than 2 years earlier. Seventy-two percent of participants with Education level II (n=161) reported having a dental visit in the last six months compared to 75% (n=38) with Education level III. Very few participants, (5%, n=11), reported Education level I or reported not having a high school diploma. Of the individuals who routinely sought dental care, fewer than half had dental insurance (46%, n=109). Frequency of dental visits and modes of payment are shown in Table II.

Table II. Dental visit frequency and payment modes (n=216)

Last dental visit	Dental insurance (n=109)	Private/group health insurance (n=25)	Pay out of pocket (n=82)
	n (%)	n (%)	n (%)
In the past 6 months	90 (83.0)	17(68.0)	54 (66.0)
7 months to 1 year	10 (9.0)	4(16.0)	10 (12.0)
13 months to 2 years	5 (5.0)	2(8.0)	5 (6.0)
2-5 years	3 (3.0)	1(4.0)	12 (15.0)
>5 years	1(1.0)	1(4.0)	1 (1.0)
<i>p-value</i>	.0096	.8248	.0176

Tobacco use

Of the 233 participants who responded to the tobacco use questions, 83% (n=195) reported never having used tobacco products, with 12% (n=29) reporting a history of using tobacco products in the past, and 4% (n=9) reporting current use of tobacco. Twelve percent (n=7) of participants who were active farmers (n=56) reported current or former tobacco use and nearly three-quarters (73%, n=27) of the current or former tobacco users had Education level II.

Alcohol use

When questioned about alcohol consumption, 65% (n=154) of participants reported some alcohol consumption. Eighty-five percent (n=126) of participants reported consuming less than or equal to four drinks a week and 14% (n=21) of participants reported consuming more than four drinks per week. Notably, most participants with Education Level III (80%, n=41) reported consuming alcohol whereas 60% (n=99) of participant's with Education Level II reported alcohol consumption ($p=0.0196$).

Oral cancer knowledge and awareness

Over one third (35%, n=84) of participants identified at least one risk factor for oral cancer, while 46% (n=110) identified two or more risk factors for oral cancer. Correct identification of the various risk factors for OC by the participants is shown in Table III. Only 10% (n=4) of the participants who reported current or former tobacco use correctly identified all the risk factors for oral cancer and 31% (n=12) of them identified all signs and symptoms of the oral cancer. Over half (65%, n=153) of the participants correctly identified two or more signs/symptoms of oral cancer while 19% (n=44) correctly identified at least one sign/symptom of oral cancer. Participants' identification of oral cancer risk factors, signs and symptoms is shown in Table II.

Table III. Participants' identification of oral cancer risk factors, signs and symptoms (n=236)

Risk Factors	Correctly identified n (%)
Tobacco use	168 (71.0)
Alcohol consumption	98 (41.0)
Use of smoking and alcohol together	92 (38.0)
Human papilloma virus	66 (28.0)
Prolonged sun exposure	68 (28.0)
Chose 'none of the above' as OC risk factors	28 (12.0)
Signs and symptoms	
Lumps or swelling under jaw	150 (64.0)
Persistent mouth sores	167 (71.0)
Feeling something stuck in throat	130 (55.0)
White patches on sides of tongue that do not go away within 2 weeks	136 (58.0)

Oral cancer screening

A total of 193 participants consented for oral cancer screening (n=193). Oral lesions were found in 17% (n=33) of the participants with 52% (n=17) of this group being male. The locations of the lesions identified through the oral cancer screenings are shown in Table IV. Thirty percent (n=10) of the participants with oral lesions correctly identified at least two risk factors for oral cancer and 42% (n=14) of the participants correctly identified all the signs and symptoms of oral cancer. Seventy percent (n=23) of the participants with visible

Table IV. Lesion location in participants presenting with oral lesions (n=33)

Location	n (%*)
Buccal and labial mucosa	13 (7.0)
Lips	11 (6.0)
Tongue(Dorsal, Ventral and Lateral parts)	8 (4.0)
Palate and Oropharynx	5 (2.5)
Gingival and alveolar ridge	4 (2.0)
Submandibular lymph nodes	—

*Percentage calculated based on number of participants screened (n=193)

lesions reported having seen a dentist in the past six months and 36% (n=12) of them had dental insurance. Twenty-one percent (n=7) with visible lesions were current or former tobacco users and two-thirds (66%, n=22) reported alcohol consumption. Of the individuals with oral lesions, 65% (n=20) were encouraged to see a dental provider for routine oral examination; 32% (n=10) were advised to have a 2-week follow up with a dental provider; and 3% (n=1) was advised to seek immediate care.

Discussion

Individuals residing in rural communities are considered an “at-risk” population for health concerns due to the remote location of work and home life.^{12,14,22} Determining a population’s OC awareness, providing education, and offering OC screenings through a community outreach event, such as a farming exposition, represents a potentially effective venue for educating individuals on medical and/or dental care.^{16,17} Schroeder et al. found during a rural community oral health screening that while the majority of study participants sought routine dental care and engaged in adequate oral home care that they still found value with having an oral health screening and being able to speak with an oral health professional regarding dental concerns at community events.¹⁵

Dental care utilization

Research supports routine preventive oral cancer examinations, to increase early detection and early treatment of oral cancer thereby improving oral cancer survival.^{17,26} Inconsistencies in oral cancer prognosis has been attributed to barriers to oral care access, low oral health literacy, and lack of oral cancer awareness.^{11,28,29} Shin et al. examined the records of patients diagnosed with oral pharyngeal squamous cell carcinoma to determine if insurance status played a role in oral cancer outcomes.¹⁰ Patients with private insurance were

more likely to seek preventive care, receive an early cancer diagnosis, and have a better prognosis than those who were uninsured or underinsured.¹⁰ Based on the findings in this study, the WFTD study participants appeared to seek routine preventive oral health care regardless of insurance status.

Tobacco use

A high percentage of study participants (71%) correctly identified smoking as a risk factor for oral cancer and the majority (96%) reported either never using or no longer using tobacco products, significantly lower than the national average of tobacco users.³⁰ The Centers for Disease control (CDC) reported approximately 18% of men and 13% of women in the United States use tobacco products.³⁰ Analysis of patient records (n=4,759) obtained from the International Head and Neck Cancer Epidemiology (INHANCE) Consortium revealed smoking status and smoking intensity at the time of diagnosis of head and neck cancer was a reliable factor in determining oral cancer outcomes.³¹

Alcohol use

Study participants reported low use of alcohol with the majority reporting drinking four or less alcoholic beverages per week. Of the participants with visible oral lesions, 66% reported alcohol consumption. The National Institute on alcohol Abuse and Alcoholism defines low alcohol consumption for women as less than 3 drinks per day but no more than 7 drinks per week.³² For men, low alcohol consumption is considered no more than four drinks per day but less than 14 drinks per week.³² Study participants with Education Level III reported consuming alcohol more frequently than those with Education Level I or Education Level II. Alcohol use and intensity has been shown a significant factor for poor oral cancer outcomes and mortality rate.³¹ A 2017 cohort population study used data from 83,006 participants from five different studies to determine whether alcohol consumption was related to years of education and mortality rate.³¹ Findings revealed that individuals with high education levels consumed more alcohol overall, than those with lower education levels.³¹

Oral cancer knowledge awareness

Male study participants identified risks associated with oral cancer more frequently (46%) than females (28%). This aligns with previous studies showing that men tend to be more knowledgeable about oral cancer risk factors than their female counterparts.¹⁴ The National Institute for Health reported that men are twice as likely as women to be diagnosed with oral cancer.¹ Low rates of knowledge were demonstrated in this study surrounding oral cancer risk factors such as alcohol

consumption and combined tobacco and alcohol use. As with a study conducted by Shimpi et al.,¹¹ the most readily identifiable risk factor for oral cancer by the participants in this study was smoking. Participants also had low levels of knowledge regarding the signs and symptoms of oral cancer.

Oral cancer screening data

The buccal mucosa and the lips were the most common areas where lesions were detected in this population. A 2017 cohort study by Kachuri et al, evaluated cancer risks in agricultural workers in Canada from 1992-2010.³² Cancer of the lip was significantly higher for agricultural workers than non-farm workers conceivable due to sun exposure³³ which may also be reflected in this population.

Interventions

Varela-Centelles et al. conducted a systematic review representing, individuals diagnosed with oral cancer (n=6,087), to disseminate the key steps and potential delays that occur from initial recognition of an oral lesion to when treatment begins.¹⁷ Survival rates were better when cancer was detected and treated during the early stages.¹⁷ Methods of reducing barriers for individuals residing in rural communities included improving access to preventive care services and offering public screening and education events.¹⁷ Findings from the WFTD 2018 oral cancer screening study also supports outreach programs to individuals residing in rural communities to bring awareness and knowledge surrounding oral cancer. School-based education programs surrounding tobacco, drug, and alcohol prevention and cessation have been shown to be effective methods at deterring youth from using these products.³⁴ Many school based tobacco, drug, and alcohol prevention programs are available but need to be incorporated into the school curriculum in order to be effective.³⁴

Individuals who seek routine medical care but not routine dental care are still in need of oral cancer screenings, education, and interventions through their health care provider.^{16,17,28,29} The primary care provider has the opportunity to be the first line of defense for identifying risk behaviors for oral cancer and oral lesions related to oral cancer. Studies have shown medical providers who offer oral health assessments and promptly refer patients to a dental provider can help improve patient willingness to seek dental care and improve oral and systemic health outcomes.^{16,29,35,36}

Study limitations

This study encountered certain limitations due to the design, location, self-administration of the study, and participant demographics. Since Wood County, Wisconsin tends to be a primarily Caucasian population, race/ethnicity

of study participants were not collected.³⁷ Incomplete participation in the survey tool in combination with the oral cancer screening for all study participants resulted in statistical limitations. Other limitations in the sample size included a lack of participation incentives and poor weather conditions at the time of the event.

This community event in a rural setting had the potential to obtain significant information surrounding the oral cancer knowledge, awareness, and risk factors specific to farmers. The study instrument asked participants if they were 'actively farming' which excluded those who may have been raised on a farm or who were retired from farming. More study participants might have been considered a 'farmer' if the survey tool specified 'ever having been a farmer or resided on a farm'. More research studies are needed to determine oral and systemic health care needs and interests specific to the farming community. As with other studies involving health screenings, researchers were unable to follow-up with study participants to determine if the screening process was effective. Future studies which have a follow-up component is important to determine if public health screenings are in fact beneficial for early detection and improved OC outcomes.

Conclusions

Positive treatment outcomes for oral cancer increase if detected early during preventive head and neck examinations performed during routine oral health care visits. Individuals residing in rural communities might be at risk for late detection of oral cancer due to lack of access to oral health care. While participants in this study were receiving routine oral health care, they lacked knowledge regarding OC risk factors, signs, and symptoms indicating the need for additional methods to provide oral cancer awareness and knowledge during routine oral and medical examinations. Oral cancer intervention programs beginning in secondary and high school and continuing into college and university curriculums might also be an effective preventive care strategy.

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Oral Health Experiences of the Limited Scleroderma Patient

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Abstract

Purpose: Limited scleroderma is associated with significant risks to the orofacial complex. The purpose of this mixed methods study was to investigate the experiences of participants with limited scleroderma related to oral health quality of life and oral health.

Methods: A sequential mixed methods study was used in a population of individuals diagnosed with limited scleroderma. Participants were recruited through rheumatology specialists, referral, and social media; purposive sampling was used to recruit participants to be interviewed. The validated Oral Health Impact profile (OHIP) and Mouth Handicap in Systemic Sclerosis (MHISS) instruments and semi-structured interviews were used for data collection. Quantitative data were analyzed using descriptive statistics and the qualitative data were reported through thematic analysis.

Results: Forty-eight (n=48) qualifying participants participated in the quantitative phase, and 12 (n=12) participated in the qualitative phase. Based on a Likert Scale from 0-4, mean OHIP-14 scores ranged from 2.76 to 2.85, with anxiety over oral condition, embarrassed by oral problems, and oral self-consciousness having the greatest negative impact on quality of life. Mean MHISS scores ranged from 2.13 to 3.11. The highest OHRQoL scores were related to dry mouth symptoms. Factors influencing oral health-related quality of life were varied; dry mouth and microstomia were the prevalent complaints. Thematic analysis revealed challenges to oral health included self-care and professional dental care factors, both of which depended upon individual disease expression. Financial and emotional burdens also influenced participants' oral health.

Conclusion: The oral health-related quality of life of those with limited scleroderma is impacted by multiple factors and oral health care professionals must seek out improved treatment modalities to address the needs of these vulnerable individuals. Future studies related to interprofessional collaborative care with scleroderma specialists are recommended.

Keywords: systemic scleroderma, limited scleroderma, CREST syndrome, oral health-related quality of life, autoimmune disease, patient experience

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Introduction

There are two major categories of scleroderma, an autoimmune disorder, limited and diffuse. Diffuse scleroderma has widespread skin involvement, rapid progression, and early visceral involvement.¹ Limited cutaneous systemic scleroderma [lcSSc], or limited scleroderma, is considered to be a rare autoimmune condition¹⁻⁷ and was formerly known as CREST syndrome. The term "CREST" is an acronym for the associated clinical features combining five autoimmune conditions including the following: Calcinosis cutis, Raynaud's phenomenon, esophageal dysmotility, sclerodactyly, and telangiectasia.^{2,8-10} Limited scleroderma patients may present with some or all of the five classic presentations.

Limited scleroderma is a slowly progressing disease with a female to male ratio of 5:1 and mean age of 55.^{3,5} Of the various types of scleroderma, 80% of those diagnosed with limited scleroderma test positive for the anticentromere antibody.¹¹ Several studies reported the prevalence of scleroderma worldwide.¹²⁻¹⁴ A current review of the literature found rates of 150-300 cases per million for Europe, the United States, Australia, and Argentina.¹⁴ Lower prevalence rates of 31-88 cases per million were found in Scandinavia, Japan, the United Kingdom, Taiwan, and India.¹⁴ Diagnosis of limited scleroderma is difficult because it mimics multiple conditions.¹⁰ There are new, promising studies exploring the possibility of early diagnosis of scleroderma through salivary

testing.¹⁵⁻¹⁶ Given the difficulty in diagnosis, identification of salivary biomarkers in scleroderma may provide a way for early diagnosis and even a possible way to distinguish between systemic and limited forms. More studies are required before conclusive diagnoses can be made using these biomarkers.¹⁶

Limited scleroderma often manifests with clear orofacial signs and symptoms. Due to vascular, inflammatory and fibrotic changes associated with the disease, the head and neck regions are susceptible to the effects of gastroesophageal reflux disease [GERD], vasoconstriction, fibrosis, hemorrhage, limited opening (microstomia), increased incidence of periodontal disease, and xerostomia.^{2,3} Early signs of the disease might include trigeminal neuropathy with no clinical cause, or persistent GERD, resulting in acid erosion, dentin hypersensitivity, and mucogingival paresthesia.^{2,17,18} The tightening of the skin around the hands and orofacial structures impact oral self-care performance and movement of oral structures. These factors contribute to an overall increased risk of oral disease.^{18,19} Fibrotic changes in oral tissues may lead to gingival recession and loss of gingival attachment. Tissue hardening may be evident in the tongue and soft palate.²⁰ The lack of sufficient self-care, limited mouth opening, and decreased vascularization are implicated in an increased incidence and risk of periodontitis in patients with limited scleroderma.¹⁷

The debilitating oral symptoms related to limited scleroderma affect the quality of life of the sufferers. Oral Health-related Quality of Life [OHRQoL] is associated with functional factors, psychological factors, social factors, and the experience of pain or discomfort, and is a highly individual concept. This construct can also measure treatment efficacy compared with adverse effects of a disease, help identify needs of those with specific diseases, and aid providers in monitoring patient status and in making treatment decisions.²¹ Assessment of OHRQoL is accomplished by comparing individuals' expectations with their actual experiences.²² Published literature have established that OHRQoL is impacted in patients with scleroderma.^{23,24}

In systematic reviews on systemic scleroderma, health-related quality of life was explored in these populations. While these reviews focused on both physical and mental impairment, none were related to oral health.^{21,25} Cross-sectional studies conducted by the Canadian Scleroderma Research Group Registry demonstrated impaired OHRQoL among scleroderma participants.²³ This same group also determined that OHRQoL is independently associated with health-related quality of life.²⁶ Literature shows a high correlation between OHRQoL and the manifestations of orofacial symptoms in individuals with scleroderma but fails

to report participant experiences with the limited form of the disease. Qualitative studies in the literature provide some insight into participant experiences with systemic scleroderma and chronic disease, although none found are specific to oral health. Any orofacial symptoms found in study participants were reported as being present with very little discussion as to the effect on their OHRQoL.

