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AN EXPLORATION OF ORAL CARE PROVIDED BY DENTAL HYGIENISTS USING
TELEDENTISTRY

by

Brenda Catalan RDH, BS

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Science in the Department of Dental Hygiene

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2023

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RE: Study Number IRB-FY2021-268 : Utilizing Telehealth To Provide Self-Care Education

Dear Ms. Catalan:

Thank you for your responses to a previous review of the study listed above. These responses are eligible for expedited review under OHRP (DHHS) and FDA guidelines. This is to confirm that I have approved your application.

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if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

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Table of Contents

List of Tables	ix
Abstract.....	x
Chapter I Introduction	1
Statement of the Problem	7
Purpose of the Study.....	8
Professional Significance of the Study.....	8
Research Questions	9
Conceptual Definitions	9
Dental Hygienist.....	9
Teledentistry	9
COVID-19	9
Practice Setting	9
Dental Hygiene Process of Care.....	9
Summary of Chapter	10
Chapter 2 Review of the Literature	11
Dental Hygienists as Oral Health Care Professionals	12
Standards of Care	18
Periodontal Disease A Public Health Issue	20
Causes and Effects of Periodontal Disease	22
Treatment of Periodontal Disease	23
Self-Care Education & Referrals.....	25
Teledentistry Background	29

Teledentistry	30
Advances in Supervision Laws	31
Teledentistry in Action	36
COVID-19 Pandemic	41
The Future of Teledentistry	44
Summary of Chapter 2.....	46
Chapter 3 Methodology	48
Research Design	48
Research Questions	48
Research Context.....	48
Research Participants.....	49
Sample description	49
Human Subject's Protection	49
Data Collection	50
Procedures and Protocols	51
Instruments	51
Validity and Reliability	2
Limitations.....	52
Proposed Statistical Analysis	52
Summary of Chapter 3.....	55
References	56
Appendix A	68
Appendix B.....	70

Appendix C	72
Appendix D	75
Appendix E	77
Appendix F	82
Appendix G	85
Title Page of Manuscript	86
Manuscript Abstract	87
Introduction	88
Methods	90
Results	94
Discussion.....	99
Conclusion.....	102
Acknowledgements	103
References	104
Tables	107

List of Tables

Table I: Allowable Procedures for Affiliated Practice Dental Hygienist in Arizona under § 32-129044

AN EXPLORATION OF ORAL CARE PROVIDED BY DENTAL HYGIENISTS USING TELEDENTISTRY

Thesis Abstract- Idaho State University 2023

The purpose of this study was to explore in depth, the phases of the process of care dental hygienists provided using teledentistry technology before and during the COVID-19 pandemic. The research design for this study is a qualitative descriptive study utilizing purposive and snowball sampling (IRB-FY2021-268). Participants who met the inclusion criteria, determined by a screening questionnaire, completed the informed consent procedures. During the interviews, data was gathered through one-on-one semi-structured interviews via zoom. Participants anonymity and confidentiality are protected using pseudonyms in conversations and on transcripts. Upon completion of the interview, a transcript was written, and the qualitative data was coded, and then grouped into themes related to the phases of the process of care. The study consisted of 20 participants with various years of career experience as dental hygienists. Participants have utilized teledentistry for at least six months and 90% are currently using teledentistry in the primary place of practice. Three major themes were identified related to oral care provided by dental hygienists using teledentistry: Innovative Approach (subthemes increased access to care and COVID-19), Promoting the Profession (subtheme of Autonomy), and Collaboration in Oral Care. Dental hygienists are utilizing teledentistry in innovative ways to increase access to oral health care and as a means to collaborate with medical professionals to address overall healthcare needs. Limitations in the scope of practice and inconsistency between state regulations create a barrier to the full success of teledentistry utilization by dental hygienists

Keywords: covid-19, teledentistry, dental hygiene process of care, workforce models.

Chapter 1 Introduction

Introduction

In late 2019 a novel coronavirus, SARS-CoV-2, began circulating as a respiratory disease of unknown origin and etiology (World Health Organization [WHO], 2023a). Shortly thereafter, the virus, now termed COVID-19, reached pandemic proportions causing widespread morbidity and mortality (WHO, 2023a). At the time of writing this thesis, there have been almost 8,000,000 infections and 7 million deaths internationally from the SARS-CoV-2 virus (WHO, 2023b). In many ways the emergence of the novel coronavirus and the COVID-19 pandemic caused the world to stop. In an effort to slow the spread of the disease and protect at-risk populations and healthcare workers travel was restricted, stay-at-home orders were put in place, and schools and business were closed - including many dental offices across the nation (WHO, 2023a). When businesses began to reopen, social-distancing had become the new normal and it was imperative for offices to find ways to safely interact with patients and coworkers to limit the spread of COVID-19 while still maintaining the best evidence-based dental practices (American Dental Education Association [ADEA], 2021; WHO, 2023a). Teledentistry was implemented in many dental offices as a way to limit direct contact with patients and triage the most necessary in-person appointments (ADEA, 2021; Suter, 2022).

Teledentistry is the interactive use of technology and communication services in the provision of oral health care (Daniel et al., 2013; Langelier, 2021). Modalities include synchronous (CDT D9995) or asynchronous (CDT D9996) provision of care (ADEA, 2021; Suter, 2022). Synchronous teledentistry includes videoconferencing or other real-time consultations, while asynchronous teledentistry can be provided through apps or text messaging, or consultations with dental and medical professionals from assessment and images previously

documented and evaluated at a later time or date by the consulting provider (Fernández et al., 2021; Langelier, 2021). Teledentistry in America is modeled from successful programs implemented by the U.S. Army (Total Dental Access Project) in 1994 (ADEA, 2021). The first dental practice implementation of teledentistry was effectively launched in 2010 at California's University of the Pacific Arthur A. Dugoni Dental School (Suter, 2022). Subsequently, teledentistry has been implemented slowly, until the COVID-19 pandemic required dental offices to find new ways of providing dental care to patients while maintaining safe distancing and limiting unnecessary direct patient contact (ADEA, 2021).

Since 2019 several studies have shown successful utilization of teledentistry in diverse settings including pediatric dentistry, orthodontics, eating disorder evaluation, school-based health clinics, and rural public health clinics (Borujeni et al., 2021; Giraudeau et al., 2021; Wallace et al., 2021; Ward et al., 2022). Overwhelmingly patients report high levels of satisfaction with teledentistry appointments (Amtha et al., 2021; Daniel et al., 2013; Rahman et al., 2020). Another benefit of teledentistry is reduced costs to both patients and providers by limiting travel and time spent in-office (Daniel et al., 2013; Flores et al., 2020).

Teledentistry has a wide variety of applications in dental care for patient triage, consultations, treatment planning, evaluations, dental hygiene education, oral lesion detection, building rapport, monitoring outcomes, and providing dental and medical referrals (College of Dental Hygienists of Ontario, 2020; Daniel et al., 2013; Flores et al., 2020; Giraudeau et al., 2021; Wallace et al., 2021). There are many benefits to both the patient and provider which can be gained by implementing teledentistry in private practice and public health settings. One of the biggest advantages of teledentistry is the increased access to care for individuals who do not live near to a dental office (Ward et al., 2022).

There have been numerous studies done to show teledentistry provides high-quality dental care with reductions in bleeding on probing, plaque and gingival indices, and white spot lesions, improved oral hygiene, and increased treatment of previously unassessed dental caries (Borujeni et al., 2021; Ward et al., 2022). In 2021, 36% of private practices and 60% of public health dental clinics were utilizing teledentistry to some capacity (Suter, 2022).

Current barriers to widespread utilization of teledentistry are mainly focused on two areas: state licensure rules and regulations and limited or variable reimbursement from insurers and Medicaid (ADEA, 2021; Langelier, 2021). However, with advances in technology and generally favorable attitudes of patients and practitioners, teledentistry will provide a much-needed resource to increase access to oral health care in the future (Amtha et al., 2021; Rahman et al., 2020; Ward et al., 2022; Weintraub et al., 2020).

There are significant oral health disparities for many individuals based on race/ethnicity, socioeconomic status, educational status, sex, age, and geographic location (Langelier, 2018). These health disparities are made worse by dental workforce shortages and uneven geographic distribution of health care providers (Langelier, 2018). Some of the ways to bridge this gap in care are to expand functions for the existing workforce, create new classifications for oral health providers, employ mobile dentistry or teledentistry, or incorporate dental into the primary care workforce (Langelier, 2018). Over 50 nations worldwide utilize mid-level dental practitioners, commonly referred to as dental therapists, under the supervision of dentists to provide dental care to underserved and at-risk populations (Simon et al., 2021). Depending on the state scope of practice regulations, dental therapists provide clinical and therapeutic care, health education, dental prophylaxis, radiographs, and limited restorative care such as caries restorations, temporary crowns, and simple extractions for adults and children (Mertz et al., 2021). Dental therapists were introduced to the U.S. in 2003 when the Alaska Native Tribal Health System

began implementing the model as part of the federally authorized Alaska Community Health Aide Program (Simon et al., 2021). Since then, the Commission on Dental Accreditation developed standards for dental therapist education and 13 states have introduced regulations to allow dental therapists to practice; however, as of April 2020 fewer than 150 dental therapists are licensed and practicing in the U.S. (Mertz et al., 2021; Simon et al., 2021).

Barriers to implementing widespread dental therapist workforce models include variability in licensure, scope of practice, education requirements, and reimbursement between states (Simon et al., 2021). While dentists and dental hygienists differed significantly in opinions of dental therapist mid-level practitioners (e.g., supervision requirements, need for the service, scope of practice, and education) the majority of dentists and dental hygienists (58% and 76% respectively) were open to collaborating with a dental therapist in their practice (Ly et al., 2019). Research has shown that broader scopes of practice for dental hygienists (often the precursor licensure for dental therapists) leads to improved dental health outcomes for the state, compared to those states with regulations not allowing dental hygienists to work within the full capacity of their education and training (Langelier, 2018). Dental therapists have a documented history of safe, high-quality care, patient satisfaction, and improved access to care for underserved populations (Mertz et al., 2021).

In addition to dental therapists, dental hygienists are employed in a wide variety of settings. Many states have extended care or extended access endorsements allowing dental hygienists to provide care in school-based or public health clinics (Simmer-Beck et al., 2015). School-based dental practices improve oral health by reducing decay, increasing dental treatment, and decreasing treatment urgency for low-income children with no established dental home (Simmer-Beck et al., 2015). By 2040, trends show dental hygienists will be more abundantly employed in alternate workforce settings, including patient-centered medical homes,

where they will work with an interprofessional team of health care experts (e.g., physicians, dentists, nurses, social workers, pharmacists, dieticians, physical therapists, speech and hearing specialists) to improve access to high-quality care, reduce costs, and increase patient wellness (Fried et al., 2017).

In Colorado, dental hygienists are working independently with pediatrician offices to provide dental care to children while they also receive medical care and check-ups (Fried et al., 2017). Dental hygienists are also working as administrators, case managers, providing care in long-term care facilities, hospitals, and community-based settings (e.g., Head Start and WIC) (Fried et al., 2017).

In the U.S., dental hygiene workforce models utilizing teledentistry go back to at least 2010 with the creation of Northern Arizona University's teledentistry-assisted affiliated practice dental hygiene model (Summerfelt, 2020). Arizona dental hygienists can enter into affiliated practice agreements with dentists allowing dental hygienists to work as mid-level providers, without direct or general supervision, for all preventive dental hygiene services under their scope of practice while also using teledentistry to connect to an oral healthcare team (Summerfelt, 2020).

Dental hygienists are licensed oral healthcare providers who are educated and trained clinically in the assessment and treatment of oral health conditions, oral hygiene education, and patient care and work within the scope of practice outlined by their state licensure boards and state regulations (ADHA, 2016a; Fried et al., 2017). All dental hygienists adhere to the standards and practices of the profession outlined by the process of care which is made up of six equally important components: assessment, dental hygiene diagnosis (DHDx), planning, implementation, evaluation, and documentation (ADHA, 2016a). Utilizing the process of care framework, dental

hygienists can tailor treatment planning to the individual needs and characteristics of each patient in order to prevent or reduce oral diseases such as gingivitis and periodontitis (ADHA, 2016a). Assessment begins with a thorough health and medical history, including documentation of patient vitals and a thorough pharmacologic history (ADHA, 2016a). Full-mouth periodontal charting including probing depths, bleeding, suppuration, hard tissue charting, gingival descriptions, radiographs, and photographs are conducted as part of the dental hygienist's clinical assessments (ADHA, 2016a). Risk assessments, including fluoride use, smoking, genetics, systemic disease, and physical disabilities are also conducted by dental hygienists prior to dental hygiene diagnosis and treatment planning (ADHA, 2016a).

Once all assessments are completed the dental hygienist develops a unique DHDx for the patient to serve as the guide and justification for any planned treatment (ADHA, 2016a). DHDx includes identifying the patient's dental wants and attitudes along with oral health status and treatment needs that fall within the dental hygiene scope of practice (ADHA, 2016a). Once written, the DHDx can be incorporated into the overall treatment plan for the patient including any services provided by the dentist, or other dental specialist (ADHA, 2016a). Once dental hygiene treatment is planned and implemented to the full allowance of the state regulations, the dental hygienist is responsible for measuring all outcomes of the treatment and determining the next course of action – including new assessments, DHDx, and next treatment or maintenance steps (ADHA, 2016a). While listed last in the dental hygiene process of care, thorough documentation of all exams, assessments, findings, discussions, recommendations, treatments, and outcomes is a primary responsibility of the dental hygienist (ADHA, 2016a). Dental hygiene records are official legal documents and an important part of the patient's medical records and therefore must be thorough, clear, accurate, and up to date (ADHA, 2016a).

Statement of the Problem

Dental hygienists have been providing oral healthcare delivered by teledentistry technology for numerous years. Dr. Glassman and associated dental hygienists have been utilizing teledentistry for 15 years in order to enhance access and oral health by establishing Virtual Dental Homes to provide care in community settings (Jackson, 2020). The urgency to implement care using this technology was intensified due to the COVID-19 pandemic. However, the literature on what phases of the process of care dental hygienists provided prior to and during the pandemic is sparse.

On March 11, 2020, the World Health Organization declared COVID-19 a pandemic, as the virus infection rates continued to rise (WHO, 2021a). Not even a week later, on March 16, 2021, the ADA recommended that all dental providers nationwide postpone elective procedures for three weeks, to avoid the spread of Covid-19 (ADA, 2020a). This recommendation was later extended to April 30, 2020 (ADA, 2020a) as infection rates were not declining.

The pandemic created the perfect setting in which dental providers were forced to use other methods such as teledentistry, to provide care to patients. A poll conducted by the American Dental Associations Health Policy Institute revealed that for the week of April 20, 2020, 24% of dentists were conducting remote problem-focused evaluations through virtual technology/telecommunications (ADA, 2020b). These virtual technology/telecommunications are forms of teledentistry. However, the literature does not provide a scientific investigation into the specific care provided by dental hygienists using teledentistry technology both before and during COVID-19 pandemic

Purpose of the Study

The purpose of this investigation is to explore in depth the phases of the process of care dental hygienists provided using teledentistry technology before and during the COVID-19 pandemic.

Professional Significance of the Study

The investigation on the process of care phases delivered via telehealth is relevant to the ADHA National Dental Hygiene Research Agenda particularly in terms of the following primary objective: to give visibility to research activities that enhance the profession's ability to promote the health and well-being of the public (2016b). In addition, this study supports the conceptual research model of the research agenda with a focus on the area Population Level, Access to Care, Interventions. An investigation into the phases of care provided by dental hygienists using teledentistry technology will advance the scientific knowledge of alternative delivery models and enhance opportunities for the provision of care for underserved populations.

This research also fulfills the Professional Development – Education objective of the ADHA agenda (2016b). By adopting the teledentistry model into dental hygiene curricula, educators could instruct students early in their careers on how to utilize teledentistry models as alternate delivery methods to provide patients with self-care education. Not only would students benefit from this model but practicing dental hygienists who work in multiple care settings could utilize teledentistry models in order to provide oral health care to their patients in different locations. The need for alternate delivery models skyrocketed as COVID-19 increased nationally, and internationally. The teledentistry model is beneficial to those in the dental field by improving early diagnosis, triage, treatment, and referrals of patients (Moore & Rover, 2017).

Research Questions

The following questions guided the conduct of this study.

- 1) How are dental hygienists using the dental hygiene process of care during teledentistry?
- 2) Has the COVID-19 pandemic influenced how dental hygienists have used teledentistry?
- 3) Is there a difference in the way dental hygienists have used teledentistry in their practice settings pre-pandemic compared to during the COVID-19 pandemic?

