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Incorporating Oral Health Care in Pediatric Primary Care Practice

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INCORPORATING ORAL HEALTH CARE IN PEDIATRIC PRIMARY CARE PRACTICE

by

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DEDICATION

This project is dedicated to my family; my husband Patrick, daughter Cara, and sons Caleb, Elnathan, and Jed. You provide me the strength and encouragement to pursue this dream.

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ABSTRACT

The most common chronic disease in childhood is dental caries and is more prevalent than asthma and hay fever (HHS, 2000). Data show that in the United States from 2011-2014, 24% of children aged 2-5 years had experienced dental caries in their primary teeth, with 11% having untreated caries (Dye et al., 2017). Primary care clinicians have an important role to play in promoting children's oral health as much as dentists because they have more contact with children. The purpose of this evidence-based practice project was to integrate an evidence-based oral health program for children in a pediatric primary care practice. A comprehensive literature search utilizing 6 databases and hand search yielded 14 relevant articles. The articles were appraised for quality using the Johns Hopkins Nursing Evidence-Based Practice Research and Non-Research appraisal tools and level of evidence using The Melnyk and Fineout-Overholt's (2015) Hierarchy of Evidence for intervention questions. The participants of the project comprised of 80 children aged from 6-months up to 6 years old received preventive oral health care services over a 3-month time. Interventions included: a) caries risk assessment, b) application of fluoride varnish, c) caregiver education, and d) referrals to a dentist for establishment of dental home and care for children at risk of developing dental caries. The Health Belief Model (Hochbaum, Kegels, & Rosenstock, 1952) and the Iowa Model Revised (Iowa Model Collaborative, 2017) were used to guide the project. Primary outcomes were fluoride varnish application rate, dental referral success rate, and adherence by caregivers to oral health recommendations. Data were collected using a questionnaire and will be analyzed. Implications of this project for practice will be discussed.

CHAPTER 1

INTRODUCTION

Oral health denotes a state of freedom from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal disease, tooth decay and loss, and other diseases and disorders that affect the oral cavity (Peterson, 2003). The importance of oral health cannot be over-emphasized as poor oral health is associated with many systemic conditions that may appear later in life: dementia, stroke, cardiovascular disease, breast cancer, pneumonia, ulcers, and autoimmune diseases (Vece, Sutter, Sutter, & Toulouse, 2016).

In addition to the systemic conditions associated with poor oral health, there are many consequences of early childhood dental caries, and the consequence may vary in severity. These include pain, failure to thrive, poor school performance, and diminished quality of life (Mattheus, Shannon, Gandhi, & Lim, 2017). Recognizing the outcomes of poor oral health in children is very crucial because the most common chronic disease in childhood is dental caries. Data reveal that in the United States from 2011-2014, 24% of children aged 2-5 years had experienced dental caries in primary teeth, with 11% having untreated caries (Dye, Lopez Mitnik, Iafolla, & Vargas, 2017).

Despite the association of oral disease with the above-mentioned systemic conditions and consequence, access to and utilization of oral health care is low in children, families living in rural areas, as well as racial and ethnic minorities (Castellano & Rizzolo, 2012; Mahat, Lyons & Bowen, 2014; Peterson-Sweeney & Stevens, 2010). Race and income play important role in disparities in both access and utilization of oral health services (Edelstein & Chinn, 2009).

The Centers for Disease Control and Prevention (CDC, 2017) reported that, there is a larger proportion of Hispanic (19.4%) and non-Hispanic black (19.3%) children with untreated dental caries in primary teeth compared to non-Hispanic white (9.5%) children. The issue of limited access to and utilization of oral health care is compounded by the lack of dentists in the United States.

One of the strategies suggested to address access to dental care is integrating oral health care into primary care (Atchison & Weintraub, 2017). This approach provides opportunities for children to be screened for oral disease, referred to dentists, and started on preventive measures. Doctoral-prepared nurse practitioners, especially the pediatric and family nurse practitioners, can play an important role in bridging the shortfall in access to oral health care in the primary care setting.

The purpose of this EBP project was to plan, implement, and evaluate the effect of implementing an evidence-based oral health program that has been incorporated into a pediatric primary care practice. This chapter introduces the EBP project by providing a background to the topic. The statement of the problem, the purpose of the EBP project, and significance of the project will also be addressed.

Background

In 2000, the publication of the first Surgeon General's report on oral health titled "*Oral Health in America*" brought the discussion of oral health to the forefront (USDHHS, 2000). One of the issues raised in the report was the fact that oral disease and disorders affect health and well-being throughout life. The report also highlighted the effect lifestyle behaviors have on oral health and that, the presence of oral health

disparities within the U.S. population remains even though there are safe and effective preventive measures for curbing dental problems.

In 2011, the Institute of Medicine (IOM) also delved into issues surrounding oral health. In their report titled "*Advancing Oral Health in America*", the committee identified areas that should be the focus of attention and approaches that would generate the needed improvement in oral health for the population. Some of the recommendations included emphasizing prevention and oral health promotion, reducing oral health disparities, and enhancing the role of non-dental health care professionals in oral health care (IOM, 2011).

The problems identified by the above-mentioned reports several years ago are still relevant in recent times. Access to dental care remains a problem in United States. There are barriers that influence access to oral health care, and they can be classified as internal and external barriers (Bersell, 2017). Oral health literacy, apprehension associated with dental care, and false impressions about preventive oral health care are some internal barriers that influence access to dental care. The external barriers include high cost of dental care, access to dental insurance, shortage and unequal distribution of dental professionals, low rate of Medicaid provider participation, inadequate professional training in evidence-based guidelines, absence of interdisciplinary collaboration, insufficient dental safety nets, and a complex oral health system.

Other factors influencing access to oral health are of social, cultural, economic, structural, and geographical origin. Children, especially those from low income families are part of the group that have most difficulty in accessing dental care (Mahat et al., 2014; Peterson-Sweeney &Stevens, 2010). Children are an example of a vulnerable

population, and they are dependent on caregivers for dental appointments, daily oral hygiene, and nutritional health.

Poor oral health and dental illness in children have a crucial effect on the well-being of the child. Oral health problems such as infection, tooth decay, pain, cavities in children can result in difficulty in eating and speaking. Abscess formation is a consequence of untreated dental caries and will require hospitalization with it associated cost. The socio-economic impact of oral disease includes reduced quality of life for both child and caregiver, physical and developmental delays, days of restricted activity, and increased health care costs (Castellano & Rizzolo, 2012).

Integration of oral health into the overall health of children at the primary care setting has been recommended to increase access to oral health care (IOM, 2011). Pediatric patients visit clinicians (that is pediatrician, nurse practitioners, and physician assistants) operating in pediatric primary care settings more often than the dentist. Therefore, it is important that these clinicians take advantage of the opportunity to provide oral health care services to prevent, intervene, and make referrals to the dentist to meet the needs of these patients.

Statement of the Problem

There is limited access to oral health care in the entire U.S. population, especially for families living in rural areas and those children living in low-socioeconomic households (Mattheus et al., 2017). The reasons for limited access to dental services for children include lack of dentists, reluctance of some dentists to provide services for young children, and others who do not provide services to patients on Medicaid (USDHHS, 2000; Shariff & Edelstein, 2016).

The consequence of this problem is the presence of many preventable oral health conditions in children. Oral health problems in children may have long-term effects such as loss of self-esteem, harm to permanent dentition, and social development (Spurr, Bally, & Ogenchuk, 2015). Tooth extraction exposes children to risks, pain, and it is associated with increased costs.

The problem of early childhood caries (ECC) is widespread in the country even though it is largely preventable. Primary care practitioners are accessible, positioned to address health needs, and practice in the context of family and community. Therefore, it is advantageous to incorporate oral health into existing scope of practice to screen and identify those children at high risk of complex oral health problems to dentist for prompt management. This EBP project set out to address the problem of limited access by increasing access to oral health care for children who visit the pediatric primary care clinic.

Data from the Literature Supporting Need for the Project

Diseases associated with the oral mucosa are considered to be pandemic in regions across the world, with an estimated 60–90 % of school children worldwide affected by oral health issues (Spurr et al., 2015). The development of dental caries in primary teeth is a preventable and reversible infectious disease process. Untreated dental caries may result in pain, bacteremia, high treatment cost, growth retardation, speech disorders, premature tooth loss, loss of self-esteem, and harm to permanent dentition (Kagihara, Niederhauser, & Stark, 2009).

The American Academy of Pediatric Dentistry (AAPD, 2016c) defined early childhood caries (ECC) as “the presence of one or more decayed (non-cavitated or

cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a child under the age of six" (p. 59). According to the World Health Organization (WHO, 2017), ECC continues to be a pandemic worldwide with higher prevalence in the United States than most European countries.

Dye et al. (2017) studied the trends in dental caries in children and adolescents according to poverty status in the U.S. from 1999 through 2004 and from 2011 through 2014 using data from the National Health and Nutrition Examination Survey. They found that among preschool-aged children in families with low incomes, although caries experience has decreased from 42% to 35% and untreated caries from 31% to 18%, the prevalence of having no caries in permanent teeth in children and adolescents has not lessened. Although these figures for pre-school children are encouraging, more work is needed to sustain or even improve the oral health of children.

Data from the Clinical Agency Supporting Need for the Project

The agency of choice (Practice X) for this EBP project will be three pediatric clinical sites that serve primarily Hispanic low-income families in two towns in one of the states in the Pacific region of the United States. Practice X is an independent primary care clinic for women and children. The health care team is comprised of an obstetrician/gynecologist, a pediatrician, a nurse practitioner, and a physician assistant.

The EBP project leader observed several cases of ECC in children who patronized the three pediatric clinics. Most of the children who visited the clinic either had dental carries, but the clinic does not provide oral health assessment or any oral health care service to the children. Discussions with some staff confirmed the prevalence of oral health problems observed in the children who visit the clinic. In

addition, the physician assistant who provides the majority of care for pediatric patients estimated that the prevalence of dental caries is about 33% in this population and that only 10% of the pediatric population has received dental sealants on the premolars and molars to prevent tooth decay (Physician assistant personal communication, July 2018).

Although the majority of these patients have access to federal or state insurance, the underlying cause of the oral health issues cannot readily be identified. However, reinforcement of healthy oral health behaviors through caregiver and children oral health education can be a solution. Incorporating oral health care services into primary care practice can be beneficial to these children when they come to the clinic for their well-child visits.

Purpose of the Evidence-Based Practice Project

The purpose of this EBP project is to develop and integrate an evidence-based oral health program for children into a pediatric primary care practice. The project will comprise strategies to identify current evidence-based practices that have been proven to be effective in promoting oral health in children. The best practice recommendations will be used as interventions, and the findings will serve as basis for adopting the oral health program into care for children at the clinic.

Compelling Clinical Question

Access and utilization of oral health care services for children are hampered by a number of extraneous factors. However, pediatric primary care practitioners are strategically positioned to expand access and utilization of oral health care. Providing oral health care for children in primary care setting involves offering an effective oral program that will be beneficial to the recipients. The compelling clinical question that

triggered this EBP project was: What evidence-based strategies are effective for improving oral health in children?

PICOT Question

The success of an EBP project depends on the project leader asking the right clinical questions that results in a systematic search for answers supported by scientific evidence. According to Melnyk and Fineout-Overholt (2015), “a focused foreground questions are essential to judiciously finding the right evidence to answer them” (p. 28). The PICOT (patient population, intervention of interest, comparison intervention, outcome, and time frame) framework was employed to guide the EBP project and find a systematic way to obtain and implement the best available evidence.

Consequently, the following PICOT question was developed: In children of age 6 months up to 6 years seen in the primary care setting (P), what is the effect of best practices for oral health care (I) compared to the current primary care practice of no oral health intervention (C) on oral health outcomes over a 3 month period (T).

Significance of the EBP Project

Oral health is an integral part of overall health and wellbeing of every individual. The importance of good oral health in children is heightened by the widespread occurrence of early childhood caries. Primary care practitioners attend to children during their well child visits and when they have other health complaints. The contact between primary care practitioners and children occurs more often than between children and dental practitioners. Therefore, adding oral health care to pediatric primary care can improve access to oral health care and reduce the burden of oral health disease in children and especially for children from families from low socio-cultural background.

The significance of this EBP project stems from the feasibility of incorporating an evidence-based oral health care program into the three clinical sites of Practice X. Using theoretical and EBP frameworks to guide a time efficient, cost-effective strategy that can be integrated within the primary care provider's workflow will promote adoption of oral health services in this setting.

The screening and oral care provided will benefit the children and their families especially those who cannot visit the dentist immediately. These children and their families will also benefit from oral health education provided by primary care clinicians. Positive oral health outcomes will support adoption of this program within the overall health care provided to the children seen by other providers within the clinic.

The findings of this project will contribute to the body of knowledge about strategies effective for increasing access to oral health care through integrating oral health care into pediatric primary care practice. The utilization of the current best available recommendations for oral health intervention for children at the primary care setting is a means of improving access to oral health and eliminating oral health disparities in racial and ethnic minorities.