Limited scleroderma is associated with significant risks to the orofacial complex, yet patients with connective tissue diseases are less likely to seek continuing oral health interventions.²⁷ Though there have been case studies published about limited scleroderma and quantitative studies specific to systemic scleroderma, there are no known qualitative studies that focus on participant experiences regarding oral health. Most studies in the literature have focused primarily on the systemic form of scleroderma, possibly due to its rapid progression and high morbidity and mortality rates.²³ Additionally, research has shown a lower oral health-related quality of life, and yet a reduced likelihood to seek professional oral health services for this population. However, the reasons for this disparity are unclear. Researchers who have conducted qualitative studies related to scleroderma and chronic disease have reported a limited discussion of orofacial symptoms as simply being present and very little discussion as to the effect these changes have on the participants, other than effects on self-esteem.²⁸ Recently studies related to scleroderma demonstrated a low oral health - related quality of life among these participants.^{23,24} However, few studies solely describe the limited form of scleroderma and the impact on oral health-related quality of life. The purpose of this study was to investigate the experiences of participants with limited scleroderma related to their oral health and the impact of the disease on their ability to seek professional oral care.

Methods

A sequential mixed method research approach was selected for this study. The Institutional Review Board, Human Subjects Committee of the Idaho State University approved this study and assigned the protocol number IRB-FY2016-342. To answer the question regarding the oral health related quality of life of individuals with limited scleroderma, quantitative data were generated through use of the reliable and validated instruments Oral Health Impact Profile (OHIP-14) short form, and the Mouth Handicap in Systemic Sclerosis Scale (MHSS).²⁹⁻³¹ The OHIP-14 short form is a scaled index of the social impact of oral disorders which draws on a theoretical hierarchy of oral health outcomes, designed for clinical use. The questionnaire was developed to measure people's perceptions of the impact of oral conditions on their

well-being.^{29,30} The MHISS was developed to assess mouth disability in scleroderma patients. It is useful to evaluate handicaps related to the mouth and face because it is simple, easily understood and not time-consuming.^{31,32} Using both instruments for future studies related to the oral health of scleroderma individuals has been recommended in previous research.²³ The instruments were used in their original forms with Likert scales, and combined into one instrument for ease of administration and permission was granted to use both instruments. Two items related to demographic and diagnostic information were added pertaining to ability to perform oral care tasks and ability to seek professional oral care. These items were directly related to the research questions thereby demonstrating content validity.

The convenience sample for the quantitative phase consisted of persons diagnosed with limited scleroderma who were recruited primarily through social media. Snowball sampling provided additional participants as individuals informed others of this research opportunity.

Individuals who consented to participate were provided detailed instructions and a link to complete the online questionnaire. The OHIP-14 was scored on a scale of 0-4 with 0=never, 1=hardly ever, 2=occasionally, 3=fairly often, 4= very often. Mean scores were derived for this scale. A low mean score indicated participants largely reported the experience rarely occurred, while a high score indicated the experience occurred very often. The MHISS was scored on a similar scale in which 0=never and 4=always. Therefore, a high score on the MHISS indicates the experience always occurred. The quantitative data were downloaded into a spreadsheet (Excel, Microsoft, Bellevue, WA) and analyzed using descriptive statistics.

A qualitative inquiry was implemented to answer the question regarding the experiences related to oral health and oral health care of an individual with limited scleroderma. Results of the quantitative questionnaire allowed investigators to identify participants displaying orofacial disease symptoms who were contacted for the qualitative phase of the study. For the purpose of generating information-rich data, only participants who reported low oral health-related quality of life were considered and were recruited as the purposive sample.

Qualitative research in the form of interviews were used to elicit data regarding the oral and general health experiences of diagnosed individuals. Informed consent procedures were completed before implementation of the semi-structured interviews via telephone or video conferencing. Participants were sent the interview guide at least one week before data collection to help them formulate responses to the interview

questions. The interview guide consisted of five, broad questions related to oral health experiences. As the study progressed, more specific questions were added to gain more depth and breadth to the data generated and the questions were created to address gaps in current literature. Pseudonyms replaced participant names during the interview and on the transcripts to preserve confidentiality and anonymity. Each interview was recorded, transcribed verbatim, and verified by the principal investigator (PI) for accuracy prior to data analysis. Field notes were collected during the interview and throughout the data collection process to capture characteristics of the participants in the interview setting, as well as to record thoughts, perceptions, and ideas of the PI.³³

Open coding was used to deconstruct the data into small segments followed by axial coding to combine these segments into larger categories or themes; this process occurred after each interview. The researchers used the constant comparative method to compare open codes and categories after each interview to ensure consistency in data analysis. Additional methods to ensure the credibility (validity) and reliability of the analysis included a co-investigator who fulfilled the role of inquiry auditor. The inquiry auditor ensured that investigator bias did not influence the data analysis and verified emergent themes and conclusions.³³ Member checks were conducted by sending the preliminary data analysis to each participant and asking them to review it for accuracy. This step served to control for misinterpretation of participant perspectives and reveal any investigator bias.³³ Participants' comments were documented as part of the study, along with the actions taken by the PI in response to their suggestions.

Results

Forty-eight individuals with limited scleroderma from the United States, Canada, Australia, and New Zealand completed the quantitative online questionnaire. Most participants were middle-aged females and identified as white/Caucasian (Table I). Each participant indicated the presence of at least one CREST syndrome symptom, however most indicated the presence of multiple (3-5) symptom presentations (Figure 1). Most participants (n=34, 68%) were diagnosed with limited scleroderma through a blood test, while 28% (n=14) were diagnosed by the presence of CREST syndrome-related disease presentations and 4% (n=2) were unsure of their method of diagnosis. Participants had experienced the symptoms from one to fifty years, with the greatest percentage of individuals (36%, n=18) living with the disease for 11-20 years.

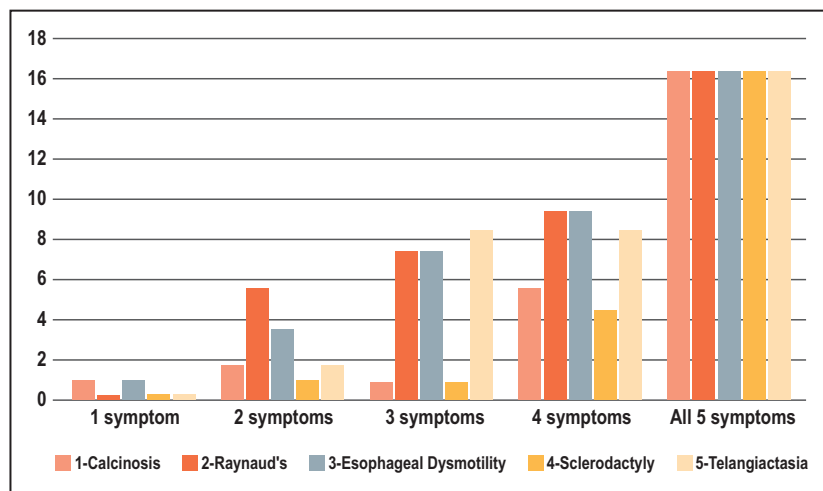
Results of the OHIP-14 indicated that respondents reported a range of difficulties related to oral health as presented in Table II. Oral self-consciousness (n=15, 33%)

Table I. Demographics*

Age	n (%)
25-30 years	1 (2%)
31-40 years	6 (14%)
41-50 years	10 (23%)
51-60 years	12 (28%)
61-70 years	11 (26%)
71-80 years	2 (4%)
Gender	
Male	0 (0%)
Female	48 (100%)
Ethnicity	n (%)
White/Caucasian	44 (91%)
African American	1 (2%)
American Indian or Alaska Native	1 (2%)
Asian	1 (2%)
Hispanic	1 (2%)
Geographic Location	n (%)
New Zealand	1 (3%)
Australia	2 (6%)
Canada	1 (3%)
United Kingdom	1 (3%)
Western U.S.	10 (28%)
Southern U.S.	8 (22%)
Midwestern U.S.	8 (22%)
Northeastern U.S.	5 (13%)

*Percentages may not equal 100% due to rounding.

and anxiety over oral condition (n=10, 22%) were symptoms occurring more frequently. Based on a Likert Scale from 0-4, mean OHIP-14 scores ranged from 2.76 to 2.85, with anxiety over oral condition, embarrassed by oral problems, and oral self-consciousness having the greatest negative impact on quality of life: participants who selected “don’t know” were not counted in mean scores. Results of the MHISS Scale indicated that dry mouth (n=18, 38%), the need to drink often (n=19, 40%), and avoidance of certain beverages (n=15, 32%) were always a concern. Mean MHISS scores ranges from 2.13 to 3.11. The highest OHRQoL scores were related

Figure 1. Number of limited scleroderma presentations present in each subject (n=48)

to dry mouth symptoms, with 3.00 and 3.11 mean scores, respectively. Additional questions were asked regarding difficulty performing oral hygiene tasks and seeking professional oral care, showing mean scores of 2.58 and 2.64, respectively.

The qualitative findings provided a deeper exploration of the experiences of limited scleroderma persons related to oral health quality of life and oral health. Twelve participants completed interviews, lasting between 30 and 45 minutes. The major themes to emerge from the data analysis included: challenges and adaptations associated with oral self-care, challenges and adaptations associated with professional oral care, emotional and financial burden, and suggestions from respondents to improve professional oral care. Each theme is described in detail with supporting quotes in Table III.

Challenges and adaptations associated with oral self-care

One challenge experienced by the participants was pain associated with self-care, especially in times of disease exacerbation. “Eating...even brushing my teeth is painful at times. When I am in a flare, I can’t hardly brush my teeth.” When one participant became bed bound, her daughters helped her adapt to the situation by preparing for completion of her daily routine in bed. Another challenge to self-care was decreased hand dexterity and strength related to the scleroderma symptoms. Adaptations to overcome these challenges included the use of a power toothbrush, various types of flossers and a water flosser. One strategy was to leave the toothpaste and mouth rinse caps loose to ease the access to these products. Additional quotes are shown in Table III.

Another commonly reported challenge was the tightening of the buccal mucosa and a minimal mouth opening. Participants modified their self-care routine by using a toddler toothbrush, interproximal brushes and power toothbrushes. Additionally, one participant only flossed her anterior teeth due to the limited access to posterior teeth. Ulcerations on the fingers hindered flossing; therefore, flossing sticks were more easily manipulated than floss.

Table II. Oral Health Related Quality of Life by symptom/complaint; combined OHIP and MHISS instruments* (n=48)

Oral Health Impact Profile (OHIP-14)							
Questions	Very Often	Fairly Often	Occasionally	Hardly Ever	Never	Don't Know	Mean Score
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Difficulty with pronunciation	4 (9%)	8 (17%)	6 (13%)	7 (15%)	19 (41%)	2 (4%)	2.36
Altered taste sensation	7 (15%)	4 (9%)	14 (30%)	5 (11%)	14 (30%)	2 (4%)	2.43
Painful aching in mouth	8 (17%)	7 (15%)	11 (24%)	11 (24%)	9 (20%)	–	2.32
Discomfort with eating	10 (22%)	9 (20%)	15 (33%)	4 (9%)	8 (17%)	–	2.63
Oral self- consciousness	15 (33%)	6 (13%)	6 (13%)	7 (15%)	12 (26%)	–	2.85
Anxiety over oral condition	10 (22%)	10 (22%)	10 (22%)	4 (9%)	12 (26%)	–	2.76
Unsatisfactory diet	4 (9%)	6 (13%)	12 (26%)	6 (13%)	16 (35%)	2 (4%)	2.29
Interruption of meals	6 (13%)	4 (9%)	11 (24%)	10 (22%)	15 (33%)	–	2.19
Difficult to relax	4 (9%)	6 (13%)	12 (26%)	7 (15%)	16 (35%)	1 (2%)	2.24
Embarrassed by oral problems	11 (24%)	9 (20%)	9 (20%)	4 (9%)	13 (28%)	–	2.82
Irritable with other people	4 (9%)	6 (13%)	7 (15%)	7 (15%)	22 (48%)	–	2.29
Oral condition affects work ability	5 (11%)	3 (7%)	5 (11%)	7 (15%)	25 (54%)	1 (2%)	2.30
Finds life less satisfying	5 (11%)	7 (15%)	10 (22%)	5 (11%)	18 (39%)	1 (2%)	2.44
Unable to function	2 (4%)	2 (4%)	2 (4%)	8 (17%)	29 (63%)	3 (7%)	1.86

Mouth Handicap in Systemic Sclerosis (MHISS) Scale						
Question	Never	Rarely	Occasionally	Often	Always	Mean Score
	n (%)	n (%)	n (%)	n (%)	n (%)	
Minimal mouth opening	11 (23%)	9 (19%)	13 (28%)	11 (23%)	3 (6%)	2.22
Avoidance of certain beverages	9 (19%)	3 (6%)	9 (19%)	11 (23%)	15 (32%)	3.00
Difficulties with professional dental care	9 (19%)	9 (19%)	12 (25%)	8 (17%)	10 (21%)	2.49
Altered dentition	10 (22%)	4 (8%)	10 (22%)	12 (27%)	9 (20%)	2.74
Retracted lips/sunken cheeks	24 (51%)	3 (6%)	5 (11%)	9 (19%)	6 (13%)	2.78
Dry mouth	4 (8%)	3 (6%)	9 (19%)	14 (29%)	18 (38%)	3.07
Need to drink often	2 (4%)	3 (6%)	6 (13%)	19 (40%)	17 (36%)	3.11
Altered eating ability	4 (8%)	4 (8%)	17 (35%)	11 (23%)	12 (25%)	2.70
Difficulty speaking clearly	16 (33%)	8 (17%)	14 (29%)	8 (17%)	2 (4%)	2.13
Modified facial appearance	16 (33%)	8 (17%)	5 (10%)	5 (10%)	14 (29%)	2.78
Self- conscious about facial appearance	18 (38%)	9 (19%)	6 (13%)	5 (10%)	10 (21%)	2.53
Difficulty chewing	10 (21%)	10 (21%)	12 (26%)	12 (26%)	3 (6%)	2.22

*Percentages may not equal 100% due to rounding.