Definitions

Dental Hygienist: health care professionals who examine patients for signs of oral diseases, provide preventive care and disease treatment, and focus on patient education for oral hygiene and disease prevention. Dental hygienists are considered to be healthcare diagnosing or treating practitioners (U.S. Bureau of Labor Statistics, 2022; U.S. Office of Management and Budget, 2018).

Teledentistry: the use of telehealth services including virtual care and education methodologies to provide dental care remotely (American Dental Association, 2020).

COVID-19: An infectious disease caused by the SARS-CoV-2 coronavirus which became a pandemic beginning in the last months of 2019 (World Health Organization, 2023).

Practice Setting: the location and nature of dental work environments including, but not limited to, public health, private practice, educational institutions, hospitals, home health, long term health care facilities, etc. (Nursing and Midwifery Board of Ireland, 2015).

Dental Hygiene Process of Care: a systematic approach to providing evidence-based dental hygiene care including the steps of assessment, diagnosis, planning, implementation, evaluation, and documentation (ADHA, 2016a).

Summary

Teledentistry is the interactive use of technology and communication services in the provision of oral health care in synchronous or asynchronous modalities. The use of teledentistry has a consistent history of providing efficient and high-quality dental care to individuals who normal have limited access to dental treatment. Patients show improved oral health outcomes and both patients and practitioners can lower costs by utilizing teledentistry models. Dental hygienists are employed in a wide variety of setting including as administrators and case managers, providing care in long-term care facilities, hospitals, community-based settings, school-based dental clinics, primary care medical facilities, and with teledentistry affiliated practice acts. Dental hygienists are preventive oral health specialists who adhere to the dental hygiene process of care while working within the full scope of their state regulations and licensing board requirements. Dental hygienists are experts at oral assessments, dental hygiene diagnosis, treatment planning, therapy implementation, outcome evaluation, and thorough accurate documentation.

Chapter 2 Review of the Literature

Dental hygienists possess professional judgement, apply critical thinking skills, and enhance the patient-provider integrations in order to optimize oral care in different healthcare settings. In addition to these qualities, and the rigorous requirements set by institutions, Commission on Dental Accreditation (CODA), and various states, dental hygienists are molded into the professional healthcare providers we know today. Dental hygienists provide oral health care, including non-surgical periodontal therapy to reduce disease and maintain their patient's oral health. Periodontal disease is a public health issue that continues to grow. Therefore, it is essential that the patient understands their treatment needs, their continuing care, and education needed to optimize their overall care. Time restrictions can affect the overall process of dental hygiene care, thus, implementing a method such as teledentistry is vital not just to the patient, but the dental hygiene profession as barriers to reach even the most underserved population could be reduced.

Teledentistry is not a new concept in the dental hygiene profession. Research, such as that of Summerfelt (2011) has investigated dental hygienists utilizing teledentistry, though there is a lack of research regarding the phases of the process of care which were delivered. This literature review focuses on dental hygienists using teledentistry as a method to provide phases of the dental hygiene process of care. Search engines used included PubMed, CINAHL complete, Ebscohost, Google Scholar, and the ADHA website. Key search terms used include dental hygienists, hygienists, teledentistry, covid-19, telemedicine, dental hygiene process of care, periodontal disease, and included dates from 2000-2022.

Dental Hygienists as Oral Health Professionals

In order to become an established oral healthcare professional, a dental hygienist must gain the knowledge required to provide all phases of the process of care. To gain this knowledge a person must complete a minimum of two years of an entry-level dental hygiene curriculum in an institution of higher education (CODA, 2021). Dental hygiene programs are accredited by the American Dental Association's Commission on Dental Accreditation (CODA). CODA is a national accrediting agency for dental and dental allied programs. The quality of dental and dental allied programs is evaluated by a rigorous, collaborative, peer review process (CODA, 2021). CODA is the only agency approved by the United States Department of Education to accredit dental hygiene programs (ADA, 2021).

There are hundreds of programs to which, a person can apply; programs can be housed in community colleges, technical colleges, dental schools, and universities (ADA, 2021). Technical schools and community colleges typically offer an associate degree, while dental schools and universities offer a baccalaureate as the entry-level degree (ADA, 2021). Each program has a set of requirements the applicant must complete before being accepted into the program. Meeting these requirements is crucial in the application process so a person can be accepted. Requirements can range from completing certain prerequisite courses, maintaining a certain grade point average (GPA), as well as learning Cardiopulmonary Resuscitation (CPR) to name a few.

High school-level courses such as health, biology, psychology, chemistry, mathematics, and speech are most beneficial for a career in dental hygiene (ADA, 2021). Many programs will express preference for individuals who have completed at least one year of college (ADA, 2021). Admission to dental hygiene programs is quite competitive. Additional requirements might include shadowing a registered dental hygienist and conducting interviews with potential

students; programs may also base their decisions on GPA, and Test of Essential Academic Skills (TEAS) or similar exam (Lakeland Community College, 2020; West Coast University, 2022; West Los Angeles College Department of Dental Hygiene, 2018).

Upon acceptance, the student must complete the coursework and demonstrate the program material being taught (See Appendix B and Appendix C). The format on how course work is taught and implemented into a program may vary from institution to institution. Students are educated to gain the knowledge base and preparation to assess, plan, implement, and evaluate dental hygiene services as an integral member of the health team (CODA, 2020).

Patient care competencies entail the student being competent in delivering dental hygiene care for children, adolescents, adults, geriatrics, and special needs patient populations (CODA, 2020). Clinical competencies address patient care, professional service, life-long learning, and scientific inquiry (CODA, 2020). Competencies are a method used to measure the standards of dental hygiene patient care provided by students. Another method to measure the standards of dental hygiene patient care being provided is through clinical education.

Clinical education in the form of patient care experiences is part of the dental hygiene curriculum (ADA, 2021). Dental hygiene programs also require various courses in liberal arts (English, speech, sociology and psychology); basic sciences (anatomy and physiology pharmacology, immunology, chemistry, microbiology and pathology) (ADA, 2021). Dental hygiene programs are also require dental sciences; “tooth morphology, head, neck and oral anatomy, embryology, histology, oral pathology, radiography, periodontology, pain management, and dental materials” and dental hygiene science; “oral health education, preventive counseling, health promotion, patient management; including special needs patients, community health, medical/dental emergencies, legal and ethical aspects, infection control

management, as well as, provision of oral health services with bloodborne infectious diseases” (CODA, 2020, p. 23).

Depending on the degree being pursued (associate’s vs bachelor’s degree), the number of courses required outside the dental hygiene curriculum can vary. In order to graduate, students must demonstrate their ability to meet or exceed the standards of dental hygiene patient care and the program competencies established by the entry-level professional program (CODA, 2020).

Once a dental hygiene student completes the competencies and educational coursework required by their dental hygiene program, the student is then able to complete the National Board Dental Hygiene Examination; this is a standardized written exam set by the Joint Commission on National Dental Examinations. Another examination that students must complete is the clinical exam. For this particular exam there are five regional tests which can be completed: Central Regional Dental Testing Services, Inc. (CRDTS), the Commission of Dental Competency Assessments (CDCA), the Southern Regional Testing Agency (SRTA), Council of Interstate Testing Agencies (CITA), and Western Regional Examining Board (WREB) (Central Regional Dental Testing Services Inc, 2021). On June 15, 2021, CDCA and WREB announced their merger to further serve the oral health professions (Western Regional Examining Board, 2021).

California, Delaware, and the U.S. Virgin Islands are three jurisdictions that administer their own clinical exams (ADA, 2012). Florida and Nevada are now administering the ADEX exam. The patient selection process is stressful. The patient, or candidate must meet the criteria set for patient acceptability (CRDTS, 2022). For example, CRDTS requires a complete health history be conducted prior to the exam; the patient must be at least 16 years old; minors must have parent or guardian written consent, and the patient’s blood pressure must be within normal limits (ADA, 2012). Patients who require medical clearance for any reason stated by CRDTS must obtain a medical clearance letter (ADA, 2012). Patients must also meet the criteria for

treatment. The requirements for treatment selection include, but are not limited to, acceptable health conditions, no soft tissue lesions which may contraindicate dental hygiene instrumentation may be present, the proper number of teeth must be present, the proper amount of calculus must be present, and calculus present must meet the definition of “qualifying calculus” (ADA, 2012).

It is important to note that these regional tests are another step in obtaining state licensure. Both the written and clinical examination must be passed to be able to apply for the individual’s state license. Each state has its own set of requirements for licensure, and candidates must do research in order to ensure that all state regulated requirements are met.

Upon receipt of licensure, dental hygienists may use the letters, “R.D.H,” after their names to signify recognition by the state that they are a Registered Dental Hygienist (ADA, 2021), and obtain employment. Professional roles for the dental hygienist include, clinician, which is most commonly known, corporate executive, public health professional, researcher, educator, administrator, and entrepreneur (Bowen & Pieren, 2020). Many of these professional roles can lead the dental hygienists to other opportunities, such as expanded function dental auxiliary certifications (EFDA). The name EFDA can be confusing as many states use the word assistant, instead of auxiliary. Certifications may be available for both dental assistants and dental hygienist.

There are more than 40 job titles for dental hygienists who have obtained an EFDA (Trowbridge, 2020). EFDA originated in 1970’s and allows for numerous reversible dental procedures to be completed under direct supervision of a dentist (Trowbridge, 2020). Some of the procedures that can be performed include:

Placement and carving of amalgam restorations, placement, contour, and finish of composite restorations, placement of interim therapeutic restorations upon hand-instrument excavation of decay, final impressions for indirect restorations, including

digital scanning of tooth preparations, adjustment and cementations of final restorations, fabrication, cementation, and removal of temporary restorations. (Trowbridge, 2020, pp. 3)

Each state varies in what functions an EFDA is allowed to perform. The additional skills an EFDA certificate gives a dental hygienist allows for a variety of procedures to be completed in a day-to-day +schedule, while increasing efficiency and production (Trowbridge, 2020).

Many EFDA certifications are 2-6-month programs, requiring both in didactic and hands on classes. These classes were created in order to prepare clinicians for the written national exam (Trowbridge, 2020). No hands-on board exam is required currently, therefore many states require a written affidavit. The affidavit must include the completion of the designated number of various procedures under the direct supervision of a dentist (Trowbridge, 2020).

More progressive states such as Minnesota, Maine, and Vermont have implemented mid-level oral health practitioner roles (Bowen & Pieren, 2020). These practitioners aid those with limited access to oral health in rural or inner-city areas, serving citizens faced with educational, economic, cultural, and health status disadvantages, due to the lack of dental providers needed (Bowden & Pieren, 2020). Another term used for the practitioners is dental therapists.

Dental therapists are providers who perform basic dental procedures. These procedures include restoring a cavity along with performing simple extractions without being certified as a licensed dentist. These therapists obtain a higher level of training than hygienists (Francis, 2021). Dental therapists work with dentists in a similar manner that a physician assistant works with a physician (Francis, 2021). In June 2021, Oregon passed a bill that would permit dental therapists to practice in the state (Francis, 2021). The services provided by dental therapists differs from state to state.

In Minnesota, dental therapists can provide services under general supervision and with a written collaborative management agreement with a dentist. These advanced practitioners can perform the following procedures: oral assessment, treatment planning, routine, non-surgical extractions of specified diseased teeth (ADHA, 2021a). In Arizona, a dental therapist has both preventive and restorative abilities in their scope of practice, working under direct supervision, OR, pursuant to a collaborative practice agreement after practicing 1,000 hours under direct supervision, dental therapists can perform non-surgical extractions of permanent teeth only under direct supervision (ADHA, 2021a). Many other states are looking to pursue mid-level oral health practitioners as well; Arizona, Florida, Kansas, Massachusetts, Michigan, Mississippi, Wisconsin, Connecticut, Washington, and Maryland (Bowen & Pieren, 2020).

No matter the role or position a dental hygienist is in, providing patients with education, along with diagnostic and preventive treatment in a manner that encourages patients to take control of their own oral health is priority (Bowen & Pieren, 2020). Influencing patients to take responsibility for their own health can mean earlier intervention in the disease process and increasing the overall oral health of various populations being served, including the vulnerable, and underserved (Bowen & Pieren, 2020).

Once accepted into an institution's dental hygiene program, the student must master the coursework material, and complete the clinical competencies. Once the course work is mastered and all competencies have been completed, the student can then sit for the National Board Dental Hygiene Examination, along with the clinical exam. When the student completes and passes both written and clinical exam, the student must apply for their state licensure. Each state has different requirements when applying.

Every step in the process of becoming a registered dental hygienist contributes to the dental hygienists being an oral healthcare professional. The licensed dental hygienist holds a

valuable role within their community. In order to provide adequate and comprehensive oral care, the provider must adhere to the ADHA standards of care for clinical practice.

Standards Of Care

As oral health care professionals, dental hygienists are bound to the American Dental Hygienist Association Standards of Care.

Dental hygienists are valued members of the health care workforce. They have the knowledge, skills, and professional responsibility to provide oral health promotion and health protection strategies for all individuals as well as groups. As licensed professionals, they are accountable for the care and services they provide. (ADHA, 2016a, p. 3)

Licensed dental hygienists have utilized these standards as a guideline since their induction in 1985. Since then, the dental hygiene profession has made several changes within the profession; factors which helped influence these changes include the economy, insurance coverage, education, access to care issues, employment expectations, and consumer expectations (Battrell, 2013). ADHA partners with several stakeholders to ensure dental hygienists are prepared for tomorrow's workplace and its opportunities (Battrell et al, 2016). To better prepare the dental hygienists, changes in dental hygiene-curricula must take place, followed by creating of new domains and competencies in order to keep up with health care evolution, and a greater emphasis must be placed on interprofessional education (Battrell et al., 2016).

Entry-level programs average 84 credit hours; in order to advance education in dental hygiene, entry-level programs should be raised to a baccalaureate degree (Battrell et al., 2016). According to Battrell et al (2016) implementing this change in the dental hygiene curricula would provide dental hygienists with the necessary education to serve in primary care roles.

Advancing education and training with interprofessional teams will better equip dental hygienists in fulfilling their role as providers.

The 2016 *Standards for Clinical Dental Hygiene Practice* is a document used to guide the individual hygienist's practice. The hygienist is still responsible and accountable to the standards set by federal, state, and local regulations which have been set for practicing (ADHA, 2016a). The ADHA (2016a) stated the standards are in no way a substitute for professional clinical judgement and should not be confused with the educational accreditation standards set for dental hygiene education programs.

The knowledge, values, practices, and behaviors promoted through the standards optimizes the goal of overall health. A major purpose for the standards is to assist clinicians in the provider-patient relationship (ADHA, 2016a). Additionally, dental hygienists in other roles such as educators, researchers, entrepreneurs, public health professionals, and administrators, can also utilize these standards to implement collaborative, patient-centered care (ADHA, 2016a). The collaboration of other healthcare providers is essential to the patient, as dental hygienist also practice in community settings, public health centers, hospitals, school-based programs, long-term care, outreach centers, and home care programs (ADHA, 2016a).

Dental hygienists adhere to the guidelines set forth by the ADHA standards of care in order to provide optimal oral care to the patient population. The position a dental hygienist holds within their community is a valuable role, in which they are responsible for improving the oral health of the community. Health concerns vary by communities, but the most common are chronic diseases such as cancer, heart, lung and periodontal disease.

Periodontal Disease A Public Health Issue

Chronic diseases are a serious public health issue and should be treated as such. Disease's such as heart, lung, kidney, cancer, stroke, Alzheimer's, and diabetes, are serious conditions, and

most people, understand the severity of them. Various healthcare professionals provide ongoing care to their patients in order to help manage their diseases. Some even follow up with their patients to ensure the care provided has made a difference, and if not, implement changes to ensure the well-being of the patient.

Similar to the medical conditions named above, periodontal disease too, is a chronic disease. Society takes heart disease, diabetes, and lung disease with all seriousness, but not periodontal disease. The CDC states 47.2% of adults aged 30 and older have some form of periodontal diseases (CDC, 2013). The diseases are also more common in men (56.4%) versus women (38.4%) (CDC, 2013). The diseases know no boundaries but affect those of lower socioeconomic level most, 65.4% of people living below the poverty level, 66.5% of people with less than a high school education, and 64.2% of people who are current smokers (CDC, 2013). As people age, the rate of periodontal diseases increases; 70.1% of adults aged 65 years and older are affected by the disease (CDC, 2013). These statistics display how periodontal diseases not only affects the well-being of Americans but that oral health in American needs to change to improve the quality of overall health.

In the year 2000, the U.S. Department of Health and Human Services (DHHS) released *Oral Health in America: A Report of the Surgeon General* (DHHS, 2000). The major message that can be taken from this report is that oral health means much more than healthy teeth and is integral to the general health and well-being of all Americans (DHHS, 2000). Along with the information released by the Surgeon General, the CDC works closely with the AAP and ADA in order to increase and maintain surveillance of periodontal diseases (CDC, 2013).