CHAPTER 2

THEORETICAL FRAMEWORK, EBP MODEL, AND REVIEW OF LITERATURE

Chapter two describes the EBP Model, theoretical framework, and current literature on integrating oral health for children in the primary care setting. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health care (Iowa Model Collaborative, 2017) and the Health Belief Model (Hochbaum, Kegels, & Rosenstock, 1952) are discussed and how they relate to and support the clinical question are explored in this chapter.

The PICOT question was: In children of age up to 6 years, what is the effect of best practices for oral health care provided in primary care setting compared to no best practice intervention on oral health outcomes over a 3-month period? Search for evidence to answer this question involves literature search, evidence appraisal, evidence synthesis, and identification of best practice recommendation and are all described in this chapter. Best practice recommendations will be used as interventions for this project and serves as basis for the project implementation in subsequent chapter.

Theoretical Framework

Overview of Theoretical Framework

The health belief model (Hochbaum et al., 1952) was chosen as the theoretical framework on which this EBP project is based. Around 1952, the health belief model was originally developed by three social psychologists, Godfrey Hochbaum, Stephen Kegels, and Irwin Rosenstock who had phenomenological orientation. They aimed to explain and predict preventive health behavior.

The two main factors that played a major part in the development of this model were the health settings in which research was required, and the training and background experiences of the originators of the model (Rosenstock, 1974). The Public Health Service of United States was geared towards preventive health care and as such the widespread failure of individuals to undertake preventive health measures was an issue that bothered the originators of the model (Hochbaum et al., 1952; Rosenstock, 1974). The influence of theories developed by social psychologist Kurt Lewin also played a role in the development of the model.

This model focuses on behavioral change at the individual level. Individuals make a decision about a health behavior change by calculating and noting that the benefits of the behavior change outweighs the costs or obstacles. The motivation of an individual to engage in a health behavior is based on the individual's perceptions, modifying behaviors, and likelihood of action (Hochbaum et al.,1952).

The model is composed of concepts that gives an indication why a person will take a preventive behavior. The original concepts are perceived susceptibility, perceived seriousness, perceived benefits of taking action, perceived barriers and cue to action (Hochbaum et al., 1952). Later self-efficacy was added to the concepts to help account for initiating and maintenance of behavioral change in chronic illnesses especially those requiring long-term changes (Rosenstock, Stretcher, & Becker,1988)

Perceived susceptibility as a concept of the model refers to the degree or level a person thinks he or she is liable to be affected by a disease condition. According to Hochbaum et al. (1952) perceived susceptibility refers to an individual's subjective risk of contracting a condition. Individuals have different levels of belief about their

susceptible to a disease. The extreme positions are those who see no possibility of contracting a given condition and those who are inclined to feel they are in danger of contracting the condition. There could be a middle ground between these two extreme positions where the threat exists, but these individuals do not see themselves at a high risk of contracting the disease.

Perceived seriousness denotes the effect a condition can have on the circumstances of a person's life. Perceived severity varies from person-to-person and is judged by both the degree of emotional excitation that emanates from the thought of the condition, and the perception of the challenges that will result from the disease condition (Rosenstock et al., 1988). According to Hochbaum et al., (1952) the perceived seriousness of a disease refers to difficulties that may emanate from the conditions and extend beyond the medical or clinical repercussions into emotional and financial burdens such as affects the individual's interaction with relatives and friends, work-output, earnings and standard of living.

Perceived benefits of taking action follows the individual's acceptance of susceptibility and seriousness of a condition. Rosenstock (1974) was of the view that belief plays an important role in the action to be taken to reduce the risk or severity of the impact of a disease. The belief that a particular action is effective compared to alternatives available drives the person to take action concerning healthy behavior. Also, the ease of taking the action is important.

According to Hochbaum et al. (1952), there could be instances when an individual decides against taking an action even though there is a belief that there are benefits in doing so. Rosenstock (1974) stated that "an individual may believe that a

given action will be effective in reducing the threat of a disease, but at the same time see the action itself as inconvenient, expensive, unpleasant, painful, or upsetting" (p. 331). These barriers must be overcome or reduced to take the action to improve health.

Cue to action relates to a trigger, jolt, or drive to an appropriate behavior. Action taken by an individual to address a disease condition is prompted by a trigger event which can originate from within such as experiencing the symptoms of an illness, or originate from outside the individual, for example seeing a commercial about a health campaign (Jones et al., 2015). The magnitude of the cue required to trigger a behavior varies according to the degree of perceived susceptibility and severity (Rosenstock, 1974). Low levels of cue are required if the level of susceptibility and severity are high and vice versa.

Self-efficacy is the confidence a person has in his or her ability to take action. According to Bandura (1997), perceived self-efficacy "is concerned with judgments of personal capability" (p.11). Individuals are most often anxious about initiating a new thing unless they believe that they can do it. Individuals exhibit a healthy behavior because they believe that they can act in that manner.

Finally, the major concepts of the model are modified by other variables such as demographic, socio-psychological, and structural factors (Rosenstock, 1974). Demographic factors that modify the major constructs of perception include age, gender, race, and ethnicity. Socio-psychological factors consist of personality, social class, and peer and reference group pressure.

Structural variables include knowledge about the disease, and prior contact with the disease. The concepts and modifying variables of the model will be utilized as

framework for the implementation of the evidence-based interventions for pediatric oral health care. The threat perception, behavioral evaluation, and the cue for initiating oral health behaviors will shed more light on the aim of the project.

Application of Theoretical Framework to EBP Project

The model has been one of the most widely utilized conceptual frameworks in health behavioral research, and a guiding framework for health behavior intervention (Champion & Skinner, 2008). It is used for explaining changes and maintaining health-related behaviors in health research. The health belief model has been employed in weight management (Das & Evans, 2014), injury prevention (Hartley, Hoch & Cramer, 2018), dental visit behaviors (Lee et al., 2018), vaccination (Scherr, Jensen, & Christy, 2017), breast cancer screening (Guilford, McKinley & Turner, 2017; VanDyke & Shell, 2017), lung cancer screening (Man-Man et al., 2018), and smoking cessation (Bakan & Erci, 2018).

The health belief model will be applied during the implementation stage of the EBP project. Component of threat perception such as perceived susceptibility will be assessed by discussing the caregivers' beliefs in the risk of their children developing dental caries and other oral diseases. Perceived severity of early childhood caries will also be addressed in the educational aspect of the intervention. The educational intervention is aimed at increasing caregiver awareness about the risk factors, preventive strategies, and healthy behaviors that can promote oral health.

Barriers to utilization of oral health for children have been raised in literature. Some of these barriers include cost, time, lack of awareness, and fear of dentists. These perceived barriers will be part of the issues to be discussed by the project team

and caregivers to find solutions to address them. Educational materials such as leaflets about the cost of dental caries and its complications will be provided. Brushing of teeth and flossing are healthy behaviors and these will be reinforced in self-efficacy.

Strengths and Limitations of Theoretical Framework for EBP Project

There are many strengths of the health belief model. The model has wide applicability in the area of health promotion and prevention. It has been used as a framework in many studies to understand treatment adherence, health behaviors, impact of educational interventions, and perceptions of people. Champion and Skinner (2008) had positive views on the performance of the model in both retrospective and prospective studies. The usefulness of the constructs on their own to predict preventive health behavior was also highlighted (Hochbaum et al.,1952).

The health belief model has universal acceptance. According to Jones et al. (2015), the model has surpassed its original purpose of aiding the adoption of preventive health behavior in the US to now being adapted to fit diverse cultural and topical contexts. The vast application of the health belief model in preventive health can therefore attest to its strength.

A limitation of the health belief model is the assumption that all behaviors are exhibited for health reasons. This assumption does not always hold. Factors other than health beliefs can to a large extent influence health behavior practices to a great extent. Some actions are taken because of their social acceptability and not health beneficial reasons (Hochbaum et al., 1952). Also, certain behaviors are habitual and not health-related but may interfere with decision-making process. Therefore, cues to actions

cannot be linked entirely to an individuals' health-related goals but other motivational factors.

Evidence-based Practice Model

Overview of EBP Model

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017) will be utilized to aid and guide the EBP Project. The Iowa model was developed by a group of clinicians working at the University of Iowa Hospitals and Clinics in the early 1990s. It evolved from pragmatic problem-solving approach and it is therefore termed a heuristic model (Steelman, 2015). The original 1994 model- The Iowa Model of Research - Based Practice to Promote Quality Care served as a guide for nurses and other health care providers for using research findings to improve patient care (Titler, Steelman, Bureau, Buckwalter, & Goode, 2001).

This was revised in 1998 to account for development in the health care market and feedback from users and was published in 2001 as The Iowa Model of Evidence-Based Practice to Promote Quality Care. Subsequently, the Iowa Model Collaborative comprised of prior authors and stakeholders was formed in 2012 to assess the necessity for revision. The outcome of survey, comments, and suggestions was a revised model known as The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Revised)**.** The revised model was later validated (Iowa Model Collaborative, 2017)

The Iowa model provides a means of using a theoretical model to guide the EBP process to improve patient outcomes, enhance nursing practice, and monitor cost of health care (Haxton et al., 2012; White & Spruce, 2015). It has been used internationally by several authors in both academic settings (Doody & Doody, 2011) and health care organizations (Haxton et al., 2012; Bergstrom, 2011; Brown, 2014) as EBP framework to effect change.

The Iowa Model Revised (Iowa Model Collaborative, 2017) comprises a series of step by step activities that will be carried out and can be thought of as a scientific method of problem-solving and critical thinking. These steps include, identifying triggering issues or opportunities, stating the question or purpose, determining organizational priority, forming a team, assembling, appraising and synthesizing a body of evidence, designing and piloting the practice change, integrating and sustaining the practice change, and disseminating results (Iowa Model Collaborative, 2017).

Application of EBP Model to EBP Project

The Iowa Model Revised (Iowa Model Collaborative, 2017) was chosen for this project because it involves activities arranged in a series of steps and has been used on numerous occasions to effect practice change. The process was used by the Project Leader of this EBP project to guide the project from the beginning to the end of the project. The following narration describes how the model was utilized for the project.

Identifying the trigger. The first step in the Iowa Model Revised is identifying the triggering issues and opportunities (Titler et al., 2001). There are many avenues that can be used to generate problem or knowledge focused triggers. These avenues include clinical or patient identified issue; organization, state, or national initiative; data

or new evidence; accrediting agency requirements or regulation; or philosophy of care (Iowa Model Collaborative, 2017). The trigger for this EBP Project came about because of patient identified needs in oral care, and the clinic being strategically positioned to meet the oral health care needs of the children who patronize the clinic for well-child visits.

Stating the question or purpose. This step was added to the Iowa Model Revised because of sentiment expressed by users of the model for its inclusion (Iowa Model Collaborative, 2017). A focused question or purpose of the EBP project is stated and provides basis for evidence search and synthesis. A popular approach in stating the EBP project question is the PICOT (Population, Intervention, Comparison, Outcome, Time). This approach was used to state the EBP question: In children of aged 1 to 6 years, what is the effect of best practices for oral health care provided in primary care setting compared to no best practice intervention on oral health outcomes over a 3-month period?

Priority of the topic. This step is a decision point because a project that is not a priority will not be supported by management. A project that is timely and meet the aspirations of management is likely to be supported. When a project is not a priority, then another issue must be considered (Iowa Model Collaborative, 2017). The EBP project became a reality because the concept of integrating oral health care to the pediatric clinic was seen by the management of the clinic to bridge the gap in access and utilization of oral health care. The idea that this service can be reimbursed provided another reason to pursue the project.

Forming a team. Team formation is a consequence of the approval of the EBP project. The task to be accomplished and skill sets needed will determine the caliber of individuals that can be members of the team. The composition of the team should include individuals from different backgrounds (Titler et al., 2001; White & Spruce, 2015). For this EBP project, the Project Manager will undertake the planning of the project and involve a team of six members in the implementation stage.

Evidence assembly, appraisal, and synthesis. Evidence is obtained by conducting a systematic search in several databases. The evidence is then appraised for quality and consistency and synthesized for application. When there is insufficient evidence, it becomes necessary for research to be conducted to generate the potential evidence. This step was followed by the EBP Project Manager to obtain the evidence that will be used as interventions for this project.

Practice change design and piloting. This step of the Iowa Model Revised is the design and implementation phase of the EBP project (Iowa Model Collaborative, 2017). Several activities are undertaken before implementing the change. Patients are engaged to identify and incorporate their preferences. A budget is calculated for the project and resources are sought and allocated. Protocol development, implementation plan development, and preparing clinicians and materials are some of the activities that are performed at this stage. The change is then implemented, and post-pilot data collected and reported. The implementation phase of the EBP project will follow the Iowa Model Revised blueprint. IRB approval will be sought for the project and the plan for implementation and evaluation developed. Baseline data will be collected by the

Project Manager. Subsequently, the oral health program for children will be implemented as a pilot practice change.

Practice change integration and sustenance. A favorable outcome of the change piloted in the previous step serves as a basis for this step (Titler, 2001). The aim is to merge the practice change into the caregiving structure of the organization. It is important to have a practice change integration plan and pinpoint individuals who can champion this cause and share the practice change vision with them. Continuous monitoring of key processes and outcomes is required even after the new practice has been adopted. Monitoring indicators help to continuously improve the new system.

