Interprofessional Collaboration for Oral Health Education and Screening of Children with Special Health Care Needs

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Interprofessional Collaboration for Oral Health Education and Screening of Children with Special Health Care Needs

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B.D.S, Cairo University in Egypt, 2008

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Interprofessional Collaboration for Oral Health Education and Screening of Children with Special Health Care Needs

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University of Connecticut
2020
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2020
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**Introduction and Background**

**Oral Health Disparities**

It has been well established that oral health is an integral part of the child’s general health.\(^1\) As per the National Health and Nutrition Examination Survey (NHANES) period 2015-2016, the prevalence of total and untreated dental caries among children and youth aged 2-19 years was 45.8% and 13.0% respectively. The dental caries experience amongst children aged 2-8 is approximately 37%.\(^2\) Prevalence varies within the same age groups across different races, socioeconomic status, physical status, dietary patterns, and oral hygiene practices. Early Childhood Caries (ECC) is a term referred to the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth in any child under six years old. The consequences of ECC across this age group population worldwide has been correlated to higher risk of hospitalization and emergency room visits, increased treatment costs, loss of school days and thus increased overall health care burden.\(^3\) To date, multiple barriers to oral health care that still exist have been identified and described in the literature. Access to oral health care has been deemed the greatest unmet oral health need in the U.S leading to poor oral health outcomes.\(^4\) Some of the general barriers to care include the isolation and separation of oral health services from other health services, the cost of dental care and lack of dental coverage, low insurance reimbursements and the lack of oral health literacy.\(^4\) Oral health disparities are the largest amongst vulnerable communities and populations such as families living in low socio-economic standards, members of some racial/ethnic groups, elderly groups, and children with special health care needs (CSHCN).
Children with Special Health Care Needs

Children with special health care needs have been described as “children at increased risk for chronic physical, developmental, behavioral, or emotional condition and those who require health related services of a type or amount beyond that required by children generally”. CSHCN present with increased challenges and demand for community-based services across all aspects of life including health, education, employment, and accommodations compared to other children. In 2016, the National Survey of Children’s Health conducted by the U.S. Department HRSA MCHB identified 18.8% of children aged 0-17 years old with Special Health Care Needs (SHCN). Of these children, 83.4% are not receiving adequate healthcare.

With regard to oral health, multiple reports throughout the literature have established that CSHCN are at higher risk for oral and dental disease, and face more obstacles to obtain dental care compared with children of the general population. They are among the population groups in the U.S. who are not well served in the oral health care system, and thus they may be at an increased risk for oral health problems that can immensely affect their quality of life.

Multiple policies and programs have been established to facilitate access to health services to CSHCN, however, to date, CSHCN have higher unhealth met needs compared to the general population with dental care being the most common category of unmet healthcare services. A study that examined data obtained from the National Survey of Children with Special Health Care needs described that 78% of CSHCN needed dental care within the previous 12 months of the survey. Of those reporting dental care needs, 10.5% did not receive the dental care they needed. In the same report, caregivers reported that dental services were the second-most needed health care service and the most unmet health care need for their special need children. A study conducted by Sarkar et al. 2017, concluded that CSHCN enrolled in
Medicaid experience even more significant disparities in access to care in comparison with those with private insurance. Some of the disparities assessed in the study included health care coordination needs, health care utilization, health outcomes, mental/educational health care services, unmet dental needs, and emergency department utilization. Overall, this research found that these children had worse oral health and vision health.13

Barriers to Oral Health Care for CSHCN

Multiple obstacles have been described in the literature that may act as barriers to oral health access and care for CSHCN. Some of these patient barriers are systematic or situational such as medical conditions (physical, psychological, organic and communication problems), mobility concerns, accessibility related to transportation or lack of providers within a reasonable geographic boundary, psychosocial factors, financial constraints and communication limitations. Functional, physical, and mental impairments as well as sensory and motor disintegration and other significant physical limitations experienced by these children can lead to the inability to tolerate daily activities of living as self-hygiene care including oral hygiene care, self-feeding, self-grooming, etc. In a study conducted by Duker et al. 2017, parents of children with autism spectrum disorder reported sensory processing and uncooperative behavior to be among the leading obstacles to oral health services utilization that lead to difficulties in access to care.14 Provider based barriers and barriers perceived by providers are more specific to the practice of dentistry. The literature results display trends that agree on a number of common barriers that can interfere with access to care. Dentist willingness to treat CSHCN, time constrains, lack of education and training, lack of interprofessional education and collaboration and decreased monetary reimbursements are all amongst such barriers.15,16,17,18,19
Casamassimo, Seale, and Ruehs 2001, analyzed a national survey completed by dentists to determine issues of access to care for CSHCN. Some of the barriers analyzed included perception of training, willingness to treat CSHCN as well as the factors contributing to their willingness (i.e. patient behavior, level of disability, level of disease, level of training, and availability of funds). This research concluded that one of the most important factors in regard to dentist’s willingness to treat CSHCN was training during dental school. Regarding barriers perceived by caregivers of CSHCN, dentist willingness to treat CSHCN, lack of providers, lack of continuity of care, lack of sufficient training to deal with the CSHCN, impaired quality of care delivered, transportation and accessibility, caregiver burden were among the most prominent ones described in the literature. Caregiver burden was defined by National Survey of CSHCN as the impact of a child’s health conditions on a caregiver’s work, time spent on health management, and finances related to a child’s conditions. Chi and McMaunus 2014, examined the role that caregiver burden has on its relationship with preventative dental care utilization for CSHCN with or without functional limitations. They found that increased caregiver burden is negatively associated with preventive dental care use which suggests that reduction in caregiver burden would improve oral health outcomes.

*American Academy of Pediatric Dentistry (AAPD) Guidelines Pertaining to CSHCN*

Current caries risk tools place CSHCN automatically at moderate caries risk category, granted other social/biological factors and/or clinical findings are accounted for. Accordingly, if a child is identified to be at moderate caries risk, the AAPD guidelines recommend recall appointments and professional application of fluoride every six months. If a child is identified to be at high caries risk, the guidelines recommend three months recall and professional application
of fluoride every 3 months. While recommendations and anticipatory guidance are determined based on caries risk, there are no set of guidelines established for CSHCN as a subgroup on their own. Since each child with special needs faces unique challenges, it is almost impossible to come up with a fixed set of guidelines to address risk, recommendations and anticipatory guidance in an individualized manner.

History of the Oral Health Care Delivery Systems Related to SHCN

Individuals with special health care needs (ISHCN) were institutionalized during the late 19th century up until almost the mid-20th century. Within these facilities, preventive dentistry programs existed and access to oral health care was readily available. The shift towards deinstitutionalization of these individuals into community-based settings in combination with the lack of dental providers trained to serve individuals with SHCN resulted in a struggle of the oral health care delivery system meet this population’s needs. With the rise of the Progressive Era in the early 20th century, under the leadership of Theodore Roosevelt, the “New Deal” was created, where the federal government role expanded into providing widespread services. In 1935, The Social Security Act (SSA) came about to provide support for low income children and their families. The SSA played a role in creating Title V, the Maternal and Child Health Services Block Grant that provides federal funds for states across the U.S focused on child health and development. Title V included funding services to address issues related to access to quality care for low income families, pregnancy related care, preventative services, and services for children with physical disabilities. Most importantly, Title V aided in the development family-centered and community-based systems of coordinated care for CSHCN. Today, Title V along with Part C of IDEA (Individuals with Disability Education Act, created in the year 1990) are programs
that support and fund statewide implementation of early intervention programs for CSHCN starting birth until the age of three years.\textsuperscript{25} The IDEA has multiple purposes including “Assisting states in the implementation of a statewide, comprehensive, coordinated, multidisciplinary, interagency system for early intervention services for infants and toddlers with disabilities and their families”.\textsuperscript{26} The aims of birth to three services are to improve the development of infants and toddlers with disabilities, minimize potential delay, and reduce educational costs by minimizing the need for special education services as these children reach school age. Upon screening and eligibility, these children are provided early intervention services within a family centered primary service provider (PSP) approach on regular basis (weekly, bi-weekly, etc.) starting birth to three years old.\textsuperscript{27} Connecticut Birth to Three is the lead federal agency in Connecticut that coordinates the implementation of Part C. The goal is to provide resources to assist caregivers and families to enhance children’s learning and development through everyday learning opportunities.

Early intervention providers deliver developmental services such as occupational therapy, speech and language pathology (SLP), applied behavior analysis (ABA) therapy, physical therapy (PT), etc. These early intervention providers establish intensive and continuous interactions with children enrolled in such programs in an individualized manner starting from the very early critical stages of life when the foundations of learning, behavior and health are most flexible to help them develop skills as physical, sensory, communication, cognitive, social, emotional, adaptive, and self-help skills. Evidence show that early intervention services can change the child’s developmental trajectory and improve health outcomes for children, families, and communities. Such services impact both children and their families and it has been found that such interventions are more effective and cost efficient when provided earlier in life.\textsuperscript{28} The
national Early Intervention Longitudinal Study (NEILS) reported findings that 71%-76% of children receiving early intervention services demonstrated improvement across performance areas of selfcare as feeding, dressing, social relationships, reasoning and problem solving.\textsuperscript{29} Despite these programs, CSHCN in the U.S. still face complicated challenges that act to negatively impact their well-being.