Table III. Additional Quotes from Study Participants

Self-Care Challenges and Adaptations
<p>Decreased Hand Dexterity/Strength and Adaptations</p> <p>“[Self-care] was just awkward with the hands because they don’t always cooperate, especially the left hand, because I’ve got one thumb I can’t bend.” Barbara</p> <p>“Holding onto a manual toothbrush is very difficult. Flossing is difficult because I cannot grasp the floss around my fingers to floss, so they do have special types of flossers.” Leenie</p>
<p>Tightening of Buccal Mucosa/Minimal Mouth Opening and Adaptations</p> <p>“Right now, I am using a kiddie toothbrush, like for small children, because the head of the toothbrush is small enough to reach all of my teeth.” Maya</p> <p>“I use those Christmas tree things, the little tiny things.” Danielle</p>
<p>Ulcerations on Fingers and Adaptations</p> <p>“If I have ulcers on both hands, I can always brush my teeth, but the flossing goes downhill. I don’t have enough strength in either hand to even manipulate it [floss]. Even with just one hand, I can’t do it.” Jennifer</p>
<p>Oral Sensitivity and Adaptations</p> <p>“I avoid everything mint because that affects the acid. I don’t put any mint down my throat. I just won’t buy anything with mint in it.” Phoenix</p> <p>“There is something in it [toothpaste] burning the inside of my mouth. My mouth is very sensitive. Now, I am using baking soda, and I still use the part peroxide and part water.” Maya</p>
<p>Xerostomia</p> <p>“My mouth] is very dry... It has been very dry for a long time. I have tried everything that has been suggested to me.” Phoenix</p> <p>“I use the mouth rinse [for xerostomia] a couple of times a day because that really helps. If I run out of it, I notice like right away. It helps the mouth sores, it seems to quiet them down.” Marie</p>
Professional Oral Care Challenges and Adaptations
<p>Minimal Mouth Opening and Adaptations</p> <p>“They have some kind of instrument that keeps your mouth open. But it becomes so painful after a very short period of time that I have to keep resting in between by closing my mouth so I can get a respite from the pain in my jaw from keeping my mouth open that long.” Leenie</p> <p>“[Dentists] would advise me to use a pain medication before coming to my appointment. It still didn’t help.” Maya</p>
<p>Dry Mouth/Lips and Adaptations</p> <p>“I never ever had any cavities my whole life until right around the time I was diagnosed actually, and I had six cavities in a year or two.” Danielle</p> <p>“The dryness may have contributed to getting cavities that led to a lot of crowns. I don’t know for sure about that. Those are all things I related to that. I just wish this one tooth wouldn’t keep moving.” Phoenix</p> <p>“I do have to go to the dentist three or four times a year just to keep up with everything and to hopefully prevent anything else from happening in my mouth. It is very discouraging because nobody wants to lose their teeth.” Leenie</p>
<p>Financial Burden and Adaptations</p> <p>“They told me that I could come more often, like three times a year instead of two times a year, but then that is a lot of out-of-pocket because insurance only pays for two a year. I only go twice a year.” Danielle</p> <p>“Because implants were too expensive, I was opting for [dentures].” Hungry Newfie</p>
<p>Emotional Distress and Suggestions to Improve Professional Oral Care</p> <p>“I would love for [oral health professionals] to be better informed and to look for ways to get experience. If I found a dental hygienist who was interested in scleroderma and wanted to treat scleroderma patients, I would switch in a heartbeat. That means everything to me.” Jennifer</p> <p>“It is painful to go to the dentist, and a lot of them don’t have empathy for you, because they don’t understand the disease.” Maya</p> <p>“There are so many different conditions that affect one’s ability to care for their teeth the way that they need to be cared for. It is such a huge part of how you present yourself. When people meet you, a lot of times that is the first thing they see is your smile. When your ability to care for your smile is affected, it affects your self-esteem and your self-worth.” Maya</p> <p>“The Scleroderma Foundation had an online pamphlet that one could give their doctor explaining this person has CREST. I handed that to my dentist. They had not seen someone with CREST before. I gave them information and they learned through me.” Marcia</p>

Oral sensitivity due to tooth pain, neuralgia, mouth sores, and xerostomia was problematic for daily self-care for the participants. Modifications to reduce tooth sensitivity were using a prescription strength fluoride toothpaste, an over-the-counter (OTC) sensitivity toothpaste and avoiding rinsing with cold water. Oral products with mint flavor and alcohol seemed to aggravate the oral mucosa; therefore, natural toothpaste and baking soda were replacements. Alternatives to commercial mouth rinses were warm saltwater and a mixture of peroxide and water.

Xerostomia was a very common oral challenge among the participants. Various products designed to alleviate these symptoms such as OTC oral lubricants, mouth rinses and lozenges were used. While some participants experienced relief from these products, many had tried multiple products with no success.

Challenges and adaptations associated with professional oral care

Minimal mouth opening was a challenge to completing intraoral procedures requiring instrumentation and exposure of bitewing and periapical radiographs. Bite blocks held the mouth open but were uncomfortable and even painful. One participant was referred to another office to have a panoramic radiograph exposed, as other intraoral images were impossible due to limited opening. Other reported adaptations were the use of pain relief medications prior to dental appointments and pediatric-size instruments. Dry mouth and lips influenced participant comfort in the dental office, as well as oral health. Participants attributed the high incidence of dental caries and tooth loss to xerostomia and difficulties with professional oral care. Modifications included the use of lip balm to keep the lips lubricated to assist in opening the mouth and more frequent re-care visits to prevent oral diseases.

Financial and emotional burden

While frequent re-care intervals were recommended due to disease risks, this recommendation also contributed to financial burden. Participants adapted to the cost by not following the oral health professionals' recommendations for more frequent care or opted for a less expensive alternative treatment.

Participants also reported difficulty in finding oral healthcare providers who had knowledge of scleroderma. A major challenge for those with limited scleroderma is general pain with professional dental care, which has a negative emotional impact. Additionally, many experienced a lack of empathy and understanding among oral healthcare professionals. Furthermore, participants reported that the oral effects of limited scleroderma negatively influenced their self-esteem.

Suggestions to improve professional oral health care

Participants provided many suggestions to improve professional oral health care for individuals suffering with limited scleroderma. These individuals found that they needed to educate healthcare professionals about their disease. Much of their time was spent discussing disease basics, rather than their own experiences with scleroderma. From their perspective, many healthcare providers did not give credence to their experiences with this often-invisible disease. The desire of this vulnerable population was that their oral healthcare providers be willing to learn about individual disease experiences and expressions. Participants reported that dental hygienists were knowledgeable in recommending products to alleviate some oral symptoms and valued individualized oral health instructions addressing issues related to scleroderma.

Participants expressed the desire for interactions with providers who listened to and believed them. Additionally, suggestions included the need for compassion, direction, and understanding from their oral healthcare providers. Some had experienced the opposite as expressed by Marcia. "Dental wise, I have very vivid memories of going to a new dentist who screamed at me because I couldn't open my mouth large enough. I have a very, very small mouth. That is part of CREST." Others had more positive experiences. "My dentist has just been very patient, and every understanding and I think that is the key. He just doesn't see me as another patient. He has a lot of compassion, and I think that is really important to find somebody like that."

Other participants reported successes in treatment, due to patience and perseverance on the part of the provider in finding the best treatments.

"[My dentist] doesn't want to pull my teeth out...he tries to work with me to see what will best fit me. He lifted my spirits too, because he started to lighten the teeth and fix me up, so I started to have a beautiful smile. He was trying to make me personally feel better. That is one of the compliments I get from most everybody is a beautiful smile." Hungry Newfie

Participants reported a generalized lack of understanding about limited scleroderma among healthcare professionals. As patients, these participants expressed the need for providers who are willing to learn more about the conditions specifically affecting them. This lack of knowledge about limited scleroderma should be addressed through continuing education courses, and through gaining more experience treating those with scleroderma.

"I know [my dentist] has read about scleroderma and kind of knows what it is ... I did refer a couple of

*other scleroderma patients to her, so she got some other experience with a few that had diffuse scleroderma and really had tight mouth openings and tooth issues. She definitely got real fast education about it when she treated that other patient. But, I think, myself and that other patient are probably the dentist's only experience with scleroderma."*Jennifer

Participants further recommended providers seek education about the disease through scholarly research and attendance at scleroderma meetings.

Discussion

This study generated information specific to the limited form of scleroderma and documented participant experiences related to oral health, in an effort to contribute to the knowledge about this rare disease. Because individuals with limited scleroderma present with varied disease expressions and often live with the disease for decades, the implications related to professional oral healthcare are important to understand. These findings are supported by epidemiologic data showing that people with the limited form of the disease live with the disease longer than those with the diffuse form.¹⁴ This study has documented the disparity between the oral health needs of these participants and the oral care adaptations available to them.

Questionnaire and interview results provided information regarding the oral health experiences of individuals with limited scleroderma, which negatively impacts their oral health-related quality of life. Xerostomia was the most commonly reported complaint, with mixed results being reported in the efficacy of common remedies. Dry mouth negatively influenced both self-care and professional care and contributed to altered dentition through increased dental caries incidence, as well. This increased risk of caries contributed to tooth loss, financial burden, and difficulties seeking professional care. These findings were similar to what has been previously described in the literature.^{24,26,34-35}

Altered dentition and microstomia were also commonly reported by participants, and these oral conditions had a significant impact on their quality of life manifesting through difficulty eating, self-consciousness and self-esteem affectation, difficulty with oral self-care, and difficulty with professional oral care. Very few adaptations were reported as being available to the limited scleroderma participants and the use of smaller instruments and mouth props were only minimally successful in addressing the needs of both provider and patient. It was surprising that none of the individuals

interviewed reported the measuring of maximal mouth opening by oral healthcare providers. There is evidence to support the success at increasing maximal mouth opening in scleroderma patients through a regimented exercise program, showing an average 10 mm increase (an approximate 9% improvement) after 18 weeks.¹⁹ Therefore, dental hygiene treatment plans that include facial exercises, frequent re-care intervals, abbreviated appointments, new physiotherapy aids or alternate uses of existing aids, and referrals for specialized care, may better meet the needs of individuals with limited scleroderma, a finding supported in the literature.^{31,36-38}

An important finding of this study concerned reasons why individuals with this disease may not seek regular professional oral health care. Some of the themes evident in the qualitative portion of this study provided insight into this issue. Participants reported financial burden, physical limitations, pain with treatment, and lack of knowledge and compassion by oral healthcare providers. Findings regarding financial burden, pain and limitation are supported in the literature.^{34,35} Participants understand that healthcare providers cannot reasonably have substantial knowledge of every rare disease. These participants highly valued interactions with providers who listened to their lived experiences and expertise (self-knowledge of disease). Most importantly, they admired and sought out providers who were willing to learn more about scleroderma to better serve their needs. Participants specifically appreciated dental hygienists for their role in promoting oral health through product recommendations but noted oral healthcare providers can do still more by developing innovative ways to utilize currently available products, or by creating new products that will better suit their needs. Participant suggestions are summarized in Table IV.

These findings are relevant because current literature does not address these issues specific to limited scleroderma. As a mixed methods study with a limited sample size, these results are not generalizable. However, the goal of qualitative research is not to generalize findings but to generate a sufficient amount of valuable information.³³ The sample size for the qualitative study is supported by similar studies, by the sole focus on the limited form, and by the rarity of the disease.^{39,40}

Further research is required to better meet the special needs of individuals with limited scleroderma. There is also a need for the development of better adaptive tools and strategies supportive of effective self-care. Collaboration between dental professionals and other interprofessional providers in scleroderma clinics merits further exploration.

Table IV. Recommendations for oral healthcare providers

Assessment Recommendations for Oral Healthcare Providers ^{18,19,32,36-38}	
Signs and symptoms of limited scleroderma	<ul style="list-style-type: none"> • Telangiectasias: small, red macules on face and oral mucosal tissues • Tightening of skin around face and hands; thinning of lips • Hardening of tissues such as tongue and soft palate • White to purple fingertips, made worse in cold conditions • Microstomia • Xerostomia • Difficulty eating and/or drinking • Acid erosion and dentin hypersensitivity caused by GI distress (e.g. GERD) • Increased periodontal disease, and loss of gingival attachment • Mandibular bone resorption • Widened periodontal ligament (PDL) • Increased dental caries risk • Trigeminal neuropathy • Mucogingival paresthesia
Measure maximal mouth opening at each visit (normal range 35-55mm)	Suggest stretching exercises to improve function Instruct patient to: <ul style="list-style-type: none"> • Create an O with their mouth • Smile, grimace, smile, grimace • Open as wide as possible • Practice slowly 10 x daily
Participants' Recommendations for Oral Healthcare Providers	
Patient centered oral hygiene instructions	Home care aids and products to recommend: <ul style="list-style-type: none"> • Small head, gentle toothbrushes • Handled flossers • Use of oral irrigator and power toothbrush • Rx 1.1% NaF dentifrice • OTC sensitivity dentifrice • Neutral products (no mint or alcohol) such as baking soda • Warm saltwater rinse • OTC oral lubricants for xerostomia • OTC sugar free mouth lozenges
Compassion and understanding	<ul style="list-style-type: none"> • Respect and trust patient-reported disease experiences and knowledge • Take the time to research the disease and apply that knowledge to patient care • Be knowledgeable in a variety of physiotherapy aids • Be patient and persevere to find the right treatment modifications to best serve the patient • When treatment planning, consider the financial impact of this chronic disease

Conclusion

The oral health related quality of life of individuals with limited scleroderma is impacted by multiple factors. This study demonstrated the need for compassion and understanding among oral healthcare providers when serving those with limited scleroderma. To address the needs of this vulnerable population, oral health professionals must seek out improved treatment modalities. The measuring of maximal mouth opening should be part of the dental hygiene process of care for scleroderma patients. Collection of these data along with information regarding other oral manifestations experienced by the patient will allow the dental team to treatment plan appropriate interventions. Future studies related to interprofessional collaborative care between oral health professionals and scleroderma specialists is recommended.

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Issues and Innovations in Dental Hygiene Education

Impact of a seated-standing protocol on postures and pain among undergraduate dental hygiene students: A pilot study

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Abstract

Purpose: Although repetitive movements may lead to musculoskeletal pain, static and sedentary postures may be primary contributors to musculoskeletal disorders. The purpose of this pilot study was to determine whether an alternating seated-standing protocol would improve postures, decrease ergonomic risks, and reduce perceived pain scores among dental hygiene students.