While all of the major findings have substantial impact on the oral health and well-being of all, a few of the findings from the Surgeon General's message stood out. These findings include oral diseases and disorders in and of themselves affect health and well-being through

life, the mouth reflects general health and well-being, and oral diseases and conditions are associated with other health problems (DHHS, 2000). Inadequate time for an appointment creates a snowball effect of inadequate delivery of the dental hygiene process of care. The patient must have the proper care in order to manage their chronic disease.

Chronic diseases are defined broadly as conditions that last one year or more and require ongoing medical attention (CDC, 2021a). Periodontal diseases are defined as the outcome of chronic infection and inflammation of not just the gingiva, but the supporting bone. Gingivitis is the earliest stage where the gingiva is red, edematous, inflamed, and may bleed. More serious is periodontitis where the gingiva can begin to recede, bone loss is evident, and teeth may become mobile, or fall out (CDC, 2013). The cause of periodontitis is from bacteria and microorganisms which have infected the support bone.

Microorganisms play a role in the etiology of periodontitis. A study by Miricescu et al (2019) revealed that there are 500-700 bacterial species which are able to colonize in the oral cavity (Miricescu et al., 2019). The oral cavity is the perfect habitat for bacteria colonization. Invasion of the gingival tissues allows for direct discharge of destructive bacteria products; these bacteria have a mechanism in which to evade the hosts defense (Mendes et al., 2015). Bacteria of the oral cavity can be classified as Gram-positive and Gram-negative and can also be classified as anaerobic or facultatively anaerobic. The accumulation of bacteria in the oral cavity leads to periodontal diseases.

Causes and Effects of Periodontal Disease

As bacteria begin to accumulate, the immune system begins to respond, and gingivitis becomes evident. The host may notice gingiva that is red, swollen, and bleeding (CDC, 2013). With the proper self-care, gingivitis is easily reversed. The continuation of improper biofilm removal will eventually lead to periodontitis.

Once periodontitis is acquired, the infection driven-inflammatory disease proceeds to destroy the periodontium (Kononen et al., 2019). The inflammation process leads to destruction of periodontal tissues such as the periodontal ligament, alveolar bone, and migration of the epithelial ligament, and finally the formation of a periodontal pocket. A periodontal pocket creates the perfect home for subgingival biofilm to colonize.

The perception that periodontitis occurs with age is outdated and therefore should be changed to fit the notion that periodontitis is linked to overall health (Holmstrup et al., 2017). As more research is conducted, evidence suggest an association between periodontitis and a multitude of comorbidities; cardiovascular disease, type 2 diabetes, rheumatoid arthritis, osteoporosis, Parkinson's disease, Alzheimer's disease, psoriasis, and respiratory infections (Holmstrup et al., 2017). The shared pathway of inflammation is likely to contribute to the comorbidities. Some comorbidities may be improved with periodontal treatment. A bidirectional relationship may exist, for example, treatment of diabetes may improve periodontal status (Holmstrup et al., 2017).

Casanova et al (2014) stated that studies on epidemiology have steadily demonstrated diabetes is associated with an increased risk of periodontal disease. The risk increase of periodontal disease is dependent on how well glycemic levels are controlled. When diabetes is controlled with an HbA1c of 7% or lower, the risk for periodontal disease drops dramatically (Casanova et al., 2014). When diabetes is not controlled and glycemic levels are elevated, the risk of periodontal disease increases between 2-3-fold; essentially, the risk is increased by 2-3 times more than the diabetic patient with controlled glycemic levels (Casanova et al., 2014).

While the links to diabetes and periodontal diseases are not understood completely, inflammation, immune function, neutrophil activity and cytokinin biology are all factors in the disease process (Casanova et al., 2014). While the direct link is not understood, acknowledging

the link between the two diseases is critical to both provider and patient. Treatment for periodontal disease should take place in a timely manner in order to reduce the disease and eventually enter a state of maintenance.

Treatment of Periodontal Disease

Dental hygienists provide a valuable service to their patients. By using the most current knowledge and skills, a dental hygiene care plan can be formulated, then communicated to the patient. The provider will monitor, measure, and professionally document patient care outcomes (Palleschi, 2020). Before actual treatment can commence, the dental hygiene care plan must be reviewed by both the patient and dental hygienist. The dental hygiene care plan is essentially the blueprint which directs the provider in achieving the patient's oral health outcomes (Palleschi, 2020). Each dental hygiene care plan is structured to meet the patient's individual needs, no two plans are identical. As with any plan, adjustments can and should be made to continue benefitting the patient's oral health care needs.

The dental hygiene provider performs non-surgical periodontal treatment. The treatment involves the treatment codes D4341 or D4342, "Periodontal scaling and root planing root planning is a procedure designed for the removal of cementum and dentin which has become rough and/or has been permeated by calculus and/or contaminated with toxins and/or microorganism" (Smiley et al., 2015, p 526). Supra- or subgingival debridement must be differentiated from scaling and root planing. "D4355, Full mouth debridement is the preliminary removal of plaque and calculus which interferes with the dentist's ability to perform and complete a comprehensive oral evaluation" (ADA, 2018, p 1).

Depending on the dental hygiene care plan, initial treatment of active periodontal disease can take multiple appointments and will require frequent maintenance appointments to assist in the stabilization of the disease. Non-surgical periodontal therapy does not rid the patient of

periodontal disease; as mentioned before, the disease is chronic, therefore requires on going treatment.

The dental hygienist can provide the most meticulous care while the patient is seated in the operatory chair; however, daily poral self-care has a significant impact not just on periodontal health, but the patient's overall health as well. "For a successful treatment plan, the continuous and active cooperation of the patient is indispensable" (Shah et al., 2017, para. 19). It is also important for patients to be adequately educated about periodontal disease and the effects it has on systemic health (Shah et al., 2017). Patient adherence with self-care instructions is extremely important in the 3-4 months between dental hygiene appointments. If patients are not following recommended self-care regimens to reduce bacteria, periodontal disease will continue to cause inflammation and the disease will remain an active disease instead of being in the maintenance stage.

Self-Care Education and Referrals

As an oral health specialist, educating patients on various systemic factors and risk factors which not only affects their periodontal health, but their overall health is part of the dental hygiene process of care. Before nonsurgical periodontal treatment, the dental hygienist will deliver self-care education (SCE) to the patient. The dental hygienist will also deliver SCE once the patient has received treatment. This education can vary from controlling systemic risk factors, obesity, dietary changes, lifestyle changes, as well as tools or methods to reduce periodontal inflammation, and maintain periodontal health. The education given is structured and delivered to suit the individual patient's needs. Systemic factors play a role in how well the patient responds to periodontal treatment. Controlling systemic factors is one of many subjects the dental hygienists can discuss with the patient.

Systemic diseases such as diabetes and other factors such as smoking, stress, immunodeficiency, obesity, and hormones are markers for increased disease (Loe, 1993; Kumar, et al., 2014). Medications, nutrition, and periodontal disease are also established risk factors. In order for the patient to reach optimum treatment results, the patient should take measures to modify or eliminate the systemic risk factors. Some systemic risk factors are controlled by the patient; therefore, emphasis is placed on the patient taking responsibility for their own health. Systemic factors that are less obvious, along with environmental issues may also need to be addressed to achieve optimal results.

Diabetes can pose complications when treating a periodontally compromised patient. If a patient has been diagnosed with diabetes, or is suspected of being a prediabetic, knowing the glycosylated hemoglobin level (HbA1c) prior to treatment is significant (Loe, 1993; Kumar, et al., 2014). The diabetic patient whose HbA1c is less than 7% is considered well controlled, and treatment should be completed as it would be with the general population. It is important to note that even though the patient is considered well controlled, there is a possibility of delayed healing or infection can occur (Loe, 1993; Kumar, et. al., 2014). If a patient's diabetes is poorly controlled, the patient should be referred to a medical provider prior to periodontal therapy. In turn, if the patient's periodontal disease is poorly controlled, this may exacerbate the diabetes. It is noted that aggressive periodontitis is the sixth serious complication of diabetes (Sunny et al., 2014). If the diabetes is not under control, the dental hygienist will stress the importance of seeking care, in order to manage the disease. Managing both chronic and systemic diseases mutually allows the patient a better opportunity in healing. Another important factor which can delay healing is smoking.

Smoking weakens the body's immune system, thus making it more difficult to heal post periodontal treatment. With an already compromised periodontium, smoking will make it much

more difficult for the gingiva to heal (CDC, 2021c). The risk of developing periodontal disease increases with the number of cigarettes smoked daily (Tomar & Asma, 2000).

Educating patients on the risks of smoking, along with encouraging them to quit, should be done prior to treatment (Van der Velden, et al., 2003; Garcia, 2005). Dental hygienists can help the patient set realistic goals for smoking cessation, such as, slowly cutting back the number of cigarettes smoked in a day, week, month. Then at the follow up appointment, a new goal can be set, or modifications can be made for the current goal in order to help the patient achieve it. The dental hygienist may also suggest the patient seek guidance from the primary care doctor, as they too, can prescribe medications, as well as offer alternative education on smoking cessation.

Medications are another factor that could potentially affect the outcome of treatment. Patients taking calcium channel blockers, immunosuppressants, or antiepileptic drugs will experience some sort of drug-induced gingival enlargement (Dongari-Bagtzoglou, 2004). Along with the presence of existing plaque or gingivitis, drugs may also induce gingival enlargement as a part of a patient's genetic predisposition (Tungare & Paranjpe, 2020). It is important to educate the patient that their medical condition should be managed, but other drug options may exist, which can potentially decrease the drug induced inflammation. The patient should be urged to contact their primary care provider for other drug alternatives. Another comorbidity to be aware of is obesity.

According to the World Health Organization, "overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health" (WHO, 2021b, para. 1). A person with a body mass index (BMI) over 25 is overweight, and if the BMI is over 30, the person is obese (WHO, 2021b). Both obesity and BMI are linked to a greater risk of periodontitis (Suvan, et al., 2014). Adipose tissue releases proinflammatory cytokines and hormones. This process is globally referred to as adipocytokines, which induce inflammatory processes and

oxidative stress disorders; this process creates a similar pathophysiology between obesity and periodontitis (Martinez-Herrea et al., 2017). A dental hygienist may suggest the patient take control over their weight by setting small, achievable goals; walk 20 minutes every morning and evening and continue increasing the time as their body allows them. Helping the patient understand a good exercise routine may lead to other healthier habits, such as eating a more balanced diet.

Eating a well-balanced diet is essential for the well-being of all. A person should have 2.5 cups of vegetables a day, 2 cups of fruit a day, 6 ounces of grains, 3 cups of dairy or dairy alternative, 5.5 ounces of protein, and 27 grams of healthy oils a day (USDA, 2019). Foods with excessive amounts of sugar, added sugars, sweets, pastries, should be limited and eaten in moderation. If a person insists, they must have their cup of coffee/tea/soda, encourage them to drink it all in one setting rather than sipping on it throughout the day. When a drink other than water is consumed, the acids bathe the teeth. Each drink taken; the acid will continue to bathe the teeth. If a person sips the drink throughout the day, the mouth stays acidic, creating the perfect environment for decay.

Once a person is finished eating and drinking, encourage the person to brush their teeth in order to remove biofilm and food particles. If that is not possible, another option would be swishing the mouth with water to help loosen food particles on the teeth. Implementing a self-care routine after consuming a meal, snack, or beverage can reduce the acidity in the mouth, along food build up on teeth.

Biofilm removal is an essential part of self-care education. Biofilm accumulates along the teeth, in between the teeth and along the gingiva. The biofilm contains bacteria that can cause decay as well as periodontitis. Brushing twice a day for two minutes is the easiest way to remove the bacteria infused biofilm. Dental hygienists will inform the patient to use only a soft bristled

toothbrush as others can cause irreversible damage to the enamel and gingiva. The patient should brush using a small circular motion, making sure not to miss where the teeth and gingiva meet. Setting a timer for two minutes will ensure the time is met. Electric toothbrushes are excellent tools, and many have timers already built into them, ensuring the patient meets the recommended two minutes.

Many times, patients with disabilities or restrictions will require modifications to the toothbrush. Modifications can be simple such as utilizing a toothbrush with a smaller head to fit in the patients mouth more easily, a tennis ball, foam wrap, or bicycle handle grip for those with compromised dexterity, as well as a Waterpik to help remove interdental biofilm.

Interdental biofilm removal can be done with different interdental devices such as floss, interdental brushes, and oral irrigators. The average patient will not utilize regular floss, “because flossing is a technically challenging task” (Ng & Lim, 2019, para. 5). Helping a patient find an interdental device that they like and can use is a key in helping that patient achieve better oral health.

The dental hygienist educates their patients on systemic factors and risk factors that can contribute to periodontal disease and the effects to their overall health. Providing self-care education to the patient prior to any treatment lays the foundation for the patient to receive helpful information regarding how to control systemic risk factors, obesity, dietary changes, lifestyle changes, as well as tools or methods to reduce periodontal inflammation, and maintain periodontal health. Implementing teledentistry as a means to deliver comprehensive care to the patient population would be beneficial not just for their oral health, but their overall health. Furthermore, teledentistry would allow the provider to follow-up with patients, where issues could be addressed, and possibly resolved without another office visit.

Teledentistry Background

According to Kopycka-Kedzierawski et al. (2018), there are three forms in which teledentistry can take place: asynchronous (transmission of a patient's oral images that are not used in real time; that is, store and forward), synchronous (use of real-time interactive technologies, such as two-way interactive video), and mobile technology (this includes smartphone apps and text messages, as a way to manage/track oral health conditions, as well as promote healthy behaviors) (p. 1961). CareQuest Institute for Oral Health (2021a) added a fourth form; remote patient monitoring (RPM). RPM allows health and medical data to be collected from an individual in a different location (para. 5).

The development of teledentistry began in 1989 at a conference in Baltimore (Weintraub et al., 2020). Then, in 1994 the U.S. Army's Total Dental Access (TDA) project was considered the birth of teledentistry. In 1996, the Department of Defense tested an integrated service digital network (ISDN), in order to establish a medical network in Bosnia, to connect Army field dentists with dentists at five regional military medical centers in the United States (Washington, Texas, California, District of Columbia, and Hawaii).

As technology makes vast improvements, teledentistry has gained more recognition and has been utilized in several parts of the nation in order to increase access to care and provide screenings and referrals to the underserved (Weintraub et al., 2020). The concept of teledentistry, while not new, may not be accepted by many dental professionals. This problem might be in part, because dental treatment is thought of only occurring in a dental office. The normal thing to see was for the provider to sit next to the patient, instruments in hand, for a diagnosis to be made (Ochoa, 2021).

Other barriers that could be affecting the acceptance of teledentistry include patient internet literacy and access, billing and insurance restrictions, laws changing on how teledentistry can be provided, and finally, the lack of contact with patients (Dentistry, 2021).

Teledentistry allows for providers to communicate with patients, while also establishing the potential of expanding care to the most vulnerable populations (Pallardy, 2020).

Teledentistry

Technology is evolving rapidly paving the way for changes to be made. Numerous technology methods have been presented for oral care specialists as a means to provide better care to the patient population (Javid et al., 2021). Telehealth has become the more popular method of choice by many providers. Teledentistry is specific to dentistry, and until recently had mostly been utilized by dentists. Teledentistry allows for phases of oral care to be provided to patients in the comfort of their own home, to those populations in rural areas who cannot drive the distanced to receive care, as well as those in poverty who may not be able to afford oral care in a regular clinical care setting (Rural Health Information Hub, 2022). Creating better access to dental care as well as establishing a method to provide phases of the dental hygiene process of care demonstrates the benefits of teledentistry.

The percentage of people in the United States in 2015 with no dental insurance was 29% overall, and 62% for older adults. When many retire, they lose benefits, and traditional Medicare does not cover routine dental care (CDC, 2021b). In addition, adults of low-income do not have public dental insurance and Medicaid programs are not mandated to provide dental benefits for adults enrolled in the program. Dental coverage varies state to state. As of 2021, 15 states provided no coverage or only emergency dental coverage for their enrollees (CDC, 2021b). Not being able to secure dental insurance creates a barrier many people cannot overcome. Changes to supervision laws have granted dental hygienists the opportunity to provide phases of the dental hygiene process of care to the underserved populations, outside the traditional setting.

Advances in Supervision Laws

There are three models of supervision a dental hygienist can perform under:

- Direct Supervision- tasks and procedures do not require the presence of dentist in the room, but require the presence of dentist on the premise
- Indirect Supervision- tasks and procedures do not require presence of dentist in office or on premises, but tasks being performed require prior consent of the dentist (CDHA, 2021).
- Direct Access- tasks and procedures do not require consent of a dentist, treatment can be provided without a dentist present in the facility, provider-patient relationship is maintained. Treatment is based on the dental hygienist's evaluation (ADHA, 2021b).