The oral health program is expected to have an impact on the overall health outcome of the children who patronize the clinic. Stakeholders satisfaction in addition to the ease of integrating oral health of children into the overall health care services delivered will provide the basis for adopting the practice change. Re-imbursement of the oral health service provided by primary care clinicians by Medicaid is another important factor that will provide a reason for the practice change to be adopted.

Disseminating results. Success of the change implemented is shared internally and externally. Internally, lessons learned from the EBP project can be shared with clinicians and management through presentation (Iowa Model Collaborative, 2017). Externally, a report can be published in a peer-review journal to add to the body of knowledge on the topic. The results of the EBP project on oral health program for children will be presented at the University as part of the oral and poster presentation by doctoral candidates. Options available for publishing clinical practice projects will be explored. Journals that publish EBP projects, focus on oral health, and pediatric health-

related issues will be identified, and letters of enquiry will be sent to them. Manuscripts will then be sent to the editors for the report to be reviewed and eventually published.

Strengths and Limitations of EBP Model for EBP Project

The Iowa Model Revised places emphasis on organizational process and has been used worldwide by nurses (Titler et al., 2001). A major strength of the model is that it is easy to understand and use. The organization of the Iowa Model Revised is clear and concise. More so, the diagrammatic representation of the Iowa Model Revised makes it easy to be followed step by step (Iowa Model Collaborative, 2017).

This model can also be used to produce clinical guidelines and protocols in clinical settings (White & Spruce, 2015). The Iowa Model Revised can also be applied to different problems, patient populations, and various initiatives and programs. A limitation of the Iowa Model Revised is that it cannot be used at the individual nurse level to solve problems in the clinical setting. The stages are many and must be followed in a sequential manner.

Literature Search

Sources Examined for Relevant Evidence

Conducting a literature search is an important step in the Iowa Model Revised (Iowa Model Collaborative, 2017). The purpose of this step is to assemble, appraise, and synthesize the body of evidence for the EBP project. This step was achieved through undertaking a systematic search of published and unpublished literature. Relevant literature chosen was then appraised to determine the quality of the evidence identified.

Search engines and keywords. A literature search was undertaken to identify relevant and best evidence for this EBP project. The electronic databases explored to gather the best evidence to answer the PICOT question included Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (MEDLINE), Joanna Briggs Institute EBP Database (JBI), Cochrane Library, Nursing and Allied Health Database (ProQuest), and Science Direct College Edition. These databases were searched using the MeSH (medical subject heading terms) system to narrow down appropriate keywords for searches.

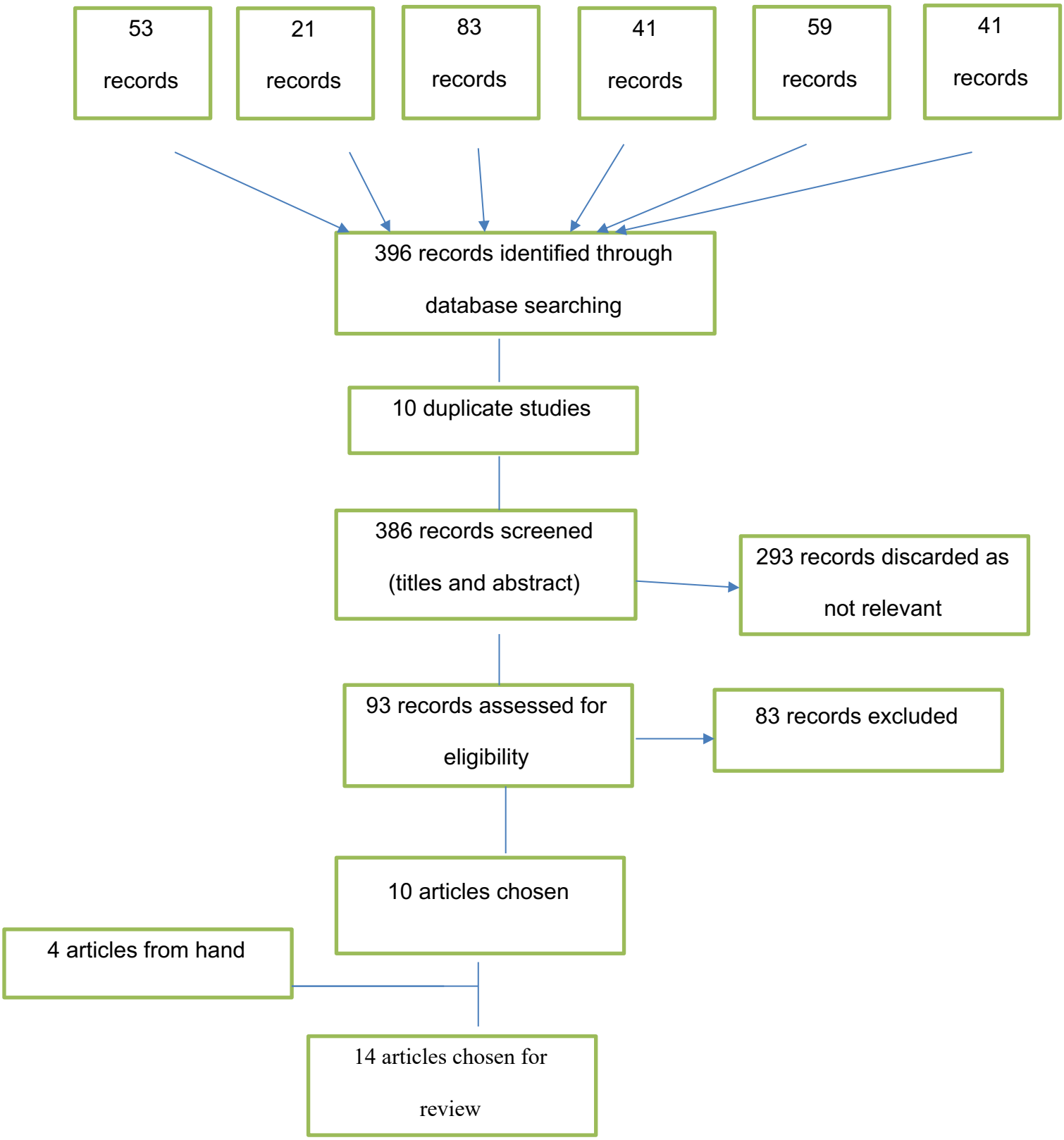
Keywords for CINAHL and MEDLINE in the search included “oral health” or “mouth care” or “oral care” or “oral hygiene” and “children” or “adolescents” or “youth” or “child” or “teenager” or “teens” or “young people” or “kids” or “pediatric” and “primary care” or “primary health care” or “family practice” or “physicians’ office.” These search terms were also used for ProQuest but sequentially.

The search of the databases yielded different numbers of hits. CINAHL yielded 53 hits, MEDLINE had 258, JBI produced 41, Cochrane Library generated 83, ProQuest had 59, Science Direct gave rise to 143 results. Hand search of relevant articles in references was also undertaken. Search results included clinical practice guidelines, systematic reviews of randomized controlled trials (RCTs), evidence summaries, epidemiological studies, systematic review of qualitative studies, and qualitative studies.

Inclusion and exclusion criteria. Criteria were set to narrow the search results. Inclusion criteria comprised literature written in English language, published between 2014 and 2018, scholarly and peer-reviewed, and focused on oral health of children.

Exclusion criteria included articles published before 2014, articles not published in English, and focused on adult population of 18 years or older. After duplicates were removed, titles and abstracts were reviewed for relevance (N = 386). From that review, 93 pieces of evidence were assessed for eligibility, resulting in 10 articles that met the inclusion criteria. Additionally, a hand search produced four other sources of evidence that were included in the final analysis (see Figure 2.1)

Figure 2.1: Flowchart of literature search process



Levels of Evidence

The level of evidence of the reviewed articles was identified using the Melnyk and Fineout-Overholt (2015) Hierarchy of Evidence for intervention questions. The rating system ranges from level 1 (highest) to level VII (weakest). The level 1 evidence includes study design that are meta-analysis, systematic reviews of RCTs, and current practice guidelines. Randomized controlled trials are level II. Level III evidence are derived from studies designed as controlled trials without randomization (quasi-experimental). These levels are generally considered good sources of evidence.

Evidence that is less powerful include epidemiologic studies such as cohort studies and case-controlled studies, which are at level IV. Level V evidence are systematic review of descriptive studies, systematic review of qualitative studies (meta-synthesis) and correlational studies. Level VI evidence are single descriptive study, single qualitative study, case series studies, case reports, and concept analysis. Also, level VII evidence is obtained from opinion of authorities, reports of expert committees, manufacturer's recommendations, and traditional literature review.

For this EBP project, the literature reviewed focused on oral health, dental services by non-dental providers, children and caregivers, early childhood dental caries risk assessment, and interventions for oral health promotion. The literature reviewed was aimed at answering the EBP project question. Fourteen studies were chosen and rated (Appendix A). The level 1 evidence identified were five comprised of three current practice guidelines, one evidence summary, and one systematic review of RCTs; one level II evidence which is a randomized controlled trial, one level III evidence from quasi-experimental study; three cross-sectional studies and one cohort study made up

level IV evidence; and four level VI evidence made up of two quality improvement studies and two qualitative studies.

Appraisal of Relevant Evidence

Appraisal of evidence is important in the Iowa Model in an attempt to obtain evidence to affect a practice change (Iowa Model Collaborative, 2017). Critical appraisal of evidence to determine the quality of evidence identified for this EBP project was guided by the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Research and Non-Research Evidence tools. The JHNEBP Research appraisal tool can be used for experimental, quasi-experimental, non-experimental, qualitative, and meta-synthesis studies. The other appraisal tool is the non-research type that is used for systematic reviews, clinical guidelines, and expert opinion.

These tools provide quality ratings for the appraisal. A grade of A is high quality and indicates evidence that was obtained from scientific work that is consistent, provides generalizable results, definitive conclusions, sufficient sample size, adequate control, and consistent recommendations based on comprehensive literature review. Evidence rated grade B is of good quality and implies it was derived from scientific work with somehow consistent results, sufficient sample size, some control, fairly definitive conclusions, and reasonably consistent recommendations based on fairly comprehensive literature review. An appraisal with grade C is low quality of evidence with major flaws and it implies the evidence was obtained with inconsistent results, insufficient sample size and conclusion cannot be drawn (Dang & Dearholt, 2014).

The 14 studies identified in the literature search were appraised using the JHNEBP Research and Non-Research Evidence appraisal tools and were rated based

on their quality. The appraisal produced different ratings such as grade A, B, and C because of the varied quality of the studies identified. Evidence will be utilized whiles taking into consideration their rating.

Level I evidence. Level I evidence consists of three clinical guidelines, one evidence summary, and one systematic review of RCTs. The clinical guidelines provide recommendations about perinatal and infant oral health care, caries-risk assessment and management for infants, children, and adolescents, and prevention of dental caries in children from birth to age five years.

The American Academy of Pediatric Dentistry (AAPD, 2016a) developed a new guideline titled- *Guideline on Perinatal and Infant Oral Health Care*. This guideline is a merger and update of the previous guidelines on infant oral health care revised in 2014 and perinatal oral health care revised in 2011 (AAPD, 2016a). The revision incorporated new evidence from current literature published in PubMed electronic database using search terms such as infant oral health, infant oral health care, early childhood caries, and prevention.

The recommendations were about oral health for infants. Parents were urged to establish a dental home for infants by 12 months of age. The initial visit should involve medical history for infant, dental history for parent and infant, a thorough oral examination, an age appropriate tooth and gum cleaning demonstration, and fluoride varnish if indicated. Counseling about teething and non-nutritive oral habits should be undertaken (AAPD, 2016a).

The guideline on perinatal and infant oral health care was developed by a nationally recognized group with a track record of using current scientific evidence for

practice. Also, the recommendations were clear, and the groups for which the recommendations were meant were clearly stated. However, the process employed in literature search, the inclusion, and exclusion criteria used to accept some articles and reject others, and the appraising of evidence were not clearly defined and reported. Other limitations of the provided guideline were that the recommendations were not supported by evidence and effort was not made to reduce the potential of bias. Therefore, the rating for this guideline is B (good quality).

The second level I piece of evidence was a guideline about caries-risk assessment and management for infants, children, and adolescents. The current guideline is an update on a 2002 document that was revised in 2006. This updated clinical guideline was based on new evidence from literature published in the prior 10 years and information derived from 75 articles. Developing the guideline was aimed at educating clinicians and assisting them in clinical decision making about diagnostic, fluoride, dietary, and restorative protocols (AAPD, 2014).

In the revision of the guidelines, three main recommendations were made. First, age-based dental caries-risk assessment should be inclusive of a routine oral health examination undertaken initially and periodically by oral health and medical providers. Second, estimating the risk of contracting dental caries will serve as a basis for evidence-based approach to medical provider referrals, frequency, and extent of diagnostic, preventive, and restorative services required. Third, clinical management protocols based on a child's age, dental caries risk, and levels of cooperation from patient and parents will serve as basis for the specific kind and frequency of service to be provided (AAPD, 2014).

The quality rating for this practice guideline is B (good quality) because the guideline is officially sponsored by a professional organization and revised within the past five years. However, a systematic literature search was not reported, and the design of the studies used were not indicated.