Methods: Thirty undergraduate dental hygiene students enrolled during the summer term were recruited to participate in the randomized control design pilot study. Participants were randomly assigned to the training (n=15) and control (n=15) groups. The training group alternated between sitting and standing every 30 minutes while providing dental hygiene care. The Modified-Dental Operator Posture Assessment Instrument (M-DOPAI) was used to evaluate ergonomic scores, the Rapid Upper Limb Assessment (RULA) was used to evaluate ergonomic risk, and the Modified-Standardized Nordic Musculoskeletal Questionnaire (M-SNMQ) was used to assess self-reported pain. Photographs were captured and levels of perceived pain were assessed at baseline, week-4, and week-8. Three raters independently evaluated the photographs using the M-DOPAI and RULA. Participants completed a survey about their experiences in the study at the end of week-8. Descriptive statistics and repeated measures ANOVAs were used to analyze the quantitative data; thematic analysis was used to analyze the qualitative data.

Results: Although all participants perceived a reduction of pain over the duration of the eight-week study ($p < .05$), the training group demonstrated no significant differences in ergonomic scores, ergonomic risks, or pain scores at the three time points ($p > .05$). Qualitatively, participants in the training group perceived that the seated-standing protocol clinically improved their postures and reduced their pain.

Conclusion: The results suggest there were minimal impacts of the alternating seated standing protocol on ergonomic scores, ergonomic risks, or perceived pain. More research is needed to determine whether there are objective benefits to an alternating seated-standing protocol.

Keywords: ergonomics, musculoskeletal disorders, standing postures, ergonomic risks, dental hygiene students

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Introduction

A high prevalence of work-related musculoskeletal disorders (WMSDs) exists in the dental and dental hygiene professions.¹⁻⁶ Musculoskeletal pain among clinicians can lead to musculoskeletal injury over time, which can lead to musculoskeletal disorders that limit the ability to practice clinically. Many of the postural habits and symptoms of pain experienced by dental and dental hygiene professionals begin during their entry-level education.^{3,7} Although repetitive movements may lead to musculoskeletal pain, static and sedentary postures may be a major contributor to musculoskeletal disorders.⁸

Prolonged seated postures have been associated with musculoskeletal and systemic health hazards.⁹⁻¹¹ In a systematic review conducted across multiple disciplines, Szczygiel et al. found seated postures involving incorrect postures of the head and pelvis contributed to cervical and lumbar spine disorders and diminished respiratory function.⁹ In the general population, increased times in seated positions have been positively correlated with increased risks for cardiovascular disease, obesity, diabetes, and total mortality.^{10,12} No differences in the amount of sedentary

behaviors were found between middle-aged women who engaged in sufficient (over 30 minutes) versus insufficient or moderate-vigorous physical activity.¹¹

For dental and dental hygiene professions, recommended methods to prevent musculoskeletal disorders included using acceptable postures, proper lighting, switching between long and short appointments, and alternating between seated and standing postures.¹³ Multiple general workplace interventions have been tested to decrease the amount of seated time at work, such as physical workplace changes, counseling, changes in break schedules and computer prompts. However, a systematic review revealed limited evidence on theoretical or proven strategies to reduce the amount of sitting in the long term, for the general population.⁸ Additionally, limited evidence exists on the effect of alternating between seated and standing postures, specifically with an additional focus on the improvement in correct postures, reducing ergonomic risks, and reducing musculoskeletal pain. The purpose of this pilot study was to determine whether an alternating seated-standing protocol would improve postures, decrease ergonomic risks, and reduce perceived pain scores among undergraduate dental hygiene students.

Methods

Expedited approval was granted by The Ohio State University Institutional Review Board (2019B0182) for this randomized control design pilot study. The study had four aims. Aims one and two were to determine whether an alternating seated-standing protocol would improve ergonomic scores and decrease ergonomic risk. The third aim was to determine whether alternating seated-standing protocol would decrease perceived pain scores, and the fourth aim was to evaluate participants' adherence to the protocol and study their attitudes regarding the seated-standing regimen. A convenience sample of 30 students enrolled in the dental hygiene program at The Ohio State University during the summer term 2019 were invited via e-mail to participate. After providing the potential participants with the research study details and an opportunity to ask questions, participants provided written informed consent.

Instruments

The Modified-Dental Operator Posture Assessment Instrument (M-DOPAI) and the Rapid Upper Limb Assessment (RULA) were used to evaluate the student participant postures. The M-DOPAI has been used for the assessment of the postures of dental professionals.¹⁴⁻¹⁶ The twelve components were patterned after Branson et al's Posture Assessment Instrument (PAI),¹⁷ which consisted of ten components, and Maillet et al's Posture Assessment

Criteria (PAC),¹⁸ which includes two additional components involving the upper arms. The posture scores ranged from a low of 12 (ideal postures) to high of 32 (harmful).

The RULA has been widely used for ergonomic risk assessments.¹⁹ The RULA uses diagrams and descriptions to evaluate risk factors for musculoskeletal disorders and provides an ergonomic risk score. The body is divided into two sections: 1) Upper arm, lower arm, and wrist and 2) Neck, trunk, and legs. The wrist/arm score is a combination of position, muscle, and force/load scores are used to calculate, which can range from 1 (low risk) to 9 (high risk). The neck, trunk, and leg score is a combination of position, muscle, and force/load scores, which can range from 1 (low risk) to 9 (high risk). The final scores are generated using the wrist & arm score and leg score, which has the following range of scores: 1-2=acceptable, 3-4=further investigation and change may be needed, 5-6= further investigation and change needed soon, and 7+= immediate investigation and change needed.

The Modified-Standardized Nordic Musculoskeletal Questionnaire (M-SNMQ) has been widely used as a validated instrument to assess musculoskeletal pain.²⁰ Pain in nine regions (neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, ankles/feet) is evaluated using a dichotomous scale (yes or no). If pain in a specific section is reported, a new series of questions appears. To generate a pain score, all yes responses received a score of 1. Since the scores for knees and ankles/feet were excluded from the pain score, overall pain scores could range from 0-7.

To evaluate participants' posture, digital photographs were captured by calibrated members of the research team using a 10.5-inch iPad Pro (Apple; Cupertino, CA, USA). Two images (front and profile) were randomly captured in the middle of a patient care appointment of each participant during each timepoint of the study. Front view allowed for the evaluation of the trunk (front to back), head and neck (front to back), elbows (level), shoulder (level), and wrists (flexion or extension) and the profile view allowed for the evaluation of the hips, trunk (front to back), head and neck (front to back), upper arms (in rotation to torso), shoulder (relaxed/slumped), and wrists (flexion or extension). Sample images are shown in Figure 1.

Procedure

All participants had received one hour of didactic instruction in general ergonomics principles in a prior preclinical course held in autumn 2018 and an additional 30 minutes of didactic instruction in standing ergonomics at the start of the summer 2019 term. The standing ergonomics instruction included principles of proper positioning

Figure 1. Sample photographs of participant postures



when working on the maxillary arch and when working on the mandibular arch, along with a review of operators photographed in a standing position.

The principal investigator (PI) assigned the 30 participants into a control group and training group using the random assignment feature in SPSS Version 26 (IBM; Armonk, NY, USA). The training group was instructed to follow the seated-standing ergonomics protocol, which was to switch from a seated to standing position every thirty minutes during each assigned three-hour clinical appointment. Figure 2 provides a sample outline on how to implement the seated-standing protocol. Participants were not required to strictly adhere to the sample protocol due to variations in the patient needs/conditions and each individual operator's habits in the implementation of dental hygiene care. The control group maintained normal seated positioning throughout each of the assigned three-hour clinical appointment sessions. E-mail reminders were sent to participants in the training group to

Figure 2. Sample alternating seated-standing protocol (alternating positions approximately every 30 minutes)

Standing	Medical history review, vital signs, dental history review, extraoral and intraoral examinations
Seated	Clinical assessments: restorative charting, periodontal probing (maxillary arch)
Standing	Clinical assessments: periodontal probing (mandibular arch); risk assessments, dental and dental hygiene faculty check-ins
Seated	Plaque score and Oral hygiene instructions, ultrasonic instrumentation (maxillary arch)
Standing	Ultrasonic instrumentation (mandibular arch)
Seated	Hand instrumentation (maxillary arch)
Standing	Hand instrumentation (mandibular arch)
Seated	Coronal polishing

adhere to the alternating seated-standing protocol at the start of each week.

Data collection took place over an 8-week period during the 2019 summer term. Demographic information (age, weight, and height) was collected at the beginning of the study (baseline). At weeks 0, 4, and 8, calibrated members of the research team captured images of all participants (front and profile) and participants reported their perceived pain levels using the (M-SNMQ) via an online survey platform (Qualtrics; Provo, UT, USA). At the conclusion of the study (week 8), all participants were asked to complete an evaluation survey with one open-ended question to provide general comments about the study. Participants in the training group were asked six additional closed-ended questions about their experiences with the seated-standing protocol; items included adherence to the protocol in the first four weeks, adherence to the protocol in the final 4 weeks, three attitudinal items regarding the protocol and one item regarding the likelihood of continuing the protocol in the future.

After the photographs were captured, three raters (two dental hygiene faculty members and one dental hygiene student) independently evaluated the photographs using the M-DOPAI and RULA instruments. The raters received a 30-min calibration session involving a discussion of ergonomic principles, recognition of compromised positions, and practice application of posture evaluations. The PI deemed consensus with scores with the agreement of at least 2 out of the 3 raters. The inter-rater reliability with the M-DOPAI was measured at Cronbach's alpha = .860 and intraclass correlation of .860

(95% CI=[.842-.876]). The inter-rater reliability with the RULA was measured at Cronbach's alpha =.702 and intraclass correlation of .8702 (95% CI=[.650-.747]).

Data analysis

Data were analyzed using SPSS Version 26 (IBM; Armonk, NY, USA). Descriptive statistics and repeated measures ANOVAs were used to evaluate whether differences existed in ergonomic scores, ergonomic risk, and perceived pain among participants between the control and training groups. Descriptive statistics were also used to analyze the attitudinal questions and thematic analysis was used to analyze the general comments.

Results

A total of 30 participants were recruited and completed the study. There were no significant differences between the control and training groups in terms of age in years ($M=21.3$, $sd=.89$, $p=.533$), weight in pounds ($M=141.7$, $sd=23.09$, $p=.911$), and height in inches ($M=65.9$, $sd=3.34$, $p=.826$). Demographics are shown in Table I.

Table I. Demographic characteristics (n=28)*

Characteristics	Group (n)	Mean (sd)	95% CI		F	Sig**
			LB	UB		
Age	Control (n=14)	21.1 (.86)	20.6	21.6	.399	.533
	Training (n=14)	21.4 (.93)	20.8	21.9		
	Total (n=28)	21.3 (.89)	20.9	21.6		
Weight	Control (n=14)	142.2 (21.30)	129.9	154.5	.013	.911
	Training (n=14)	141.2 (25.55)	126.5	156.0		
	Total (n=28)	141.7 (23.09)	132.8	150.7		
Height	Control (n=14)	66.0 (3.26)	64.1	67.9	.049	.826
	Training (n=14)	65.7 (3.54)	63.7	67.8		
	Total (n=28)	65.9 (3.34)	64.6	67.2		

* demographic characteristics are reported from 28 of the total 30 participants

** p -values < .05

For the first aim, repeated measures ANOVA was used to evaluate for significant differences in ergonomic scores, using the M-DOPAI, based on time and group (Table II). No interaction effects were found with time x group ($F(2)=.557$, $p=.459$). No significant differences were found with the main effect for time ($F(2)=1.062$, $p=.54$) or group ($F(1)=.557$, $p=.459$). For the second aim, repeated measures ANOVA was used to evaluate for significant differences in ergonomic risk scores, using the RULA, based on time and group (Table II). No interaction effects were found with time x group ($F(2)=1.218$, $p=.304$). No significant differences were found with the main effect for time ($F(2)=.165$, $p=.848$) or group ($F(1)=.029$, $p=.866$).

For the third aim, repeated measures ANOVA was used to evaluate for significant differences in perceived pain based on time and group (Table II). A significant difference with the main effect of time was found ($F(2)=3.030$, $p=.050$). Post-hoc analysis using Least Significant Difference (LSD) revealed significant decrease in perceived pain scores from week 1 ($M=2.703$, $sd=.266$) to week-4 ($M=1.905$, $sd=2.88$, $p=.047$) and from week-1 ($M=2.703$, $sd=.266$) to week-8 ($M=1.869$, $sd=.276$, $p=.035$). No

interaction effects were found with time x group ($F(2)=.979$, $p=.326$) and no significant differences were found with the main effect for group ($F(1)=.979$, $p=.326$).

For the fourth aim, 12 of the 15 participants in the training group completed the post-study survey, for an 80% response rate (Table III). Half of the training group participants reported compliance to the alternating standing/seated protocol over >50% of the time during weeks 1-4 and weeks 5-8. Most (64%, $n=8$) believed that the alternating standing/seated protocol resulted in improved postures in addition to a reduction of their perceived pain. However, more participants believed that while the alternating standing/seated protocol reduced their perceived pain (84%, $n=10$), it did not improve their postures (75%, $n=9$). Most (67%, $n=8$) reported the likelihood of using standing postures in the future when providing dental hygiene care.

General comments regarding the study protocols were elicited from a majority of participants (83%, $n=25$); the themes are shown in Table IV. Regarding the challenges to the alternating standing/seated protocol, over half of the training group ($n=7$) reported difficulty in adopting behavioral changes (remembering to alternate between sitting and standing) and the physical limitations (height of the patient chair, magnification loupes) while adopting the protocol in the student clinics.

Discussion

The purpose of this pilot study was to determine whether an alternating seated-standing protocol would improve ergonomic scores, reduce ergonomic risks, and reduce perceived pain scores over the

Table II. Descriptive and summary statistics comparing intervention and control conditions (n=30)

	Intervention Group		Control Group		Interaction Effects		Main Effects			
	(n=15)		(n=15)				Time		Group	
	<i>M</i> (SD)	95% CI	<i>M</i> (SD)	95% CI	<i>F</i>	Sig	<i>F</i>	Sig	<i>F</i>	Sig
Ergonomic Scores					1.396	.257	1.062	.354	.557	.459
Baseline	16.7 (4.08)	[15.01- 18.39]	14.90 (2.92)	[13.21- 16.59]						
Week 4	14.50 (2.73)	[12.26- 16.31]	14.75 (1.04)	[13.71- 17.09]						
Week 8	15.00 (2.11)	[13.54- 16.63]	14.14 (.90)	[12.12- 16.17]						
Ergonomic risk scores					1.218	.304	.165	.848	.029	.866
Baseline	4.00 (1.41)	[3.32- 4.68]	3.40 (.36)	[2.68- 4.12]						
Week 4	3.25 (.46)	[2.45- 4.05]	3.80 (.36)	[3.08- 4.52]						
Week 8	3.58 (.90)	[2.93- 4.24]	3.43 (.43)	[2.57- 4.28]						
Pain scores					.979	.326	3.030	.050*	.979	.326
Baseline	2.71 (1.54)	[1.98- 3.45]	2.69 (1.55)	[1.93- 3.46]						
Week 4	2.08 (1.00)	[1.29- 2.88]	1.73 (1.35)	[.90- 2.56]						
Week 8	2.15 (1.57)	[1.39- 2.92]	1.58 (1.08)	[.79- 2.38]						

* *p*-values < .05

course of eight weeks. Although all participants reported reductions in perceived pain over the eight-week study, the seated-standing protocol had no effect on ergonomic scores, or ergonomic risks. However, training group participants perceived the seated- standing protocol improved their postures and reduced their perceived pain.