Each state in the U.S. has a practice act governing the scope of dental hygiene practice specifying the type of supervision necessary to provide care in different care settings. For instance, progressive states such as Colorado allow for dental hygienists to provide care directly to populations without supervision requirements. Dental hygienists have the opportunity to open mobile dental hygiene practices to increase access to care to underserved populations such as the older adult population (Salierno, 2020). Preventive dental hygiene services for the elderly are provided in their own homes, assisted living facilities, as well as memory care facilities (Salierno, 2020). In order to sustain oral health between appointments, professional self-care is performed on a weekly basis (brushing and interdental cleaning), along with distributing sweetened products made of 100% xylitol (Salierno, 2020).

One dental hygienist works in collaboration with a dentist three days a week and this collaboration allows for her to obtain limited prescriptive authority for fluoride, medicated mouth rinses, as well as the ability to place silver diamine fluoride on patients in order to arrest decay (Salierno, 2020). When oral conditions are beyond the dental hygienist's scope of practice, MouthWatch, a teledentistry platform, is used to asynchronously share information with the collaborating dentist for referral and follow-up treatment (Salierno, 2020). "Many residents have

rampant tooth decay, fractured teeth, fistulas, and retained root tips” (Salierno, 2020, pp. 8), and need dental treatment by a dentist. The dental hygienist can assess the overall state of the patient to determine if the patients are mobile enough to leave the facility, if the required treatment is safe, as well as the ability to afford cost of the need dental care (Salierno, 2020).

Arizona state passed legislation (§ 32-1290), in 2004, allowing dental hygienists and dentists to enter “into an affiliated practice relationship” to provide oral health care to the underserved populations (Summerfelt, 2011, p. 733). An affiliated practice relationship is defined as the

delivery of dental hygiene services, pursuant to an agreement, by a dental hygienist who is licensed to pursuant to this article who refers the patient to a dentist who is licensed pursuant to this chapter for any necessary further diagnosis, treatment, and restorative care. (Arizona State Legislature, 2021, p. 1)

Direct access services were provided without supervision requirements. Many states require general or direct supervision. General supervision is defined as the dentists needing to authorize treatment prior to service, but does not have to be present, while direct supervision is defined as the dentist not needing to be present (ADHA, 2021a). The applicable services the dental hygienist performed under the agreement included the full scope of dental hygiene care, except root planing, the use of nitrous oxide, and the administration of local anesthesia. Local anesthesia is only permitted under special circumstances (Summerfelt, 2011). The dental hygienist places, contours, finishes restorations, cements prefabricated crowns, as well as places interim therapeutic restorations (Summerfelt, 2011)

The dental hygienist must meet specific qualifications:

a minimum of five years of dental hygiene experience, active engagement in dental hygiene practice for at least 2,000 hours in the five years immediately preceding the

affiliated practice agreement, twelve additional hours of continuing education within the current triennial licensure renewal period, which must include four hours of medical emergencies and a minimum of eight hours chosen from pediatric, special health care needs, preventative dentistry, public health, or community-based dentistry. (Summerfelt, 2011, p. 733)

Table 1

Allowable procedures for affiliated practice dental hygienist in Arizona under § 32-1290

Area of Focus	Detailed description
Patient Assessment	<ol style="list-style-type: none">1. Assess blood pressure2. Screen/photograph oral cavity along with surrounds structures3. Perform dental restorative charting, record clinical findings4. Expose/process radiographs according to ADA guidelines5. Perform caries assessment6. Review health history and dental history
Preventive Services	<ol style="list-style-type: none">1. Perform all necessary procedures to complete prophylaxis2. Apply sealants according to ADA/CDC guidelines3. Place topical fluoride gels/varnishes according to ADA/CDC guidelines
Patient Education	<ol style="list-style-type: none">1. Discuss patient's self-care2. Provide individualized self-care instructions3. Provide tobacco cessation intervention, and referral when appropriate

Note. Adapted from *Teledentistry-assisted, affiliated practice for dental hygienist: An innovative oral health workforce model*, by the Summerfelt, F. F., 2011, pp. 733-742.

In addition, the affiliated dental hygienist must adhere to the standard of care for dental hygiene services, and if a difficult case arose, the dental hygienist was required to consult with the affiliated dentist (Summerfelt, 2011). The combination of expanded scope of practice the new legislation provided and the use of teledentistry technology opened new opportunities for dental hygienists in Arizona.

One new opportunity to involve dental hygiene students occurred at Northern Arizona University (NAU). The dental hygiene program developed a teledentistry-assisted, affiliated practice dental hygiene workforce model, by adding teledentistry competencies to their curriculum (Summerfelt, 2011). The competencies were met by students who completed the training sessions and evaluations with the portable equipment and the teledentistry technology, both the software and hardware. The knowledge and skills gained were applied by students who provided care during the annual Kiddie Clinic, a clinic aimed to reach underserved children in the area. Ten senior dental hygiene students exposed digital bitewings and occlusal radiographs, representing the assessment phase of the process of care (Summerfelt, 2011). Students performed head-and-neck examinations also representing the assessment phase. Additionally, students performed prophylaxes, sealants, and fluoride varnish representing the implementation phase of the process of care (Summerfelt, 2011). The radiographs received approval from the volunteer dentists as they were both diagnostic and allowed for the clinic flow to be increased with the teledentistry equipment. The positive outcome of the trial led to a second trial, in which improvements were made.

The second trial took place in 2010, just a year later (Summerfelt, 2011). This trial focused on the accuracy of student training with digital equipment along with the diagnostic efficiency of the digital radiographs acquired (Summerfelt, 2011). Ten senior dental hygiene students were prepared with training on the Nomad Pro Handheld X-ray, along with the

manufacturer's training and certification of examination (Summerfelt, 2011). On the day of the project, a stratified-random method was utilized for patient-by-age-selection, the patients were grouped by age, then were assigned by random to one of the two simulated rooms where digital radiographs were taken (Summerfelt, 2011). Clinic dentists were asked to evaluate the digital x-rays as diagnostically unacceptable; diagnostically acceptable, but improvable; or diagnostically acceptable with no improvement necessary (Summerfelt, 2011).

Three testing sites were set up: two remote locations adjunct to the dental hygiene clinic and NAU's radiology lab. NAU's radiology lab was utilized as the control group (Summerfelt, 2011). It was concluded that students at the remote locations were able to obtain equally diagnostic x-rays compared to those students' taking x-rays in the lab (Summerfelt, 2011). The data from the trials demonstrated that with education, training, and certifications dental hygienists are more than qualified to provide services within their scope of practice. The data also indicate that the teledentistry model allows for dental hygienists to reach the underserved populations, populations that would otherwise go without care if advances such as the new laws and teledentistry had not been implemented.

Teledentistry in Action

Expanding access to vulnerable populations through teledentistry helps facilitate the goal of overall health. Daniel et al., (2013) completed a systematic review in order to identify clinical outcomes, health care utilization and costs associated with teledentistry. Studies date from the earliest date until March 2012. Of the 58 initial screening titles, abstracts and full-text re-trivial of pertinent articles, only 19 fit the criteria (Daniel et al., 2013).

There was a focus on research studies with clinical outcomes emphasizing on the validity, accuracy, and reliability of teledentistry while screening for dental cares, identifying oral mucosa lesions, and orthodontic consults and referrals (Daniel et al., 2013). Documented oral lesions

included, but were not limited to decay, leukoplakia, tongue lesions, aphthous ulcers, and gingivitis (Daniel et al., 2013). The systematic review also found that there was no statistical difference between teledentistry and clinical screenings for dental caries. The sensitivity accuracy ranged from 98-100%. There was also no significant difference between clinical versus teledentistry screenings in assessing prevalence of early childhood caries; the mean of Decay Filled Surfaces (DFS) via clinical exam was 1.40 (SD=4.07) and via teledentistry was 1.56 (SD=4.15) (p. 347). Both teledentistry screenings and clinical screenings for dental caries in young children was shown to be cost-effective and valid (Daniel, et al., 2013). Teledentistry examinations utilized to identify orthodontic referrals was found to be as effective as clinical examination referrals (Daniel, et al., 2013).

Another study conducted at the University of Rochester's Eastman Institute for Oral Health [EIOH] envisioned teledentistry as a means to screen mass numbers of children for oral diseases, mainly dental caries in an underserved rural area. Two small-scale studies were conducted by the EIOH using a store-and-forward (asynchronous) model, to test the hypothesis that teledentistry could reduce or eliminate the need for a dental provider to perform a visual/tactile oral examination. The studies screened Medicaid-eligible children, ages 1-6 for caries (Kopycka-Kedzierawski et al., 2018). The success of the asynchronous model led to the development and implementation of a synchronous teledentistry model.

Finger Lakes Community Health, a federally qualified health center, contacted EIOH in 2010 with concerns their dentists had noticed; children referred for specialized pediatric dental services rarely had their treatment completed (Kopycka-Kedzierawski et al., 2018). When 158 records were reviewed, it was noted that only 15% of the pediatric patients actually had treatment completed. This observation led to the establishment of a live video (synchronous) teledentistry program for oral care, to help the children in this underserved area

On the day of the initial consultation, the parents or primary care giver signs a consent form for teledentistry examination. An internet connection is established, and the participants are introduced, and their roles explained. The pediatric dentist then conducts a brief medical history review with the parent or primary care giver. Any questions are answered and the teledentistry examination begins. The video feed is switched from the webcam to the intraoral camera. The telepresenter systematically shows the pediatric dentist views of the hard and soft intraoral tissues. After completion of the intraoral examination, the video feed is switched back to the webcam. The findings of the examination are discussed with the parent or primary caregiver, and treatment recommendations are discussed along with risks and benefits of the various treatment modalities. (Kopycka-Kedzierawski et al., 2018, p. 1963)

A review conducted for the initial 251 patients enrolled in the teledentistry synchronous model was conducted in 2014. The data indicated that of the 251 patients, 93% had their treatment completed. The completion rate for pediatric patients utilizing the teledentistry model indicated the rates of treatment being completed was more than six times greater than those who utilized a normal in person model (Kopycka-Kedzierawski et al., 2018). The synchronous model has allowed for over 850 rural pediatric patients to receive dental exams.

Teledentistry models such as those from the EIOH have shown success with patients from various age groups. There is a continued problem of caries prevalence in children with limited access to care, adopting new care models such as teledentistry, along with utilization of dental hygienists could help the underserved receive the oral health care they rightfully deserve. The implementation of teledentistry models has allowed for educational institutions such as the Department of Dental Hygiene at the University of Tennessee Health Science Center (UTHS) to

conduct studies demonstrating that dental hygienists are more than capable of providing oral hygiene care, along with caries detection (Daniel & Kumar, 2017).

For example, the Urban Smiles is a program operated by UTHS which provides prophylactic care to underprivileged children in the surrounding schools of Memphis. For this particular study 82 participants were selected based on the qualification set by UTHS, of these participants 78 met the chosen criteria (Daniel & Kumar, 2017). A total of four examiners were selected, one clinical examiner was a dentist, one clinical examiner was a dental hygienist, one teledentistry examiner was a dentist, and one teledentistry examiner was a dental hygienist (Daniel & Kumar, 2017).

The examiners documented the following assessment data in each patient's chart: missing primary teeth, existing permanent teeth, dental caries, as well as existing restoration (Daniel & Kumar, 2017). The dental caries and restorations charted for each participant were converted to DFS scores by the primary investigator (Daniel & Kumar, 2017). The data were then analyzed with different methods, one of which was Spearman's correlation. Spearman's correlation indicated there was high positive correlation in the DFS scores between all examiners. The high positive correlation between the two clinical examiners was $r = 0.993$ and 0.749 – 0.808 between the two teledentistry examiners (Daniel & Kumar, 2017). It was also noted that there was "no significant differences between gender, ethnicity, or age by DFS scores between all the examiners" (Daniel & Kumar, 2017, p. e145).

The high positive correlation between all examiners indicates that dental hygiene providers are capable of providing oral hygiene care along with caries detection in both clinic and teledentistry settings. Implementation of teledentistry models and utilization of dental hygienists can help reduce the continued problem of caries prevalence in children along with adults who have limited access to oral care.

Additionally, teledentistry technology was used during interprofessional education rotation. The Dental Hygiene Department at Northern Arizona University (NAU) collaborated with Flagstaff Medical Center as a way to provide preventive dental care via teledentistry technology during the rotation (Moore, 2020). A lead faculty dental hygienist and student dental hygienists conducted an oral screening (Moore, 2020). The patient was 63 years old, of Native American descent who presented with oral pain (Moore, 2020). In conjunction with the clinical assessment and review of the medical history, the data revealed the patient was type 2 diabetic and was in the hospital step-down unit for cardiovascular concerns (Moore, 2020). The oral assessment consisted of an intraoral screening, which revealed the tooth in question, #14 presented with AAP stage III, Grade C status, with a Class II mobility and furcation involvement. Text messages are considered part of mobile technology in teledentistry (Kopycka-Kedzierawski et al., 2018). The intraoral photo, taken with a cellphone was sent via text message to an NAU faculty dentist. The patient was referred for surgical extraction and comprehensive care to the Indian Health Services (Moore, 2020).

For many dental providers, teledentistry was not something viewed as beneficial to their patients, or practice. The benefits of teledentistry outweighed any negative thoughts the moment Covid-19 surpassed the status of epidemic and was declared a pandemic, causing business to close for public health safety.

COVID-19 Pandemic

In March of 2020, shelter-in-place mandates became widespread throughout the nation in order to reduce Covid-19. This caused stress for many dental providers as patients with dental emergencies still needed to receive care. With the additional barriers Covid-19 presented, the oral health community cried out for an innovative change (Carequest Institute for Oral Health [CQIOH], 2021b). “Adoption of new modes of telecommunication in dentistry, whether among

providers, or between providers and patients was overdue. This crisis has helped to highlight and accelerate progress stated Kirill Zaydenman, Vice President of innovation at Carequest Innovation (CQIOH, 2021b).

One innovative approach to oral healthcare during COVID-19 was demonstrated by dental hygiene educators presented with barriers which led to minimal contact between NAU's Dental Hygiene Department and their Head Start schools, community centers, assisted living facilities, and elementary schools, all part of their curriculum's rotations (Moore, 2020). The collaborated with a company that produced hardware and software allowing the dental teams to conduct virtual dental visits with residents of assisted living facilities and patients of Flagstaff Medical Center during the pandemic (Moore, 2020). A total of six intraoral cameras and two laptops were distributed to assisted living facility directors and to the Flagstaff Medical Center director (Moore, 2020). The intraoral cameras and laptop computers were the equipment needed in order to complete the assessment phase of the standards of dental hygiene care including taking medical health histories, gathering dental assessments, collecting intraoral pictures/videos, and completing NAU forms for consultation, referral and appointment scheduling (Moore, 2020).

COVID-19 brought dental hygiene providers in offices, university programs, and public health settings to an abrupt halt during the pandemic in March 2020. The pandemic presented an opportunity for dental hygienists to provide care outside the traditional settings utilizing teledentistry for a delivery method. For example, a dental hygienist in Utah, owned Healthy Smiles Dental Hygiene [HSDH] (Adapting using teledentistry, 2020). HSDH operated a school-based oral health program, along with Senior Smiles, a mobile program that serves nursing homes. The Senior Smiles program was one of many affected by the COVID-19 pandemic (Adapting using teledentistry, 2020). Under Utah's practice standards, dental hygienists are able

to provide care under the general supervision if the work being performed is on a patient who is homebound, in a hospital, in a nursing home, or in a public institution (Utah Legislature, 2021).

The sudden closure meant the students participating in the school-based program could no longer be seen in person. Therefore, one of the dental hygienists from the Smart Smiles program recorded a video discussing self-care (Adapting using teledentistry, 2020). The video was dispersed to the students to educate them in the interim (Adapting using teledentistry, 2020).

The video education created for the Smart Smiles program was not considered a method of teledentistry. However, in the Senior Smiles program asynchronous teledentistry technology was utilized when oral health emergencies occurred. Utilizing their own personal phones, the nursing staff was able to provide photos of the person's oral conditions (Adapting using teledentistry, 2020). After the photos had been reviewed, the dental hygiene providers put supplies together, then were able to provide treatment at the site (Access, 2020). The pandemic created the opportunity for providers such as Stout to utilize teledentistry technology as a tool to provide continuing care to their patients. However, prior to the pandemic, some dental offices had already implemented teledentistry.