\textit{Interprofessional Collaborative Practice}

At the dawn of the 21st century, the Institute of Medicine (IOM) highlighted the importance of interprofessional collaborative practice (IPCP) in the medical field.\textsuperscript{30,31} In a report by the World Health Organization, Interprofessional education was defined as “when two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes”. Interprofessional collaboration was described as the following “Collaborative practice in health care occurs when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, and communities to deliver the highest quality of care across settings”.\textsuperscript{32} Despite earlier proposals by the IOM for closer integration between dentistry and medicine through research, education, and patient care, the dental field remained isolated from the medical field.\textsuperscript{33} The importance of creating models and systems for the delivery of preventative oral health services
became inevitable as concerns for increased caries prevalence and disparities in access emerged. Throughout the first decade of the 21st century, efforts for IPCP led to improved health care systems and health outcomes.\textsuperscript{34,35} In 2008, an environmental scan study was performed by the WHO on the global status of interprofessional education and collaborative practices across the world. This study demonstrated that interprofessional education takes place in many different countries and health care settings including allied health, medicine, midwifery, nursing and social school. It is notable that oral health care providers were not reflected in this study.\textsuperscript{35} Some established efforts for interprofessional education and collaboration are demonstrated in the fight against communicable diseases such as HIV/AIDS, malaria, and tuberculosis as well as non-communicable chronic diseases such as cancer, dementia, malnutrition, asthma, mental health, and health action in cases of humanitarian crisis.\textsuperscript{35} Health policy makers and multiple organizations as the WHO, HHS, CDC, NIH, HRSA, ADA, ADEA, AAP, AAPD are a few amongst several organizations that emphasize recommendations for inter-professional and collaborative practices (IPCP) between the dental field, medical field, and other frameworks involved in improving the well-being of all humans. This shift toward a more wholesome and holistic approach to health care is one major component of improved health outcomes in the U.S. population.

Within the field of dentistry, the goals of inter-professional and collaborative practices include, but are not limited to, increasing knowledge that correlates oral and general health, increasing oral health education, and improved access to care for the management of acute and chronic oral conditions.\textsuperscript{19} Reports indicate that children are significantly more likely to have been seen by a primary care physician versus a dental provider within the first year of life. The CDC reports that 95% of children aged 0-4 years are seen by a medical provider, versus reports
that only 25% of children under 6 years old are seen by a dentist.\textsuperscript{36,37} For that reason, the AAP and the AAPD issued recommendations that primary health care professionals become involved in the preventive oral health framework. This includes performing periodic caries risk assessments and providing anticipatory guidance to parents about oral health including oral hygiene, diet and fluoride exposure.\textsuperscript{38,39} Today, prominent efforts exist in the U.S. within the pediatric medical and dental communities to address barriers and increase access to dental care. Stakeholders sought inter-collaborative educational and clinical opportunities to integrate oral health education, screening, and administration of preventative measures (such as topical fluoride varnish application) to address root causes of barriers and lack of access to oral health care for these patients. Various researchers have reported that interprofessional collaborative practice studies aiming to improve knowledge, confidence, and practice for primary healthcare providers—as pediatricians, family nurse practitioners and several specialized care providers—are associated with improved oral health outcomes.\textsuperscript{40,41,42,43,44}

One key example of an inter-professional project involving pediatric dental and medical providers was “Chemo Without Caries” which was conducted at the Hassenfeld Children’s Hospital of New York University. The objective was to integrate preventive oral health services (POHS) into pediatric oncology care. The project was administered through an educational oral health program prepared by the American Academy of Pediatrics (AAP) along with pre and post training surveys. Through this project, 53 pediatric oncology patients received preventive oral health services. As a result of this project, an institutional policy was established to provide preventive oral health services for oncology patients as a gold standard of their care, which has led to improving health outcomes for their patients.\textsuperscript{44}
Another example of an inter-professional project conducted by Atchison et al. was an environmental scan study of US integration and inter-professional publications from January 2000 to August 2017. They identified four case studies as program models for providing preventive oral health services. The first case study is the “Into the Mouth of Babes”, a statewide Medicaid program in North Carolina which represents the model of preventive oral health services provided by medical care providers in their medical setting. In this model, primary care physicians are trained through a continuing medical education course. Participants receive education on screening children for oral problems, guidelines for referral to a dentist, parental counseling on the care of the children’s oral health, and procedures for applying fluoride varnish to children teeth during a medical office visit. The goals of this program were to increase access to preventive oral health services for low-income children up to 3 ½ years of age, reduce the prevalence of ECC, and increase health care delivery system capacity to serve young children. The research concluded that this model has been successful through the past 20 years in reducing inequities in access to preventive oral health services and improving oral health. The second case study is the” Michigan Grace Health” which represents the model of preventive oral health services provided by dental personnel in non-traditional settings. In this program, dental hygienists completed a special certification, then they were invited to provide preventive oral health services for pregnant women in the medical clinic setting for pre and post-natal screening, prophylaxis, education, and infant oral health education. The third case study was “Health Partners”, a well-established care organization in Minnesota. In this model, preventative general health services are provided by dentists. Their model involves multidisciplinary teams including dentists for oral cancer, diabetes, dental caries, blood pressure diseases. This program acknowledged the important role that dentists have in identifying preventative care gaps. The
fourth case study was the “Intercommunity Health Network Coordinated Care Organization”. This model aims to help facilitate interprofessional consultation, referral and care coordination across different health care settings, including dentistry. Hallas.D and Shelley.D 2009 discussed the role that pediatric nurse practitioners (PNP) have within a framework of family-centered health care promotion. They describe that this model places the PNP specialty in a well-suited position for the implementation of preventive oral health education and screening services. This study highlighted the need for establishing standardized evidence-based inter-professional training programs between oral health and PNP disciplines. Another study conducted by Herendon et al. 2010 suggested that oral health training plays an essential role in promoting the confidence of medical physicians which in turn promotes recommended practices. An Example of an existing interprofessional collaborative program in a postgraduate advanced pediatric dentistry training setting is the Strategic Planning for Interprofessional Collaborative Education in Pediatric Dentistry or SPICE-PD. This program consists of nine different evidence-based CODA accredited modules that supplement the existing pediatric dentistry residency curriculum to train pediatric dental residents to provide care for the underserved and special needs groups and communities.

Physicians and nurses are not the only disciplines involved in inter-professional oral health promotion. Martin et al. 2018 explored the potential for building a pediatric oral health training curriculum for community health workers, which they described as one potential approach for improving access and delivery of health services. One pilot study—that explored the role of dental hygienists in improving oral health of CSHCN served by a feeding team—called for the need for further research required to create models for multidisciplinary interactions between these two disciplines.
Gaps in Current Literature

In pursuit of working along the vision and goals laid out by the HHS (U.S. Department of Health and Human Services) Strategic Framework 2014-2017, the Surgeon General report 2000, the NIH, CDC, ADA, AAPD, AAP, and multiple other agencies on the federal, government, public, and private sectors, this research project seeks to explore one area where the current literature is scarce. As previously stated, within the practice of pediatric dentistry, oral health services are provided to children ages grouped 0-18 including CSHCN. Within the context of a dental home, these children are more likely to receive preventative and routine dental care. Advanced training programs in pediatric dentistry involve both non-pharmaceutical and pharmaceutical behavior management techniques required for optimal delivery of care for this population. Behavior guidance techniques for this population may be incredibly challenging; however, most patients with physical and mental disabilities can be managed in the dental office setting. When non-pharmaceutical techniques are not adequate, pharmaceutical management in the form of sedation or general anesthesia is the behavioral guidance armamentarium of choice. Advanced training programs within the dental education setting is limited when it comes to addressing specific and tailored day-to-day challenges of CSHCN (e.g. physical motor abilities, sensory disintegration and mental disabilities) facing caregivers when it comes to oral hygiene practices which, as a result, increases the burden for care. Caregivers should provide the appropriate home oral care when the patient is unable to perform it adequately and independently. The education of caregivers is critical for ensuring appropriate and regular supervision of daily oral hygiene and health measures such as brushing twice daily with fluoridated dentifrices, desensitization strategies for toothpaste taste and texture sensory issues, and utilizing fluoride mouth rinse. Electric toothbrushes and floss holders can help
improve compliance. Early intervention professionals whose training and goals complement those of dental providers may have a role in early childhood caries prevention. Ideally, a team of dental professionals in collaboration with early intervention inter-professional providers should develop an individualized oral hygiene program that considers the unique disabilities and barriers of each patient.

It is the responsibility of healthcare providers to continuously seek and pursue opportunities to advocate in the best interest of patients’ well-being. This current research project seeks to address an existing gap regarding home preventive oral health care services for CSHCN. This gap can create unique inter-professional education and collaboration opportunities between oral health and early intervention providers, especially at such critical stages of development. Such an opportunity would ultimately lead to improving the overall health outcome that the US strives so hard to achieve. Review of the literature reveals that there are no previous studies that highlight efforts to coordinate interdisciplinary communications between those disciplines to address this gap.
**Objectives**

The objectives of the study are to address the gap regarding preventive oral health services for children with special health care needs ages zero through three years old and improve access to oral health care for children with special needs through interprofessional education and collaboration. Our goal is to improve the oral health delivery system that would in return help improve the overall health outcomes of the nation.

**Aims of Study**

The aims of this project are as follows

1) Assess the oral health knowledge of early intervention providers.
2) Assess providers current oral health practice.
3) Assess provider-based barriers to providing oral health screening and education.
4) Assess perceived caregiver barriers to care.
5) Identify early intervention discipline groups that are most relevant to perform preventive oral health services

**Hypothesis**

The hypothesis states that there are no significant differences amongst early intervention therapy disciplines in relation to oral health knowledge, current practices, and barriers to oral health care.