All participants improved ergonomic scores within the time frame of the study but the alternating seated-standing protocol was not shown to have a direct impact on improved postures and risk for musculoskeletal disorders. During the summer 2019 term, the participants were beginning their second semester of patient care. As the students grew more confident with their delivery of dental hygiene care, they may have been able to divert more attention to improving their postures; in the post-study survey three fourths of the training group participants agreed that the seated-standing

protocol improved their postures. Previous studies reported in the literature have shown that any improvement in ergonomic scores is beneficial in reducing risks for musculoskeletal disorders.^{14, 16, 21-25} Simply being aware of one's posture as part of the process of the delivery of patient care can have long-term benefits especially since musculoskeletal pain has been shown to originate during dental hygiene education.^{18,21,22}

Ergonomic risk scores decreased for the training group as compared to the control group, but not to a level of statistical significance. Other indirect objectives of the alternating seated-standing protocol could be found in the reduced risks for systemic diseases associated with seated postures¹⁰⁻¹³ and the translation of improved standing postures to seated postures. Most participants found the seated- standing protocol beneficial, as represented in the following comments: "It gave me new ways to clean and move the patient while standing.

Table III. Training group post-study survey items (n=12)*

Question	0-25% of the time	26-50% of the time		51-75% of the time	76%-100% of the time
During the first 4 weeks of the study, how well did you follow the protocol to alternate between sitting and standing every 30-60 minutes?	(n=3) 25%	(n=3) 25%		(n=3) 25%	(n=3) 25%
During the final 4 weeks of the study, how well did you follow the protocol to alternate between sitting and standing every 30-60 minutes?	-	(n=6) 50%		(n=4) 33%	(n=2) 17%
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe that the sitting and standing protocol resulted in the improvement of my posture and the reduction of my pain.	-	-	(n=4) 33%	(n=7) 58%	(n=1) 8%
I believe that the sitting and standing protocol resulted in the improvement of my posture.	-	-	(n=3) 25%	(n=8) 67%	(n=1) 8%
I believe that the sitting and standing protocol resulted in the reduction of my pain.	-	(n=1) 8%	(n=1) 8%	(n=8) 67%	(n=2) 17%
	Very unlikely	Unlikely		Likely	Very likely
In the future, how likely will you stand when providing dental hygiene care?	(n=1) 8%	(n=3) 25%		(n=2) 17%	(n=6) 50%

* Voluntary responses from 12 of the 15 participants in the training group are reported.

Table IV. Open-ended post-study comments, all participants (n=25)*

Benefits (n=9)Challenges (n=7)	Challenges (n=7)
Alternative postures <ul style="list-style-type: none"> • “It was a nice change of pace.” • “I had better visibility while standing at times.” Reduced Pain <ul style="list-style-type: none"> • “Standing definitely improved my discomfort throughout the day and made it easier doing certain tasks including head/neck cancer screening and periodontal charting.” • “I think standing was easier on my back.” 	Behavioral changes <ul style="list-style-type: none"> • “I prefer sitting than standing.” • “I saw and felt the benefits of alternating between sitting and standing during appointments but think it may flow better/be less awkward if I just stood and sat for every other patient (i.e. consistently stand throughout one entire appointment and consistently sit through the next).” • “It was helpful to set a timer to remind yourself to alternate.” • “For me, it was honestly hard to remember to alternate between standing and sitting. I feel like we are so used to sitting that it was awkward and felt uncomfortable standing.” Physical limitations <ul style="list-style-type: none"> • “Most of my pain occurred during Expanded Functions Dental Auxiliary (EFDA) practice as I was using different muscles and different seating positions. Other than that, clinic hasn’t really caused me any pain.” • “I feel like I was too tall for the maximum height the chair could rise, so it may have caused me more pain.” • “My photographs may not be as helpful due to my loupes magnification not working. My posture isn’t always great because it’s hard to see.”

* Voluntary responses from 25 of the total 30 participants are reported.

It showed me that standing is sometimes easier than sitting and moving around everywhere” and “I had better visibility while standing at times.” However, while self-awareness of one’s posture may help reduce the risks for musculoskeletal disorders, the accuracy of this assessment may be challenging. Dental students asked to evaluate their clinical performance were shown to report more favorable self-assessments when compared to the evaluations made by faculty members.²⁶ Facilitating dental hygiene students’ abilities to make more accurate ergonomic self-assessments through photography and faculty feedback may translate into overall improvements in seated and standing postures.

Self-reported perceived pain scores decreased significantly for all participants at week 4 and 8 when compared to the baseline scores. Because the study started after a break in between academic terms, all participants may have experienced more perceived pain at the beginning of the study. As the term progressed, levels of perceived pain may have subsided with more regular and continual clinical practice. Since the perceived pain relied on self-reported data, participants may have been affected by social desirability bias, which leads to underreported pain based on cultural norms. However, the apparent reduction in perceived pain, experienced by the control group, may have been caused by the Hawthorne effect. The M-SNQ instrument has been shown to be an appropriate measurement of interventions on musculoskeletal health and pain.²⁷ Most participants indicated that the seated-standing protocol resulted in the reduction of their perceived pain. One participant stated, “standing definitely improved my discomfort throughout the day and made it easier doing certain tasks including head/neck cancer screening and periodontal charting” and “standing was easier on my back.” Physiologically, seated and other static postures can lead to pain as a response to compressed blood vessels and non-physiologic positions including curvature of the spine.¹³ Training group participants may have experienced actual muscular relief associated with changing to the less static seated-standing protocol.

Adherence to the seated-standing protocol may have been a challenge for the training group participants. During the final four weeks of the study, all of the participants reported following the protocol only about 25% of the time. Training group participants reported that, “I prefer sitting than standing” and “it was honestly hard to remember to alternate between standing and sitting. I feel like we are so used to sitting that it was awkward and it felt uncomfortable standing.” If students are taught and conditioned to practice in seated positions exclusively, incorporating standing positions in clinical practice may not be considered a viable alternative

and may be considered a challenge. Although preclinical instruction is focused on the acquisition of fine motor skills in the preclinical environment,²⁸ a more holistic approach may be needed including feedback on seated postures and the use of alternative standing positions.

Another contributor to the lack of adherence to the seated-standing protocol may have been the lack of support and feedback from the clinical faculty members. For the present study, the clinical faculty members were instructed to provide periodic verbal reminders to the training group participants to adhere to the protocol and provide ergonomic feedback during the clinical sessions. However, posture and ergonomics are not part of the daily grading rubric and the clinical faculty members do not receive ergonomics calibration training. Professional development programs utilizing captured photographs to illustrate ergonomic positioning has been shown to increase the levels of agreement among clinical faculty members.¹⁵ Future research should include the impact of calibration training with a seated-standing protocol on student postures.

Incorporating self-assessment procedures with the implementation of the seated-standing protocol may affect the impact on posture and perceived pain among dental hygiene students. Previous research on dental hygiene students’ self-assessments using captured images of seated postures resulted in improvements in ergonomic scores when using the M-DOPAI¹⁴ and reductions in ergonomic risks using the RULA.²⁹ Future studies should determine the impact of using self-assessments on seated-standing postures.

The physical limitations of the dental unit may have prevented the full implementation of the seated-standing protocol in this study. One participant commented “I felt like I was too tall for the maximum height the chair could rise, so it may have caused me more pain.” Although the mean height of the participants was 66 inches, some of the participants’ heights approached 72 inches and may require additional accommodations. Most manufacturers of dental chairs have not considered standing postures for oral healthcare professionals and usually provide height ranges from 13-32 inches.³⁰ Additional training with the dental unit, particularly the chair, may be needed in the clinic environment. Learning how to fully utilize the semi-supine position of the chair back and the articulating head rest can have a positive impact on student ergonomics as well as patient comfort.

This pilot study had limitations. The small sample size and short time frame limits the generalizability of the results. Future studies should incorporate larger samples from multiple institutions over a longer period to increase the rates

of implementation and determine the impact of the seated-standing protocol. Static photographs were used to evaluate ergonomic scores and ergonomic risks at single points in time. Captured videos could be used to provide ergonomic evaluations based on a series of timepoints in future research. Future studies should The impact of an alternating seated-standing protocol with licensed dental hygienists in clinical practice should also be studied within the context of one hour appointments.

Conclusion

Although there were no statistically significant differences with the seated-standing protocol on dental hygiene student postures and perceived pain, the participants perceived a positive clinical impact of the protocol on their postures and levels of perceived pain. The results suggest there were minimal impacts of the alternating seated-standing protocol on ergonomic scores, ergonomic risks, or pain. More research is needed to determine whether there are objective benefits to an alternating seated-standing protocol.

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2021 Research Poster Abstracts

The following posters were presented during the American Dental Hygienists' Association Annual Conference held in Phoenix, Arizona, June 18 – 20, 2021.

The Impact of Adjunctive Autofluorescence Imaging on the Accuracy of Oral Cancer Screening Outcomes and Triage Decisions by Dental Hygienists, Dentists and Community Screeners*

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Problem: Oral cancer outcomes are adversely affected by inaccurate screening outcomes from dental professionals, resulting in late specialist referral and diagnosis.

Purpose: The purpose of this study was to determine whether providing adjunctive autofluorescence images can improve the accuracy of oral cancer screening outcomes and triage decisions by dental hygienists, dentists, and non-specialists and compare the screening performance of each group

Methods: This was an observational study that included 20 dental hygienists, 20 dentists, and 20 healthcare students, who acted as surrogates for community health workers. After receiving standardized training in clinical oral cancer screening and autofluorescence imaging, these screeners documented screening outcome and triage decision in 19 subjects with oral lesions based on a de-identified dataset of risk factors, clinical history, and white light photographs of each subject. The screeners subsequently viewed the matching autofluorescence images for each subject and documented an additional screening outcome and triage decision considering

all data, including the additional autofluorescence images. Data collection was implemented by means of an online questionnaire, on which screeners documented in multiple choice format the screening outcome and triage decision for each subject. Oral lesions included leukoplakic, erythroplakic, ulcerated, and mixed oral lesions. All subjects had previously received a standard of care diagnosis by an in-person oral medicine specialist, which served as the gold standard for evaluating screening outcome and triage decision. The images that were utilized in the study had previously been recorded in vivo in each subject using a prototype high-resolution, polarized white light and multispectral autofluorescence intra-oral camera. Two-way ANOVA, Tukey's multiple comparisons tests, and an unpaired t-test were used to analyze the data.

Results: The screening and triage decisions made by hygienists, dentists and healthcare students respectively based on risk factors, clinical history, and white light photographs did not differ significantly ($p>0.05$) between the 3 types of testers, averaging 56%, 53% and 54%, respectively. However, screening and triage accuracy by hygienists and dentists were significantly improved using the additional autofluorescence images ($p<0.05$), averaging 68% and 67% respectively, but not for the healthcare students ($p>0.05$), averaging 53%. Dental hygienists and dentists performed similarly regarding screening accuracy and triage decision without and with the added autofluorescence images ($p>0.05$).

Conclusion: Providing adjunctive autofluorescence images may improve the accuracy of screening and triage by dental hygienists and dentists in individuals with oral lesions.

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Using Motivational Interviewing to Increase Confidence in Nutritional Counseling among Dental Hygiene Students

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Problem: Dental hygienists have the unique opportunity to educate patients on connections between nutrition and oral health. As students, they are introduced to these concepts, but struggle share this knowledge with patients. The clinician who is not confident in their skills may not perform nutritional counseling.

Purpose: This pilot study evaluated an educational module on motivational interviewing (MI) and an assessment and counseling tool to build student confidence with nutritional counseling.

Methods: The study utilized a quasi-experimental, one-group design to gather qualitative and quantitative data to evaluate change in confidence with nutritional counseling. Students participated in an educational module to review MI and introduce the nutritional risk assessment and counseling tool. Prior to the module, participants completed a pretest about confidence levels regarding MI and nutritional counseling. After three weeks of clinical practice, participants completed a post-test. Data was compared for quantitative changes with a Wilcoxon signed-rank test and qualitative themes from responses through content and narrative analysis.

Results: Twenty-two students (n=22) participated in both the pretest and posttest. There were statistically significant changes in participants' confidence ($p=0.007$) and comfort ($p=0.020$) discussing nutrition with patients. Participants struggled to become more confident in MI as demonstrated by no significant change in their feelings surrounding MI ($p=0.150$). Students reporting increased nutritional counseling sessions showed improvement in their confidence.

Conclusion: This pilot study suggests introducing motivational interviewing with an assessment and counseling tool to aid dental hygiene students may improve confidence with nutritional counseling.

Utilizing Clifton Strengths to Increase Professional Development in Dental Hygiene Students*

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Problem: Traditional dental hygiene education programs may not provide sufficient training in professional development to prepare graduates to be primary care providers in an integrated health care delivery system.

Purpose: The objective of this two-year study was to utilize results from the CliftonStrengths assessment to support entry-level dental hygiene students' professional development and learning experiences.

Methods: An exploratory research design including both quantitative and qualitative methods was used among a convenience sample of entry-level dental hygiene students (IRB-FY2019-182). CliftonStrengths assessment was used to determine the professional strengths of the participants for quantitative analysis. Faculty were trained to coach and engage students utilizing their strengths during clinic, classroom, and laboratory activities. At the end of the first year, an exploratory focus group design assessed student and faculty perceptions of professional strengths based on learning experiences. All participants used pseudonyms to protect confidentiality. Focus groups occurred through the Zoom platform, were recorded and transcribed using a professional transcriptionist. Frequencies and percentages were used to summarize the top five strengths of each participant's CliftonStrengths. For the qualitative portion of the study, the Dedoose program was used to identify parent and child codes. The investigators systematically reviewed these codes and key quotes to identify themes. Investigator triangulation and member checks were used to validate the responses.

Results: Thirty-two entry-level dental hygiene students and twenty-eight faculty agreed to participate in the CliftonStrengths assessment. Both students and faculty have strengths in the executing, strategic and relationship building domains for the top five professional strengths. All students participated in the focus groups while fourteen faculty were available to complete focus group sessions. For the student focus groups quotes were condensed into nine parent codes and fifty-two child codes. The following themes were identified: awareness, application, positive approach, successful strategies, and personal growth. For the faculty

focus groups quotes were condensed into seven parent codes and twenty-four child codes. The following themes were identified: recognition, change in perspective, personalized approach, participatory environment, and empowerment.