An example of an office using teledentistry since 2018 is reflected by an RDH who works in Missouri. Changes to the way the office used synchronous teledentistry were made by adding a method of triage (Adapting using teledentistry, 2020). A link was set up via their office website where patients were able to make an appointment to speak with the doctor one-on-one (Access, 2020). Patients were required to complete a COVID screening, health history, and upload a photograph of the oral health concern. Once these requirements were completed, the patient scheduled a synchronous teledentistry session with the dentist to determine what type of appointment was needed when it would occur.

When COVID-19 forced shelter-in-place mandates to take place, the dentist took this opportunity to begin educating his dental colleagues about the benefits teledentistry could have on their practice. One barrier to this delivery model was insurance providers were not interested in Suter's teledentistry model until the COVID-19 pandemic (Hartwell, 2020). The dentist has worked with offices which utilize teledentistry in order to supervise dental hygienists at satellite locations or on weekends where a dentist is not present (Hartwell, 2020). "Teledentistry has been tried and tested with great results as another way to extend dental practice outside of the four walls" (Hartwell, 2020, para. 16). "Incorporating teledentistry services with the hygiene team can add value to staff members because it allows them to work at the top of their license..." (para. 15).

Other offices utilized audio calls via the telephone to conduct consults and appointments (Adapting using teledentistry, 2020). When the RDH and her colleagues learned and adopted other platforms for synchronous visits, triaging patients became much easier. Providers were also able to see the oral health concern the patient had (Adapting using teledentistry, 2020).

At the global level, the pandemic impacted dental hygienists. The International Federation of Dental Hygienists (IFDH) conducted a survey from May 5, 2020 to May 31, 2020 in order to better understand the impact the pandemic was having on dental hygienists on a global level. The respondents (n=9,866) from 30 countries completed the survey (IFDH, 2020). There was a range of practice settings; general private practice 71%, specialty private practice 8%, corporate practice 7%, community/public health 6%, education setting 4%, hospital clinic 2% and other 3% (IFDH, 2020). Of the total participants (n=9,688), 2% checked that video appointments; teledentistry was the level of treatment they were providing (IFDH, 2020). Protective measures being taken included a variety of methods and there were 4,767 which

responded. Of the total participants (n= 4,767), 4% checked they were only practicing teledentistry; videos and phone calls (IFDH, 2020).

A survey administered by CQIOH in June 2020, revealed that 86% of patients were satisfied with their teledentistry experience, and would recommend it to others. A third of the patients also reported they did not require an in-office visit after their teledentistry appointment. (CQIOH, 2021a, para. 3). These surveys indicate that patients have been receptive to teledentistry. Patients have demonstrated a positive response to teledentistry, making it evident that this delivery method has a future in the dental hygiene profession.

The Future of Teledentistry

Teledentistry has the potential to bridge the gaps in oral health by reducing unnecessary in office visits, missed work, and overall costs (Pallardy, 2020). Teledentistry also allows for those individuals residing in rural and underserved areas another option when seeking a dental provider, as many areas have a shortage of dental providers. Teledentistry allows for oral hygiene advice, prescriptions, and referrals to patients with conditions which can be managed in the comfort of their home (CareQuest Institute for Oral Health, 2021a).

“Without access to regular, preventative dental care....minor dental problems can become severe and urgent and, in turn, lead to costly visits to the emergency department. And research continues to show that poor health can hurt overall health, reducing the quality of life. (Carequest Insistute for Oral Health, 2021a. para. 2)

While there is no one solution to solve all these problems, teledentistry can help reduce some of the barriers. Teledentistry requires an environment where it is fully supported, this support should come from state governments.

State policymakers should address key areas in order to support teledentistry, these areas include updating reimbursement policies for both Medicaid and Medicare, clarifying legal issues, and facilitating sharing patient information (CQIOH, 2021a). If policymakers make changes to policies related to teledentistry, the needs which have arisen during the COVID-19 pandemic can be addressed, along with preparation for any future crisis, which could directly affect the dental field (CQIOH, 20021a).

By supporting teledentistry, states can “save money and the health system, while improving both oral health and overall health” (CQIOH, 2021a, para. 13). Adopting teledentistry could present a positive impact not just to oral health care providers, it could also expand access to oral care for the underserved populations, benefit patients who are high risk, while keeping low risk patients healthy and out of the dental chair. Adapting new technologies to provide continuing care could reduce barriers to dental care.

Summary of Chapter 2

Dental hygienists are oral health professionals who follow the Standards of Care set by the American Dental Hygiene Association. The Standards of Care are the blueprint for dental hygiene providers and serve as a guide in treatment planning and implementation in order to enhance the patient-provider interactions and outcomes. There are many rigorous requirements implemented by institutions of education, CODA, and their state of practice which helps mold dental hygienist into the professional oral health care providers they are. As oral health care providers, the dental hygienist will provide patients with non-surgical periodontal therapy. Periodontal disease is a chronic disease affecting a large portion of the American population. According to the CDC (2013c), 70.1% of adults 65 years and older are affected by the disease. As the bacteria accumulates, it triggers an immune system response. Gingivitis can easily be reverse, whereas once periodontitis is acquired, the patient must learn to manage the chronic disease.

As oral healthcare providers, educating patients on various systemic risk factors that could impact the patient's overall health is essential in helping the patient reach optimum health. Ensuring the patient understands the information given is critical to their health, due to time restrictions in the schedule, the dental hygienist may not be able to establish that understanding for the patient. Implementation of a new method to deliver the complete standard of care is vital for both the patient and the dental hygiene profession. As technology advances, many medical professions have adopted telemedicine into their practice. The option of telemedicine is a way to provide care for patients in the comfort of their home, to the populations in rural areas that do not have access to oral health care, and to those who may not be able to afford oral care in a regular dental setting. The Covid-19 pandemic further highlighted the need for dental providers to adopt a new method to reach their patients, while offices were closed down. Adopting and

implementing teledentistry has the potential to bridge the gaps in oral healthcare by expanding access to oral care for the underserved populations, benefiting patients who are high risk, while keeping low risk patients healthy and out of the dental chair.

Chapter 3 Methodology

The purpose of this investigation is to explore in depth the phases of the process of care dental hygienists provided using teledentistry technology before and during the COVID-19. The following sections will explain the research design, context, participant sample, data collection instruments, limitations to the study, and the proposed analysis.

Research Design

The research design used for this study was both quantitative and qualitative. The quantitative portion of the study assessed demographic data. The qualitative portion of the study used a qualitative exploratory design for the in-depth exploration of teledentistry as an alternative delivery model to provide dental hygiene care with a random sample of dental hygienists across the United States. An exploratory research design is used when there is little information about the topic (Jacobsen, 2021; Merriam & Tisell, 2016). A purposive sample of dental hygienists using teledentistry across the U.S. were recruited for the study with a snowball sampling to recruit other participants (Merriam & Tisdell, 2016). Interviews conducted were semi-structured, this allowed for more open-ended questions to be asked, thus gaining the specific information desired for the research (Merriam & Tisdell, 2016).

Research Questions

The following questions guided the conduct of this study.

- 1) How are dental hygienists using the dental hygiene process of care during teledentistry?
- 2) Has the COVID-19 pandemic influenced how dental hygienists have used teledentistry?
- 3) Is there a difference in the way dental hygienists have used teledentistry in their practice settings pre-pandemic compared to during the COVID-19 pandemic?

Research Context

Dental hygienists engaged in teledentistry use in a practice setting across the U.S. were invited to participate in this study. In the context of this study, teledentistry use was described as telehealth services including virtual care and education methodologies to provide dental or dental hygiene care remotely (American Dental Association, 2020). For this study practice settings were defined as dental work environments including, but not limited to, public health, private practice, educational institutions, hospitals, home health, long term health care facilities, etc. (Nursing and Midwifery Board of Ireland, 2015). Dental hygienists were selected because they use the dental hygiene process care which entails a systematic approach to providing evidence-based dental hygiene care including the steps of assessment, diagnosis, planning, implementation, evaluation, and documentation (ADHA, 2016a). Many of the components of the dental hygiene process of care can be performed through the use of teledentistry.

Research Participants

Sample Description

Participants were dental hygienists who had experience using teledentistry in a practice setting for at least six months. Participants were recruited from states within the U.S. that allowed dental hygienists to use teledentistry in that states practice act scope. A sample size of 12 was predetermined; however, recruitment continued until data saturation was achieved.

Inclusion/Exclusion Criteria

Inclusion criteria included the participant being a registered dental hygienist who had been utilizing teledentistry for at least six months. A pre-screening questionnaire was utilized to identify practitioners who met the criteria (see Appendix E). Practitioners were excluded if they were not a registered dental hygienist and had not utilized teledentistry technology for dental hygiene care for at least 6 months. Participants were also excluded if they met qualifications but did not wish to participate.

Humans Subjects Protection

Approval by the Human Subjects Committee was granted by the Idaho State University Human Subjects Committee (HSC) to conduct the study (IRB-FY2021-268). The PI recruited participants through email, social media, and state dental hygiene associations (see Appendix D). Participants who were interested were sent a pre-screening survey to determine eligibility (see Appendix E). Selected participants signed an informed consent (Appendix F). The written consent was sent via email on a password protected, private e-email account that was not shared with anyone. Participants were informed regarding how all information is kept confidential and anonymous through the use of pseudonyms during the interview and on the transcript. In addition, participants were informed that consent to participate in this study is voluntary and withdrawal is possible at any time without consequence. The participants anonymity and confidentiality were protected using pseudonyms in conversations and on the transcripts.

Data Collection

Approval from the Idaho State University Human Subjects Committee was received (IRB-FY2021-268), and participants were recruited first by purposive sampling using a pre-survey guide, followed by snowball sampling. Snowball sampling (also known as chain or network sampling) is the most common method for purposeful sampling (Merriam & Tisdell, 2016). The Snowball sampling strategy involved the primary investigator to locate a few key participants who easily meet the criteria that have been established for the study. Early participants are interviewed, and the primary investigator requests the participants to refer at least one other participant (Merriam & Tisdell, 2016).

Data was gathered by the PI through one-on-one semi-structured interviews that took place via Zoom. The Zoom session was scheduled at the convenience of the participant who was instructed to find a private and secure location for the interview. The participant used their own

computer or other device to complete the interview. Individual interviews were recorded and transcribed prior to data analysis. Using the dictate feature on Word, the recording was uploaded and transcribed by the primary investigator. Accuracy of the transcript was verified by reviewing the Zoom recording.

Instrument

Face-to-face interviews via Zoom were conducted using an interview guide with open-ended questions. The questionnaire used during the interviews began with an opening question, which was designed to be an ice breaker, and easy to answer (Kruger & Casey, 2015) (see Appendix G). The opening question was followed by two introductory questions as a means to get the participant thinking about the connection, they have with teledentistry use and providing dental hygiene care. The transition questions linked the introductory questions to the key questions that were asked during the interview. The transitions questions guided the participant to think deeper about the subject of teledentistry. Finally, the key questions prompted the participant to analyze the use of this model in the practice setting (Kruger & Casey, 2016). The interview guide ended with two concluding questions asking participants if would like to share anything else about teledentistry or if there was anything else that should have been discussed but was not.

Procedure and Protocols

The primary investigator discussed potential participation in the study with dental hygienists who met the inclusion criteria. Each participant received a copy of the Interview Guide (see Appendix G) one week prior to the scheduled interview. At the beginning of the interview, time was provided for the potential participant to ask questions about the interview process.

The interview guide allowed for areas that require a more in-depth concentration to be better understood in a health care context (Neegaar et al., 2009). A qualitative descriptive case study was selected and examined the bounded system of dental hygienists who were educated to provide dental hygiene care, thus answering the research question. Interviews were scheduled at the convenience of the participant to facilitate participation in the study. The primary researcher conducted the interviews and recorded them using the record feature on Zoom. A Zoom link was created specifically for each participant. Once the participant entered the meeting the Lock Meeting feature was used to prevent anyone else from entering the session.

The recorded interviews were downloaded onto a password protected computer. Interviews were kept on an external hard drive that has been placed in a locked cabinet. The anonymity of the participants was protected by utilizing pseudonyms during the interview process, as well as on the transcripts. Only the principal investigator and the thesis committee members have access to said recordings.

Once the primary researcher's thesis defense is completed, all materials and recordings will be sent to Idaho State University Department of Dental Hygiene by certified mail, requiring a signature upon receipt. These materials will be kept in the university's department of dental hygiene archive room for seven years as mandated by Idaho State University.

Limitations

Limitations in this exploratory study included each state having its own scope of practice for dental hygienists, which leads to variability in the dental hygiene care provided via teledentistry. Having a limited number of participants limited the generalizability of this study.

Another limitation to this study may be having the PI as the moderator of the semi-structured interviews. The PI does have an implicit bias for teledentistry use especially towards

increasing access to care. Steps were taken to control biases through the pilot testing of the questions, member checks, and having at least one thesis member present during the interviews.

Statistical Analysis

Quantitative demographic data was analyzed using descriptive statistics. Results of demographic information included age, gender, educational level, number of years practicing dental hygiene, types of practice, state of primary practice, and duration of teledentistry use.

The data generated from the qualitative semi-structured interviews was coded after reaching saturation with 20 interviews. The primary investigator (PI) and the thesis advisor and one thesis committee member analyzed the data collected using the classic analysis strategy to code interviews by using the online qualitative program Dedoose. Dedoose is an application utilized to organize and analyze interview data (Dedoose, n.d.). Interview transcripts were sorted into parent and child codes. Coding is used when multiple aspects of data are categorized into shorthand designation so that specific data can be easily retrieved (Merriam & Tisdell, 2016). The codes were then collapsed to create overarching themes (Creswell & Creswell, 2018; Dedoose, n.d.). The classic analysis strategy was used to identify themes and allows a review based on frequency, consistency, emotion, and extensiveness (Krueger & Casey, 2015).

During the semi-structured interviews with participants in this study, at least one thesis committee member was in attendance.

Validity and Reliability

Establishing validity and reliability is critical in qualitative research. It aids in ensuring data from the study is both valid and reliable. Various methods are used to assess validity and reliability. In this study pilot-testing, triangulation, saturation, and member checks were used to establish validity and reliability. The first method used to establish validity and reliability was sending the interview guide to three content experts (Krueger & Casey, 2015). The three experts

in qualitative research offered suggestions for the interview guide for modifying the questions to increase validity. These experts were appropriate due to their training, experiences, background, and knowledge in qualitative research (Krueger & Casey, 2015).

Next the PI pilot tested the interview questions with five participants. The pilot study ensured that questions asked were comprehended by the participants and would facilitate the answers driving the research study (Krueger & Casey, 2016). To establish reliability, two members of the thesis committee sat in on the pilot interviews, assessed the principal investigator's transcripts of the pilot interviews, coding of the pilot interviews, and provided feedback.

Triangulation was used throughout the coding process and helps establish credibility of the research (Merriam & Tisdell, 2016). When coding was conducted, codes did not have multiple meanings, rather one definition was utilized for the analysis (Creswell & Creswell, 2018). Communication between the primary investigator and the two thesis committee members was continuous during the coding process and meetings occurred regularly via Zoom (Creswell & Creswell, 2018). Intercoder agreement took place when the primary investigator's coding was cross-checked by the two thesis committee members with the same or similar results in coding (Creswell & Creswell, 2018). This agreement can take place if two or more coders agree on codes being used. The passage from the transcript is not coded by all researchers simultaneously. The two thesis committee members reviewed the transcripts separately to determine if coding and theme formation were similar to that of the principal investigator (Creswell & Creswell, 2018).

Additional methods for determining validity are achieved by interview saturation and incorporating member checks. Saturation was achieved with 20 participants indicating that no new information or data was presented from the participants (Merriam & Tisdell, 2016). Member

checks were conducted by the participants after the interview was completed (Merriam & Tisdell, 2016). The member check process included a copy of the analysis emailed to each individual participant via a password protected private email account. The participants were encouraged to email the primary researcher to set up an appointment for analysis or clarification. Participants were given ample time (7-10 days) to review the interview transcript and provide written or verbal feedback to the primary researcher if modifications needed to be made (Merriam & Tisdell, 2016). Upon receiving feedback from the participant, if needed, modifications were made to the original interview transcript to ensure the results of the interview matched the thoughts and intentions of the participant.

Summary of Chapter 3

The purpose of this investigation is to explore in depth the care dental hygienists have provided using teledentistry as an alternative delivery model to provide dental hygiene care before and during the COVID-19 pandemic. The research design that was used to drive this study was a qualitative exploratory study. Using the qualitative exploratory study design allowed the principal investigator to explore information that is new or has not been previously studied. Participants were recruited through a method known as snowball sampling. Through these interviews, the primary investigator requested participants refer at least one other participant.