The third level I piece of evidence was a recommendation about prevention of dental caries in children from birth through age five based on a systematic review**.** Moyer (2014) undertook an update of the 2004 US Preventive Services Task Force (USPSTF) recommendation regarding prevention of dental caries in preschool-aged children. The methodology involved a commissioned systematic review about dental caries prevention by primary care clinician for children five years and younger (Chou et al., 2013). Although an in-depth description of the method used was not described, rationales for recommendations were provided.

The updated recommendations include the directive that primary care clinicians prescribe oral fluoride supplementation starting at age 6 months for children whose water supply is deficient in fluoride (Moyer, 2014). Also, clinicians should undertake fluoride varnish application to the primary teeth of all infants and children starting at the age of primary tooth eruption. However, there was “insufficient evidence to assess the balance of benefits or harm of routine screening examinations for dental caries performed by primary care clinicians in children from birth to age five years” (Moyer, 2014, p.1103).

The quality rating for this clinical practice guideline is A (high quality evidence). The reason for this conclusion emanates from the nature of the sponsor of the guideline. USPSTF is a public organization with pedigree and proven track record of

writing many clinical guidelines and providing recommendations. The current recommendations were also rated based on the scientific strength of the studies used to arrive at the definitive conclusion.

The penultimate level I piece of evidence reviewed was an evidence summary on topical fluoride therapy in dental caries prevention. Kaesler-Smith (2016) undertook an evidence summary to find an answer for the question: What is the best evidence regarding effectiveness of topical fluoride therapy in the form of varnish, gel, mouth rinse, or toothpaste in preventing dental caries in the child or adolescent population? The evidence for the summary was derived from several systematic reviews of randomized controlled trials with meta-analysis, systematic reviews of quasi-randomized controlled trials with meta-analysis, and other systematic reviews.

The best practice recommendations include the use of topical fluoride in addition to fluoride toothpaste results in a modest reduction in caries compared to toothpaste alone in children and adolescents (Kaesler-Smith, 2016). Also, regular toothbrushing with fluoride toothpaste is effective in preventing caries in the permanent dentition in children and adolescents. Toothpaste containing fluoride at least 1000 ppm for children and 1500 ppm for older children can prevent dental caries; however, there could be the risk of the child developing fluorosis. Application of fluoride gels or varnish two to four times a year in permanent or milk teeth reduces tooth decay in children. Supervised and regular use of fluoride mouth rinse at specified strength and frequencies slows the increment of dental caries in children. The rating for this evidence is A (high quality) because of the pedigree of the agency which undertook the review, the year it was published, and the methodology that was followed.

The final level I piece of evidence was a systematic review on fluoride gels for preventing dental caries in children and adolescents**.** Marinho, Worthington, Walsh, & Chong (2015) conducted a systematic review of RCTs and quasi- RCTs with meta-analysis to assess the effectiveness and safety when using fluoride gels for dental caries prevention in children and adolescents. The search strategy employed was extensive covering eight well-known databases, hand searching of referenced articles, and without restricting language or publication date.

The sample included 28 studies comprised of randomized or quasi-randomized controlled trials where blind outcome assessment was indicated in the review. These studies compared topical fluoride gel with placebo or no treatment in children and adolescents up to the age 16. Other characteristics of the studies utilized for the review included fluoride application frequency of at least once a year and study duration of one year. There was a total of 9140 participants involved.

The outcome measured was increase in dental caries. Data were extracted and analyzed. The prevented fraction was primary measure of effect. This was calculated as the difference between the mean caries increment between the treatment and control groups expressed as a percentage of the mean increment in the control group. A meta-analysis showed that the D(M)FS pooled prevented fraction (PF) estimate was 28% (95% confidence intervals (CI) 19% to 36%; $p < 0.0001$; with substantial heterogeneity ($p < 0.0001$; $I^2 = 82\%$); moderate quality evidence). The authors concluded that there was moderate quality evidence that fluoride gel inhibit caries formation in permanent dentition.

The purpose of the systematic review was clearly stated. Also, a comprehensive search strategy was employed, and key terms were clearly stated. The inclusion and exclusion criteria were also set to determine the studies that could be accepted or rejected. The methodology for the review was succinctly described. Also, the basis for selecting the studies was provided. The conclusion drawn was based on the results obtained. The authors stated the limitations of the study and provided strategies they employed to reduce them. Quality rating of this evidence is therefore A (high quality).

Level II Evidence. The level II evidence identified was a study about fluoride varnish as adjunct to oral health promotion. Agouropoulos et al. (2014) investigated the effect of biannual fluoride varnish applications in preschool children who were recipients of school-based oral health promotion and supervised toothbrushing with 1000 ppm fluoride toothpaste. The design of this study was a double-blind randomized controlled trial with two parallel arms involving 424 preschool children between the ages of 2 to 5 years. The study was conducted from 2009 to 2011.

Children in the sample were stratified on the variable of caries risk before randomization was done to verify whether test and control groups could be homogeneous Children in the test group were recipients of biannual fluoride varnish application in addition to oral health education twice a year and daily supervised brushing of the teeth. The control group had a placebo and oral health education twice in a year, and daily supervised brushing of the teeth.

In addition, the children were examined at the baseline, at the end of the first year, and at the end of the second year. The primary outcomes measured were prevalence and increment of dental caries. Also, gingival condition, salivary tests to

determine the presence of Mutans Streptococci growth, and salivary buffer capacity were the secondary outcomes measured.

The results indicated the two groups were similar in dental caries prevalence-test (37.5) and control groups (37.8) at baseline. After year 1 and 2, there were no significant difference between test (63 and 64.8) and control (64.8 and 65.8) regarding caries prevalence or increment. However, there was a reduction in the number of new pre-cavitated enamel lesions in the second year of the study ($p=0.05$). The application of fluoride varnish had no effect on the secondary outcomes in course of the study. Therefore, biannual fluoride varnish application did not provide noticeable caries-prevention benefit when used in conjunction with school-based oral health education when compared to supervised once daily toothbrushing.

The quality rating of this study is B (good quality). The reasoning for this conclusion is that the result was reasonably consistent, but it falls short of consistent and generalizable results. It was noted that the sample size used for the study was short of the required number necessary to effect significant change in the result of such study.

Level III evidence. The level III evidence was a study exploring oral health promotion program effectiveness on early childhood caries**.** Braun et al. (2017) employed a quasi-experimental oral health program interventional study to evaluate the impact medical providers have on early childhood caries. This study was undertaken at four federally qualified health center in Denver between 2009 and 2015. The 420 participants were aged between three and four years.

The intervention employed included early childhood caries risk assessment, oral examination and instruction, dental referral, and fluoride varnish application. Outcome measured by the investigators was decayed, missing, filled tooth surface (dmfs) count and was undertaken by three dental hygienists blinded from the study. A secondary outcome investigated was decayed tooth surface count. Caregiver characteristics and eight oral behaviors on behalf of the child were measured. Data were taken pre-intervention, mid-intervention, and post-intervention and analyzed using descriptive statistics, and the Fisher exact test.

Results obtained indicated that fluoride varnish application's mean(range) for the three periods were 0.0 (0), 1.1 (0-7) and 4.5 (4-7) in 2009, 2011, and 2015 respectively. In general, data obtained in 2015 for children who received four fluoride application showed appreciable decrease in decayed, missing, and filled tooth surface. The quality rating of this study is A (high quality).

Level IV Evidence. A level IV study was conducted about the association between early childhood caries (ECC), feeding practices, and an established dental home**.** Kierce, Boyd, Rainchuso, & Palmer (2016) undertook an observational cross-sectional study using survey instrument among 132 Medicaid-enrolled children aged two to five to evaluate the association between established dental home and ECC, and feeding practices associated with an increased prevalence of ECC. The study compared children who have an established dental home to those without dental homes in feeding practices, parental knowledge of caries risk factors and oral health status. The children with an established dental home numbered 101 and had preventive care

and anticipatory guidance while 31 children had no dental home and no history of preventive or restorative dental visits.

For each subject, a questionnaire was administered, and a clinical examination undertaken to document existing caries lesions, and restorations and or missing teeth. The children received fluoride varnish application, oral hygiene instructions and nutritional counseling. The results indicated that children with an established dental home presented with lower rates of biofilm (*79.2%, $p < 0.05$*) compared to higher biofilm rates (*96.8%*, *$p < 0.05$*) in children who did not have a dental home. Also, gingivitis rates for children who have dental home and those without dental home are 44.6% and 71% respectively.

It was also noted that children without dental homes consumed more soda and juice and ate more sticky fruit snacks than those with an established dental home. Establishment of dental homes confer a strong protective effect on caries, and the mean decayed, missing and filled teeth (DMFT) index with an odds' ratio of 0.22 in both univariate and confounding adjusted analyses. Considering the nature of results obtained, the sample size, and conclusion drawn, the appraisal rating for this evidence is B.

Provision of dental services by nondental providers was the second level IV study that met the inclusion criteria for this review**.** Arthur and Rozier (2016) conducted a time-series cross-sectional study of preventive services provided by medical and dental providers for Medicaid-enrolled children from birth to age five years from 2010 to 2013, in all states and District of Columbia. The focus of the study was to assess the magnitude of oral health services provided by nontraditional providers compared with all

providers and link it with the Medicaid policies on the provision of oral health services. The attributes of state policies on oral health policies and how they determine the oral health services provided by non-traditional providers were also examined.

Data for the study was extracted from the State Annual Medicaid Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) Participation Report for the Federal Fiscal Years 2010 through 2013. The results indicated that 44 states having reimbursement policy for primary care providers reported 4.38% of children aged 0 to five years received oral health services per state per year. Aggregating state data showed an average of 30.1% received preventive dental services and 34.5% total preventive dental services (i.e., oral health services plus preventive dental services). The states were at different stages of adopting oral health services policies. The majority of them reimburse only the application of fluoride varnish and is contingent on the provider undergoing some form of training. Appraisal rating of this evidence is B (good quality)

A comparison of medical and dental providers of oral health services was another study considered for this review**.** Kranz et al. (2014) conducted a retrospective cohort study to find out the identity and effectiveness of oral health service providers to Medicaid enrollees before age three and oral health at age five in North Carolina for children enrolled in kindergarten during the 2005-2006 school year. Data were extracted from North Carolina Medicaid claims (1999-2006) and oral health surveillance data (2005-2006). The outcome measured were the number of DMFT and proportion of DMFT that were untreated. Regression models were used to analyze data for 5,235 children with two or more oral health visits from a PCP, dentist, or both.

The findings indicated that there was no difference in mean DMFT of primary teeth in kindergarten children who had multiple PCP or dentist visits. However, children who visited PCP only presented with a higher proportion of untreated decayed teeth. The quality rating of this evidence is B (good quality) because the results were reasonably consistent, with a sufficient sample size, and a fairly definitive conclusion.

Level VI Evidence. Integrating oral health care into nurse-managed health centers was one of the level VI pieces of evidence reviewed. Vece et al. (2017) implemented an evidence-based oral health program in three nurse-managed health care clinics in Northern Virginia to describe the demographic characteristics and oral health needs of the vulnerable population served at these sites. The project employed a convenience sample of 116 parents and 221 children from two months to 18 years of age, who were brought by caregivers for physical examinations.

The design of the project was a mixed method, nonrandomized, cross-sectional design. Interventions included oral risk assessment, oral examinations, oral health education, and appropriate dental referrals. Data collected included demographic, oral health background data, patient engagement and parents' satisfaction data. The demographic data indicated that 60% of the parents who accompanied their children were female and 40% were males. The racial background of the families was predominantly Hispanic (61%) followed by Asians (21%), Black (10%), White (5%) and others (3%). Baseline oral health needs including 11.2% of families do not have toothpaste, 23.3% brushed their teeth once daily, 44.8% brushed their teeth twice daily, and 29.3% brushed their teeth three or more times daily. More than 50% of the parents reported not having dental floss at home and only 11% of parents reported their children

flossed their teeth daily. Only 46% of parents reported they have taken their children for a dental visit.

Intervention measures indicated that 94.5% to 96.5% of all families with children present received oral health interventions. All the families found the intervention helpful, very helpful, and extremely helpful with a mean of 4.61 out of 5 on a 5-pointLikert scale. Families satisfaction with the oral health program was high with a mean of 4.68 out of 5 on a 5-point Likert scale. The appraisal rating for this evidence is B (good quality). The reason for this conclusion is that the result was reasonably consistent, but it falls short of consistent and generalizable results. Sample size used for the study was sufficient.

Oral health integration into pediatric practice was another level VI study reviewed. Sengupta, Nanavati, Cericola, & Simon (2017) integrated dental caries prevention into well-child visits and enhance the incidence of dental home establishment at a federally qualified health center in Boston, Massachusetts. The oral health program was initiated in 2015 and covered 3400 children. The study design involved implementing three oral health interventions of caries risk screening and oral health education, application of fluoride varnish for all eligible children, and expedited referral to a dental clinic nearby for children without dental homes.

Findings showed an increase of caries screening from 0 before the implementation of the project to 60% in the first month, and to 85% in 24th month. Fluoride varnish application rates increased to more than 80% after 18 months and 79 after month 24. Fifty-two percent of children referred to dentists successfully made appointments and 36% completed their appointment. The gains were achieved without any added time to the providers' workflow and quality improvement was sustained. The

quality rating for this evidence is B (good quality). This conclusion was determined because the result was reasonably consistent, but it falls short of consistent and generalizable results. However, the sample size used for the study was more than adequate.