Conclusion: Results of year one of this study highlight the potential benefits of a strengths-based approach to undergraduate dental hygiene education. Helping students recognize their strengths and learn how to leverage those strengths in a challenging educational setting may lead to increased empowerment, and professional growth and development. Further study with year two data may offer an opportunity to learn more about how CliftonStrengths impacts students' learning experiences.

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Orofacial Manifestations of Lyme Disease: A systematic review

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Problem: Orofacial manifestations of Lyme disease can affect head and neck structures examined by dental professionals. It is important for dental professionals to be aware and have a referral plan for patients as needed.

Purpose: The purpose of this systematic review was to examine the literature for types and frequencies of Lyme disease orofacial manifestations documented in the United States.

Methods: This systematic review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. An electronic search of the literature was conducted by a librarian and included Dentistry and Oral Sciences Source (EBSCO), PubMed, Cinahl Plus, and Medline for articles published from January 1990 to October 2019. Search term alterations were used and synonyms were cross-checked using the United States National Library of Medicine Unified Medical Language System Metathesaurus. The search strategy of databases used keywords and MeSH terms for Lyme disease, vector, pathogen, head/neck anatomical landmarks, and orofacial manifestations. The search was limited to peer-reviewed journals and articles were included if they met the following criteria: (1) studies of US populations, (2) available in full-text and English, and (3) confirmed Lyme disease diagnosis. Retrieved articles were independently reviewed based on titles and abstracts by two researchers. Risk of bias

was assessed independently, and data extraction was completed using a modified version of the Cochrane Data Collection Form for randomized control trials and non-randomized control trials. Meetings were held to resolve disagreements by consensus. An initial search of databases produced 217,381 results; 43 met inclusion/exclusion criteria and were deemed appropriate for inclusion. All were from non-dental journals and represented less than half of the Lyme endemic states.

Results: Among twelve included articles, there were 951 confirmed Lyme disease cases. Frequencies of eight orofacial manifestations were reported as: headache (n=376, 39.5%), facial palsy (n=404, 42.5%), temporomandibular joint arthralgia (n=4, .42%), altered taste N=1, .11%), stiff neck (n=129, 13.6%), sore throat (n=29, 3.0%), neck pain (n=71, 7.5%), and erythema migrans rash on the head/neck (n=49, 5.2%).

Conclusion: This systematic review revealed eight Lyme disease orofacial manifestations that could be recognized by dental professionals. Current research regarding orofacial manifestations of Lyme disease is needed so this medical phenomenon can be well understood by dental professionals to best serve their patients.

Dental Hygiene Clinical Faculty Attitudes and Willingness to Work During the COVID-19 Pandemic

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Problem: The inability or reluctance of dental hygiene clinical faculty to continue working during the COVID-19 pandemic is a major concern in keeping dental hygiene educational systems open and functioning. Therefore, it is important to determine any factors or barriers of willingness to work during the COVID-19 pandemic. Little or no scholarly research has been conducted on dental hygiene faculties' attitudes and willingness to work during a pandemic. Understanding such factors may aid in taking actionable plans to remove such barriers, identify current changes being made, and to determine appropriate planning interventions intended for the future.

Purpose: The purpose of this study was to expand the body of knowledge regarding dental hygiene clinical faculty's attitudes about working during the COVID-19 pandemic and to identify factors that may influence their ability and willingness to work.

Methods: This quantitative study used a survey validated in the United Kingdom and modified for spelling. The survey

was emailed to dental hygiene clinical faculty in July 2020 (13.15% response rate). Three attempts were made to increase the response rate. The first section (seven questions) dealt with attitudes toward working during the pandemic. An example is as follows: “if there were a COVID-19 outbreak would you be more likely to work if...your employer provided life/disability insurance, vaccine, etc.?” Respondents were given two choices, “more likely” or “about the same.” The second section (nine items) asked participants to agree or disagree about work-related situations such as, “I have to go to work because I couldn’t manage if I lost any of my wages.” Respondents were given two choices, “tend to agree” or “tend to disagree.” SPSS V. 27 was used to describe the data using response frequencies.

Results: Respondents’ mean age was 51.71 (+/- 10.5) years; mean years of teaching experience, 13.55 (+/-9.3 years). Thirty percent were over 60 years of age. The likelihood of staying on the job if certain work-related conditions were met was 33%. Approximately 78% would remain if personal protective equipment were offered when working around and with potentially infected patients. Almost all respondents indicated that their main responsibility was to themselves/family, which took priority over work responsibilities. In addition, respondents sought more timely guidance from professional bodies/government organizations about best clinical practices during the pandemic.

Conclusion: This pandemic has placed all stakeholders in dental hygiene education under extreme strain. Personal and work-related issues are causes of unease in these respondents. The latter issues may have implications for employers as educational programs work to fully re-open and to progress students through their educational programs.

University of Hawaii Dental Hygiene Students Offer Virtual Oral Health Education to Head Start Families During the Pandemic

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Significance: The COVID-19 pandemic resulted in the closure of the University of Hawaii (UH) dental hygiene clinic and most community dental sites eliminating all live clinical experiences for dental hygiene students. An alternative clinical experience was created allowing students an opportunity to provide virtual oral health education to UH’s Head Start partners and families throughout the state.

Purpose: To develop an innovative program that provides a valuable clinical experience for dental hygiene (DH) students and an opportunity for head start families to receive oral health education during the pandemic.

Key Features: Dental hygiene students created presentations on various dental health topics, which were then shown virtually to Head Start children and families using Zoom. A questions and answer session followed the presentations, and each child was sent a dental kit for home use. Evaluation for the program included collecting data on the number of DH students participating in each session along with the number of classrooms and Head Start children reached using this virtual format. Following each session, a student self-evaluation as well as Head Start staff evaluation of the presentations were completed.

Evaluation Plan/Results: From August 2020 until April 2021, 20 DH students participated in the virtual sessions with education provided to 53 Head Start classrooms reaching 775 children and their families. Creating and providing virtual oral health education was a valuable experience for DH students, while also meeting the needs of the Head Start community. Students found this alternative clinical experience using a virtual educational platform, to be initially challenging, while also gratifying once they were able to complete each session successfully. Head Start staff appreciated the extra effort to provide separate videotapes of each session for future use in their classrooms and found the topics pertinent to the needs of their families. As dental clinics reopen, dental hygiene programs should continue to use this creative approach which allows for the provision of education regardless of location in the state.

The Profession of Dental Hygiene: Pathways to Career Choice and Influences on Professional Identity

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Purpose: The purpose of this study was to ascertain factors which influenced dental hygienists to choose the profession and identify ADHA resources which promote and sustain members’ professional identity.

Methods: This was a quantitative, cross-sectional, non-experimental study. A 48-item web-based survey was designed and pilot tested. Multiple choice, Likert-scale, and open-ended questions regarding demographics (10), career choice (4), and professional identity (34) were used. The survey was disseminated by the American Dental Hygienists' Association to student and professional members. Descriptive and inferential statistics were used to analyze data.

Results: A total of 1,983 surveys (n=1,983) were returned, response rate of 6.3%. The majority (n=1,699, 86%) of respondents were professional members. Most participants were female (n=1,940, 98%), White (n=1,668, 84%), and 55+ years of age (n=727, 37%). Both student and professional members rated a desire to work in a health field as the most influential reason for entering the profession (n=59, 21% and n=468, 28%, respectively). Both groups identified continuing education and evidence-based research resources as positively affecting their professional identity (4.11.0 and 4.11.0, $p=0.41$, respectively) and (4.11.0 and 4.01.0, $p=0.13$, respectively). Advocacy efforts, Journal of Dental Hygiene, and Access Magazine had a significantly greater positive influence on Professional Members' professional identity ($p=0.001$, $p=0.028$, and $p=0.001$, respectively). Student members reported greater influence on their professional identity in the areas of patient care resources ($p=0.01$) and support of their career ($p<0.001$).

Conclusion: The desire to have a career in a health field was the most influential factor for career choice. Continuing education and evidence-based research resources most positively affects all members' professional identity.

An Evaluation of a 15-Minute Yoga Intervention Prior to Entry-Level Dental Hygiene Students' Final Exams

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Problem: Stress is a physical, psychological, or emotional response to an internal or external demand. Stress can be beneficial by enhancing productivity and motivation, or stress can be crippling, reducing performance. Health science students, including entry-level dental hygiene students, have an increased source of stress due to the rigorous curriculum, high clinical expectations, and academic demands. Numerous stress reduction treatments and pharmacological interventions exist; however, little is known about the effect yoga has on entry-level dental hygiene students' stress.

Purpose: The purpose of this study was to determine the effectiveness of a 15-minute yoga intervention to reduce entry-level dental hygiene students' stress prior to final exams.

Methods: An experimental research design using a randomized controlled trial was used. Thirty-two first year entry-level dental hygiene students were randomly assigned to either the experimental or control group. The intervention was performed prior to each final exam and included gentle yoga movements, breathing, and meditation. The control group proceeded with their normal pre-exam routines. Baseline and post-trial blood pressure, pulse and 10-item PSS data were recorded for both groups. Repeated measures of blood pressure and pulse were recorded before and after yoga for the experimental group and the control group prior to each exam. Data analyses included Paired-samples t-test, Independent-samples t-test and ANOVA, ($p=0.05$).

Results: The main effect for yoga from pre- to post-session was statistically significant for blood pressure ($p=0.02$ systolic; $p=0.02$ diastolic) but not for pulse ($p=0.23$). Significant effects on blood pressure measures showed yoga sessions reduced stress but effects sizes were small. The paired t-tests indicated the 10-item PSS values were significantly lower ($p<0.00$). Statistical significance of differential, beneficial effects of yoga versus control were not demonstrated: systolic ($p=0.35$), diastolic ($p=0.46$), pulse ($p=0.68$), and 10-item PSS ($p=0.54$).

Conclusion: Results demonstrated statistically significant positive effects on stress measures, particularly blood pressure, within the yoga group. However, statistical significance of yoga versus control were not demonstrated. This study provides evidence of yoga's positive effects in both physiological and psychological domains within entry-level dental hygiene students. It also achieved high levels compliance and demonstrated yoga's feasibility even during a notoriously stressful time for entry-level dental hygiene students. Research on a larger sample of entry-level dental hygiene students using yoga over the course of a semester is recommended.

US Virgin Islands' Caregiver Oral Health Knowledge and Feeding Practices of Children in Their Care

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Problem: Children with low socio-economic status have been identified as being at risk for early childhood caries. In the USVI, 32% of families live at or below the poverty

level. However, the oral health knowledge and practices of USVI caregivers, and risk for early childhood caries in USVI children, has not been investigated since the 1990s.

Purpose: The objective of this study was to understand US Virgin Islands (USVI) caregivers' oral health knowledge regarding risk factors for developing early childhood caries, and the feeding practices of the children in their care.

Methods: A cross-sectional qualitative study was conducted with three focus groups, using semi-structured open-ended questions to collect data from participants (n=16). A non-probability purposive sampling technique was employed to recruit USVI caregivers (18 years of age and older) from a resource center that provides family assistance and resources for children aged 6 years and under. The ten (10) questions used to collect data centered on children's feeding habits and participants' knowledge of risk factors for dental caries. Participants' responses were audio recorded and transcribed using an online transcription software platform. Triangulation was employed in the thematic analysis with two investigators independently identifying emerging themes.

Results: Demographic data revealed the majority of participants were single (69%), female (87%), 20 to 30 years of age (44%), with a high school education or less (63%). The thematic analysis performed on the data identified three major themes; limited knowledge of etiology of dental caries, lack of understanding of influence of feeding practices on poor oral health, and lack of recognition regarding consequences of dental caries on well-being. Although participants expressed an understanding of the relationship between diet and dental caries, the majority (n=15/93%) reported that sodas and juices were the beverages most frequently given to their children. All of the participants (n=16/100%) identified snacks comprised of fermentable carbohydrates as the first choice served to their children.

Conclusion: Study results suggest caregivers from low socio-economic status backgrounds in the USVI should be educated on the risk factors for early childhood caries, and offered nutritional guidance on how to reduce the frequency of cariogenic foods and beverages for children in their care.

Tobacco Cessation Counseling Training for Medicaid Dental Providers

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Problem: There is a higher level of tobacco use among Medicaid beneficiaries than in the general population. The aim of this project was to reduce tobacco use among Medicaid beneficiaries by supporting dental professionals to initiate and promote tobacco cessation in their practices.

Purpose: The purpose of this program was to develop open access, continuing education-based Tobacco Cessation (TC) training modules for dental professionals. Through statewide promotion of the website resources, target dental providers who treat Ohio Medicaid beneficiary patients.

Key Features: The Ohio Department of Medicaid (MedTAPP) funded a two-year grant between The Ohio State University College of Dentistry and Case Western Reserve University School of Dental Medicine to create and distribute online modules, patient scenario videos and resources on tobacco related harm and tobacco cessation methods. Contributors included professionals from dentistry, dental hygiene, public health, social work, medicine and pharmacy. A website was created to host fourteen 30-minute modules, patient scenario videos, literature references and resources for TC referrals. Module topics included foundational knowledge on tobacco harm, skills for behavioral modification, pharmacological treatment approaches and TC in special populations. To receive continuing education credits, participants register, view the module presentations and satisfactorily complete module tests. Live virtual continuing education webinars, highlighting a selection of the modules and videos, were also presented in the spring and summer of 2020, at no charge, to dental professionals and community health centers. The completed modules and website resources went live

October, 2019 and are available at: <https://www.ohpenup.com/tobacco-cessation.html>. The project connected with Community Health Clinics and Federally Qualified Health Centers throughout Ohio. Additional partners included the Ohio Dental Association, the Ohio Dental Hygienists' Association, the Ohio Association of Community Health Centers and the Oral Health Improvement Through Outreach (OHIO) Project.

Evaluation Plan/Results: As of January, 2021, 301 individuals had registered on the website; 91 registrants completed continuing education modules, with an average of 7 modules viewed. Registrants represented 6 dental professional organizations and 12 educational institutions in Ohio, along with private practitioners. Among registrants, approximately 68% were dental hygienists, 20% dentists, 6% dental assistants and 6% others. Over 40% of registrants reported serving a population of greater than 30% Medicaid beneficiaries. A nearly equal number of participants received continuing education credits through attendance at the live virtual webinars. This project encouraged dental professionals to increase their knowledge of oral and systemic harm caused by tobacco use and to expand their skills in tobacco cessation methods.

Medical Emergency Management Training Utilizing High-fidelity Simulation: Faculty Confidence Levels and Perceptions

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Problem: Dental offices are seeing a growing number of geriatric and medically compromised patients in their practices that may increase the likelihood of medical emergencies. According to the Centers for Disease Control and Prevention (CDC), 80% of the older population have one chronic disease and 50% have two or more chronic diseases. Research has indicated a lack of confidence among dental professionals when dealing with medical emergencies.

Purpose: The purpose of this study was to determine faculty confidence in managing medical emergencies in the dental clinic utilizing high-fidelity simulation and assess their perceptions on utilizing this type of training within the dental hygiene curriculum.