Semi-structured interviews were conducted via Zoom among qualifying dental hygienists nationwide. The interviews were recorded with the record feature on Zoom. Video interviews were transcribed and interpreted by the primary investigator. Participants verified the interpretation was valid by reviewing the transcript. Participant's anonymity was guarded by utilizing pseudonyms during the interview process, as well as on the transcripts. Findings from this study may contribute to the advancement in the scientific knowledge of alternative delivery

model and possibly enhance opportunities for the provision of care for underserved populations through teledentistry use.

Results and discussion will be reported in the form of a manuscript to be submitted for publication in the *Journal of Dental Hygiene*. The manuscript specifications and author guidelines can be accessed online at

http://www.adha.org/resources-docs/7833_JDH_Author_Guidelines.pdf

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Appendix A

Microorganisms Found in Periodontitis

Microorganisms	Microorganisms cont.
<i>Actinobaculum</i> spp. <i>Actinomyces cardiffensis</i> <i>Actinomyces odontolyticus</i> <i>Aggregatibacter actinomycetemcomitans</i> <i>Alloprevotella tanneriae</i> <i>Anaeroglobus geminatus</i> <i>Bacteroides</i> (unidentified family) <i>Campylobacter</i> spp. • <i>Campylobacter showae</i> <i>Candida albicans</i> <i>Capnocytophaga</i> spp. <i>Campylobacter morbi</i> <i>Clostridiales</i> (unidentified family) <i>Desulfobulbus</i> spp. <i>Dialister</i> spp. • <i>Dialister invisus</i> <i>Enterobacteriaceae</i> (unidentified genus) <i>Eubacterium</i> spp. • <i>Eubacterium brachy</i> • <i>Eubacterium saphenum</i> <i>Filifactor</i> spp. • <i>Filifactor alcoris</i> <i>Fretibacterium</i> spp. • <i>Fretibacterium fastidiosum</i> <i>Fusobacterium</i> spp. • <i>Fusobacterium nucleatum</i> subsp. <i>Vincentii</i> • <i>Fusobacterium periodonticum</i> <i>Hafnia alvei</i>	<i>Olsenella uli</i> <i>Parvimonas micra</i> <i>Petococcus</i> spp. <i>Peptostreptococcus</i> spp. • <i>Peptostreptococcus anaerobius</i> • <i>Peptostreptococcus stomatis</i> <i>Phocaeicola</i> spp. <i>Porphyromonas</i> spp. • <i>Porphyromonas endodontalis</i> • <i>Porphyromonas gingivalis</i> <i>Prevotella</i> spp. • <i>Prevotella intermedia</i> • <i>Prevotella nigrescens</i> <i>Propionibacterium</i> spp. <i>Pseudoramibacter</i> spp. • <i>Pseudoramibacter alactolyticus</i> <i>Selenomonas</i> spp. • <i>Selenomonas sputigena</i> <i>Serratia marcescens</i> <i>Spirochaetes</i> spp. <i>Staphylococcus capitis</i> <i>Streptococcus gordonii</i> <i>Streptococcus intermedius constellatus</i> <i>Streptococcus</i> spp. Oral clone BW009; oral strain T1=E5 and T4-E3 <i>Synergistes</i> spp. <i>Tannerella forsythia</i> TM7 <i>Treponema</i> spp. • <i>Treponema denticola</i> • <i>Treponema maltophilum</i>

	<ul style="list-style-type: none"> • <i>Treponema parvum</i> • <i>Treponema pectinovorum</i> 8:A:33768 and OMZ831 • <i>Treponema socranskii</i>
<i>Johnsonella spp.</i>	Unidentified Human Oral Bacterium C20
<i>Klebsiella pneumoniae</i>	Veillonellaceae spp.
<i>Lachnospiraceae (unidentified genus)</i>	<i>Tissierellaceae (unidentified genus)</i>
<i>Lactobacillus gasseri</i>	
<i>Leptotrichiaceae (unidentified genus)</i>	
<i>Mogibacteriaceae (unidentified genus)</i>	
<i>Mycoplasma spp.</i>	
<i>Neisseria spp.</i>	
• <i>Neisseria flava</i>	
• <i>Neisseria subflava</i>	

(Adapted from Patini et al., 2018).

Appendix B

Courses Required for Idaho State University's Bachelor of Science in Dental Hygiene

Junior Year – Fall Semester (20 credits)

DENT 3307	Prevention and Management of Dental Emergencies
DENT 3308	Oral Histology and Embryology
DENT 3311	Tooth Morphology
DENT 3312	Head and Neck Anatomy
DENT 3313	Clinical Dental Hygiene I
DENT 3313C	Clinical Dental hygiene I Clinic
DENT 3315	Preventative Dentistry
DENT 3316	Dental Materials

Junior Year - Spring Semester (19 credits)

PPRA 3314	Basic and Applied Pharmacology for Dental Hygiene
DENT 3309	General and Oral Pathology
DENT 3314	Clinical Dental Hygiene II
DENT 3314C	Clinical Dental Hygiene II Clinic
DENT 3318	Oral Radiology
DENT 3318L	Oral Radiology Lab
DENT 3319	Preclinical Restorative Procedures
DENT 3320	Pain Management
DENT 3321	Periodontology

Senior Year - Fall Semester (19 credits)

DENT 4401	Research Methods
DENT 4402	Advanced Periodontology
DENT 4403	Advanced Clinical Theory I
DENT 4403C	Advanced Clinical Practice I Clinic
DENT 4408	Ethical and Legal Principles
DENT 4411	Application of Restorative Therapies
DENT 4411C	Restorative Care I
DENT 4413	Community Health and Special Needs Populations
DENT 4422	Education Strategies and Applied Methods

Senior Year – Spring Semester (15 credits)

DENT 4404	Advanced Clinical Theory II
DENT 4404C	Advanced Clinical Practice II Clinic
DENT 4405	Dental Hygiene Seminar
DENT 4412C	Restorative Care II
DENT 4414	Community Outreach Experiences
DENT 4421L	Leadership and Health Policy
DENT 4424	Principles of Interprofessional Practice Management

(Adapted from Idaho State University. (n.d.) *Dental Hygiene Curriculum*).

Appendix C

Idaho State University Program Competencies

Program Competency #1: Professional and Ethical Behavior. The dental hygiene graduate must demonstrate professional behaviors that are consistent with dental hygiene Standards of Care, legal regulations, and the Core Values of the ADHA Code of Ethics.

- **Supporting Behavior 1.1:** Follow laws and regulations for the provision of oral health care services.
- **Supporting Behavior 1.2:** Utilize effective written and verbal communication skills during interactions with clients, colleagues, and other professionals
- **Supporting Behavior 1.3:** Utilize effective problem solving strategies related to comprehensive client care and ethical situations including those situations related to research and practice management.
- **Supporting Behavior 1.4:** Conduct professional activities in accordance with the Core Values of the ADHA Code of Ethics and Standards of Care.
- **Supporting Behavior 1.5:** Assume responsibility for recording comprehensive and concise documentation of all integrated aspects of care.
- **Supporting Behavior 1.6:** Investigate evidence-based scientific literature and apply ethical and legal principles when engaged in professional activities.

Program Competency #2: Professional Development. The dental hygiene graduate must acquire and synthesize information to continue life-long learning in the professional discipline.

- **Supporting Behavior 2.1:** Assume responsibility for professional development through self- assessment and critical thinking skills.
- **Supporting Behavior 2.2:** Access and critically evaluate scientific literature to make evidence- based decisions that improve the quality of care to clients and communities.

Program Competency #3: Professional Commitment. The dental hygiene graduate must strengthen commitment to the profession by advancing and promoting its values and enhancing oral health through interprofessional collaborations.

- **Supporting Behavior 3.1:** Promote the profession during interprofessional collaborative interactions.
- **Supporting Behavior 3.2:** Engage in interprofessional activities to disseminate information to advance oral health knowledge of other health care professionals.

Program Competency #4: Client Population. The dental hygiene graduate must be competent in providing dental hygiene care for members of diverse populations.

- **Supporting Behavior 4.1:** Provide quality, safe, and comfortable dental hygiene care for the child, adolescent, adult, and geriatric client.
- **Supporting Behavior 4.2:** Provide quality, safe and comfortable dental hygiene care for clients with special needs and those from diverse cultural backgrounds.

Program Competency #5: Assessment. The dental hygiene graduate must systematically collect, analyze, and record conditions of systemic, oral, and psychosocial health of various client populations.

- **Supporting Behavior 5.1:** *Assess client concerns, goals, values, needs, and preferences to guide person-centered care.*
- **Supporting Behavior 5.2:** *Accurately collect, record, and interpret a medical/ dental history and vital signs recognizing conditions that require consultation, referral, special precautions, or consideration prior to or during dental hygiene care.*
- **Supporting Behavior 5.3:** *Perform an extraoral and intraoral examination of all the hard and soft tissue including the periodontium and teeth; accurately record and interpret the pathological and non-pathological findings; and initiate monitoring or referral procedures based on individual client needs.*
- **Supporting Behavior 5.4:** *Analyze the client's individual conditions to determine the need for radiographs, and safely expose diagnostic quality radiographs.*
- **Supporting Behavior 5.5:** *Interpret radiographic images and correlate with clinical documented conditions.*
- **Supporting Behavior 5.6:** *Recognize risk factors and implement interventions for the prevention and control of disease.*

Program Competency #6: Dental Hygiene Diagnosis. The dental hygiene graduate must use critical thinking and problem-solving to determine the client's dental hygiene needs based on all available assessment data.

- **Supporting Behavior 6.1:** *Use critical decision making skills to analyze and interpret the assessment data to formulate an accurate dental hygiene diagnosis.*

Program Competency #7: Planning. The dental hygiene graduate must formulate a comprehensive, client-centered care plan based on assessment information, dental hygiene diagnosis, and current scientific evidence.

- **Supporting Behavior 7.1:** *Design a comprehensive, individualized dental hygiene care plan collaboratively with the client and engage the person in the decision- making process for preventing and treating oral diseases.*
- **Supporting Behavior 7.2:** *Provide a dental hygiene case presentation which includes the dental hygiene diagnosis and obtain informed consent from the client using effective interpersonal and communication skills.*

Program Competency #8: Implementation. The dental hygiene graduate must provide individualized care that encompasses educational, preventive, and therapeutic services to achieve and maintain oral health.

- **Supporting Behavior 8.1:** *Educate clients on disease theories and risk factors contributing to caries, periodontal disease, and oral and systemic health conditions; and preventive and therapeutic interventions to address the client's individual needs.*

- **Supporting Behavior 8.2:** Provide comprehensive, safe, and comfortable care for clients through the use of appropriate referrals, client management strategies, pain control measures, medical emergency management, and life support measures.
- **Supporting Behavior 8.3:** For various stages of periodontal disease including moderate to severe stages of periodontitis, apply basic and advanced principles of debridement, scaling and root planing to obtain the appropriate clinical endpoint without causing trauma to hard or soft tissue.
- **Supporting Behavior 8.4:** Provide supportive and preventive dental hygiene services that can be legally performed in any state using efficient time management (e.g., selective polishing, amalgam polishing, sealants, margination, impressions study models, fluoride and whitening trays, localized therapeutic delivery, STC, etc.).
- **Supporting Behavior 8.5:** Deliver quality restorative oral health care (placing and finishing amalgam and composite restorations, etc.); to promote and maintain oral health.
- **Supporting Behavior 8.6:** Adhere to infection control standards following the CDC, OSHA, and OSAP guidelines and departmental policies and protocols to prevent the transmission of infectious disease to others.

Program Competency #9: Evaluation and Maintenance. The dental hygiene graduate must evaluate the effectiveness of implemented educational, preventive, therapeutic, and restorative services and make modifications as needed.

- **Supporting Behavior 9.1:** Compare client's and clinician's initial goals to outcomes following treatment.
- **Supporting Behavior 9.2:** Evaluate the effectiveness of dental hygiene care and the client's self-care based on clinical parameters, client satisfaction, and client self-assessment; and reinforce referrals as necessary.
- **Supporting Behavior 9.3:** Critically assess treatment outcomes, dental hygiene diagnosis, and patient behaviors to determine prognosis, which establishes the continuing care intervals for periodontal supportive therapy.

Program Competency #10: Community Involvement. The dental hygiene graduate must assume responsibility for health promotion and disease prevention activities in the community and collaborate with other health care professionals, organizations, or governmental agencies concerning oral health care services.

- **Supporting Behavior 10.1:** Assess and plan oral health programs to diverse populations or those with limited access to care in a variety of community settings.
- **Supporting Behavior 10.2:** Implement and evaluate outcomes of oral health programs in community settings.
- **Supporting Behavior 10.3:** Present health promotion and disease prevention information using appropriate and effective teaching strategies in oral health programs or community rotations.
- **Supporting Behavior 10.4:** Provide screenings, education, preventive agents, and referrals for diverse populations in a variety of community settings.

(Adapted from Idaho State University. (n.d.). *Dental Hygiene Program Competencies*).

Appendix D

Recruitment Guide

September 16, 2021

Dear Fellow Dental Hygienist,

I am a current dental hygiene graduate student from Idaho State University planning my qualitative exploratory study on the phases of dental hygiene care provided by dental hygienists utilizing teledentistry. Dental hygienists have always put patient care first, and this situation was the same during the COVID-19 pandemic. You are a potential participant for the study, if you would be willing to participate. Your interest to participate does not mean that you have enrolled in the study.

The anticipated benefit of this research relates to the profession of dental hygiene. Information regarding phases of the dental hygiene process of care provided utilizing teledentistry that is constructed from the data will add a new piece of scientific literature to the dental hygiene body of knowledge.

As a participant, your involvement in this study would include:

- Completing the screening questionnaire will take approximately 10 minutes. The answers to the questions will determine whether your background meets the criteria for the study.
- Completing the informed consent procedures so you fully understand the voluntary nature of participation, the expectations for participating, and your right to withdraw from the study at any time. First, a written informed consent will be sent to you by email to your password protected, private e-mail account that is not shared with anyone. Please do not use an e-mail address associated with employment as it is usually subjected to an employer's inspection and messages may be archived by the server. Second, review the consent form at your convenience. Third, at the beginning of the interview, you will be allowed ample time to ask any questions regarding your participation. Participation is voluntary and you may withdraw at any point without consequences.
- Participating in a private interview which will be conducted via Zoom and be recorded. The interview will take approximately one hour. You will be given the interview questions at least one week prior to the date of the interview.
- Once the primary researcher reviews the transcribed data of the interviews, you will receive a copy of the analysis to review. This review will take approximately one hour to read and provide feedback on my interpretation to ensure it matches your experiences with the dental hygiene phases of care provided utilizing teledentistry. Your written or verbal, via phone, or Zoom, feedback is requested within seven to ten days.

- Selecting a pseudonym (false name) for privacy and confidentiality, will be used as your identity during the interview and on all forms of data such as the transcript from the interview.

I would truly appreciate your willingness to be a potential participant for this study. Nine to ten dental hygienists will be selected and interviewed for this study.

If you are willing to complete a screening questionnaire or would like more information regarding the study, please email me through my Idaho State University email: velabren@isu.edu. My thesis co-advisors are also available to provide assistance and can be contacted at the following emails: Leciel Bono, RDH- ER, MS, Ed. D(c), at bonoleci@isu.edu, or Rachelle Williams, RDH, MS, at rachellewilliams@isu.edu

Thank you again for considering this research opportunity,

Brenda Catalan, RDH, BS

Appendix E

Screening Questionnaire

Returning this questionnaire does not mean you enrolled in the study. I am looking for dental hygienists who utilize teledentistry to provide oral care to their patients. I would truly appreciate your participation by filling out this questionnaire to determine if you meet the criteria for this study. Thank you, Brenda Catalan, RDH, BS

1. What was your age at the time of your last birthday? _____
2. To which gender do most identify? **Please circle or highlight**
 - a. Female
 - b. Male
 - c. Transgender Female
 - d. Transgender Male
 - e. Gender non-conforming
 - f. Other (please specify) _____
3. What degree or certificate did you earn upon graduation from your entry-level dental hygiene program? **Please circle or highlight**
 - a. Dental Hygiene Certificate
 - b. Associate degree
 - c. Bachelor degree
4. What is your highest level of education? **Please circle or highlight**
 - a. Dental Hygiene Certificate
 - b. Associate degree
 - c. Bachelor degree
 - d. Master degree

- e. Doctorate degree
- f. Other, please specify _____

5. How many years have you been practicing dental hygiene? **Please circle or highlight**

- a. Less than one year
- b. 1-6 years
- c. 7-12 years
- d. 13-17 years
- e. 18-23 years
- f. 24+ years

6. What is your professional role(s) at your place of employment? **Please circle or highlight**

- a. Clinician
- b. Corporate
- c. Public Health
- d. Researcher
- e. Educator
- f. Administrator
- g. Entrepreneur

7. What population do you primarily serve? **Please circle or highlight**

- a. Children
- b. Pregnant women
- c. Older adults
- d. General
- e. Other, please specify: _____

8. In what setting(s) do you currently practice primarily? **Please circle or highlight**

- a. Private dental practice
- b. Group dental practice
- c. Periodontal practice
- d. Community health setting
- e. Assisted living facility
- f. Hospital
- g. Prison
- h. School
- i. Faculty practice clinic
- j. State and Federal government facility
- k. Indian Health Services clinic
- l. Other

9. Did you use teledentistry technology before the COVID-19 Pandemic (March 10, 2020 and earlier)? **Please circle or highlight**

- a. No
- b. Yes

i. When did you begin using teldentistry technology, and for how long?