There are existing barriers for early intervention care providers enrolled in the Birth to Three programs that would prevent them from providing oral health care education, screening, and referrals of CSHCN.
**Materials and Methods**

**IRB Approvals**

This research study was approved by the University of Connecticut Health Center Institutional Review Board # 20X-012-2 Exemption Category 2 on August 5, 2019 and by The Office of Early Childhood Institutional Review Board # 2019-10-02 on November 8, 2019.

**Supporting Institutions**

University of Connecticut

Office of Early Childhood

Connecticut Birth to Three Agency

**Study Design**

**Comparative and Descriptive Study**

Data was collected through a quantitative and qualitative survey administered electronically and paper format consisting of multiple-choice questions. This survey is a modified version of the American Academy of Pediatrics Survey of Fellows #70 on pediatricians’ practices regarding oral health assessment and counseling.\(^5^3\)

*Aim 1: Determine pre-existing oral health knowledge of early intervention care providers enrolled in the birth to three programs in Connecticut regarding oral health.* The first aim of this study is to circulate the survey to groups of early intervention providers enrolled in programs that are affiliated with the lead agency in Connecticut Birth to Three. A descriptive analysis of this survey will help determine baseline oral health knowledge, oral health education, incorporation of dental counseling and screening in their practice.
Aim 2: Identify and assess current practices and barriers that early care providers have in providing oral health screening and education as well as barriers that early care providers perceive parents of CSHCN may have that decreases access to care. The second aim of this study is a continuation of the survey based on the American Academy of Pediatrics Survey of Fellows #70. A descriptive analysis will seek to assess current oral health practices and also the barriers that early intervention providers themselves face in providing oral health counseling related to their therapy sessions with CSHCN. The survey also seeks to assess early intervention providers’ perception of parental barriers to oral health care.

Aim 3: Identify specific early intervention disciplines that are most relevant to perform individualized oral health screening, education and for inter-professional collaboration with oral care providers. A comparative analysis of data collected from different early intervention disciplines will help determine whether certain disciplines are more relevant than others to perform oral screening, oral health education, behavior shaping, desensitization and modification. The aim of this objective is to possibly help focus future efforts and allocate resources with the highest impact of such goals.

Aim 4: Development of an educational training module. Data results were utilized to tailor an educational training module for early intervention providers that would enable them to educate their clients and introduce concepts of initial screening for oral health problems. The educational module was completed in a power point presentation form. This module is based on the Smiles for Life National Educational Curriculum readily available online free of charge. This curriculum includes components for oral health education such as the nature and etiology of dental caries, recommendations and anticipatory guidance related to oral hygiene practices, screening tools, referral and counseling information.
**Sample Size Calculation**

**Sample Size**

Sample size was obtained through correspondence with the Office of Early Childhood Birth to Three agency. We hypothesize that at least two disciplines have unequal mean knowledge scores. The mean knowledge score of each discipline is specified as follows, with a common standard deviation of 1.5. Given the population size of each discipline, a 10% response rate across disciplines will give us 96.5% power to detect any between-group difference by one-way ANOVA at the 5% significance level. The power analysis was performed in G*Power.

<table>
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<th>BCABA/LBA</th>
<th>PT/PTA</th>
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**Subject Characteristics**

- Age: 18-65 years old
- Ethnicity: Any Ethnicity
- Gender: Male, Female, Other
**Inclusion Criteria**

Men and women age 18-65 years of any race/ethnicity with the ability to speak, read, write, and understand English. These participants will be early intervention health care providers in the fields of occupational therapy, physical therapy, applied behavioral therapy, and speech and language pathology employed through Connecticut Birth to Three program.

**Exclusion Criteria**

Men and women age <18 and >65 years, those unable to speak, read, write, and understand English.

**Survey Components**

The survey was prepared as a modified version of the validated AAP Survey of Fellows #70. Major components of the survey were utilized. Some questions were modified, and other questions were customized specifically for the targeted audience. An electronic or paper form of the survey includes a cover letter, a sociodemographic information, an oral health knowledge questions, current practices, perceived barriers to care, current barriers to care and attitudes questions sections.

**Survey Distribution and Data Collection**

Subjects were asked to complete an online or written survey that should take approximately 10 minutes to complete. At the end of the survey, participants were asked if they would be interested in receiving educational modules about oral health screening. Email Survey were made
available through January 31, 2020. Meeting distributed surveys were available depending on meeting days only.

*Electronic Survey*

In collaboration with Connecticut Birth to Three program, the electronic form of the study survey was created and distributed via a survey monkey link to an email list of early intervention program directors within the Birth to Three OEC. Program directors were emailed the invitation emails and they were asked to distribute the links to providers/therapists employed by their program. Four reminder emails were sent periodically.

*Paper Survey*

Paper forms of the survey were disseminated to early intervention providers via program directors at their own leisure. Programs then mailed back completed paper survey to the specified professional address of correspondence. Responses were then manually entered into survey monkey by the researchers.

*Recruitment*

Eligible participants were given either an electronic survey or paper survey to be read and completed at their leisure. Eligible participants interested in the study were presented with two options: Option 1- Study Participation: men and women will have the opportunity to complete the 10-minute survey administered through paper or electronic format. Option 2- Decline to Participate: Study participation is voluntary, and participants will have the option to decline.
**Privacy of Subjects and Consent Process**

Anonymous surveys will be distributed via email address or paper. Participants are free to complete the survey electronically on their personal computers or via written form at their own leisure. Implied consent by returning written or electronic surveys.

**Confidentiality of Data**

Electronic survey answers are sent to a link at SurveyMonkey.com where data is stored in a password protected format. SurveyMonkey does not collect identifying information such as your name, email address, or IP address, therefore responses will remain anonymous. No one would be able to identify study participants or their answers and no one would know whether subjects participated in the study. Information obtained electronically from SurveyMonkey was collected, stored, and analyzed on University of Connecticut encrypted computers. Paper surveys were distributed and collected in a sealed envelope with no identifying date, raw data will be recorded on encrypted computers and paper surveys will be destroyed. Only the investigators had access to the electronic and paper surveys and the data remained in the clinic, locked in secure cabinets at all times.

**Methods of Data Analysis**

Each of the 12 knowledge questions was scored 1 (correct) or 0 (incorrect). Questions to assess practice frequencies and barriers were scored from the least to the most, starting from 1 with an increment of 1. The correction rate or sectional mean score was calculated. “Not applicable” responses were not scored and excluded from analyses. Categorical variables were summarized by specialty groups and overall using frequencies and percentages and were
compared between specialty groups using Fisher’s exact tests. Mean and standard deviation were used instead to summarize continuous variables and a two-sided two-sample t-test was applied to test for the between-group difference. All the statistical analyses were performed in R. A $p$-value smaller than 0.05 was considered statistically significant.
Survey

Modified version of the AAP Periodic Survey of fellows #70

Survey Domains

- Oral Health Knowledge
- Oral Health Education
- Current Practice
- Barriers to Care
- Attitude

Demographics

1. What is your gender? Male - Female - Other
2. What is your age? 18-24, 25-34, 35-44, 45-64, 65+
3. What is your specialty? Please mark one of the choices below
   - OT/ COTA
   - PT/PTA
   - SLP/Audiologist
   - LBA/BCABA
   - Teacher/Developmental therapist/ Developmental therapy specialist/ Developmental therapy assistant para
   - Nutritionist
   - Social worker/counselor
4. Have you received any dental education?
   - School
   - Continuing education
   - None of the above

Oral Health Knowledge

Nature of caries process

1. Caries is an infectious disease. (True/ False)
2. Cavity-causing bacteria can be transmitted between mother and child. (True/False)
3. Cavities are caused by
   - Dietary factors only
   - Host/ genetic factors only
   - Bacteria only
   - All the above
4. Children with special health care needs are considered as caries risk as per caries risk assessment tool.
   - Low
   - Moderate
   - High
**Dietary habits**

5. Only bottle-fed children get early childhood dental caries. (True/ False)

6. Going to bed with a bottle has no detrimental effect of caries activity. (True/ False)

7. The frequency of snacking does not affect caries risk but rather just the type of diet. (True/ False)

**Oral hygiene practices**

8. Children should see an oral health provider by the age of
   - 6-12 months
   - 12-24 months
   - After 24 months of age

9. Children 6-24 months should be brushing with
   - No toothbrush necessary, wash cloth is sufficient
   - Toothbrush only
   - Toothbrush and non-fluoride toothpaste
   - Toothbrush and fluoride toothpaste

10. Tooth brushing twice per day should commence
    - When first tooth erupts in the oral cavity
    - By 1 year of age
    - By 2 years of age

**Fluoride**

11. Fluoride is used in dentistry to
    - Act as an antibacterial
    - Promote remineralization of demineralized dental tissues
    - Helps strengthen teeth

12. Which drinking water source has optimal water fluoridation levels?
    - Bottled water
    - Well water
    - City tap water

**Current Practice**

Do you perform, if any, oral health counseling with your clients? Yes (please complete next section 1). No (please skip section 1)

1. How often (for all or most patients) do you perform the following

<table>
<thead>
<tr>
<th>Activity</th>
<th>0%</th>
<th>1-25%</th>
<th>25-50%</th>
<th>51-75%</th>
<th>76-99%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examine and identify a child’s teeth for dental caries and Plaque</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Counsel on going to the dentist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Counsel on the importance of tooth brushing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Counsel on techniques for tooth brushing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Inform clients on oral health effects of surgery food and drinks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Provide aids/tools pertained to the OT/SLP/ABA/PT field to help clients with daily oral hygiene practices specific to each child’s needs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Apply Fluoride Varnish</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
2. What percentage of your clients:

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>1-25%</th>
<th>25-50%</th>
<th>51-75%</th>
<th>76-99%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Express difficulty with oral hygiene practices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Express Functional/ sensory disintegration related to oral hygiene practices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

**Barriers to Care**

1. General Barriers to Care: How much of a barrier have your clients expressed to obtaining care from a dentist are the following: Circle one response for each item.