Methods: This descriptive quantitative pilot study used a convenience sample of dental hygiene faculty observing student medical emergency simulation training at a small Midwest

university. Prior to simulations, a pre-survey designed by the researchers was given to supervising faculty (n=11). This survey contained 12 statements regarding confidence when performing various medical emergency skills. A 5-point Likert scale was used to assess confidence. A post survey containing the same questions plus 5 additional questions regarding student engagement, learning, and future recommendations was distributed immediately following. Research data were analyzed using Wilcoxon signed-rank tests.

Results: For 11 of the 12 statements, an increase in confidence was reflected in the faculty's mean scores. A significant increase of confidence was identified for 1) administering emergency oxygen ($p=0.038$), 2) administering emergency medications ($p=0.001$), 3) obtaining accurate blood pressure readings ($p=0.025$), 4) initiating and implementing "Code Blue" emergency protocols ($p=0.012$), 5) managing a medical emergency ($p=0.011$), and 6) communicating with the patient during a medical emergency ($p=0.026$). All faculty stated the medical emergency simulation engaged the students, enhanced their learning, and would help them remember emergency procedures better. Furthermore, faculty recommended additional emergency simulation experiences and continued implementation of this type of training to teach future dental hygiene students.

Conclusion: High-fidelity simulation provides an opportunity for students to experience real-life medical emergencies without risk to patients. This type of training may be an effective tool to enhance learning and increase confidence in medical emergency management not only for the students but also for faculty in their own dental practice.

Implementing Environmental Sustainability Educational Intervention in Dental Hygiene Instruction

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Problem: The healthcare industry, including dentistry, contributes to a large portion of national waste output. Steps should be taken to minimize dentistry's contribution to waste and improve public health outcomes.

Purpose: The purpose of this study was to implement an educational intervention and assess its usefulness on improving Dental Hygiene (DH) students' perceptions and knowledge on environmentally sustainable dentistry (ESD).

Methods: A convenience sample of thirty-five second-year DH students located at a dental institution in the southern United States were recruited for this quasi-experimental non-randomized observational mixed-methods pilot study. The intervention, an online educational module titled “Environmental Sustainability and Dentistry”, was created and incorporated the 2nd year DH course “Clinical Dental Hygiene”. Students filled out pre- and post-surveys immediately before and after completing the module. Surveys utilized Likert-scale and multiple-choice questions that ranged from self-reported level of knowledge & attitude on climate change and environmental sustainability to objective knowledge-based questions. Pre- and post-module survey scores were compared with paired t-tests. Three weeks after module completion, students were assigned a follow-up assignment and post-assignment survey to get feedback on the assignment. Univariate and qualitative analyses were conducted on the post-assignment component.

Results: Twenty-four students completed the pre- and post-module survey for a response rate of 68.57%. Most participated in the post-assignment survey component (n=22, 62.86%). There was a statistically significant ($p<0.0001$) difference between pre-survey and post-survey ESD knowledge scores following the educational module intervention. There was also a statistically significant ($p<0.0001$) positive difference between pre-survey and post-survey ESD attitude scores after module completion. Most respondents (>90%) indicated that the follow-up assignment strengthened their ESD learning experience. Qualitative analysis revealed that the reflective assignment helped students apply module concepts in the real world and adopt behavioral changes to be less wasteful in clinic.

Conclusion: Findings from this study support that instructional interventions on ESD in DH education may improve student’s knowledge of ESD and encourage behavioral changes to be more waste conscious.

Web-based Unfolding Case Study in an Interprofessional Online Class

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Significance: Collaborative Online Learning (COL) has been designated by the Health Professions Accreditors Collaborative as an interprofessional learning modality that utilizes information and communication technology to facilitate collaboration

between students from different health programs or with practitioners that represent different professions. Innovative approaches to COL have been investigated to address logistical challenges that limit the implementation of interprofessional education (such as variance in program design, resources, accreditation standards, infrastructure, financing models, policy, scheduling difficulties, and geographic locations). A combination of an unfolding case study and virtual reality simulation may solve these logistical barriers while providing students with opportunities for engaging and immersive interprofessional collaboration.

Purpose: The primary objectives were 1) determine impact of a web-based unfolding case study on the knowledge, skills, and attitudes of dental, nursing, physician assistant, medical, pharmacy, and public health students in an online, interprofessional population health course and 2) gain student feedback to modify and improve for future iterations. This pilot has been expanded to include dental hygiene students in the current cohort.

Key Features: An unfolding case study was delivered within a population health class over a series of four modules relating to the topics of 1) needs assessment and quality improvement, 2) health disparities, 3) patient engagement, and 4) care coordination and collaboration. The unfolding case format utilized prototypical virtual reality to create an interactive video experience depicting a patient encounter. A total of 309 students from the listed professions were assigned to interprofessional teams of 4-5 to complete a series of activities embedded in the unfolding case

Evaluation/Results: Qualitative and quantitative data were collected to evaluate program and learner outcomes. An appraisal of activities and reflection papers was conducted to assess learner outcomes. A quantitative post-module objective-based survey, a qualitative post-course survey, and a debriefing session were used to gather data to evaluate effectiveness of the program and gather feedback for improvement of the modules. Response rates to the quantitative post-module survey varied from 57% (n=176) to 68% (n=211). Sixty-nine percent of respondents agreed that module 3 objectives were met, 79% agreed that module 4 objectives were met, 81% agreed that module 5 objectives were met, and 83% agreed that module 6 objectives were met. Qualitative data provided information about knowledge, skills, and attitudes gained from the unfolding case, feedback for further development of the virtual reality prototype, and the impact that the start of the COVID-19 pandemic had on the unfolding case.

Knowledge of HPV among Dental Hygiene Students in Illinois

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Problem: Human papillomavirus (HPV) is becoming more prevalent among individuals and manifestations can be identified in the oral cavity at routine dental visits. HPV can go undiagnosed, although patients may have symptoms present in the oral cavity. A lack of understanding exists between HPV related lesions and other intraoral conditions. Furthermore, dental hygienists must feel confident in providing education on HPV.

Purpose: The purpose of this research is to assess the knowledge of HPV and confidence in providing patient education on HPV among associate and baccalaureate dental hygiene students in the state of Illinois. Differences between seniors and non-seniors were also examined.

Methods: This IRB approved, quantitative, cross-sectional study evaluated the students' knowledge and confidence in providing patient education on HPV. A 43-item electronic survey was developed to compile data collection that consisted of demographic and polar questions. The survey was emailed to eight program directors throughout the state to forward to their students (n=69, 26% response rate). A value of 1 was assigned for each correct answer on the composite knowledge score. The highest possible composite knowledge score was 41. Composite knowledge scores and confidence questions were compared between senior students and non-seniors using an independent t-test and Mann-Whitney U test, respectively. The chi-square goodness of fit test was used to assess students' knowledge of oral manifestations of HPV. The study was approved by the SIUC's IRB (20230).

Results: The internal consistency (α) for the knowledge subscale and confidence subscale of the survey was 0.76 and 0.95, respectively, indicating adequate internal consistency for both sub-scales. There were no statistically significant differences between senior students and non-seniors for the composite knowledge scores or the confidence questions. The average confidence score for providing patient education was 3.28. Chi-square was statistically significant ($p<0.001$) for focal epithelial hyperplasia, oral squamous papilla, and condyloma acuminatum, indicating that students identified these intraoral manifestations less frequently than expected.

Conclusions: The results indicate more education regarding HPV is indicated through the dental hygiene curriculum based on the low knowledge score and low levels of confidence in providing patient education. Dental hygiene students did not feel confident discussing HPV with their patients but felt it was important to do so. Limitations included social desirability bias and small sample size.

Implementation of the Objective Structured Clinical Examination (OSCE) in the Assessment of in Dental Materials

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Significance: The Objective Structured Clinical Examination (OSCE) is an assessment method used to measure student understanding of properties and delivery in treatment planning incorporating clinical judgement skills in clinical practice through a stepwise structure. The OSCE has been shown to be superior to written exams by fostering the learning and development of clinical competency aligning to study strategies.

Purpose: The purpose of this investigation was to compare student outcomes between the practicum and the OSCE. Prior to the OSCE introduction, only a lab practicum and examination to evaluated success. OSCE fosters learning and development using case scenarios to evaluate the student's clinical proficiency, confidence, and competence in critical thinking. In contrast, the practicum only offers practical application of the material in a laboratory setting with focus on theory.

Key Features: The learning structure uses a "tell, show, do" approach. Students attend lecture followed by positive reinforcement with a demonstration and hands on laboratory experience. The student then collects material and verbalizes the procedure and rationale to the "mock" patient. During the procedure, the student orally presents each step describing the manipulation properly and delivery of the material. The student makes the commitment to the OSCE and challenged with questions directed with temperature change and setting times appropriate to the materials. Each OSCE is built on detailed rubrics describing a step-by-step process in the manipulation and delivery of material based on a case study. Expected outcomes include patient evaluation, rationale for material use, armamentarium, patient safety, manipulation, delivery and patient post-operative instructions.

Evaluation Plan: Four cohorts of students (2017-2020) participated in the investigation comparing outcomes in dental materials. The first group (n=90, 2017 and 2018) used a traditional practicum framework. The second group (n=91, 2019-2020) used the OSCE method. Evaluation of student performance of both groups was determined through identical quizzes, and exams. The OSCE group scores reflected consistently higher performance rates, whereas the scores for groups performing practicums revealed larger difference in student understanding. Those performing OSCE's scored higher, demonstrating a significant benefit to student learning with the implementation of the OSCE.

Dental Hygiene Faculty and Student Knowledge, Psychological Health and Vaccination Behaviors Regarding COVID-19: A pilot study

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Problem: The COVID-19 pandemic has been characterized by extreme uncertainty, stress, and anxiety. Mitigating risk of contracting and transmitting COVID-19 while remaining current with the ever-changing information and guidelines has been challenging. Dental hygienists need accurate knowledge about COVID-19 in order to protect themselves and their patients. Lack of knowledge and psychological health may impact behaviors including vaccination.

Purpose: This pilot study aimed to gain insights on dental hygiene faculty and student COVID-19 knowledge, psychological health during the pandemic, and vaccination behaviors.

Methods: This descriptive quantitative pilot study used a 26-item online survey to examine the impact of COVID-19 on psychological health (10 items), decision to receive vaccination (2 items), and knowledge of COVID-19 (10 items). The validated Patient Health Questionnaire 4 (PHQ-4) screened participants for depression and anxiety. Data collected between February 26 to March 1 were analyzed using descriptive statistical methods and t-tests.

Results: The 52 participants in this convenience sample were knowledgeable about COVID-19; the faculty mean knowledge score of 8.78 out of 10 was significantly higher than students at 7.79 ($p=0.021$). Of the ten items, 69.2% of participants did not know if the Food and Drug Administration had approved any drugs to treat COVID-19, and 42.3% did not know if ultraviolet light could be used to disinfect surfaces. The PHQ-4 identified 38.5% of participants with elevated

anxiety scores and 21.2% with elevated depression scores. The mean PHQ-4 scores of students (2.57) were higher than faculty (0.89) at a significant level ($p=0.023$). Participants were significantly more anxious about contracting ($p=0.037$) and unknowingly transmitting ($p=0.002$) COVID-19 to others during normal daily activities than during clinical treatment. Of the students, 19 (46.3%) had received at least one dose of the vaccine, 13 (31.7%) intended to vaccinate in the future, and 9 (21.4%) did not plan to be vaccinated. One (11.1%) of the eight faculty did not plan to be vaccinated. Participants who did not plan to be vaccinated listed concerns about limited research regarding adverse effects.

Conclusion: In this pilot study, the majority of dental hygiene faculty and students were knowledgeable about COVID-19 and willing to be vaccinated, regardless of psychological health. It is essential for faculty to know the latest information and guidelines about COVID-19, and to educate students and patients. Further research with a larger sample is needed to determine if correlations exist between knowledge scores, vaccination behaviors, and/or psychological health.

Effectiveness of Adjunct Laser Therapy on Periodontal Pathogens: A systematic review

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Problem: Dental hygienists need to offer patients the most effective treatments possible within their scope of practice. In 2015, a systematic review and meta-analysis was published in the Journal of the American Dental Association indicating the use of photodynamic therapy with diode lasers as beneficial adjuncts to NSPT. However, the use of lasers within the dental hygiene scope of practice, including as an adjunct to non-surgical periodontal therapy (NSPT) continues to be a contentious subject.

Purpose: The objective of this systematic review was to evaluate if adjunct laser treatment was more effective than traditional NSPT alone in the reduction of periodontal pathogens.

Methods: To answer the question, "what is the efficacy of the adjunct use of dental lasers (including diode, NdYAG, ErYAG, and CO2) on microbiological parameters/indices," PubMed, Google Scholar, CINAHL, and Web of Science databases were searched for literature pertaining to the effects of laser therapy on periodontal microbes. The primary outcome was the reduction of periodontal pathogens. Inclusion criteria were randomized clinical trials, human studies, and

published in English between January 2015 and December 2020. Keywords included “nonsurgical periodontal therapy”, “periodontal disease”, “laser therapy”, and “pathogens.” These terms were combined in various ways with “AND” and “OR” commands to obtain the most narrowly defined and relevant articles. A total of 1662 records were found, and after screening titles and abstracts, 187 articles were included. After full texts of the remaining studies were screened, another 174 publications were excluded. All screening was performed by three investigators. Thirteen, relevant full-text articles were read and evaluated independently. A meta-analysis was not performed because of the heterogeneity of the study designs.

Results: Overall, seven of the studies in this systematic review reported better treatment outcomes than SRP alone while six studies reported that the outcomes were comparable to SRP alone. All studies were assessed using a Cochrane review. Nine of the articles showed low risk of bias while four of the studies showed moderate risk of bias due to lack of information regarding some of the domains.

Conclusion: Within the limitations of the studies included in this systematic review, certain types of laser treatment in conjunction with NSPT are more effective at reducing the number of periodontal pathogens than SRP alone. The adjunct use of combined Nd:YAG + Er:YAG and diode lasers, including their use in photodynamic and low-level laser therapy, resulted in more improvement of microbiological parameters than SRP alone.

Stress and Coping Mechanisms of Dental Hygiene Students Before and During the COVID-19 Pandemic

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Purpose: Stress is not uncommon among students and research has demonstrated health care students, including dental hygiene (DH) students, experience high levels of stress during their education. DH students have an added stress of requiring live patients to complete their education requirements. The COVID-19 pandemic created barriers to completing these requirements causing additional stress students. The purpose of the study was to evaluate perceived stress and coping mechanisms of DH students before and during the COVID-19 pandemic.

Methods: The cross-sectional survey research was used to assess a convenience sample of DH students (n=291). Two validated survey instruments, Perceived Stress Scale 14 (PSS-14) and Brief-COPE (Coping Orientation to Problems Experienced) questionnaire along with 5 questions addressing academic related stress and needed resources were used to assess stress and coping mechanisms of study participants. The survey was distributed on DH students Facebook® pages. Participants completed the survey twice, the first time reflecting on stress and coping prior to the pandemic and the second reflecting on stress and coping during the pandemic. Data was analyzed using Spearman’s rank, independent t-tests, linear regression, and thematic analysis.