10. Did you use teledentistry technology during the COVID-19 Pandemic (March 11, 2020- current time)? **Please circle or highlight**

- a. No
- b. Yes

- i. When did you begin using teldentistry technology, and for how long?

11. In which state(s) are you currently practicing teledentistry? **Please list**

a. _____

b. _____

c. _____

12. How would you describe the community(ies) in which you are currently using teledentistry technology? **Please circle or highlight**

a. Urban

b. Rural

c. Suburban

d. Other: _____

13. Are you practicing in a Dental Health Professional Shortage Area? **Please circle or highlight**

a. Yes

b. No

c. Unsure

d. Please list county(ies) currently serving:

The interviews will remain confidential to the fullest extent possible and you will select a pseudonym (false name) to protect anonymity and confidentiality. Your participation would be greatly appreciated.

14. Would you be willing to be interviewed? _____ Yes _____ No

IF Yes,

Name _____

Phone _____

If selected for the study, what method, email or mailing address, is your preference for receiving and returning documents? Participants who select e-mail as the form of communication must use a private e-mail address that is not shared with anyone.

Email _____

15. If you participate in the study, what pseudonym would you like to use (only first name needed) _____

Appendix F

Human Subjects Committee Informed Consent Form

You are being asked to participate in a research investigation conducted by Brenda Catalan, RDH, BS-DH, a graduate student from the Department of Dental Hygiene at Idaho State University. The Human Subjects Committee at Idaho State University has reviewed and approved this research project. You have been asked to participate in this research because you are a dental hygienist who is currently utilizing teledentistry for patients. Your participation in this research project is voluntary. Please read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

PURPOSE OF THE STUDY

The purpose of this investigation is to explore in depth the care dental hygienists provided using teledentistry technology before and during the COVID-19 pandemic

PROCEDURES

Before formally agreeing to participate in this investigation, the participant will be provided a copy of the Humans Subject Consent Form. At the beginning of the interview, the informed consent form will be reviewed and time will be provided for the potential participant to ask questions. Before the interview commences, the participant will provide verbal consent to participate (recording feature will capture the consent).

You would participate in a private face-to-face interview via Zoom, which may last approximately one hour. You will be given the interview questions at least one week prior to the date of the interview. The questions will be regarding your experiences with teledentistry at your place of employment.

The interview will be recorded. The interview will then be downloaded to a password protected computer. The voice recorded files will also be downloaded to a separate external portable back-up hard-drive which will be kept in a locked cabinet. Only your pseudonym will be used in the interview and on the transcript. Only the primary investigator, the two thesis committee members will have access to the audio-recording.

Word -for-word transcription of the audio-recording will be completed by the primary investigator. After the written transcript is verified that the wording is verbatim, the recording of the interview will be deleted from the computer.

After the primary researcher's thesis defense, the interview written transcripts will be sent to Idaho State University, via certified, signature required mail, to be held in the Idaho State University's department of dental hygiene archive room for three years. After the three years, all materials pertaining to the study will be destroyed by Idaho State University following the university's protocols.

After data analysis of all interviews is completed, you will receive a copy of the analysis to review. This review will take approximately one hour to read and provide feedback on my interpretation.

PRIVACY AND CONFIDENTIALITY

No information about you, or provided by you during the research, will be disclosed to others without your written permission. When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity. During the personal interview, the conversation will be recorded and later transcribed using your pseudonym as the identifier. All computer files and audio-recordings are maintained in a locked cabinet with access only available by the researcher and the faculty thesis chairpersons. After the thesis defense, all of the audio-recordings and transcripts will be stored in secured storage at Idaho State University.

POTENTIAL RISKS

An e-mail address associated with employment is usually subjected to an employer's inspections and messages may be archived by the server. The risks of communicating via e-mail include an archive system that automatically logs incoming and outgoing messages from the e-mail server. Another risk is sending e-mail messages to unintended recipients not associated with the research. For these reasons, the primary researcher will contact you in person regarding your participation with this study. In the event that the interview and other contact with the researcher is creating stress for you, the researcher will stop the interview and all contact regarding this study.

ANTICIPATED BENEFITS TO PARTICIPATION

You should not expect to benefit directly from participation in this research. You have the right to refuse participation in this research study and withdraw from the study at any point.

ANTICIPATED BENEFITS TO SOCIETY

The anticipated benefit of the research is to the profession of dental hygiene. Information that is constructed from this study will add to the scientific body of literature for teledentistry and dental hygiene.

PARTICIPATION AND WITHDRAWAL

Your participation in this research is **VOLUNTARY**. You may withdraw at any time.

In the event that you have any questions about the study, you can ask the investigator during the interview, when the interview is complete or at any time you feel is appropriate. In addition, you may contact my thesis advisors.

Brenda Catalan, RDH, BS-DH Phone: 620-521-6668 Email: velabren@isu.edu

Major thesis advisor Dr. Leciel Bono, bonoleci@isu.edu, and second committee member Rachelle Williams, rachellewiliams@isu.edu, Department of Dental Hygiene at Idaho State University.

I have read the information provided above. I have been given an opportunity to ask questions, and all of my questions have been answered to my satisfaction. I have been given a copy of the informed consent form. I give my consent for the results of the research to be published or discussed in conferences using my pseudonym, no information will be included that would reveal my identity.

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

Appendix G

Interview Guide

Questions for participants

<i>Opening</i>	1. Tell us your pseudonym for this research, how long have you been a dental hygienist.
<i>Introduction</i>	2. How did you learn about teledentistry?
	3. What interests you about teledentistry?
<i>Transition</i>	4. When did you first become involved in teledentistry?
	5. What were your initial impressions of using teledentistry?
<i>Key</i>	6. What is the major goal you are trying to accomplish incorporating teledentistry in your practice setting? (Would you tell me more about that?)
	7. How are you using the dental hygiene process of care as part of teledentistry? (Would you tell me more about that?)
	8. How has the pandemic influenced your use of teledentistry? Have you noticed a difference between the way you used teledentistry pre-pandemic versus throughout the pandemic?
	9. What are the major benefits of teledentistry in your practice setting? (Would you tell me more about that?)
	10. What obstacles or limitations have you encountered with using teledentistry? (Would you tell me more about that?)
	11. What changes would make the teledentistry in your practice setting better? (Would you tell me more about that?)
	12. What future uses for teledentistry in our profession do you envision? (Would you tell me more about that?)
<i>Ending</i>	13. Is there any additional information you would like to share with me regarding the use of teledentistry?
	14. Is there anything we should have talked about but did not?

Title: An Exploration of Oral Care Provided by Dental Hygienists Using Teledentistry

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This manuscript supports the NDHRA priority area, **Population Level**, Access to Care, Interventions.

Title: An Exploration of Oral Care Provided by Dental Hygienists Using Teledentistry

Abstract

Purpose: The purpose of this study was to explore in depth, the phases of the process of care dental hygienists provided using teledentistry technology before and during the COVID-19 pandemic.

Methods: The research design for this study was a qualitative exploratory study with 20 dental hygienists recruited through purposive and snowball sampling. Participants anonymity and confidentiality were protected using pseudonyms. An interview guide was created and validated by focus group experts and pilot testing. Data were collected through one-on-one semi-structured interviews recorded and transcribed in Zoom. The classic analysis strategy was used to identify themes. Validity was established through piloting testing of the interview guide, investigator triangulation, saturation, and member checks.

Results: The study consisted of 20 participants with various years of career experience as dental hygienists and who had utilized teledentistry for at least six months. Ninety percent of participants were currently using teledentistry in the primary place of practice. Three major themes were identified related to oral care provided by dental hygienists using teledentistry: Innovative Approach with the subthemes Increased Access to Care and COVID-19, Promoting the Profession with the subthemes of Autonomy and Scope of Practice and Collaboration in Oral Care.

Conclusions: Dental hygienists are utilizing teledentistry in innovative ways to increase access to oral health care and as a means to collaborate with medical professionals to address overall healthcare needs. Limitations in the scope of practice and inconsistency between state regulations create a barrier to the full success of teledentistry utilization by dental hygienists.

Key Words: Teledentistry, registered dental hygienist, qualitative, pandemic,

This manuscript supports the NDHRA priority area, **Population Level**, Access to Care, Interventions.

INTRODUCTION:

In March of 2020, shelter-in-place mandates became widespread throughout the nation due to the COVID-19 pandemic. This created a need to find alternative ways to provide oral health care to patients (Carequest Institute for Oral Health.¹ Teledentistry was one method adopted to address communication between patients and providers during the pandemic.¹

Teledentistry utilizes both asynchronous (transmission of a patient's oral images that are not used in real time; that is, stored and forwarded), and synchronous (use of real-time interactive technologies, such as two-way interactive video).²⁻⁴ Teledentistry allows for oral care to be provided to patients in the comfort of their own home, to those populations in rural areas who cannot drive the long distances to receive care, as well as those experiencing poverty who may not be able to afford oral care in a regular clinical care setting.⁵

Systematic literature reviews have demonstrated that teledentistry is effective and an efficient way for providers to make referrals, hold consultations, discuss treatment planning, make diagnoses, and improve periodontal health.^{3,4} Research has demonstrated that screenings for dental caries done via teledentistry were just as effective as screenings completed at chairside; this finding was also true for screenings in assessing early childhood caries prevalence.⁵

New workforce models are being created using teledentistry.⁶ One such model with expanded practice dental hygienists (EPDH) used teledentistry for assessment and treatment planning with information being sent asynchronously to a supervising dentist for review prior to placing interim therapeutic restorations in community settings.⁸ This workforce model of EPDH's adapted the Glassman's Virtual Dental Home model. Dr. Glassman and associated dental hygienists have been utilizing teledentistry for 15 years to enhance access and oral health by establishing Virtual Dental Homes to provide care in community settings.⁷ The Virtual Dental Home model allowed for services to be brought to locations where underserved vulnerable populations would otherwise go without. Services

being provided included diagnostic, preventative, as well as early intervention restorative care.⁸ (Registered Dental Hygienists were also able to place interim therapeutic restorations.⁸

Other workforce models such as the teledentistry-assisted affiliated practice dental hygiene workforce model are created in educational settings by adding teledentistry to the curricula.⁶ These new workforce models have created an avenue in which increased access to care is utilized by underserved populations.^{3,6} Primary uses for teledentistry in these workforce models is asynchronous dental hygiene assessment followed by treatment after review by a supervising dentist.⁶ More recent research regarding the use of teledentistry by dental hygienists has demonstrated that caries detection and oral health care can be effectively implemented.³

As teledentistry is being implemented, more so since the pandemic, changes in the definition of dental hygiene in the workforce occurred in 2018 by the Bureau of Labor Statistics (BLS).⁹ Dental hygienists were categorized as Healthcare Diagnosing or Treating Practitioners which placed dental hygienists in the same category as dentists, physicians, pharmacists, registered nurses, physical therapists and other providers and diagnosticians.⁹ This new classification provides an opportunity to utilize the expanded dental hygiene diagnosis more fully^{10,11} especially with new workforce models using teledentistry.

The purpose of this study was to explore how dental hygienists are using teledentistry. The following research questions guided this study.

- 1) What are the experiences of dental hygienists using teledentistry?
- 2) How is the dental hygiene process of care being used in teledentistry?
- 3) How has the pandemic influenced the use of teledentistry?

METHODS AND MATERIALS

The research design used to drive this study was a qualitative exploratory study, this allowed the principal investigator to analyze responses for themes or patterns related to the phases in the process of care gained from the participants regarding how teledentistry technology is used before and during the

COVID-19 pandemic. The study underwent an expedited review under OHRP (DHHS) and FDA guidelines and the University's Human Subjects Committee and received approval (IRB-FY2021-268).

A focus group approach was taken when conducting the semi-structured interviews. Participants in focus groups are chosen as they have similar characteristics in common which relate to the topic.¹² The primary investigator creates an environment that encourages the participant to share their perceptions and point of view on the topic.¹² The focus group approach helped mold the individual interviews that were conducted for this study. A random sample of registered dental hygienists throughout the United States was used. Participants were recruited through purposive and snowball sampling. Snowball sampling is the most common method for purposeful sampling. This method involved finding participants that easily met the criteria established by the primary investigator for participation in the research.¹³ The concept is, people know others who work in a similar way as they do.¹²

Once a participant is interviewed, the primary investigator requested the participant to refer another participant. Twenty participants were interviewed, and interviews were ceased upon reaching saturation. Saturation is reached when the primary investigator ceases collecting data due to the primary investigator no longer achieving new data insights.¹⁴ Participants were asked to fill out a survey via Qualtrics to ensure they met the criteria for the study. The Qualtrics survey allowed for the primary investigator to ensure the inclusion criteria was met. The inclusion criteria included the participant be a registered dental hygienist who has been utilizing teledentistry for at least six months. Maximum variation will gain diversity within the sample. Maximum variation is defined as purposely pursuing diversity in sample selections which allows for a larger range of application of the findings by consumers of research.¹³ Sample diversity will range based on demographic and practice variable. Participants selected will range in number of years in practice, amount of time utilizing teledentistry, as well as practice settings. Participants will be excluded if they are not a registered dental hygienist and has not utilized teledentistry technology for dental hygiene care for at least 6 months.

Prior to the 20 interviews taking place, a pilot study was conducted with five participants. The pilot study was conducted to ensure the questions asked were comprehended by the participants and

would facilitate the answers driving the research study.¹² Three experts in qualitative research offered suggestions for the interview guide for modifying the questions to increase validity. These experts were appropriate due to their training, experiences, background, and knowledge in qualitative research.¹²

During the semi-structured interviews, at least one thesis committee member was in attendance.

Transcription of the interviews was conducted after each interview and sent to the participant to review and for verification.¹²

Interviews began with an opening question, which was designed to be an ice breaker, and easy to answer.¹² Then followed two introductory questions to get the participant thinking about the connection they have with teledentistry.¹² The transition questions linked the introductory questions to the key questions that were asked. The transition questions guide the participant to think deeper into the subject of teledentistry.¹² Finally, the key questions which probe the participant even deeper into the subject of teledentistry and their use of the model in their practice setting. Three experts in qualitative research offered suggestions for the interview guide for modifying the questions to increase validity.

Semi-structured interviews were conducted via Zoom among the qualifying dental hygienists. Interviews were recorded with the record feature on Zoom. Interviews lasted between 30 minutes to one hour. Interviews were transcribed on Microsoft Word using the dictate feature. Once transcription was completed the primary investigator and two thesis committee members worked together to analyze the data. The online software Dedoose was used to consolidate data into parent and child codes. This consolidation of data is known as classic analysis strategy. The process is broken down into chunks, making analysis more visual.¹²

Participant's anonymity was guarded by utilizing pseudonyms during the interview process, as well as on the transcripts. Only the principal investigator and the thesis committee members have access to the recordings. Interviews were scheduled at the convenience of the participant to facilitate participation in the study.

The first method used to establish trustworthiness is peer examination. Throughout the entire study, two members of the thesis committee provided continuous feedback to the principal investigator's

coding and development during data analysis. Peer examination allowed the principal investigator to analyze the responses for themes or patterns related to the use of teledentistry technology in their practice setting before and during the COVID-19 pandemic.

The second method for validating the trustworthiness of the data analysis is by employing member checks. Member checks were conducted by the participants after data analysis of all the interviews were completed. The participant's verified the researcher's interpretation of the interview data to ensure it is valid.¹³

The member check process included a copy of the analysis emailed to each individual participant via a password protected private email account. The participants were encouraged to email the primary researcher to set up an appointment for analysis or clarification. Participants were given ample time (7-10 days) to review the analysis and provide written or verbal feedback to the primary researcher if modifications needed to be made. Upon receiving feedback from the participant, if needed, modifications were made to the original data analysis to ensure the results of the interview matched the thoughts and intentions of the participant.