<table>
<thead>
<tr>
<th></th>
<th>Not applicable</th>
<th>Not at all a barrier</th>
<th>Somewhat a barrier</th>
<th>A moderate barrier</th>
<th>A significant barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of dentists who provide care for CSHCN</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Transportation problems getting to the dentist office</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Parents not perceiving dental visits as necessary for their CSHCN</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Dentist experience/confidence in providing care for CSHCN</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Behavior management difficulties at dental office</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Insurance dental coverage plan</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. During visits with patients with CSHCN, how much of a barrier to providing oral health counseling would each of the following be

<table>
<thead>
<tr>
<th></th>
<th>Not applicable</th>
<th>Not at all a barrier</th>
<th>Somewhat a barrier</th>
<th>A moderate barrier</th>
<th>A significant barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time during visits</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of ability to bill separately for oral health counseling on preventative oral hygiene</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of professional training on oral health care counseling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of communication / interprofessional collaboration between dental home and your discipline</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**Attitude**

1) Do you believe your specialty has a role in promoting oral health for CSHCN
   1- Agree    3- Neutral    4- Disagree

2) How interested would you be in CE courses on pediatric oral health counseling and education
   1- Not interested    2- Slightly interested    3- Moderately interested    4- Very interested
**Results**

**Response Rate**

Out of 722 early intervention providers enrolled with Connecticut Birth to Three early intervention programs, 104 responded back to the survey with a response rate of 14.4%. 74 respondents completed the online survey, while 30 respondents completed the paper survey. Paper survey responses were entered manually into Survey Monkey by a single investigator. All paper surveys were archived. Specialties were grouped together into two main groups based on the nature of service provided. The first group was designated as “Group 1”. The providers in this group address physical needs, and it consists of occupational therapy with its subspecialties, speech therapy/pathology with its subspecialties, physical therapy with its subspecialties, and applied behavior therapy with its subspecialties. The second group was designated as “Group 2”. The providers in this group address educational needs which includes special education teachers, developmental therapists and its subspecialties, and social workers.

**Demographics**

There are multiple disciplines involved in the early intervention care for CSHCN. Connecticut Birth to Three provided us with a breakdown of different specialties displayed below in Diagram 1a. Of the total 104 respondents, the highest number of providers were the teachers and developmental therapy group with 42.16%. Almost all respondents were female (99%) as demonstrated in Diagram 1b. The age ranges of participants revealed: 18-24 years old at 1%, 25-34 years old at 13%, the 35-44 years old at 27%, 45-54 years old at 32%, 55-64 years old at 21%, and 65+ at 6% of the total, this is referenced below in Diagram 1c. The most common age range group was 45-54 years old at 32%. Providers were also asked to identify if they had received any dental education either through schooling, continuing education, or none
of the above and these results are displayed by Diagram 1d. While 89% of the respondents reported not receiving any dental education, 2% received continuing education, and 9% received dental education through their specialty schooling. There was no statistical significance between different early intervention disciplines with regard to prior exposure to dental education. Table 1.0 compiles all demographic information below.

<table>
<thead>
<tr>
<th>Table 1.0 Demographic of Early Intervention providers including Discipline, Gender, Age, Oral Health Education</th>
<th>Overall</th>
<th>LBA/BCACA</th>
<th>OT/COTA</th>
<th>PT/PTA</th>
<th>SLP/Audiologist</th>
<th>Social Worker</th>
<th>Teacher/DTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>100 (99%)</td>
<td>3 (100%)</td>
<td>13 (100%)</td>
<td>20 (100%)</td>
<td>18 (100%)</td>
<td>4 (80%)</td>
<td>42 (100%)</td>
</tr>
<tr>
<td>Male</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (20%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td>1 (8%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>25-34</td>
<td>13 (13%)</td>
<td>0 (0%)</td>
<td>1 (8%)</td>
<td>1 (5%)</td>
<td>4 (22%)</td>
<td>1 (20%)</td>
<td>6 (15%)</td>
</tr>
<tr>
<td>35-44</td>
<td>27 (27%)</td>
<td>2 (67%)</td>
<td>3 (23%)</td>
<td>7 (35%)</td>
<td>7 (39%)</td>
<td>1 (20%)</td>
<td>7 (17%)</td>
</tr>
<tr>
<td>45-54</td>
<td>32 (32%)</td>
<td>1 (33%)</td>
<td>7 (54%)</td>
<td>7 (35%)</td>
<td>4 (22%)</td>
<td>1 (20%)</td>
<td>12 (29%)</td>
</tr>
<tr>
<td>55-64</td>
<td>21 (21%)</td>
<td>0 (0%)</td>
<td>1 (8%)</td>
<td>5 (25%)</td>
<td>2 (11%)</td>
<td>1 (20%)</td>
<td>12 (29%)</td>
</tr>
<tr>
<td>65+</td>
<td>6 (6%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (6%)</td>
<td>1 (20%)</td>
<td>4 (10%)</td>
</tr>
<tr>
<td>Oral Health Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td>2 (2%)</td>
<td>0 (0%)</td>
<td>1 (8%)</td>
<td>0 (0%)</td>
<td>1 (6%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>School</td>
<td>9 (9%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (12%)</td>
<td>1 (20%)</td>
<td>6 (14%)</td>
</tr>
<tr>
<td>None</td>
<td>89 (89%)</td>
<td>3 (100%)</td>
<td>12 (92%)</td>
<td>19 (100%)</td>
<td>14 (82%)</td>
<td>4 (80%)</td>
<td>36 (86%)</td>
</tr>
</tbody>
</table>
Diagrams 1a, 1b, 1c, and 1d.

Demographic Rates for Discipline, Gender, Age, and Oral Health Education Amongst Participating Early Intervention Therapists

Diagram 1a.

Diagram 1b.

Diagram 1c.

Diagram 1d.
Oral Health Knowledge

Providers were presented a series of multiple-choice questions regarding their oral health knowledge. They were asked to choose one answer for each of the 12 questions. Each of the knowledge questions was scored 1 (correct) or 0 (incorrect). For descriptive purposes, researchers considered 60% to be the cut off for adequate knowledge performance. If 60% or above of the overall number of providers scored a question correct, then the respondents were considered to have clinically adequate knowledge about that question, and vice versa.

The first subset of questions in this section related to “nature of the caries process”. Overall, respondents scored the least on “caries is an infectious disease” and “children with special health care needs are considered as____ caries risk as per caries risk assessment tool” with a correct response rate of 51% and 23%, respectively. Group 2 scored significantly better than Group 1 on “caries is an infectious disease” with a \( p-value=0.001 \). There were no significant differences between the response rates of Group 1 and Group 2 for the remainder of the questions related to “nature of the caries process” with \( p-values \) noted in Table 2. The second subset of questions addressed “dietary habits”. Overall, most respondents reported high correct response rates, 99% and 97% respectively for the first 2 questions, with the lowest correct rate of 62% on the question “the frequency of snacking does not affect caries risk but rather the type of diet”. There were no statistically significant differences between both groups on any of the questions in this subset. The third subset of questions pertained to “oral hygiene practices”. The lowest correct response rate was 18% for question “children 6-24 months should be brushing with”. Comparing both groups, Group 2 performed significantly better than Group 1 on the same question “children 6-24 months should be brushing with” with a \( p-value=0.012 \). For question “children should see an oral health provider by the age of”, the correct response rate was 45%
with no significant difference between Group 1 and Group 2. It should be noted that the correct response rate for question “toothbrushing twice per day should commence by age” was 52%, thus all response rates for this section were below the threshold of clinically adequate knowledge with no statistical difference between the two groups.

The last subset of questions is related to “fluoride knowledge”. This section had 2 questions. Respondents performed well on one question “which drinking water source has optimal water fluoridation levels” with a correct response rate of 94%. Alternatively, the correct response rate for question “fluoride is used in dentistry to” was 24%. There was no statistical difference between Group 1 and Group 2 regarding their correct response rate. After excluding the questions that were left blank by some respondents, the mean correction rate for the knowledge questions was 0.61 ± 0.11 overall. Group 1 had a mean correction rate of 0.59 ± 0.12 while Group 2 was 0.64 ± 0.11. Two-sided two-sample t-test performed for the mean correction rates between Group 1 and Group 2 shows statistical significance with a \( p\text{-value}=0.042 \), with Group 2 scoring slightly higher overall compared to Group 1. However, the mean correction rates reveal that this difference is less than one question, which may not be practically significant. Diagrams 2a. displays the overall correct and incorrect rates for “Oral Health Knowledge” questions and Diagram 2b. shows the Group 1 and Group 2 correct response rates for each knowledge question.

**Attitudes and Interest in Additional Education**

At the end of the survey, we asked providers whether they believe their specialty has a role in promoting oral health for CSHCN. 69% agree, 30% were neutral, and 1% disagree. We also asked them whether they would be interested in CE courses on pediatric oral health counseling and education. 59% replied that they are either very interested or moderately
interested while 41% replied showing slight or no interest. Diagrams 1e. and 1f. displays current and future attitudes toward oral health promotion.

**Diagrams 1e. and 1f. Current and Future Attitudes Toward Oral Health Promotion**

**How interested would you be in CE courses or pediatric oral health counseling and education?**

- Not interested: 20%
- Slightly interested: 39%
- Moderately interested: 8%
- Very interested: 34%

Diagram 1e.