Another level VI study reviewed for evidence concerned an interprofessional oral health initiative in a nondental, American Indian setting**.** Murphy and Larsson (2017) designed and implemented a non-experimental quality improvement project with the aim of improving the oral health status of American-Indian. A convenience sample of 47 caregiver/child dyads was involved in the study. The interventions administered were caries-risk assessment, oral health education, and dental referral.

Data were collected with the aid of a customized sheet, dental referral tracking slip, and oral health risk assessment tool. The procedure for data collection involved the primary care provider completing the caries risk assessment for participants, followed by knee-to-knee oral health screening on all children, and documentation of findings. Age appropriate education was provided, educational materials were reviewed at the clinic, and two educational handouts were given to be read at home. Dental referral slips to present at the dental clinic were provided.

The results indicated that most of the children were high risk for caries development (91.1%). Of those children who had their first tooth eruption, 27.8 % had healthy teeth, and 19.4% had a dental visit in the past three months. Out of 80.6% of the children referred to the dentist, 72.4% completed their appointment. The result was reasonably consistent, but it falls short of consistent and generalizable results. The

sample size used for the study was too small for generalizability of results. Therefore, the quality rating for this evidence is B.

The final level VI piece of evidence involves outcomes of a quality improvement project to identify primary care pediatric patients at high-risk for development of early childhood caries and referral to a dental provider (Jackson, 2015). The project site adopted a caries-risk screening tool. Baseline data were obtained from retrospective chart reviews from the same practitioners during the same three-month period, in the year preceding the intervention. For this project, records were reviewed of all patients seen for their nine, 12, or 18-month well child visit with focus on the proportion who received dental care during the three months in which the screening tool was implemented.

Data were also collected for high-risk patients referred directly to dental providers. One hundred and six pediatric patients were seen during the period. Thirty-one children screened at a nine-month well visit, 36 children at a 12-month visit, and 39 children at an 18-month visit. The results showed a slight difference in the proportion of patients classified as high-risk of developing ECC at three age groups: 62% in nine months screening, 78% in 12 months, and 62% in 18months screening group. However, the figures were high compared to the baseline data of 0%, 42%, and 27% for the nine, 12, and 18-months visit respectively. Also, 35% of the participants were referred to a dental provider. The rating for this study is B because the results were reasonably consistent, and the sample size was just sufficient.

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

This section brings together all the knowledge derived from the literature review and appraisal to address the question of what the best practice for children regarding oral health care is. The common themes identified from the evidence were synthesized and served as the basis for development of the best practice recommendation of this EBP project.

Synthesis of the literature that was reviewed and appraised which helped in determining the best practice for promoting oral health for children in the primary care setting. This activity is a requirement for the Iowa Model Revised (Iowa Model Collaborative, 2017). There were many similarities among the studies because of the adoption of clinical practice guidelines and other recommendations of studies undertaken. A common feature among the evidence is the importance of caries risk assessment in detecting dental caries and directing appropriate action for those children at risk and those requiring preventive care (AAPD, 2014, Braun et al., 2017; Jackson, 2015, Murphy & Larsson, 2017; Vece et al., 2017).

The role of topical fluoride in preventing caries and other dental problems was explored in a number of studies (Agouropoulos et al. 2014; Braun et al., 2017; Kaesler-Smith, 2016; Marinho et al., 2015; Moyer, 2014; Murphy & Larsson, 2017; Sengupta et al., 2017). Other themes encountered include education of caregivers (Murphy & Larsson, 2017; Vece et al., 2017), referrals to dentist to establish dental homes (Braun et al., 2017; Kierce et al., 2016; Murphy and Larsson , 2017; Sengupta et al., 2017) and the role of nondental primary care practitioners in preventive oral health care of children

(Arthur & Rozier, 2015; Kranz et al., 2014). These themes played an important role in establishing the essential component of the best practice recommendation to address the clinical question.

Caries risk-assessment. The literature reviewed and appraised supported the use of a caries risk-assessment tool to identify children at risk of developing dental caries, and to aid the clinician in how to care for the patient better (AAPD, 2016b). Caries risk-assessment has been adopted by the American Academy of Pediatric Dentistry, and they have recommended it to all primary care clinicians. However, due to insufficient evidence USPSTF (2014) was unable to assess the harm or benefit that routine caries risk assessment undertaken by primary care clinicians generate (Moyer, 2014).

Some of the evidence appraised employed caries risk-assessment as an intervention in their studies. A study about a caries risk screening tool for a quality improvement project resulted in an increase in dental referral rates (Jackson, 2015). Another quality improvement project utilized a caries risk assessment tool and identified a high proportion of children at risk of developing ECC (Murphy and Larsson, 2017).

Further, a program developed to integrate oral health into pediatric practice and coordinate dental referrals reported the benefits of caries-risk assessment where 1840 children were screened for risk of developing EEC, and 54% were at risk (Sengupta et al., 2017). Caries risk assessment was also utilized as an intervention in a project to integrate oral health care into nurse-managed health centers which resulted in many dental referrals (Vece et al. 2017). Caries risk-assessment is therefore one of the best practice interventions in preventive oral health care in children.

Fluoride varnish application. The usefulness of fluoride varnish application has been repeatedly supported (AAPD, 2016; Braun et al., 2017; Kaesler-Smith, 2016; Marinho et al. 2015; Moyer, 2014; and Sengupta et al., 2017) for the prevention of dental caries and its proliferation. Fluoride varnish application by pediatric primary care clinicians is a recommendation by AAPD (AAPD, 2016). Fluoride varnish application to the primary teeth of all infants and children starting at the age of primary tooth eruption is a recommendation by USPSTF (2014). Also, fluoride gels or varnish should be applied two to four times a year in permanent or milk teeth to reduce tooth decay in children (Kaesler-Smith, 2016).

There was a reduction in early childhood caries when children received four or more fluoride varnish application at a medical visit by age three (Braun et al., 2017). Fluoride varnish application was employed as an intervention for all eligible children in an oral health program at a health center and the outcome reported was about 80% application rate (Sengupta et al., 2017). Therefore, fluoride varnish application for all children starting from the age of tooth eruption and repeated at least twice yearly is effective in reducing or preventing dental caries.

Referral to dentist. Dental homes for all children by the age of 12 months of age is one of the best practice recommendations so that their oral health needs can be met (AAPD, 2016). Referring children without dental homes to dentists is aimed at finding a solution to this problem. Children who have dental homes have healthier teeth than those who do not (Kierce et al., 2016) and dental referrals by primary care providers is important in improving oral health care (Sengupta et al., 2017).

Caregiver education. Caregiver education is an important oral health promotion strategy. Many studies and quality improvement projects have used caregiver education as an effective intervention in oral health promotion (Sengupta et al. 2017, Murphy & Larsson, 2017; and Braun et al. 2017). The best practice recommendations include providing age-appropriate information on teething, etiology and prevention of early childhood caries, oral hygiene, diet, and avoiding saliva sharing behaviors (AAPD, 2016a)

Role of nondental practitioners. The preventive oral health care services provided at the primary care settings by clinicians such as the DNP family nurse practitioner results in similar oral health care outcomes compared to the dentist (Kranz et al., 2014). In addition, the services being rendered by these clinicians are associated with an overall increase in access to preventive dental services for children from zero to five years of age (Arthur & Rozier, 2016).These observations imply that the setting and type of provider do not influence the effectiveness of preventive oral health service hence, the DNP family nurse practitioner has an important role to play in oral health care of children.

The recommendations by AAPD (2016b) and USPSTF (Moyer, 2014), indicate that primary care clinicians provide caries risk assessment and fluoride varnish application are best practices. Therefore, integrating oral health care for children in the primary care setting by clinicians such as the DNP family nurse practitioner has merit especially when these clinicians are already providing medical care to this particular patient population.

Best Practice Model Recommendation

The adoption of the most current evidence derived from the appraised literature (Appendix A) will yield the best practice recommendation for this EBP project on integrating oral health for children in the primary care setting. Subsequently, the evidence from literature reviewed indicates that multifactorial interventions are the best practice for improving oral health of children and that primary care practitioners such as the DNP family nurse practitioner have an important role to play to achieve this goal. The multifactorial interventions for child oral health supported by evidence include, (a) caries risk assessment, (b) application of fluoride varnish, (c) caregiver education, and (d) referrals to a dentist for establishment of a dental home. These interventions are supported by many practice groups such as AAPD, American Academy of Pediatrics (AAP), and American Association of Nurse Practitioners. Health facilities such as Federally Qualified Health Centers are adopting these interventions in their quest to promote oral health for children.

How the Best Practice Model will Answer the Clinical Question

The best practice recommendation for promoting oral health for children will answer the clinical question by demonstrating that multifactorial interventions of caries risk assessment, application of fluoride varnish, caregiver education, and referrals to a dentist for establishment of dental home have an impact on preventing early childhood caries and promoting general oral health of children. The impact of the multifactorial oral health interventions will be compared to the usual care of children in a setting where there is a lack emphasis placed on oral health care. Through comparison of pre- and

post-implementation data collected, the success of the best practice multifactorial interventions can be evaluated.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

This chapter provides an in-depth narration of the method used for translating and implementing the current and best available evidence for integrating oral health for children in a pediatric primary care setting. Doctoral prepared family nurse practitioners are part of these clinicians that provide preventive oral health services to children. Also, the chapter sheds light on the steps taken to provide the answer to the PICOT question: In children of age 6 months up to 6 years, what is the effect of best practices for oral health care provided in primary care setting compared to no oral health intervention on oral health outcomes over a 3-month period.

The implementation of practice change represents the step seven of the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017). The components of this step in the Iowa Model include engaging patients and verifying preferences, resource consideration, constraint and approval, developing localized protocol, creating an evaluation plan, collecting baseline data, developing an implementation plan, preparing clinicians and materials, promoting adoption, collecting post-pilot data, and reporting.

The chapter provides a description of the element involved in the implementation of the practice change such as participants and setting, outcomes, interventions, planning, recruiting, data, and protection of human subjects will be undertaken. Implementation of practice change based on current and relevant evidence to answer a compelling clinical question is a role most DNP graduate play in the clinical setting.

Participants and Setting

Participants in the EBP project comprised of children aged 6 months up to 6 years who attended well-child-visit or visited the pediatric primary care provider for common complaint of daily occurrence that does not require specialist care. Children from this age group were chosen because they are young and vulnerable, depend on their caregivers for dental appointment, and are known to be prone to the development of early childhood caries. Moreover, in this clinical setting, it was observed that the majority of children are Hispanics and have been enrolled in the state funded health insurance known as Medi-Cal. Racial disparity in oral health care exists (USDHHS, 2000) and there are few dental practitioners in this area who attend to children and accept Medical insurance as mode of payment for service.

The settings for this EBP project were three pediatric clinical sites of an independent clinic and serve low income families. The clinics were located in two neighboring towns in Southern California. Choice of this setting emanated from the observation that most of the children who were seen at the sites have dental caries. Access to oral health care services in this primary care facility through preventive care and education will improve the overall health of these children.

Outcomes

The primary outcomes measured in this project were fluoride varnish rate, dental referral success rate, and adherence to oral health recommendation. The secondary outcome was caregiver characteristics. The data collected include data about children who needed oral health services, percentage of children who are referred to a dentist, and caregiver or parent characteristics such as age, gender, ethnicity, insurance,

education, and oral behaviors on behalf of child such as dental visit, bottle use, drinking fluoridated tap water, brushing of teeth, and eating behaviors. Data were collected from assessment, one-on-one interview, and questionnaire that was used to collect demographic data as well as caries risk assessment. These data were collected from the commencement of the project implementation on November 2018 to February 2019.

Intervention

The interventions used in this EBP project were based on best available evidence in literature on oral health promotion in children. The four components of the intervention were: (a) caries risk assessment (AAPD, 2016), (b) fluoride varnish application for all eligible children, (c) expedited dental referral for establishment of dental home, and (d) caregiver education about oral health. A work guideline was developed based on clinical care guidelines (Braun et al. 2017) that explains the process the participants will go through to receive care when they check-in till they leave the premises.

The work guideline involved a front-desk staff (member of the team) informing caregivers and their children about the oral health project and those who were interested were introduced to the Project Leader who gave them the introductory letter (Appendix B), consent forms (Appendix C), and assent forms (Appendix D) to the child if applicable. Caregivers and children who accepted to be part of the project and signed the necessary forms were interviewed using the questionnaire (Appendix E) that comprised of demographic characteristics and oral health risk assessment tool during the well child visit. Oral health examinations were undertaken followed by fluoride varnish application were undertaken for eligible children, dental referrals for children

who were at risk of developing ECC or do not have a dental home, and then caregivers were educated about improving children's oral health. Oral health kit comprised of toothbrush and toothpaste were then given to the family at the end of the visit.

The oral health risk assessment tool was designed to be used by health care professionals to obtain information about the caregiver and the child's oral health practices and examination of the child's mouth undertaken to assess the risk of dental caries. This assessment includes biological factors, protective factors, and clinical findings. The assessment provided an indication that a child has a high or low risk for developing early childhood caries or other oral health problems. The result obtained with the aid of the assessment tool also provides options for the self-management goals that ought to be set and achieved.