The third method for validating the research used was qualitative reliability. Transcripts were reviewed to ensure no mistakes had occurred.¹⁴ When coding was conducted, codes did not have multiple means, rather one definition was utilized for the analysis.¹⁴ Communication between the primary investigator and the two thesis committee members was continuous, meetings occurred regularly via Zoom.¹⁴ Intercoder agreement took place when the primary investigator's coding was cross-checked by the two thesis committee members.¹⁴ This agreement can take place if two or more coders agree on codes being used in text. The passage is not coded by both simultaneously, rather both coders concluded that if another coder was utilized, that coder would code the same, or similar to their coding.¹⁴ Interviews were scheduled until saturation was reached. Saturation is reached when no new information is being brought forward by the participants.¹⁴

RESULTS

The study consisted of 20 participants with various years of career experience as dental hygienists. Of these participants, 95% (n=19) were female, 55% (n= 11) have been dental hygienists for 20+ years. Participants had been using teledentistry for at least six months, of which 60% (n=12) had been using prior to the COVID-19 pandemic, and 90% (n=18) are currently using teledentistry in the primary place of practice. Participants were from 10 states from the west and central regions of the United States. Demographic information is summarized in Table 1

Participants were asked if they had used teledentistry technology for at least six months before advancing to the questions addressing if teledentistry technology was used prior to the pandemic or during the pandemic. During the interview, participants were asked what benefits teledentistry provided along with obstacles they encountered. Some major benefits expressed were practicing dental hygiene at the top of their scope, providing care to patients without waiting for an exam, and collaboration with other providers to ensure patients were receiving all necessary care. Other benefits included patients in non-traditional settings seeing a provider on site. Obstacles encountered included lack of internet access, legislative issues, and platform malfunctions. Other obstacles included patients not knowing how to navigate teledentistry platforms.

Three major themes along with subthemes were identified regarding teledentistry use (see Figure 1). Participant quotes supporting the themes are shown in Table II.

Theme 1. Innovative Approach

Dental Hygienists participating in this study discussed a variety of innovative approaches such as utilizing technology for teledentistry exams, assessment, triage screenings, virtual patient education, and in medical settings. One participant stated, “Now we have the technology where the dentist can be in my computer with my appointment and they can see everything, including the patient.” A participant utilizing teledentistry for patient education stated, “We, as hygienists I think, are educators first and so making sure that we're keeping our patients engaged and aware of their oral health, their oral health condition, and ways that they could potentially improve.” Another participant working in a hospital setting stated:

I work in a hospital and so my patients are inpatients and emergency room patients that come in for dental pain and so a lot of those patients aren't regularly seeing a dental practitioner in a dental office, and so I can utilize teledentistry by taking images or X-rays and forwarding them to a teledentist who can view those...make appropriate recommendations and then I can send the patient to a dentist.

Another innovative approach by dental hygienists who were using teledentistry was for oral myofunctional therapy appointments. Assessment procedures and therapy exercises such as swallowing, open and closing the mouth, tongue placement, and breathing techniques were completed during the teledentistry appointment.

Increased access to care emerged as a subtheme due to many of the participants identifying access to care as a major benefit of utilizing teledentistry. One participant stated, "Improving access by connecting people to a dental home. Because we're in a rural area, teledentistry has improved the scope of people that we're able to reach." Another participant expressed a similar statement:

It's reaching people that otherwise are not able to be reached. Pregnant women, uninsured pregnant women, parents with young children, young children, homebound people old and young, those too fearful of going to a dentist, those who don't know how to find a dental clinic.

Access to care for older populations was a topic of discussion especially in areas where there was limited daylight. One participant discussed how patients were traveling over four hours in the dark to receive treatment and then having to travel back another four hours in the dark. "Again, this time of year, especially with our geriatric population, they don't like to drive after it gets dark, so that limits their window of appointment times two."

An additional subtheme of COVID-19 emerged as participants discussed how the pandemic accelerated the utilization and acceptance of teledentistry. One participant stated,

"Oh, it's been a significant impact. The pandemic helped bring teledentistry into the forefront." Another participant stated, "I would say the pandemic is the exclusive reason why we are using teledentistry." Additional participants discussed concerns with meeting oral health needs during the

pandemic and patient acceptance. One participant shared their thoughts, “How could we be available without being in front of the patient and triage at the time? So, I think COVID really played a big involvement in it. I think patients that know more are willing to try it.”

Theme 2. Promoting the Profession

Many participants discussed how teledentistry promotes the dental hygiene profession. One participant expressed, “I think we have reached the level of the max that we can do with it right now. It does help promote hygienists and the hygiene profession to patients.”

One subtheme that emerged related to promoting the profession was autonomy. Autonomy topics included: legislative issues, increased scope of practice, and licensure portability. Participants could see the value of teledentistry but were concerned about the legislative issues surrounding teledentistry use. One participant stated,

I love it. I want to use more of it and the more I use [teledentistry] the more we see how helpful this can be. We don't have the dental board ok to use it. We are trying to stay within the boundaries as much as possible. I've worked really hard trying to gain that technology so we could have access to our dentists without the dentist having to be in the facility, especially for new toothaches [and] emergencies like that would be great. That is something that we must pass with the legislature.

Expanding the dental hygiene practice scope and licensure portability was discussed to increase teledentistry use. A participant discussed the impact of teledentistry if these pathways were available.

As we expand our scope and our licensure portability across states, I think, making this [teledentistry] more nationwide would be huge, because you know some states don't even allow hygienists to be the person triaging, don't even allow the hygienists to be the one doing the work. But, of course, that comes with that licensure portability.

Theme 3. Collaboration in Oral Care

Participants in the research study expressed that in order to provide comprehensive care, outside of dental hygiene utilizing teledentistry, collaboration with other providers must occur. A participant stated,

In Colorado we are able to diagnose perio. I take full mouth radiographs. I do full perio charting. I do ph saliva testing and I look at nitric oxide. I send my patient's saliva off to a lab for PCR testing for DNA. All of this information and doing their extensive medical history review, reviewing systems, taking into consideration the patients overall health as a related to what I'm finding in their mouth and being able to relay that information to the appropriate providers that would be able to help them.

Another participant expressed, "I can utilize this within my scope of practice to be able to make the collaboration and communication between dentists and other providers much easier." Other key quotes supporting this theme are as follows. "I screen for sleep apnea, so I might be referring to an ENT. I might be referring to an airway focused dentist, or orthodontist for expansion of the airway."

Participants were asked in this study what future uses for teledentistry in the profession they envision. Many hygienists suggested that simply being able to use teledentistry more in practice would benefit the profession and patients as this would expand access to care. One participant stated:

I would say I could see a lot more of dental hygiene independent treatment or independent practices, maybe more, since the hygiene therapy has passed. I could see that being used for hygiene therapy, to work with dentists offsite and then agreeing or collaborating with the dentist. Just allowing more treatment, to be done.

DISCUSSION

Dental hygienist who participated in this study demonstrated innovative approaches to utilizing teledentistry and working collaboratively with other health professionals. These innovative approaches not only included using teledentistry in community health setting, private practice, or in mobile units, but also included teledentistry in prisons, Indian health services, myofunctional therapy appointments, and

even in emergency rooms. These innovative approaches identified by participants demonstrated their ability to creatively increase access to care, which was an overarching topic mentioned throughout the interviews. Participants mentioned they are the ones the patient seeks for oral health care and COVID-19 created a greater isolation for those populations who were already unable to access oral health care.

Although dental hygienists have been utilizing teledentistry for numerous years, the pandemic escalated the need to develop creative programs and workforce models in order to provide safe and effective oral health care, especially for vulnerable populations. Throughout the pandemic, existing use of teledentistry gained momentum as a means to increase access to oral health care in a variety of settings including rural public health clinics, school-based programs, assisted living/skilled nursing facilities, pediatric dentistry, for eating disorder evaluation, orthodontics, and health clinics.¹⁵⁻¹⁸

Variability in state practice acts played a key role in the ability for dental hygienist in this study to utilize teledentistry to its full potential. Participants in states with broad scopes of practice such as Colorado, who are able to have independent practices were able to work collaboratively with dental and medical professionals.¹⁹ Arizona dental hygienists with affiliated practice agreements are able provide oral health care as mid-level providers for all preventive services within their scope of practice while also using teledentistry to connect to oral healthcare teams.¹⁹ However, as evidenced in this study practice scopes were also a limiting factor for teledentistry use in states such as Kansas where legislative actions are needed to implement its use.

With the advances in technology and increased favorable attitudes with patients and practitioners since the onset of the pandemic, dental professionals, specifically dental hygienists', ability to utilize teledentistry is a much-needed resource to increase oral health care in the future.^{18,20-22} However, a major barrier to seeing widespread utilization of teledentistry by dental hygienists are current state licensure rules/regulations and limited insurance reimbursement.^{23,24} Research has shown states with broader scopes of practice for dental hygienists have increased oral health outcomes as compared to states who do not allow dental hygienist to work within the full capacity of their education and training.²⁴

Due to the small sample of dental hygienists interviewed, results from this study cannot be generalized to all dental hygienists who use teledentistry. Those who had not used it for at least six months were not represented in this study. This research serves as a reference point for identifying innovative uses of teledentistry by dental hygienists. Further research concerning dental hygienists use of teledentistry in non-traditional settings such as mobile dental clinics, providing care at patient's homes, places of business, or even providing care in parking lots of common shopping areas are needed. In addition, further research on the benefits of teledentistry/telehealth utilization for interprofessional teams is an area warranting investigation.

CONCLUSION

This study provided insight on how dental hygienists are using or have used teledentistry to provide patients with oral care within their scope of practice. Dental hygienist are licensed professionals who are utilizing teledentistry innovatively in diverse settings. Teledentistry is an effective instrument, which can be operated to increase access to oral health care. Participants expressed the benefits of teledentistry use in our profession. The need to expand the scope of dental hygiene practice, so that teledentistry technology can be used in order to provide oral care to those most vulnerable is important. State rules/regulations create a barrier for dental hygienists in many states to fully utilize teledentistry to address the oral health concerns of underserved populations. Allowing dental hygienist to perform to their full scope of practice in all states has the potential to not only increase access to oral health care, but also allows collaborative care between dental and medical professionals to improve overall health.

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Table 1. Participant Demographics

Characteristic	N=20 (%)
Gender	
Female	19
Male	1
Age	
30-39	3
40-49	6
50-59	4
60+	4
Did not disclose	3
Years as a Dental Hygienist	
0-9	1
10-19	8
20-29	5
30+	4
Did not disclose	2

Location of Participant	
Colorado	11
Washington	2
Idaho	1
California	1
Kansas	1
South Dakota	1
Nebraska	1
Missouri	1
Utah	1
Oregon	1
Populations Primarily Served	
Children	3
Pregnant women	2
Older Adults	6
General Population	6
Other	4

Degree Earn upon Graduation of entry level DH	
Associates Degree	9
Bachelor's Degree	11
Master's Degree	0
Highest Level of Education	
Associate degree	4
Bachelor's Degree	11
Master's Degree	5
Doctoral Degree	1
Professional Role(s) and Place(s) of Employment	
Clinician	10
Public Health	11
Educator	9
Administrator	III
Corporate	
Entrepreneur	
Other	I

Primary Practice Setting	
School	8
Private Dental Practice	1
Prison	1
Community Health Setting	6
Indian Health Services	1
Dental Hygiene Owned Practice	3
Provider currently using Teledentistry in Primary Practice Setting	
Yes	18
No	2
Provider used Teledentistry Prior to Pandemic	
Yes	12
No	8
Community(ies) currently being served with Teledentistry	
Rural (a population fewer than 2500)	3
Urbanized Area (a population of 50,000 or more)	9

Urbanized Cluster (a population of at least 2,500 people but fewer than 50,000 people)	8
Unknown	1
Practicing in a Dental Health Professional Shortage Area	
Yes	11
No	8

Table II. Interview Guide with selected responses

Interview Question	Selected Response
What is the major goal you are trying to accomplish incorporating teledentistry in your practice setting?	<p>We are trying to improve oral health status so the oral systemic connection. Basically, educating patients. So in between times where they're able to visit for their, let's say their regular maintenance or their hygiene visits, we're able to touch base with them. And give them oral hygiene instructions, but also, oral health promotion strategies. Whether that's... I'm talking to a pregnant patient about their risks for periodontal issues or you know someone with diabetes and encouraging them to making sure, that they're taking care of their diabetic condition as long as well as their oral health.</p> <p>The main thing that we use it for is screening purposes, kind of like a triage scenario. So, we utilize teledental platforms to pre-screen individuals, and then help navigate them to dental homes based on their needs. So, assess and refer essentially.</p>
How are you using the dental hygiene process of care as part of teledentistry?	My population is largely... has a low dental IQ just because their access to care has been limited. So, my biggest pleasure is to be able not only to provide them my traditional dental hygiene

	<p>services, but to talk to them and educate them on their habits and their...what they do when they're not with us that affects their dental health</p> <p>So, motivational interviewing is a big thing. You know, visual screenings that are within our scope of practice. Preliminary, you know, using the words; suspected, probable, or caries, things like that. Soft tissue evaluation just preliminarily, and then hygiene instruction, and then referral process</p>
<p>How has the pandemic influenced your use of teledentistry? Have you noticed a difference between the way you used teledentistry pre-pandemic versus throughout the pandemic?</p>	<p>I would say the pandemic is the exclusive reason why we are using teledentistry. So, prior to the pandemic we just weren't using it at all. And now that the pandemic has kind of come and gone, we've seen that it can be used to reach patients for whatever reason, we need to reach them</p> <p>Pre-pandemic we were doing the same thing, I was seeing toothaches, and doing the same thing right now. After pandemic...during COVID, a lot of dental people left this career. Don't know why we're struggling through it right now and it is very difficult to get in to see a dentist in a community health setting. We cannot find employees – DDS, RDH, DA's, patient services etc post COVID. All of us in safety net clinics are packed! We are trying to get the ECP, RDH away from this very busy clinic. We are trying to triage people in the field. It gives us a priority on some patients and allowing others to sit back and wait a minute. And even in nursing homes when it's COVID in nursing homes, they love me because I come in protected and I go to their bedside and I help them. We have seen so many dental health issues in nursing homes right. There is toothaches, and yet they're very scared of outsiders coming in during COVID. I come in with the medical staff, and I'm trusted, and I'm protected. A DDS can stay in the clinic. Let the ECP, RDH run in front of them.</p>
<p>What are the major benefits of teledentistry in your practice setting?</p>	<p>I could see the major benefits being immediate. Immediate diagnosis or not immediate, but within 10-8 hours you have a guideline on that. Of an urgent problem where you would need antibiotics, or you would need an immediate referral. Right now, if the dentist is not there and I'm practicing that day because I do all our intakes and all our emergencies, when she's not there. I have to rely on</p>

	<p>the pediatricians to feel that option because I'm not able to get an image out to the dentist.</p> <p>I think just the ability to connect with patients and to let them know that we're available and maybe even humanize us, a little bit in terms of we really care about their oral health, their oral health status. So, it allows us to, rather than always doing the technical side of dentistry where they're actually talking to patients, and sometimes our conversations will veer into other areas of life that aren't oral health related, and we can really make a difference in those ways too.</p>
What obstacles or limitations have you encountered with using teledentistry?	<p>Technology doesn't always work, so it really depends on the patient's internet connection, their speed, so frequently we would lose audio or video. Or the patients just weren't able to navigate through the zoom link and so you know meetings were delayed or couldn't happen, and so technology was probably the biggest piece that was a struggle for us.</p> <p>. Billing is one. Medicaid covers it to a point but they're still hesitant to cover the independent hygienists, they will cover the costs of a dentist though or if a hygienist is directly supervised by a dentist. And they're the only ones to my knowledge. Hopefully, that's changing</p>
What changes would make the teledentistry in your practice setting better?	<p>Definitely we used Zoom, which is HIPAA compliant, but I feel like a dedicated platform, like a software platform for TELEDENTISTRY would be extremely helpful because then you could e-mail a patient a link, or you know, just an e-mail with a button that starts the meeting where they don't have to kind of navigate through zoom.</p> <p>Get legislature to make it OK that we can use it. Right now, I was asked just a couple of days ago. A dentist in one of our clinics called in sick. The clinic had to reschedule all the new patients. The patients of record were far and few.</p>
What future uses for teledentistry in our profession do you envision?	<p>I think probably at some point they'll figure out some way for patients to be able to stick something in, and, you know, take a picture of the distal of 15. Or you know, take an X-ray from home or whatnot</p>

	<p>so I think those types of advancements and technology, will be the biggie, and then you can have conversations before they even step in the door about what they're looking for, and what type of treatment they're after.</p> <p>I would love it if we would have just a practice that was just if we could do just strictly hygiene, and have that tele dentistry available which in a way, I kind of do when I'm in one office. But that will change. There will be a doctor there, but I would just love it if hygienists could independently do their collaborative agreement with the doctor and have a have tele dentistry as part of their practice their own private.</p>
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