**Do you believe your specialty has a role in promoting oral health for children with special health care needs?**

- Agree: 69%
- Disagree: 1%
- Neutral: 30%

Diagram 1f.
Table 2.0 Shows Knowledge Questions Response Rates and Attitudes. Correct responses are scored 1, Incorrect responses are scored 0. Two-sided two-sample t-test was applied to test for the between-group difference. Mean correction rates were calculated. A *p*-value smaller than 0.05 is considered statistically significant.

<table>
<thead>
<tr>
<th>Oral Health Knowledge</th>
<th>Overall n</th>
<th>Overall %</th>
<th>Group 1 n</th>
<th>Group 1 %</th>
<th>Group 2 n</th>
<th>Group 2 %</th>
<th><em>p</em>-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries is an infectious disease.</td>
<td>0</td>
<td>50</td>
<td>35</td>
<td>65%</td>
<td>15</td>
<td>32%</td>
<td><strong>0.001</strong></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>52</td>
<td>19</td>
<td>35%</td>
<td>32</td>
<td>68%</td>
<td></td>
</tr>
<tr>
<td>Cavity-causing bacteria can be transmitted between mother and child.</td>
<td>0</td>
<td>27</td>
<td>16</td>
<td>30%</td>
<td>11</td>
<td>24%</td>
<td>0.652</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>74</td>
<td>38</td>
<td>70%</td>
<td>35</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>Cavities are caused by:</td>
<td>0</td>
<td>6</td>
<td>2</td>
<td>4%</td>
<td>4</td>
<td>8%</td>
<td>0.420</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>96</td>
<td>51</td>
<td>96%</td>
<td>44</td>
<td>92%</td>
<td></td>
</tr>
<tr>
<td>Children with special health care needs are considered as ___ caries risk as per caries risk assessment tool.</td>
<td>0</td>
<td>79</td>
<td>45</td>
<td>83%</td>
<td>33</td>
<td>70%</td>
<td>0.154</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>23</td>
<td>9</td>
<td>17%</td>
<td>14</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Only bottle-fed children get early childhood dental caries.</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2%</td>
<td>0</td>
<td>0%</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>101</td>
<td>53</td>
<td>98%</td>
<td>47</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Going to bed with a bottle has no detrimental effect on caries activity.</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0%</td>
<td>3</td>
<td>6%</td>
<td>0.097</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>100</td>
<td>54</td>
<td>100%</td>
<td>44</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>The frequency of snacking does not affect caries risk but rather just the type of diet.</td>
<td>0</td>
<td>39</td>
<td>17</td>
<td>31%</td>
<td>22</td>
<td>47%</td>
<td>0.152</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>64</td>
<td>37</td>
<td>69%</td>
<td>25</td>
<td>53%</td>
<td></td>
</tr>
<tr>
<td>Children should see an oral health provider by the age of:</td>
<td>0</td>
<td>57</td>
<td>34</td>
<td>63%</td>
<td>21</td>
<td>44%</td>
<td>0.073</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>47</td>
<td>20</td>
<td>37%</td>
<td>27</td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td>Children 6-24 months should be brushing with:</td>
<td>0</td>
<td>85</td>
<td>49</td>
<td>91%</td>
<td>34</td>
<td>71%</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>19</td>
<td>5</td>
<td>9%</td>
<td>14</td>
<td>29%</td>
<td></td>
</tr>
<tr>
<td>Toothbrushing twice per day should commence:</td>
<td>0</td>
<td>49</td>
<td>20</td>
<td>38%</td>
<td>27</td>
<td>56%</td>
<td>0.074</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>54</td>
<td>33</td>
<td>62%</td>
<td>21</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>Fluoride is used in dentistry to:</td>
<td>0</td>
<td>79</td>
<td>41</td>
<td>76%</td>
<td>36</td>
<td>75%</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>25</td>
<td>13</td>
<td>24%</td>
<td>12</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Which drinking water source has optimal water fluoridation levels?</td>
<td>0</td>
<td>6</td>
<td>5</td>
<td>9%</td>
<td>1</td>
<td>2%</td>
<td>0.211</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>97</td>
<td>49</td>
<td>91%</td>
<td>46</td>
<td>98%</td>
<td></td>
</tr>
<tr>
<td>Mean Correction Rate</td>
<td>0.61 ± 0.11</td>
<td>0.59 ± 0.12</td>
<td>0.64 ± 0.11</td>
<td></td>
<td></td>
<td></td>
<td><strong>0.042</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you believe your specialty has a role in promoting oral health for children with special health care needs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>71</td>
<td>69%</td>
<td>40</td>
<td>75%</td>
<td>30</td>
<td>62%</td>
<td>0.230</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>1%</td>
<td>0</td>
<td>0%</td>
<td>1</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>31</td>
<td>30%</td>
<td>13</td>
<td>25%</td>
<td>17</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>How interested would you be in CE courses or pediatric oral health counseling and education?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not interested</td>
<td>8</td>
<td>8%</td>
<td>5</td>
<td>10%</td>
<td>2</td>
<td>4%</td>
<td>0.246</td>
</tr>
<tr>
<td>Slightly interested</td>
<td>34</td>
<td>34%</td>
<td>13</td>
<td>25%</td>
<td>21</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>Moderately interested</td>
<td>39</td>
<td>39%</td>
<td>23</td>
<td>45%</td>
<td>16</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Very interested</td>
<td>20</td>
<td>20%</td>
<td>10</td>
<td>20%</td>
<td>9</td>
<td>19%</td>
<td></td>
</tr>
</tbody>
</table>
Diagram 2a. Overall Correct and Incorrect Rates for Oral Health Knowledge Questions

- Caries is an infectious disease.
- Cavity-causing bacteria can be transmitted between mother and child.
- Cavities are caused by children with special health care needs.
- Only bottle-fed children get early childhood dental caries.
- Going to bed with a bottle has no detrimental effect on caries activity.
- The frequency of snacking does not affect caries risk but rather just the type of diet.
- Children should see an oral health provider by the age of children 6-24 months.
- Children 6-24 months should brush with Toothbrushing twice per day should commence.
- Fluoride is used in dentistry to which drinking water source has optimal water fluoridation levels.

Incorrect  Correct
Diagram 2b. Group 1 and Group 2 Comparison of Correct Response Rates for Knowledge Questions

- Caries is an infectious disease
- Cavity-causing bacteria can be transmitted between mother and child
- Cavities are caused by
- Children with special health care needs are considered as ___ caries risk as per caries risk assessment tool
- Only bottle-fed children get early childhood dental caries
- Going to bed with a bottle has no detrimental effect on caries activity
- The frequency of snacking does not affect caries risk but rather just the type of diet
- Children should see an oral health provider by the age of
- Children 6-24 months should be brushing with
- Toothbrushing twice per day should commence
- Fluoride is used in dentistry to
- Which drinking water source has optimal water fluoridation levels

* p-value = 0.001
* p-value = 0.01
Providers were presented a series of questions regarding their current practice with respect to oral health. They were asked to identify whether they participate in each practice “0% of the time”, “1-25% of the time”, “26-50% of the time”, “51-75% of the time”, “76-99% of the time”, or “100% of the time”. Questions to assess practice frequencies and barriers were scored from the least to the most, starting from 1 with the increment of 1. For practice frequency assessment, provider response “0% of the time” was assigned a score of 1, “1-25% of the time” was assigned a score of 2, “26-50% of the time” was assigned a score of 3, “51-75% of the time” was assigned a score of 4, “76-99% of the time” was assigned a score of 5, “100% of the time” was assigned a score of 6. The correction rate or sectional mean score was calculated. Categorical variables were summarized by specialty group (Group 1 vs. Group 2) and overall using frequencies and percentages and were compared between specialty groups using Fisher’s exact tests. Mean and standard deviation were used instead to summarize continuous variables and a two-sided two-sample t-test was applied to test for the between-group difference. All the statistical analyses were performed in R. A \( p \)-value smaller than 0.05 was considered statistically significant. The collective review of \( p \)-values comparing Group 1 vs. Group 2 for each question shows that there were no significant differences in their responses.

The practices most employed by early intervention providers identified as having the highest mean correction rates were “counsel on the importance of toothbrushing” (mean correction rate= 2.87 ± 1.61), “inform clients on oral health effects of sugary food and drinks” (mean correction rate= 2.85 ± 1.71), and “counsel on going to the dentist” (mean correction rate= 2.79 ± 1.48). The component that early intervention providers most commonly incorporate into
their practices was found to be “counsel on the importance of toothbrushing” with 32% of providers engaging in this practice >50% of the time (8% practicing this 100% of the time, 12% practicing 76-99%, and 12% practicing 51-75% of the time). The between-group comparison for this question also showed no significant difference (p-value=0.94). The second highest practice of providers was “inform clients on oral health effects of sugary food and drinks”. Overall, 35% of providers engage in this specific practice >50% of the time (11% reported 100% of the time, 11% reported 76-99%, and 13% reported 51-75% of the time). There was no difference in the response rates for Group 1 and Group 2 regarding this practice (p-value=0.74). The third ranking oral health initiative that providers reported was “counsel on going to the dentist” with 28% provider participation >50% (7% reported engaging in this practice 100% of the time, 9% reported 76-99%, and 12% participating 51-75% of the time). Once again, Group 1 and Group 2 did not differ in their responses to this question (p-value=0.96).