Application of fluoride varnish two to four times a year is another recommendation that has been found to reduce tooth decay (AAPD, 2014; USPSTF, 2014). The usefulness of topical fluoride arises from its effect of reducing demineralization of enamel and promoting remineralization as well as its antibacterial effect on both primary and permanent teeth (Clark, Kent, &Jackson, 2015; Castellano & Rizzolo, 2012). Previously, it was recommended that fluoride varnish be applied to the teeth of children at high risk of developing dental caries based on result obtained from risk assessment tool. Presently, all children 6 years and younger with primary teeth can benefit from fluoride varnish irrespective of the presence of fluoride in their drinking water or other risk factors. The application of fluoride varnish is simple and require little training and skill. The varnish solidifies on the tooth surface when it comes into contact

with saliva and decreases the likelihood of ingestion whiles increasing the contact between fluoride and tooth surface.

Primary care providers are required to refer children who have high risk of developing dental caries and those who do not have a dental home to a dentist. Referral to a dentist is one of the recommendations made to reduce early childhood caries. The concept of a dental home is related to the concept of a medical home, which is intended to improve health care utilization by families and obtaining the proper preventive services. According to AAPD (2015), the dental home is "the ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family-centered way" (p. 1). It is expected that children by the age of 12 months would have dental homes where they can regularly receive dental care.

Caregiver education about oral health is very important because children depend on their caregivers for access to healthcare. Oral health education focused on oral hygiene, diet especially sugar consumption, and the role bacteria plays in dental caries. The education was tailored to a child's age and his or her oral health needs at that age. Emphasis was placed on prevention of dental problems.

Planning

A significant amount of time went into designing the workflow and planning data collection procedure. Components of the planning were based on the Iowa Model Revised (Iowa Model Collaborative, 2017). A team was formed comprising of six Medical Assistants from the three clinics, the project facilitator, and the project leader. The team was trained about conducting an assessment using oral health/caries risk

assessment tool, applying fluoride varnish, making referrals to dentists, and educating caregivers or parents about oral health.

The EBP project leader procured fluoride varnish and dental kit from America's Tooth Fairy (National Children's Oral Health Foundation). Although arrangement was made by the project leader to buy more fluoride varnish from a dental supply company with "her" resources to add up to the supplies that were donated, in the end it was unnecessary because the supplies donated were adequate. The fluoride varnish and dental kits were kept at the sites and under the supervision of a team member during the implementation stage of the project.

Charges for oral health service delivered during the project was discussed with the Project Facilitator. There is a policy where Medicaid and other insurance companies reimburse primary care providers for oral health care service delivery. The reimbursement topic was raised with the Project Facilitator who explored how it could have been set up. However, it was agreed that children who do not have insurance would not be charged for the oral health service. Subsequently, a consensus was reached that because the project was being piloted it was prudent to render this service free at this stage. The charges would be applied to oral health service if the project was successful and subsequently adopted by the clinic.

The procedure for the implementation of the oral health program involved having access to the patient after the clinician has completed her procedure for the well-child visit. Team members helped caregivers complete a questionnaire on caregiver characteristics and oral health/caries risk assessment. Dental home status was then verified. This was followed by a standardized oral health education. Further, a member

of the team undertook the application of fluoride varnish to those children who are eligible. Patients who disclosed that they do not have dental homes were offered appointment at nearby dental clinic or given a list of all dentist in the county. A dental kit was given to the children at the end of the visit. EBP project was implemented on November 2018 to February 2019. Post change data was collected in February and March 2019. A timetable for the project implementation was included (Appendix F)

Recruiting Participants

Caregivers who brought their children to well-child visit or sick visit and were 18 years and above were informed about the project. They were then be asked if they were interested in participating in the project. Caregivers that expressed interest were given an introductory letter about the project (Appendix B). They were provided with information regarding their rights and were given consent forms to sign (Appendix C). Children who were matured in enough to understand what the project entailed were given assent forms (Appendix D) to sign.

Data

Measures

The primary outcomes that were measured in this project were fluoride varnish rate, dental referral success rate, and adherence to oral health recommendations. Fluoride varnish application rate and dental referral rate were recorded on the questionnaire. Children were referred to dentist if the oral health assessment undertaken using the Oral health /Caries-risk Assessment Tool indicated that the children have high risk of developing dental caries. Also, children who did not have dental homes were referred.

Dental referral rates were measured as children who were referred to a dentist after assessment. Adherence to oral health recommendation were measured by parents or caregivers providing information on whether they were able to carry out the recommendation about oral health provided during educational component of the intervention. These data were recorded on the questionnaire This was measured through the telephone call with the parents or caregiver and recorded on questionnaire. Parents or caregivers were also called on telephone to verify if they booked and honored the dental appointment.

The demographic caregivers or parents and children characteristics and oral health behaviors on behalf of the child. Questionnaire was used to measure this outcome. The section of questionnaire for measuring child and caregiver or parents' characteristics was adopted from a study undertaken by Braun et al. (2017) and oral health risk assessment tool. The questionnaire for measuring caregiver's oral health behaviors on behalf of the child (Appendix F) has been validated as being able to predict specific caregiver characteristics that can contribute to children's oral health status (Braun et al., 2017; Wilson et al., 2016)

Collection

Data collection during the implementation phase took place between November 2018 and February 2019. Data was collected at the three clinical sites at different times and on the days the clinician was on duty.

Management and analysis

Data collected at the clinical sites were handed to the project leader who was therefore responsible for protection of the oral health information of the participants. The

data were analyzed using IntellectusStatistics software. Raw data were entered into the software and a series of analyses were run to generate results.

Protection of Human Subjects

Protection of human subjects is very important in all EBP projects and effort was made to uphold this principle before implementation and throughout the intervention of the study. The project leader completed Institutional Review Board (IRB) training through the National Institute of Health and received a certificate for completion of the web-based training course “Protecting Human Subject Research Participants” on April 3, 2018. Application for expedited review was submitted to the University’s IRB for approval.

Participants were briefed on what the project entails, and their informed consent obtained from the beginning of the implementation phase. Participants in the study were informed of voluntary nature of the project, and their right to withdraw from the study at any time. Confidentiality of participants’ identity and personal information were protected through various means. Demographic information of participants was presented in aggregate form to conceal their identities and thus maintaining confidentiality. All data were stored in a locked cabinet with the key being kept in a secret location accessible to the project leader alone. The project leader transferred the data to a password-protected computer to prevent them from being stolen. Statistical data from the study were used in the aggregated form so data about participants were concealed.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to develop and integrate an evidence-based oral health program for children into a pediatric primary care practice. The project was comprised of strategies that were identified as current evidence-based practices shown to be effective for promoting oral health in children. The best practice recommendations were used as interventions with the aim of obtaining data to support adopting oral health program into care for children at the clinic. Outcomes for the project included fluoride varnish application rate, dental referral success rate, and adherence to oral health recommendations. This chapter describes the findings of the EBP project: (a) participant characteristics, (b) changes in outcomes, (c) statistical testing, and (d) significance.

Participants

Size

The participants in this project consisted of 80 children, and their caregivers who attended the clinic at the three sites of the project.

Characteristics

The children and their caregivers who were part of the project demonstrated the following characteristics summarized in Table 4.1. The participants answered questions about age, gender, ethnicity, insurance, caregiver educational level, number of persons in house-hold, and annual house-hold income. The ages of the children ranged between less than 1 year of age to 6 years.

Table 4.1

Characteristics of the Participants

Variable	n	%
Age in years		
6	10	12.50
5	9	11.25
4	16	20.00
3	7	8.75
2	11	13.75
1	14	17.50
Less than 1	13	16.25
Gender		
Female	37	46.25
Male	43	53.75
Ethnicity		
African-American	7	8.75
Asian	2	2.50
Hispanic	68	85.00
Samoan	2	2.50
White	1	1.25
Insurance		
Public	73	91.25
Other	7	8.75
Parent's education		
Below high school	24	30.00
High school	43	53.75
College	13	16.25
Patient or sibling		
Patient	68	85.00
Sibling	12	15.00
Household income		
60,000 or more	1	1.25
50,000-59,999	3	3.75
45,000- 49,999	4	5.00
Less than 45,000	72	90.00

For the most part, ages were evenly distributed among the children (Figure 4.1). The most frequently observed category of age was 4 (*n* = 16, 20%). Most of the participants were male (n = 43, 53.75%) while 46.25% (n = 37) of the participants were female (Figure 4.2). Ethnic composition of the participants consisted primarily of Hispanics at 85% (n = 68), followed by African-Americans at 8.75% (n = 7), Samoan at 2.5% (n = 2), Asian at 2.5% (n = 2), and White at 1.25% (n = 1) (Figure 4.3).

The characteristics of participants regarding insurance indicated that 91.25% (n = 73) had public type of insurance from Medicaid while 7.5% (n = 6) had private insurance, and 1.25% (n = 1) paid for healthcare out-of-pocket. The educational background of most of the parents or caregivers who brought these children to the clinic was high school (n = 43, 53.75%) followed by below high school at 30% (n = 24), and college at 16.25% (n = 13). Patients accounted for 85% (n = 68) of the children who participated and 15% (n = 12) were siblings. The most frequently reported annual household income for participants was less than $45,000 (90%, n = 72) while the least was $60,000 or more at 1.25% (n = 1). The most common family size was six and the highest number of individuals in a family was nine (Table 4.1).

Oral Health Outcomes

The caries risk of children was assessed using the Oral Health Risk Assessment Tool (AAP, 2011). Variables on the assessment tool included whether the child had a cavity in the past 2 years, type of visit, parent's active decay, parent's dentist, child sippy cup use, frequent snacking, child existing dental home, intake of fluoridated water or supplement, fluoride varnish application (FVA) in the last 6 months, teeth brushed twice daily, white spots in the past 12 months, obvious decay, restoration, visible