Results: Survey completion rate was 46% (n=134). Average change in PSS scores was 10.13 (SD=10.39) which represented a 7% increase in perceived stress from before COVID-19 outbreak to the time of survey completion. DH students reported higher perceived stress (M=48.1, SD=10.4) during COVID-19 compared to their before perceived stress (M=38.0, SD=7.0), $t=-11.3$, $p<0.001$. When comparing Brief-COPE responses before and during the pandemic problem focused coping was higher for during COVID-19 compared to before. Additionally, emotion focused, and perceived avoidant coping were also higher during COVID-19 in contrast to scores perceived before. Thematic analysis identified students expressed a need for counseling; more communication and clarity from faculty and institutions; and assistance with patient recruitment.

Conclusion: Dental hygiene students experience high levels of stress and anxiety trying to meet the rigorous demands of educational programs and patient recruitment needs. Results from this study demonstrated that the COVID-19 pandemic had an impact on student stress and coping methods. Moreover, there was an increase in negative problem and emotion focused methods, and avoidant coping mechanisms. Pandemics will eventually pass but student stressors and negative coping methods will remain. Dental hygiene programs should consider including stress reducing interventions and positive coping strategies into the curriculum to provide students with skills needed to maintain overall health and well-being to support academic success.

Integrating Case Management into the Dental Hygienist's Role: Improving Access to and Utilization of Oral Health Care for Pregnant Women

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Significance: In Maryland, Medicaid provides dental coverage for pregnant women yet only 28 percent of enrollees had a dental visit in 2018. Medicaid-enrolled pregnant women experience barriers to accessing dental care, which can negatively impact maternal and child health. This innovative program aims to decrease barriers to oral health care for an underserved community while providing experience for future dental hygienists in treating patients whose health outcomes are impacted by social determinants.

Purpose: In partnership with the University of Maryland Women's Health Center (UMWHC), the University of Maryland School of Dentistry's (UMSOD) Dental Hygiene program developed a case management protocol for low-income pregnant women to increase utilization of oral health care services. This program was designed to expand access to oral health care by integrating dental hygiene faculty and students into the prenatal healthcare protocol at a university-based women's health center.

Key Features: Key features of the program include (1) frequent dialogue between the UMWHC prenatal providers and the UMSOD to manage dental referrals and address patient concerns and 2) a streamlined, multistep process at the UMSOD to schedule, register, and coordinate oral health care that builds patient trust and addresses patients' dental needs. Information regarding prenatal oral health care safety, importance, and coverage by Medicaid, is disseminated to pregnant women through Zoom presentations during UMWHC "baby shower" events and case management services (via text or phone). These services are integral to increasing oral health equity for vulnerable pregnant women and expands the scope of dental hygiene practice.

Plan Evaluation: Data has been collected monthly by the program coordinator since program initiation in 2018, to evaluate effectiveness. Measures include: 1) number of pregnant women referred to the UMSOD from the UMWHC, 2) number of pregnant women who report for dental appointments at the UMSOD, 3) number of pregnant women who do not show for dental appointments at the

UMSOD, and 4) number of pregnant women who complete comprehensive dental hygiene care. Current program data collected through case management of all UMWHC referrals indicates that partnering with the UMWHC and providing case management services has: 1) increased referrals from 5 to 30 per month, 2) increased the number of pregnant women who have dental appointments from 3 to 12 per month, 3) decreased the percentage of pregnant women who do not show for appointments from 75% to 31%, and 4) increased the percentage of pregnant women who completed dental hygiene care from 47% to 62%.

The Correlation between Periodontal Disease and Systemic Health in Rural Southern Illinois

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Problem: Patients who are treated in the dental practice often do not associate oral health with systemic health. Incomplete health history self-reporting confirms the lack of knowledge of current or existing health conditions. Periodontal disease can affect all individuals, although there is a higher prevalence among those living below the federal poverty level. In the southern Illinois region, approximately 1/3 of the population is covered under the medical assistance program.

Purpose: The purpose of this study was to identify the correlation between systemic health issues and periodontal disease and determine if consistencies exist with data from southern Illinois and national trends.

Methods: A convenience sample of current patients in the advanced periodontics clinic at Southern Illinois University Carbondale (SIUC) agreed to participate in this IRB approved study. An Excel data sheet was used to gather demographic information in addition to health issues and dental concerns from June 2019 to February 2020. Medical information included conditions that affect the nervous system, respiratory system, endocrine system, bone/muscle disorders, digestive system, urinary system, heart/blood vessel disorders and 'other' conditions. Patients received a periodontal screening to determine calculus deposit levels and the overall periodontal condition. Chi-square test of independence was calculated to test the relationship between systemic health issues and periodontal disease.

Results: High blood pressure was the most reported systemic health issue among all patients and among those ages 50 and older. Statistically significant relationships were found

between periodontal disease and high blood pressure, joint pain, and arthritis among all patients (n=927). No statistically significant relationships ($p<0.05$) were identified among those age 50 and older (n=348) however, not all patients completed all portions of the health history.

Conclusion: Oral-systemic relationships between periodontal disease, hypertension and joint conditions were identified from the data collected at the dental hygiene clinic at SIUC, an access point for patients who lack health care in the region. The dental hygiene clinic is the access point for patients who lack healthcare in the region. Future research should focus on educating this vulnerable population on oral-systemic health and overall risk reduction.

Comparison of Single Operator Using Hand-held High Volume Evacuation Systems versus Slow Speed Suction During Ultrasonic Usage

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Problem: Aerosols and splatter are produced during a variety of dental procedures such as the use of ultrasonic instruments, handpieces, and air polishers. These airborne particles may contain harmful microorganisms. A common approach to contain aerosols and splatter is the use of a high-volume evacuation (HVE) system. It is unclear which HVE systems are most effective at removing aerosols and splatter.

Purpose: The purpose of this study was to measure aerosol containment when various forms of suction were utilized. The various forms included slow-speed saliva ejector, saliva ejector adapter used with HVE, HVEsolo^â, Purevac^â and Safety Suction^â.

Methods: This was an observational study. Trials were completed using a dental mannequin. Two calibrated investigators completed ultrasonic instrumentation on all surfaces of the anterior teeth. Glo Germ^â gel was placed on the cervical 1/3 of the anterior teeth and investigators were timed for 2-minutes. Purevac^â HVE instructions were utilized. Thirty trials were conducted for each system. For each trial, paper with a 175-cell grid, cells measuring 1 cm³ were placed 3 inches from the opening of the oral cavity at a 50-degree angle to the floor. Two investigators recorded readings using black light. An Intraclass Correlation Coefficient (ICC) was obtained from data retrieved from the saliva ejector results.

The ICC represents the interrater reliability. Results indicated that ICC=.98 which indicates excellent agreement. This supports the reliability of the assessment technique. Cells with Glo Germ^â were counted as contaminated. A one-way ANOVA was used to examine how the HVE groups differed on the number of contaminated cells.

Results: Results indicated that there were significant group differences, $F(4, 144)=22.23$, $p<.001$, $\eta^2=.38$. Post hoc pairwise comparisons indicated that the control group (saliva ejector) had a significantly lower number of contaminated cells than each of the other groups ($p<.01$). The slow speed suction, with no HVE utilized, resulted in 4.71% contaminated cells. The least number of cells contaminated when using HVE was the PureVac^â with 8.81%. The remaining HVE tested had higher percentages of contamination: HVE solo^â (11.8%), Safety Suction^â (13.9%), and Saliva Ejector Adapter (15.9%).

Conclusion: The results indicated that using slow-speed suction alone presented with the least amount of contamination. The possible reasons for this are that the HVE suction, utilized in the anterior region, nearest the orifice, causes a disturbance in the aerosols and spatter, catapulting the contaminant into the atmosphere.

Reducing Fatigue and Musculoskeletal Burden while Improving Clinician Comfort and Efficacy During Ultrasonic Scaling using a Novel Wristband Cord-Holder*

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Problem: Ultrasonic scaling, and many forms of dental instrumentation are related to a wide range of musculoskeletal diseases, as well as intra- and postoperative discomfort and fatigue.

Purpose: The goal of this study was to evaluate the effect of a novel wearable cord-holding device (Cordeze[®], Phoenix, AZ) on muscle work, musculoskeletal symptoms, fatigue, and comfort during ultrasonic scaling.

Methods: This was a randomized, controlled crossover clinical study. A standardized ultrasonic scaling task was performed twice by 5 right-handed hygienists with no history or symptoms of musculoskeletal disease. Using a dental

typodont with standardized calculus load, testers spent 2 minutes scaling each lingual or buccal surface of each quadrant respectively. The entire scaling protocol was performed twice: once with and once without the novel wearable cord-holding device which attaches to the ultrasonic scaler cord to anchor it and reduce cord pull-back during instrumentation. The sequence of wristband use vs non-use was randomized, and the 2 study arms were interspersed by a 20-minute rest period. Muscle activity in four hand and arm muscles was recorded throughout scaling using four wireless surface EMG (sEMG) electrodes (FreeEMG™, BTS Engineering, Quincy, MA). Hygienists' hand, finger and arm positions were filmed during instrumentation and ultrasonic cord pullback force measured using a tensional dynamometer. Immediately after scaling, Visual analog scale (VAS) measures of comfort, hand, wrist, and arm fatigue were recorded on a scale of 0-10. The timepoints at which sensations of fatigue, discomfort and pain occurred and at which testers made non-functional grip adjustments to counter discomfort throughout scaling were recorded. sEMG traces were analyzed using multivariate ANOVA and Bonferroni post-hoc tests; t-tests for the remaining analyses.

Results: Based on sEMG measurements, work/s during scaling was reduced by 30% and total work to complete the scaling task by 25% using the wristband (sig., $p<0.05$). VAS surveys showed that combined fatigue in all 4 muscles was reduced by 60% using the wristband, and comfort improved by a factor of 3 (sig., $p<0.05$). Time to onset of musculoskeletal symptoms doubled (sig., $p<0.05$), 60% fewer non-functional grip adjustments were made (sig., $p<0.05$) and overall testers reported 80% fewer symptoms using the wristband (sig., $p<0.05$). Cord pullback force was eliminated using the wristband, while measuring 2.3 N without it.

Conclusion: Results from this pilot study demonstrated that a novel wristband cord-holder may improve the ergonomics and reduce musculoskeletal burden of ultrasonic scaling.

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Comparison of a Novel Curette Handle Design to a Stainless-Steel Handle on Hand and Arm Fatigue when Scaling

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Problem: Musculoskeletal diseases (MSDs) affect most dental clinicians. Current instrument handle designs are linked to MSD-related variables including fatigue, reduced pinch & grip strengths.

Purpose: To compare fatigue, comfort and muscle work associated with the use of 2 periodontal curettes during scaling. One curette featured a novel, bendable adaptive handle design, the other a conventional stainless-steel design. Long-term goal is to develop, test and validate an optimized periodontal curette design that overcomes barriers to improving musculoskeletal health in dental clinicians and improves instrumentation efficacy.

Methods: This was a randomized cross-over clinical study. Twelve dental hygienists with no signs or symptoms of MSDs were recruited to scale a typodont using 2 Universal curettes with different handle design. One curette was a prototype featuring an adaptive silicone-covered handle (Curette A), the second a stainless-steel curette (Curette B). The sequence of instrument use randomized (randomizer.com). All testers completed standardized training. Teeth in a typodont model were then scaled using a standardized protocol by all testers. Four wireless surface EMG (sEMG) electrodes (FreeEMG™, BTS Engineering, Quincy, MA) were attached to each tester's dominant hand and arm to trace activity in 4 muscles during instrumentation: Extensor digitorum communis, Flexor digitorum superficialis, Extensor carpi radialis brevis, and First dorsal interosseous muscles. Correctness of a modified pen grasp, blade adaptation, operator fatigue and comfort, as well as pre- and post-instrumentation pinch and grasp strength were additionally recorded using image analysis, VAS scales and dynamometers. Paired t-tests and a repeated measures ANOVA with covariates tested for differences between instruments for each evaluation criterion. Significance level was $p<0.05$.

Results: Curette A performed significantly better in all categories ($p < 0.05$). Muscle fatigue at completion of the set scaling task averaged 30% less for Curette A than Curette B. Instrumentation with Curette A required 25% less total muscle work and significantly less work in each of the 4 individual muscles. Curette A was rated as 80% more comfortable than Curette B. Testers implemented a correct instrument grasp 35% more often and optimal blade-to-tooth adaptation 75% more often using Curette A than Curette B. Pinch and grasp strength were significantly reduced post-instrumentation for Curette B (mean 19%) but not for Curette A (mean 9%).

Conclusion: A curette featuring a novel adaptive, silicon-surfaced handle design demonstrated significantly improved ergonomic performance as compared to a conventional stainless-steel curette. Additional clinical studies are needed to evaluate the potential short- and long-term benefits of the novel curette handle design.

An Oral Health Viewpoint of Grandparent Caregivers Raising their Grandchildren

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Problem: Approximately 2.7 million children are being raised full-time by their grandparents in the United States. Children living with their grandparents often reside in racial and ethnically diverse, low-income households, where oral health disparities continue to exist. The rate of caries in primary teeth of Mexican American, non-Hispanic black, and low-income children was one to two times greater than non-Hispanic white and higher-income children. Limited research has been conducted investigating the grandfamily dynamic as it relates to children's oral health.

Purpose: This study had two aims, first to investigate grandparent caregivers' perceptions, behaviors, and knowledge of oral health for the grandchildren they are raising; and, secondly to explore potential influences of the caregiver's knowledge, perceptions, and behaviors held regarding their grandchild's oral health.

Methods: This descriptive, cross-sectional survey study recruited grandparents who were the primary caregiver of their non-adult grandchild(ren) at various public health centers in Ohio and on various online grandparent support forums. The

questionnaire was initially validated from previous studies and further developed in this study through content validity. The questionnaire contained 26 items: knowledge (6), perceptions (5), values (5), behavior intent (2), and demographics (8). Lastly, before implementation, the questionnaire was pilot tested for readability and comprehension with an individual who met the study inclusion.

Results: Seventy-five grandparents participated in the study. Of the 75 participants, 72.6% ($n=53$) identified as White/Caucasian and 19.2% ($n=19.2$) identified as Black/African American. Approximately 47% ($n=34$) of participants reported having a high school diploma or less. Results indicated that grandmothers were primarily responsible (76.7%, $n=56$) for their grandchild's dental care and understood the significance of preventive dental care; with 26.9% ($n=21$) reporting that they were not confident in recognizing early dental caries. Most participants (52%, $n=42$) answered the oral health knowledge questions correctly. The study showed a relationship between low-income grandparents ($M=3.94$, $SD=1.02$) having greater pediatric oral health knowledge than their higher-income counterparts. Additionally, grandparent caregivers' knowledge may influence the oral health of their grandchildren.

Conclusion: While not generalizable, this study found that regardless of a grandparent caregiver's socioeconomic status, oral health knowledge does influence oral health-related behaviors and values, which can positively motivate their grandchild's oral health behaviors. Further exploration of this topic with variable associations using a larger sampling and broader region of the country is warranted.