Two of the practices that were least employed by providers were “apply fluoride varnish” (mean correction rate= 1.03 ± 0.17) and “examine and identify a child’s teeth for dental caries and plaque” (mean correction rate= 1.37 ± 0.85) and there were no significant differences in the between-group comparison for either of these questions (p-value=0.43 and p-value=0.60, respectively). Providers were least likely to “apply fluoride varnish” with 100% of participants answering <25% of the time (0% was reported by 97% of providers and 1-25% was reported by the remaining 3% of providers). Surveyed participants were also the least likely to “examine and identify a child’s teeth for dental caries and plaque” with 91% answering <25% of the time (0% was reported by 78% and 1-25% of the time reported by 13%).
Provider Assessment of their Clients’ Reported Oral Practices Concerns

In addition to current practices employed by providers, study participants were asked to report whether their clients “express difficulty with oral hygiene practices” or “express functional/sensory disintegration related to oral hygiene practice”. 16% of providers responded that their clients “express difficulty with oral hygiene practices” >50% of the time (mean correction rate= 2.49 ± 1.05). Only 22% of providers reported that their clients “express functional/sensory disintegration related to oral hygiene practices” >50% of the time (mean correction rate= 2.56 ± 1.22). There was no significant difference in p-values for between-group comparison of these questions. Diagram 3a. shows the rates of clients’ oral practices concerns as reported by respondents. Diagram 3b. shows the providers rates relative to their participation rates for each current practice question.

Diagram 3a. Provider Assessment of Clients’ Reported Oral Practices Concerns

![Diagram 3a. Provider Assessment of Clients’ Reported Oral Practices Concerns](image-url)
Examine and identify a child's teeth for dental caries and plaque
Counsel on going to the dentist
Counsel on the importance of tooth brushing
Counsel on techniques for tooth brushing
Inform clients on oral health effects of sugary food and drinks
Provide aid/tools pertained to the OT/SLP/ABA/PT field to help clients with daily oral hygiene practices specific to each child's needs
Apply fluoride varnish

Diagram 3b. Overall Current Oral Health Practice Rates
**Comparison of Barriers to Care**

Survey participants were asked a series of questions regarding their perceived barriers to their clients/patients obtaining dental care. Surveyed providers were asked to rank each barrier as “not at all a barrier”, “somewhat a barrier”, “a moderate barrier”, “a significant barrier”, and “not applicable”. Statistical analyses performed on the comparison of perceived barriers were identical to that described for comparison of current practice (previously mentioned). Provider response “not at all a barrier” was assigned a score of 1, “somewhat a barrier” was assigned a score of 2, “a moderate barrier” was assigned a score of 3, “a significant barrier” was assigned a score of 4, “not applicable” responses were not scored and excluded from analyses. Additionally, barriers were categorized as perceived caregiver barriers or provider-based barriers. Overall, between-group comparisons for each barrier were not statistically different between Group 1 and Group 2.

**Perceived Caregiver Barriers**

The barriers that providers perceived as being the greatest for caregivers of CSHCN were “behavior management difficulties at dental office” (mean correction rate= 2.76 ± 0.9) and “transportation problems getting to the dental office” (mean correction rate= 2.46 ± 0.98). “behavior management difficulties at dental office” was identified as the highest significant perceived barrier. A total of 48% of people found this barrier to be “significant” or “moderate”, with percentage scores of 21% and 27%, respectively. Transportation problems was the second most important perceived barrier with 31% of providers reporting this as either “significant” or moderate”, with percentage scores of 12% and 19%, respectively.

Providers found the least contributive perceived barriers for caregivers were “dental experience/confidence in providing care for children with special health care needs” (mean
correction rate= 1.88 ± 0.97) and “lack of dentists who provide care for children with special health care needs” (mean correction rate= 2.2 ± 0.97). “Dentist experience/confidence in providing care” between-group comparison revealed no significant difference between the answers of Group 1 and Group 2 (p-value=0.62). Overall, 58% of study participants found this to be either “not at all a barrier” or “somewhat a barrier”, with percentage values of 35% and 23%, respectively. “Lack of dentists who provide care for children with special health care needs” was the second least important perceived barrier with 55% of providers finding this “not at all a barrier” or “somewhat a barrier”, with percentage values of 32% and 23%, respectively. Diagram 4. shows overall rates of perceived barriers to care.

Provider-Based Barriers to Care

The mean correction rates revealed that the most significant barriers in this category were lack of communication/interprofessional collaboration (mean correction rate= 2.83 ± 1) and lack of professional training on oral health care counseling (mean correction rate= 2.78 ± 1.01). Lack of communication/interprofessional collaboration was the most significant barrier that survey participants identified. The between-group comparison revealed no significant difference between the answers of Group 1 and Group 2 (p-value=0.797) regarding this barrier. Overall, 46% of study participants found this to be either “a significant barrier” or “a moderate barrier”, with percentage values of 27% and 19%, respectively. “Lack of professional training on oral health care counseling” was the second highest rated significant barrier with a between-group comparison having no significant difference (p-value=0.536). In summary, 49% of participants found lack of training to be a “significant barrier” or “moderate barrier”, with percentage values of 22% and 27%, respectively.
The barriers identified as being the least important were lack of time during visits (mean correction rate= 1.87 ± 0.9) and “lack of ability to bill separately for oral health counseling on preventative oral hygiene” (mean correction rate= 2.25 ± 1.21). Time constraints was reported as having the lowest perception of being a provider-based barrier. The between-group comparison revealed no significant difference between the answers of Group 1 and Group 2 ($p$-value=0.15). Overall, 66% of study participants found this to be either “not at all a barrier” or “somewhat a barrier” with percentage values of 33% each. “Lack of ability to bill separately for oral health counseling on preventative oral hygiene” was noted to be the second least important barrier for providers in both groups. Overall, 35% of providers found this be either “not at all a barrier” or “somewhat a barrier” with percentage values of 23% and 12%, respectively. Table 3 shows provider oral health practices, perceived caregiver barriers, and provider-based barriers to care mean correction rates. Diagram 5. shows the overall percentage of provider-based barriers. Diagram 6. shows the mean correction scores for current practices and barriers to care.
<table>
<thead>
<tr>
<th>Current Practice - Part I</th>
<th>Overall</th>
<th>Group 1</th>
<th>Group 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examine and identify a child's teeth for dental caries and plaque</td>
<td>1.37 ± 0.85</td>
<td>1.31 ± 0.72</td>
<td>1.44 ± 0.99</td>
<td>0.48</td>
</tr>
<tr>
<td>Counsel on going to the dentist</td>
<td>2.79 ± 1.48</td>
<td>2.83 ± 1.48</td>
<td>2.77 ± 1.52</td>
<td>0.83</td>
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<tr>
<td>Counsel on the importance of tooth brushing</td>
<td>2.87 ± 1.61</td>
<td>2.83 ± 1.59</td>
<td>2.94 ± 1.68</td>
<td>0.75</td>
</tr>
<tr>
<td>Counsel on techniques for tooth brushing</td>
<td>2.12 ± 1.24</td>
<td>2.19 ± 1.21</td>
<td>2.06 ± 1.29</td>
<td>0.62</td>
</tr>
<tr>
<td>Inform clients on oral health effects of sugary food and drinks</td>
<td>2.85 ± 1.71</td>
<td>2.79 ± 1.68</td>
<td>2.98 ± 1.77</td>
<td>0.59</td>
</tr>
<tr>
<td>Provide aid/tools for daily oral hygiene practices</td>
<td>1.99 ± 1.32</td>
<td>2.17 ± 1.37</td>
<td>1.75 ± 1.18</td>
<td>0.10</td>
</tr>
<tr>
<td>Apply fluoride varnish</td>
<td>1.03 ± 0.17</td>
<td>1.02 ± 0.14</td>
<td>1.04 ± 0.2</td>
<td>0.50</td>
</tr>
<tr>
<td>Mean Score</td>
<td>2.14 ± 0.94</td>
<td>2.16 ± 0.92</td>
<td>2.14 ± 0.97</td>
<td>0.90</td>
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<tr>
<td>Current Practice - Part II</td>
<td>Overall</td>
<td>Group 1</td>
<td>Group 2</td>
<td>p-value</td>
</tr>
<tr>
<td>Express difficulty with oral hygiene practices</td>
<td>2.49 ± 1.05</td>
<td>2.53 ± 1.05</td>
<td>2.43 ± 1.07</td>
<td>0.66</td>
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<tr>
<td>Express disintegration related to oral hygiene practices</td>
<td>2.56 ± 1.22</td>
<td>2.6 ± 1.18</td>
<td>2.52 ± 1.3</td>
<td>0.77</td>
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<tr>
<td>Mean Score</td>
<td>2.53 ± 1.09</td>
<td>2.56 ± 1.08</td>
<td>2.48 ± 1.12</td>
<td>0.72</td>
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<tr>
<td>Barriers to Care - Part I</td>
<td>Overall</td>
<td>Group 1</td>
<td>Group 2</td>
<td>p-value</td>
</tr>
<tr>
<td>Lack of dentists who provide care for CSHCN</td>
<td>2.2 ± 0.97</td>
<td>2.37 ± 1.01</td>
<td>2.03 ± 0.87</td>
<td>0.09</td>
</tr>
<tr>
<td>Transportation problems getting to the dentist office</td>
<td>2.46 ± 0.98</td>
<td>2.57 ± 0.95</td>
<td>2.29 ± 1.01</td>
<td>0.18</td>
</tr>
<tr>
<td>Parents not perceiving dental visits as necessary for their</td>
<td>2.21 ± 0.85</td>
<td>2.21 ± 0.86</td>
<td>2.21 ± 0.86</td>
<td>0.97</td>
</tr>
<tr>
<td>Dentist experience/confidence in providing care for</td>
<td>1.88 ± 0.97</td>
<td>1.95 ± 0.95</td>
<td>1.82 ± 1</td>
<td>0.56</td>
</tr>
<tr>
<td>Behavior management difficulties at dental office</td>
<td>2.76 ± 0.9</td>
<td>2.74 ± 0.82</td>
<td>2.77 ± 1.01</td>
<td>0.90</td>
</tr>
<tr>
<td>Insurance dental coverage plan</td>
<td>2.31 ± 0.94</td>
<td>2.41 ± 0.96</td>
<td>2.21 ± 0.95</td>
<td>0.32</td>
</tr>
<tr>
<td>Mean Score</td>
<td>2.27 ± 0.7</td>
<td>2.33 ± 0.72</td>
<td>2.2 ± 0.67</td>
<td>0.39</td>
</tr>
<tr>
<td>Barriers to Care - Part II</td>
<td>Overall</td>
<td>Group 1</td>
<td>Group 2</td>
<td>p-value</td>
</tr>
<tr>
<td>Lack of time during visits</td>
<td>1.87 ± 0.9</td>
<td>1.96 ± 1.03</td>
<td>1.79 ± 0.7</td>
<td>0.38</td>
</tr>
<tr>
<td>Lack of ability to bill separately for oral health counseling</td>
<td>2.25 ± 1.21</td>
<td>2.29 ± 1.27</td>
<td>2.25 ± 1.15</td>
<td>0.89</td>
</tr>
<tr>
<td>Lack of professional training on oral health care counseling</td>
<td>2.78 ± 1.01</td>
<td>2.82 ± 0.96</td>
<td>2.71 ± 1.1</td>
<td>0.65</td>
</tr>
<tr>
<td>Lack of communication/interprofessional collaboration</td>
<td>2.83 ± 1</td>
<td>2.95 ± 0.99</td>
<td>2.68 ± 1.02</td>
<td>0.23</td>
</tr>
<tr>
<td>Mean Score</td>
<td>2.45 ± 0.75</td>
<td>2.52 ± 0.79</td>
<td>2.37 ± 0.7</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Table 3. Provider Oral Health Practices, Perceived Caregiver Barriers, and Provider-Based Barriers Mean Correction Rates
Not at all a barrier = 1, Somewhat a barrier = 2, Moderate barrier = 3, Significant barrier = 4
Diagram 4. Overall Perceived Caregiver Barriers