Figure 4.1 Ages of Participants

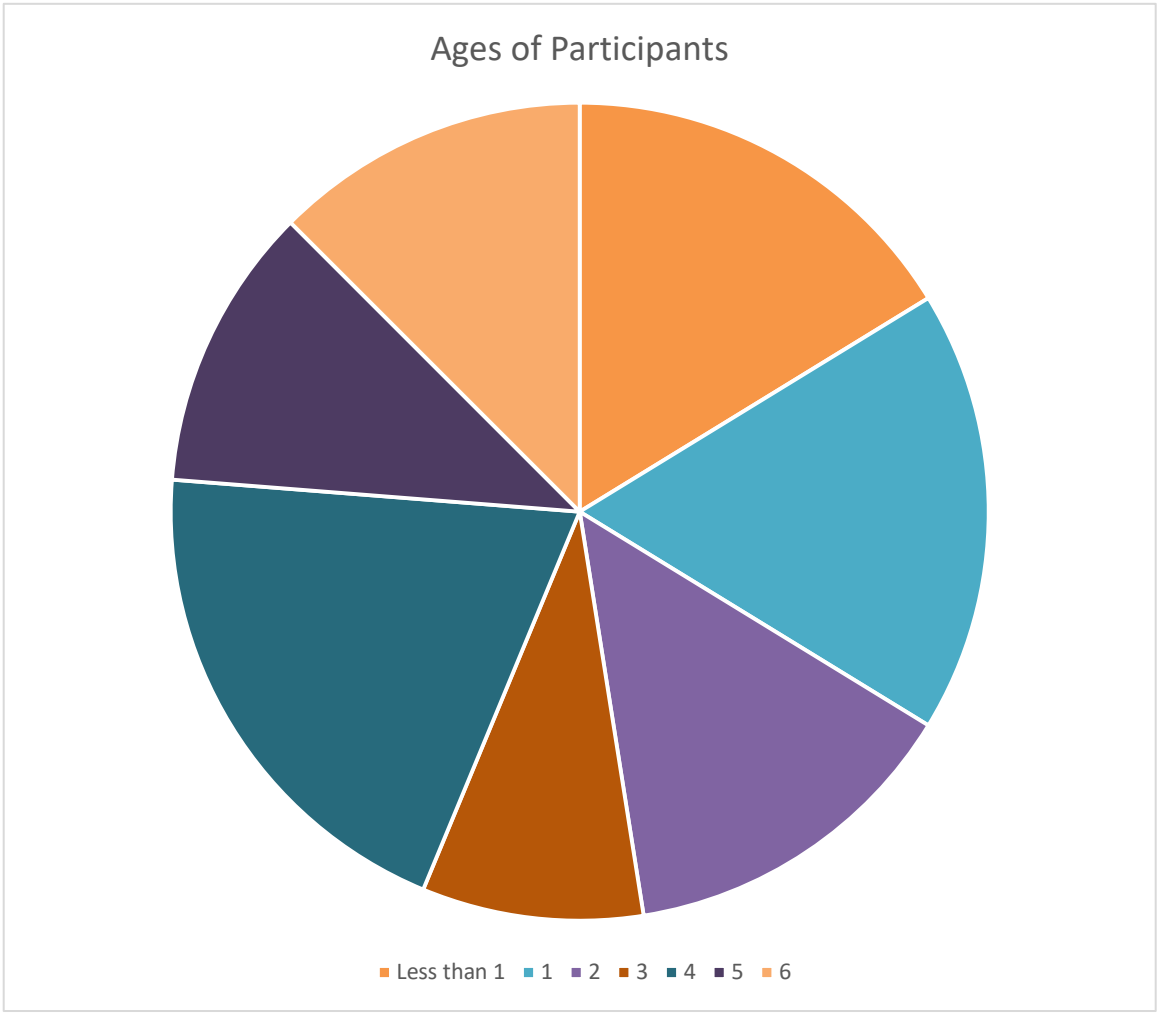


Figure 4.2 Gender of Participants

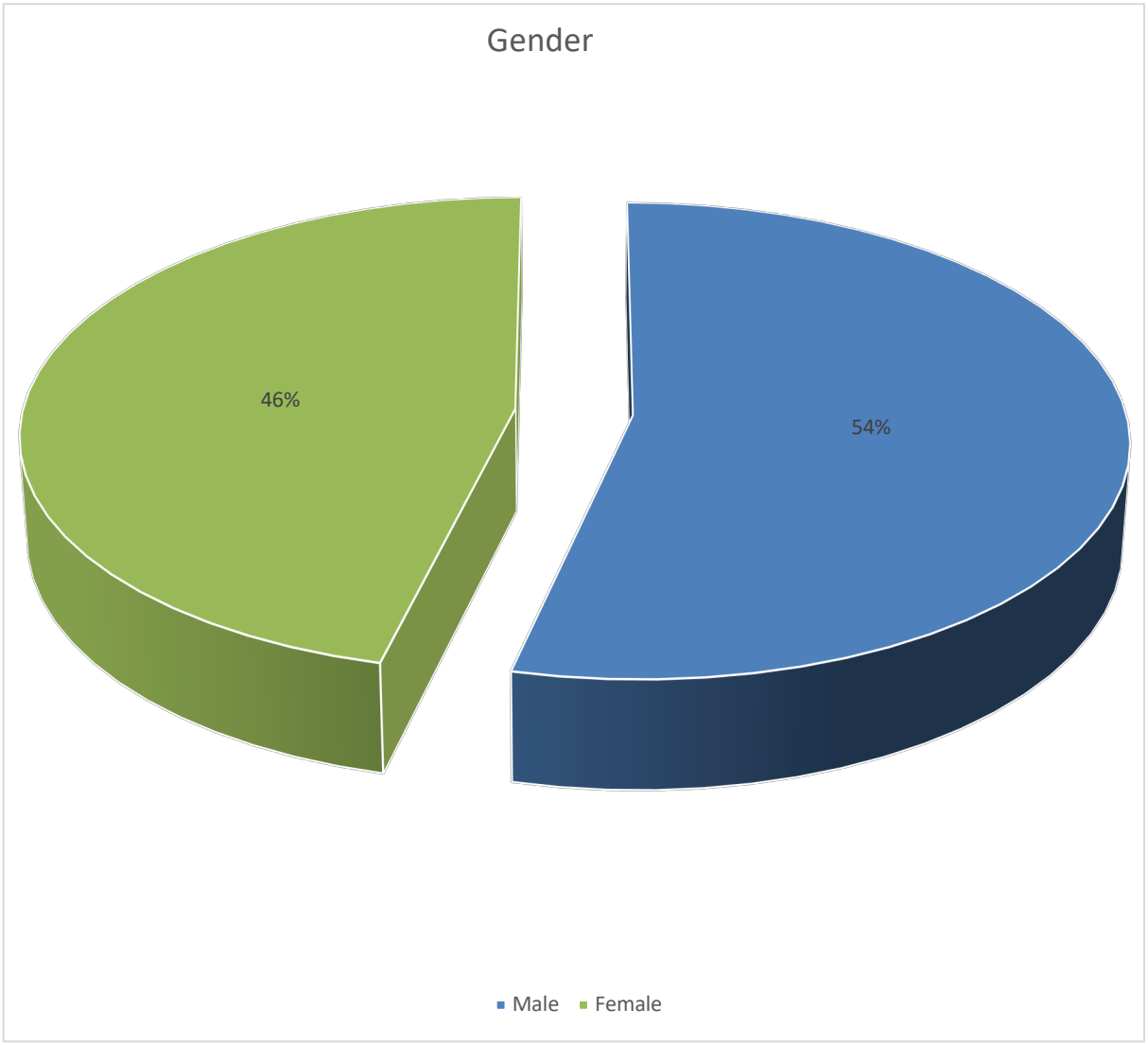
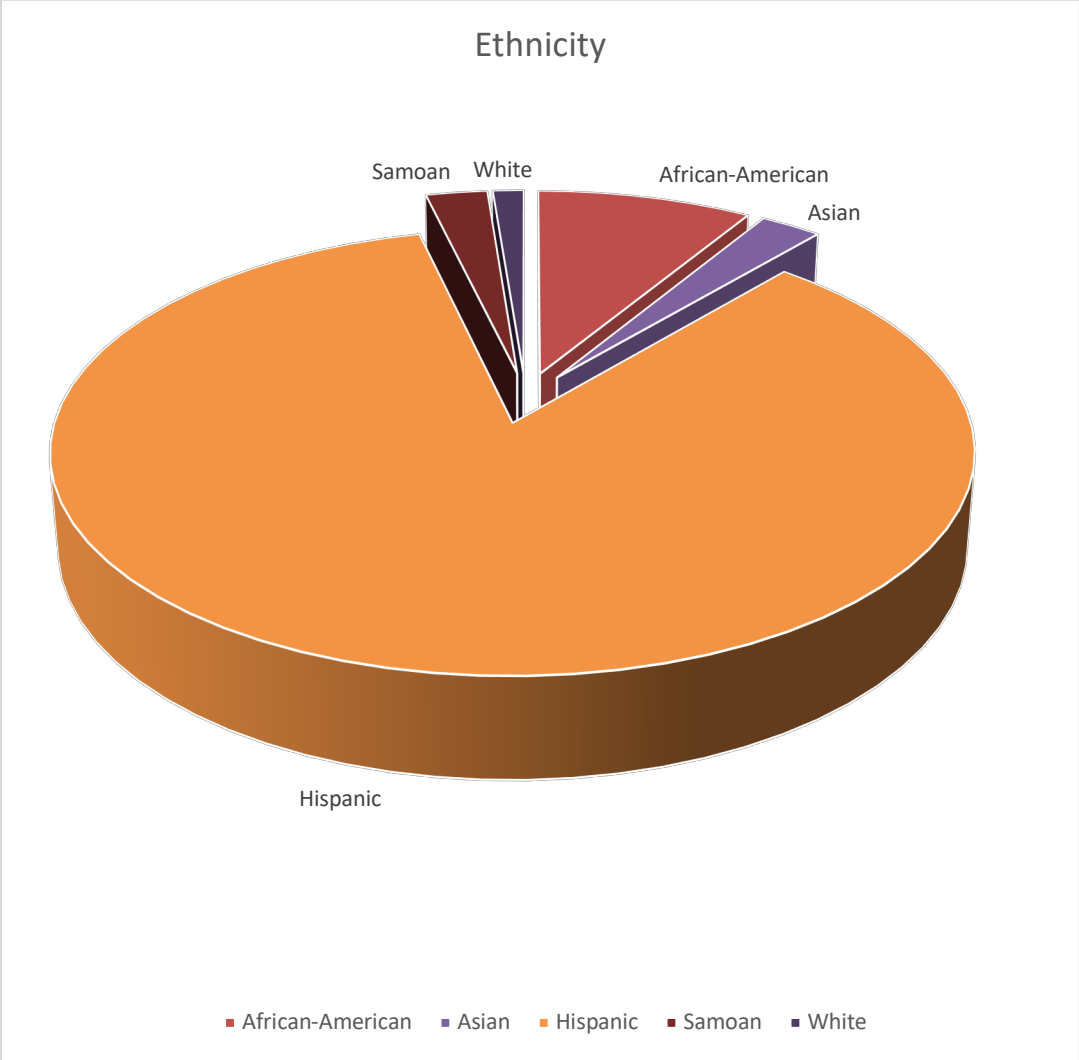


Figure 4.3 Ethnicity of Participants



plaque, and caries risk. Most visits were well-child visits (n = 51, 63.75%). Most of the parents did not have active decay (n = 64, 80%); however, most of the parents did not have dentist (n = 44, 55%). The most frequently observed category of frequent snacking was Yes (*n* = 65, 81%). Most children had no existing dental home (*n* = 47, 59%) no intake of fluoridated water or supplement (*n* = 70, 88%), and no FVA in the last 6 months (*n* = 54, 68%). Nearly three quarters of the children did not brush their teeth twice a day (*n* = 57, 71%) while about half of them had no visible plaque (*n* = 42, 52%). Assessments showed that 74% (n = 59) of the children had no white spots in the past 12 months and 70% (*n* = 56) had no obvious tooth decay. Most children had no restoration (*n* = 67, 84%) and their risk for dental caries was high (*n* = 76, 95%) (Table 4.2).

In addition to the oral health assessment, strategies for this EBP project included fluoride varnish application, dental referral, follow up call, visit to dentist, and change in oral health behavior. More than half of the children received fluoride varnish application (n = 42, 52%) and 66% (n = 53) were referred to a dentist. Follow-up calls were made to determine whether children had seen a dentist or were performing oral hygiene. Forty-nine percent (n = 39) of participants' caregivers responded to the call while 51% (n = 41) did not respond. Of those who responded to the call, 28% (n = 22) made appointment to see a dentist, 16% (n = 13) responded they were yet to make an appointment, and 2.5% (n = 2) visited a dentist. Also, 5% (n = 4) of the caregivers also reported a change in oral health behavior, 29% (n = 23) reported their change in behavior is in progress, whiles 5% (n = 4) said they have noticed a change in their oral health behavior.

Table 4.2

Frequency Table for Nominal Variables

Variable	*n*	*%*
Cavity in the past two years		
No	51	63.75
Yes	16	20.00
Not sure	13	16.25
Missing	0	0.00
Visit		
Sick visit	19	23.75
Well child	51	63.75
Other	10	12.50
Missing	0	0.00
Parent's active decay		
No	64	80.00
Yes	16	20.00
Missing	0	0.00
Parent's dentist		
Yes	36	45.00
No	44	55.00
Missing	0	0.00
Sippy cup use		
No	46	57.50
Yes	34	42.50
Missing	0	0.00
Frequent snacking		
No	15	18.75
Yes	65	81.25
Missing	0	0.00
Special health needs		
No	74	92.50
Yes	6	7.50
Missing	0	0.00
Medicaid eligible		
Yes	71	88.75
No	9	11.25

Missing	0	0.00
Child existing dental home		
Yes	33	41.25
No	47	58.75
Missing	0	0.00
Intake of fluoridated water or supplement		
No	70	87.50
Yes	10	12.50
Missing	0	0.00

Note. Due to rounding errors, percentages may not equal 100%.

Table 4.3

Frequency Table for Oral Health Assessment

Variable	*n*	%
FVA in the last 6months		
No	54	67.50
Yes	26	32.50
Teeth brushed twice daily		
No	57	71.25
Yes	23	28.75
White spots in the past 12 months		
No	67	83.75
Yes	13	16.25
Obvious decay		
No	56	70.00
Yes	24	30.00
Restoration		
No	67	83.75
Yes	13	16.25
Visible plaque		
No	42	52.50
Yes	38	47.50
Missing	0	0.00
Gingivitis		
No	78	97.50
Yes	2	2.50
Teeth present		
Yes	74	92.50
No	6	7.50
Healthy teeth		
No	50	62.50
Yes	26	32.50
Missing	4	5.00
Caries risk		
Low	4	5.00
High	76	95.00

Table 4.4

Frequency and Percentage of EBP

Variable	*n*	*%*
Fluoride Varnish		
Yes	42	52.50
No	38	47.50
Dental referral		
No	27	33.75
Yes	53	66.25
Follow up call		
Responded	39	48.75
Did not respond	41	51.25
Visit to dentist		
Attended	2	2.50
Made appointment	22	27.50
Yet to make appointment	13	16.25
No appointment made	1	1.25
Missing	42	52.50
Change in oral health behavior		
In progress	23	28.75
No change	3	3.75
Changed	4	5.00
Missing	50	62.50

Note. Due to rounding errors, percentages may not equal 100%.

Statistical Testing and Significance

Oral health care was not part of the services provided at the clinic; hence, there was no pre-implementation data. Therefore, instead of a paired-sample *t* test to compare mean pre and post-intervention score, a *Chi*-square test was undertaken to compare the observed frequencies to the expected frequencies of two nominal level variables within the sample to determine either their independence or association (Cronk, 2018).

Varnish application. A *Chi*-square goodness of fit test (Cronk, 2018) was conducted to examine whether fluoride varnish application was equally distributed across the two categories of children who received the varnish and those who did not. The results of the *Chi*-square test (Table 4.5) were not significant, ($\chi^2(1) = 0.200$, $p = .655$), indicating that the differences between observed and expected frequencies were not significantly different for children who received the varnish and those who did not. Also, a *Chi*-square test of independence was conducted to examine whether fluoride varnish application and gender were independent. The results of the *Chi*-square test were not significant, ($\chi^2(1) = 0.07$, $p = .796$), which shows that boys and girls were equally likely to receive fluoride varnish (Table 4.6).