- Lack of dentists who provide care for children with special health care needs
- Transportation problems getting to the dentist office
- Parents not perceiving dental visits as necessary for their child
- Dentist experience/confidence in providing care for CSHCN
- Behavior management difficulties at dental office
- Insurance dental coverage plan

Legend:
- Not at all a barrier
- Somewhat a barrier
- Moderate barrier
- Significant barrier
Diagram 5. Overall Provider-Based Barriers

Lack of communication/interprofessional collaboration
Lack of professional training on oral health care counseling
Lack of ability to bill separately
Lack of time during visits

- Not at all a barrier
- Somewhat a barrier
- Moderate barrier
- Significant barrier
Diagram 6. Mean Correction Scores for Current Practices and Barriers to Care.
Not at all a barrier = 1, Somewhat a barrier = 2, Moderate barrier = 3, Significant barrier = 4. There was no statistically significant difference for between Group 1 and Group 2 comparisons.
Discussion

This project aims to assess the oral health knowledge, assess current practices, and survey barriers to providing oral health screening and education by early intervention providers employed by the Connecticut Birth to Three agency. The goal of this project was to gather data that might, with further research and commitment to the cause, help improve access to oral health care for CSHCN aged birth to three years old of age through interprofessional education and collaboration between oral health care and early intervention providers. Recent literature within the past 5 years still concludes that dental care remains the most or second most prevalent unmet health care need for CSHCN. Many CSHCN receive more frequent care from early intervention providers in a vast array of specialties including speech and language pathology, physical therapy, occupational therapy, behavior therapy, and developmental therapy. The involvement of early intervention providers and interprofessional collaboration with oral health providers could be a key target in addressing such disparity. Although there are established programs and policies being implemented in 42 of the 50 states for state insurance reimbursements to support access to preventative dental services by non-dental care providers, no previous research or efforts exist pertaining to collaborations between the oral health and early intervention services.

Oral Health Knowledge

The survey results support the initial hypothesis that states that there are no significant differences amongst early intervention therapy disciplines in relation to oral health knowledge. For an overall view of the “Oral Health Knowledge” questions section, respondents reported a correct score below 60% for six of the twelve and a correct score rate above 60% for the other six questions. The data shows that 89% of respondents reported not receiving any form of oral
health education during school or in the form of CE courses. The limited professional clinical knowledge could be an indication that oral health education is not incorporated in the educational plans for early intervention providers.

Each subsection of the oral health knowledge questions was evaluated for common trends. Addressing each of the weakest areas can help improve the implementation of oral health education in their practice. Respondents scored less than 60% correct answers in areas of knowledge related to “nature of caries process” with the lowest correct rate of 23% for the question related to the caries risk of CSHCN. The correct answer to this question relates specifically to knowledge about caries risk assessment tools that are readily available for medical providers who currently implement oral health screening, education, and referrals within their practice. Knowledge related to the “nature of caries process” may help providers explain and address key information about this disease in their discussions with caregivers and patients. It is important to note that only around 50% of providers understand that caries is an infectious disease. An area of future research would be to assess the influence of educating caregivers about the nature of caries has on changing oral health behaviors. In the section related to “oral hygiene practices”, respondents scored the lowest correct answer score rates with all responses below the 60% threshold set by the researchers for adequate clinical knowledge. It has been well established within AAPD recommendations that practices related to the three questions in this section—the age range of establishing a dental home, the age range of commencing tooth brushing twice a day and the method of brushing the teeth for 6-24 months old infants—are critical factors in projecting the caries risk especially for early childhood caries. Moreover, this information lays foundation to help providers steer anticipatory guidance and self-management goals that can be reevaluated and redirected periodically. Respondents reported the highest
correct response rates for the “dietary habits” subsection; however, the question with the lowest correct response rate was regarding frequency versus quantity of snacking. It is now well established that the frequency—rather than the quantity—of snacking is a major factor that influences the caries risk and experience.22 As per caries risk assessment tools, frequent snacking more than three times per day places a child at high risk for caries. On the topic of fluoride knowledge, a vast majority of providers recognize that community water has optimal water fluoride levels, but about 75% of respondents are unaware of the mechanism and role of fluoride in dentistry. Knowledge about the role of fluoride in dentistry is specific and requires acquiring educational information about it. This could help answer and rectify questions that caregivers would have about the stigma around fluoride toxicity, and also discredit the misinformation concerning its relationship with autism.

Based on the study findings, it appears that a gap does exist in relation to oral health knowledge of early intervention providers. Such a gap can create opportunities for interprofessional education between oral health and early intervention providers. Current oral health policies and guidelines related to knowledge of caries process, dietary habits, oral hygiene practices and fluoride have been well established. The topics addressed in the knowledge section make up parts of caries risk assessment tools that collectively determine the caries risk of each child. Early intervention disciplines are heavily involved in the care framework of the population they serve. It is prudent that these providers have some degree of evidence-based oral health knowledge information. This can help these providers communicate oral health anticipatory guidance recommendations and also address oral health concerns and barriers to care for CSHCN and their caregivers. A survey study conducted by Herndon et al. noted that oral health knowledge, education and training of pediatricians had a positive significant association with
confidence of pediatricians in screening and risk assessment of patients. Shimpi et al. 2019, conducted a survey study that suggests that oral health education as components of PCP training increases knowledgeability regarding oral health and systemic health associations. This in turn promotes confidence and comfort levels of providers in engaging in patient education, oral screening and referrals to oral health providers. The study projected that oral health education and training supports higher levels of integrated care delivery. In existing literature, reports on different methods of interprofessional education is the administration of oral health educational modules into the curricula of professional school training programs, Continuing Education courses or focus groups. Lewis et al.2005, recommended incorporating an interprofessional educational and collaborative oral health module into under and postgraduate medical school residency training programs. A study by Cooper et al. 2017, evaluated the changes an interprofessional practice and education oral heath course had on a group of dental, osteopathic medical and nurse practitioner students. The pre and post survey results show statistically significant improvement of knowledge, confidence and clinical practice and a positive upward trend towards their attitudes towards children’s oral health. Another study by Berkowitz et al. 2017, conducted a pre- and post-test for a group Physician Assistant (PA) students to evaluate the impact which an interprofessional practice curricular model had on the retention rates of oral health knowledge. They concluded that interprofessional education and practice on oral health encourages oral health practices, referrals and overall patient care. Another study by Mattheus et al. 2018, aimed to evaluate current oral health knowledge and practices of a group of Nurse Practitioners (NP). They analyzed survey responses from NPs who previously received oral health education content during advanced training program and/or at oral health CE courses with those who reported not receiving any education. The survey results indicated significant
association between those who reported attending previous CE courses with oral health knowledge and comfort in oral health counseling compared who did not attend previous CE courses. The Hassenfeld Children’s Hospital study has successfully led to the adoption of “Chemo Without Caries” oral health prevention program for pediatric oncology patients being treated at that facility.

Smiles for Life is one National Oral Health Curriculum that has been established in 2005 by regional organizations of dentists, family physicians, and educators including the University of Connecticut Schools of Medicine and Dental Medicine. The primary goal behind the development of this curriculum was to offer educational oral health promotion resources for family medicine residency programs. Currently, Smiles for Life is considered one of the nation’s most comprehensive curriculum targeting primary care clinicians. It has been endorsed by 20 national organizations and is being broadly utilized in professional schools and post-graduate training programs to improve the oral health knowledge of primary care providers.

The curriculum offers multiple free online access educational modules including child, adult and geriatric oral health care modules, oral health in pregnancy, oral examination and fluoride varnish modules, and a global oral health module. As part of this study plan to mitigate the result findings that highlights the existing knowledge gaps, we developed a module based on the Smiles for Life curriculum. The educational module created from this research study has been formulated to specifically target early intervention providers who provide care for CSHCN. It contains educational child oral health material; it highlights and addresses study results and the gap that creates the need for inter-professional and collaboration opportunities.

**Current Provider Practices**

Despite the survey findings related to current practices indicate that some of the respondents incorporate oral health counseling, the study did not identify the circumstances
under which these practices are performed i.e. whether they are performed incidentally or proactively. About one third of respondents reported that they counsel on tooth brushing, going to the dentist and dietary oral health. Around one fifth reported that they examine patient’s teeth and provide aids and tools pertained to their respective field. Since more proactive practices as oral examination and fluoride application had the lowest reported practices rates, we can confidently assume that no routine oral health services are administered. As for provider assessment of client’s reported oral practices concerns, around one third of the respondents reported that their clients express difficulty with oral hygiene practices or express functional/sensory disintegration related to oral hygiene practice. A qualitative survey study by Cruz et al. 2016 conducted in Spokane county, Washington aimed to identify barriers to the provision of oral health services administered by different community-based organizations including early intervention services agencies. Interviewee representatives from these agencies reported that proactive limited parent oral health education and incidental oral screenings is only provided to caregivers of CSHCN with specific oral conditions or concerns such as oral aversions. However, no routine oral health education or preventative dental care such as applying fluoride varnish are being proactively provided as part of their plan. Proactive incorporation of oral health counseling and screening requires deliberate planning, adoption and implementation that could be made possible through interprofessional collaborative efforts. As per guidelines, CSHCN birth through three are typically seen by an oral health care provider every 3-6 months for periodic recalls. Typically, during these recall appointments the child’s caries risk is revised, oral hygiene and dietary counselling goals are set, and anticipatory guidance information is provided. On the other hand, early intervention providers mostly provide services on weekly basis. Moreover, the practice scope of a some of these disciplines, as occupational and speech
therapy, is related to the oral cavity and surrounding structures. Clients who have oral sensory and motor issues that impede oral hygiene practices could possibly benefit from therapy as desensitization or successive approximation strategies that therapists commonly employ. Further research is required to assess and compare the impact of weekly/biweekly oral health and preventive counseling by early intervention therapists versus regular month based oral health provider visits.

Current Perceived Caregiver Barriers to Oral Health Care

Contrary to previous studies that suggest that dentist willingness to treat CSHCN is among common perceived barriers for providing oral health care for CSHCN, a high percentage of study participants perceived this as either “somewhat a barrier” or “not at all a barrier”. The Study results show that the highest reported perceived barrier was related to behavior management difficulties at the dental office. Although these are perceived barriers to oral care, these results may reflect barriers to care experienced by respondents in their practice. Existing literature that explored caregiver perceived barriers show that caregiver burden, difficulty finding dentists willing to treat their child, cost of dental care and pre-existing medical conditions that complicate dental treatment are amongst the most prominent barriers that impede their utilization of preventative dental services. A couple of perceived caregiver barriers reported in the Spokane Washington study were the lack of available qualified dentists and the low demand from parents for oral health services owing to caregiver burden. Although perceived barriers impose a limitation to this study, they should not be discredited. These barriers are not direct accounts from caregivers but are rather reports of the providers point of view to be a barrier for the clients they serve. Thus, these might not be accurate to describe actual barriers that caregiver would otherwise report. Future research could extend a similar survey to caregivers themselves.
in order to obtain direct barrier accounts. It would be important to examine whether these barriers align with this study reports. Moreover, contradictory literature results warrant further research in order to compile evidence on perceived barriers to care.

**Provider-Based Barriers to Oral Health Care**

This study sought to determine the greatest barriers reported by providers that may impede their delivery of oral health services in their practice. While existing literature suggests that time limitations and reimbursement for oral health services may be the greatest provider-based barriers, this study results agree with the hypothesis and suggests that the two greatest barriers that CT birth to Three early intervention providers reported were lack of communication/interprofessional collaboration and lack of professional training on oral health care counseling. Results show that lack of time and lack of ability to bill separately for oral services were the least important barriers. This highlight the existing disconnect in education and interprofessional collaboration in the comprehensive oral health care of CSHCN. Moreover, the findings from the oral health knowledge and education section of the study reflect on these results. One national study by Gereige et al. 2015 surveyed general pediatrics residents to assess knowledge, confidence and perceived barriers to incorporating Bright Futures oral health concepts into well-childcare for children below 3 years. Results show that lack of time and knowledge in identifying caries were the highest reported perceived barriers to care. Their conclusion highlighted the need for implementing oral health education and training in order to increase oral health practices competencies.57 The Spokane Washington study reported that amongst the most prominent barriers to oral health services reported by the early intervention providers are limited agency resources as time and funding, as well as administrative barriers as
lack of coordination efforts. The study agrees that such community-based organizations are in unique positions to promote and implement more proactive universal integration of oral health services to families with CSHCN.\textsuperscript{56}

A number of limitations were identified in this study. The first limitation is that results cannot be generalized to the entirety of early intervention programs and providers in the U.S. as voluntarily participation was offered in coordination with the Connecticut Birth to Three agency. Early intervention agencies in different states might have different policies with the possibility that oral health might be integrated into routine practices. Another limitation in this study is responder bias because responses were self-reported. It is unknown whether respondents to the survey used outside resources while answering knowledge-based questions. Moreover, this study cannot confirm/deny that reported practices reflect actual practice patterns pertaining to oral health. With a response rate of 14.4%, it is possible that providers who decided not to participate might have a different experience and opinions. One study investigated the response rates to surveys of medical and dental professional across a ten-year period to be at an average within 11% and 39%.\textsuperscript{58} Another study reported that low response rates are common among physicians and that nonresponse bias is likely to be less a concern among physicians owing to having more homogenous characteristics compared to the general population.\textsuperscript{59} Further research is warranted to collect information on a national scale from this target population in order to determine generalizability and minimize the risk of bias. Although this study’s response rate was sufficient to obtain statistically significant results, the response rate from each separate representative discipline was too low to perform the comparative analysis between each specialty individually. As a result, the decision was made to group disciplines into Group 1 or Group 2 depending on the nature of the service they provide. Group 1 consisted of disciplines that provide physical
services and Group 2 consisted of therapists that provide educational services. The aim of the comparative analysis was to determine whether there was a difference between the types of providers in each group. Determining whether there was a gap in either group could help redirect educational services to improve outcomes. This study revealed that both Group 1 and Group 2 participants performed at the same level and therefore education of all early intervention providers can help in planning, adoption and implementation of interprofessional educational and collaborative efforts for a specific target population such as CSHCN. Nevertheless, the information provided by the study was valuable in shedding some light on existing gaps in specific knowledge and the barriers within the target population. This research highlights the potential for linking interprofessional efforts between two broad disciplines, oral health and early intervention, to better the health of one common vulnerable population they both serve: CSHCN.

**Conclusion**

Early Childhood Caries is a predictor of the future caries experience. Children with special health care needs are considered of the most vulnerable groups in the U.S. population. They are increased risk for oral and dental diseases compared to the general population. Early intervention therapists provide individualized therapy sessions for CSHCN aged birth through three years old on a weekly or bi-weekly basis. Early intervention providers whose training and goals complement those of dental providers may be in a unique position and well suited to provide preventive oral health services in a tailored individualized manner to their patients. This could help reduce the Early Childhood Caries experience which in turn can improve the oral health of these children.
This study suggests that participating early intervention providers enrolled in the Connecticut Birth to Three agency do not have sufficient oral health knowledge information to provide oral health education for caregivers of CSHCN. While few providers reported that they counsel their patients on the importance of tooth brushing or importance of going to a dentist, the study highlights that preventive oral health counseling is generally not part of their routine practices. The study results suggest that the most prominent reasons for lack of oral health care delivery by Connecticut Birth to Three early intervention providers might be due to the lack of oral health training and lack of inter-professional education/collaboration with the oral health field. Based on trends of existing literature and based on this study, there is a unique opportunity for inter-professional collaborations between oral health and early intervention providers to address the current existing gap in access to preventive oral health services that CSHCN face. This would ultimately help improve health outcomes for this population.

**Areas of Future Research**

Areas of future research include conducting a pre and post training surveys to evaluate the effectiveness of the educational module on the adoption, implementation, effectiveness, and retention of preventative oral health services. Due to the lack of literature or models of interprofessional collaborations between oral health and Birth to Three services, further research in this area is warranted on a national level. In addition, this survey can be extended to caregivers to identify their barriers to oral health care. Another area of study can be evaluating the effectiveness of weekly follow up performed by early intervention providers on the adoption of oral health anticipatory guidance and self-management goals by caregivers.
Take Home Message

Early intervention therapists might help better the oral health outcomes for CSHCN throughout their lives. Interprofessional education and collaborations improves the oral health delivery system that in turn improves the overall health outcomes of the nation. I like to think of our profession that we are oral health advocates who practice dentistry and not vice versa. This places us in position where we can champion efforts to help improves the lives of the people we serve.

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