Further, a Fisher's exact test (McHugh, 2013) was conducted to examine whether caries risk and fluoride varnish were independent. The results of the Fisher exact test were not significant, (OR = 2.81, $p = .617$), which indicates that children at high risk for dental caries were just likely to receive a fluoride varnish as children who are at low risk for dental caries (Table 4.7).

Table 4.5

Chi-Square Goodness of Fit Test for Fluoride Varnish

Level	Observed	Expected
Yes	42	40
No	38	40

Results: $\chi^2 = 0.200$, df = 1, p = .655

Table 4.6

Chi-square test of Independence for Fluoride Varnish and Gender

	Gender				
Fluoride Varnish	Male	Female	χ^2	*df*	*p*
Yes	22 (22.575)	20 (19.425)	0.067	1	0.796
No	21 (20.425)	17 (17.575)			

Note. Values formatted as Observed [Expected]

Results: $\chi^2 = 0.067$, df = 1, p = .796

Table 4.7

Chi-square test of Independence for Fluoride Varnish and Caries Risk

	Caries risk			
Fluoride Varnish	Low	High	OR	*p*
Yes	3[2.10]	39[39.90]	2.81	.617
No	1[1.90]	37[36.10]		

Note. Values formatted as Observed[Expected].

A *Chi*-square test of independence (Cronk, 2018) was conducted to examine whether fluoride varnish and age were independent. There were 2 levels in fluoride Varnish: Yes and No. There were 7 levels in Age: 6, 5, 4, 3, 2, 1, and Less than 1. The results of the *Chi*-square test were not significant, $\chi^2(6) = 7.69$, $p = .261$, indicating that receiving fluoride varnish application does not depend on age (Table 4.8).

A *Chi*-square test of independence was conducted to examine whether fluoride varnish and dental referral were independent. There were 2 levels in fluoride varnish and dental referral categories respectively: No and Yes. The results of the *Chi*-square test were significant, ($\chi^2(1) = 14.98$, $p < .001$), indicating that these variables are related to one another. This implies that children who received the fluoride varnish were likely to be referred to a dentist (Table 4.9).

Dental referral. *Chi*-square tests were conducted to examine the independence between dental referral with the variables of parents with dentist, Medicaid eligibility, children with existing dental homes, FVA in the past 6 months, intake of fluoridated water or supplement, obvious decay, and visible plaques. McNemar's *Chi*-square test (IntellectusStatistics, 2019) for 2 x 2 contingency tables was conducted to test these outcome proportions.

There was statistically significant, ($\chi^2(1) = 29.13$, $p < .001$) result when comparing dental referral and parent active decay. The result indicates that children of parents with active decay are more likely to have dental referral. Table 4.10 presents the results of the McNemar's *Chi*-square test.

Table 4.8

Chi-square test of Independence for Fluoride Varnish and Age

	Fluoride Varnish				
Age	Yes	No	χ^2	*df*	*p*
6	4[5.25]	6[4.75]	7.69	6	.261
5	3[4.72]	6[4.28]			
4	9[8.40]	7[7.60]			
3	3[3.67]	4[3.33]			
2	7[5.78]	4[5.22]			
1	11[7.35]	3[6.65]			
Less than	5[6.83]	8[6.17]			

Note. Values formatted as Observed[Expected].

Table 4.9

Chi-square test of Independence for Fluoride Varnish and Dental Referral

	Dental referral				
Fluoride Varnish	No	Yes	χ^2	*df*	*p*
Yes	6[14.18]	36[27.82]	14.98	1	< .001
No	21[12.82]	17[25.18]			

Note. Values formatted as Observed[Expected].

Table 4.10

McNemar's Chi-square test for Dental Referral and Parents' Active Decay

	Parent active decay				
Dental referral	No	Yes	χ^2	*df*	*p*
No	22	5	29.13	1	< .001
Yes	42	11			

When dental referral and parent dentist were compared, the results of the test were not significant, ($\chi^2(1) = 2.79$, $p = .095$), indicating that dental referral does not depend on whether a parent have a dental home (Table 4.11). Similarly, there was no statistically significant difference ($\chi^2(1) = 3.00$, $p = .083$) when dental referral and child existing dental home were compared (Table 4.13).

There were some variables that were related to dental referral. For example, test comparing dental referral and FVA in the last 6 months was statistically significant, ($\chi^2(1) = 10.27$, $p = .001$), indicating that children who did not receive FVA in the last 6 months were more likely to have dental referrals (Table 4.14). Children who do not drink fluoridated water or take in fluoride supplements were more likely to be referred to a dentist ($\chi^2(1) = 36.25$, $p < .001$) (Table 4.15). Additionally, testing (Table 4.16) showed statistical significance, ($\chi^2(1) = 15.29$, $p < .001$) which indicates that children with obvious decay are more likely to be referred to a dentist. There was statistically significant difference ($\chi^2(1) = 5.23$, $p = .022$) showing that children who had visible plaque were more likely to receive dental referral (Table 4.17). The final analysis using McNemar's Chi-square test for 2 x 2 contingency table was conducted to determine if the outcome proportions were equal for dental referral and caries risk. There was statistically significance difference between these characteristics, $\chi^2(1) = 19.59$, $p < .001$ (Table 4.18) which indicates that children with risk for caries were referred to a dentist.

Table 4.11

McNemar's Chi-square test for Dental Referral and Parent Dentist

	Parents with dentist				
Dental referral	Yes	No	χ^2	*df*	*p*
No	17	10	2.79	1	.095
Yes	19	34			

Table 4.12

McNemar's Chi-square test for Dental Referral and Medicaid Eligible

	Medicaid eligible				
Dental referral	Yes	No	χ^2	*df*	*p*
No	25	2	40.33	1	< .001
Yes	46	7			

Table 4.13

McNemar's Chi-square test for Dental Referral and Child Existing Dental Home

	Child existing dental home				
Dental referral	Yes	No	χ^2	*df*	*p*
No	24	3	3.00	1	.083
Yes	9	44			

Table 4.14

McNemar's Chi-square test for Dental Referral and FVA in the last 6 months

	FVA in the last 6months				
Dental referral	No	Yes	χ^2	*df*	*p*
No	5	22	10.27	1	.001
Yes	49	4			

Table 4.15

McNemar's Chi-square test for Dental Referral and Intake of Fluoridated Water or Supplement

	Intake of fluoridated water or supplement				
Dental referral	No	Yes	χ^2	*df*	*p*
No	23	4	36.25	1	< .001
Yes	47	6			

Table 4.16

McNemar's Chi-square test for Dental Referral and Obvious Decay

	Obvious decay				
Dental referral	No	Yes	χ^2	*df*	*p*
No	14	13	15.29	1	< .001
Yes	42	11			

Table 4.17

McNemar's Chi-square test for Dental Referral and Visible Plaque

	Visible plaque				
Dental referral	No	Yes	χ^2	*df*	*p*
No	13	14	5.23	1	.022
Yes	29	24			

Table 4.18

McNemar's Chi-square test for Dental Referral and Caries Risk

	Caries risk				
Dental referral	Low	High	χ^2	*df*	*p*
No	2	25	19.59	1	< .001
Yes	2	51			

A *Chi* square Test of Independence (Cronk, 2018) was conducted to examine whether parent's education and dental referral were independent. There were 3 levels in parent education: below high school, college, and high school. There were 2 levels in Dental referral: No and Yes. The results of the *Chi*-square test were not significant, $\chi^2(2) = 0.96$, $p = .618$, suggesting that parent education and dental referral could be independent of one another. This implies that the observed frequencies were not significantly different from the expected frequencies. Table 4.19 presents the results of the *Chi* square test.

Change in oral health behavior. Caregivers were asked if there has been any change in their oral health behaviors as a result of the education provided them. There were three categories; changed (n = 4, 5%), in progress (n = 27, 33.75%), and no change (n = 3, 3.75%). A *Chi*-square goodness of fit test was performed to determine the frequency distribution in change in oral health behavior and there was a statistically significant difference in frequency distribution in the three categories of change in oral health behavior ($\chi^2 = 32.529$, $df = 2$, $p < .001$) . This result indicates that the response obtained was different from the response expected.

A Fisher exact test (McHugh, 2013) was conducted to examine whether change in oral health and parents' education were independent. There were 3 levels in change in oral health: (a) in progress, (b) no change, and (c) changed. There were 3 levels in Parents' Education: below high school, college, and high school. The results of the Fisher exact test were not significant, $p = .514$, suggesting that parents' education and Change in oral health could be independent of one another (Table 4.21).

Carries risk**.** A secondary outcome observed was the participants' caries risk. Most of the participants had high risk of developing dental caries risk (*n* = 76, 95%). A *Chi* square goodness of fit test (Cronk, 2018) was conducted to examine whether Caries risk was equally distributed across all categories. There were 2 levels in caries risk: Low and High. The results of the test were significant, $\chi^2(1) = 64.80$, $p < .001$, indicating that there were fewer observations than expected in Low and more observations than expected in High (Table 4.22).

Table 4.19

Chi-square test of Independence for Dental Referral and Parent Education

	Dental referral				
Parent Education	No	Yes	χ^2	*df*	*p*
Below high school	10[8.10]	14[15.90]	0.96	2	.618
College	4[4.39]	9[8.61]			
High school	13[14.51]	30[28.49]			

Note. Values formatted as Observed[Expected].

Table 4.20

Chi-Square Goodness of Fit Test for Change in Oral Health Behavior

Level	Observed Frequency	Expected Frequency
In progress	27	11.33
No change	3	11.33
Changed	4	11.33

Note. $\chi^2(2) = 32.53$, $p < .001$.

Table 4.21

Fisher Exact Test for Change in Oral Health and Parents' Education

	Parents' Education			
Change in oral Health	Below high school	College	High school	*p*
In progress	8[3.38]	6[2.36]	13[5.74]	.514
No change	2[0.38]	0[0.26]	1[0.64]	
Changed	0[0.50]	1[0.35]	3[0.85]	

Note. Values formatted as Observed[Expected].

Table 4.22

Chi Square Goodness of Fit Test for Caries risk

Level	Observed Frequency	Expected Frequency
Low	4	40.00
High	76	40.00

Note. X2(1) = 64.80, $p < .001$.

CHAPTER 5

DISCUSSION

This EBP project was developed to integrate an evidence-based oral health program for children into a pediatric primary care practice. Through a literature search, the Project Leader identified current evidence-based practices such as caries risk assessment, fluoride varnish application, caregiver education, and dental referral to promote oral health in children. The findings from the project will be discussed in this chapter. Also, the applicability of the EBP model and theoretical framework, and implications for the future of this EBP project will be looked at.

Explanation of Findings

The health care provided at the pediatrics clinics where the project was implemented had no oral health component. Therefore, the Project Leader with the help of the provider and the staff design and implemented an evidence-based oral health project at the clinics. The children were assessed for their risk of developing dental caries using the Oral Health Risk Assessment tool. Also, the children who were eligible to receive fluoride varnish were given. The caregivers were given oral health education .and children were referred to a dentist. To embrace a family approach in the nursing care provided, siblings were also included if caregivers give their consent. The final sample comprised of 80 children who received the oral health interventions.

Fluoride varnish protects the teeth of children by reducing enamel demineralization, inhibition of bacterial metabolism and acid production, and promoting enamel remineralization. Of the children in this sample, 52% (n = 42) had fluoride varnish applied to their teeth. Sengupta et al. (2017) integrated an oral health preventive

program into a pediatric practice and achieved fluoride varnish application rate between 65% to 90% in a period between 2015 and 2017. Although there was no pre-implementation data for comparison, the number of children who required and were given the fluoride varnish indicated how useful the project was. However, the fluoride varnish application rate was lower for this project.

The most common reason why some of the participants did not receive the fluoride varnish was because they had already received the varnish within 6-months to the time of the project (30%, n = 24). In addition, some of the children had dental appointments booked (9%, n = 7) and their caregivers were inclined to wait, and have it done at the dental clinic. Furthermore, a few of the children were agitated and did not want to be given the varnish, while some caregivers also did not want their children to receive the fluoride varnish.

Findings indicated that the likelihood of receiving a fluoride varnish application was not affected by gender, caries risk, or age. The studies reviewed (Braun et al., 2017, Marinho et al., 2015, and Sengupta et al., 2017) also did not establish any relationship between fluoride varnish and gender or age. Children who are eligible to receive fluoride varnish are given it without considering their gender. The effectiveness of fluoride varnish has also been studied in preschool children aged 2 to 5 years (Agouropoulos et al. 2014) and children and adolescent (Marinho et al. 2015) without a definite link between fluoride varnish and a particular age category.

The results from this EBP project also indicated that children who received dental referral were more likely to have fluoride varnish applied ($\chi^2(1) = 14.98$, $p < .001$). Although, most studies (AAPD, 2016, Kierce et al., 2016, and Sengupta et al., 2017) did

not establish a relationship between dental referral and application of fluoride varnish, dental referral could be based on high caries risk or lack of dental home in the sample for this EBP project. These two factors can also be a possible reason for children to receive fluoride varnish application.

The percentage of participants who were referred to dentist was 66.25% (n = 53). This result is comparable to 60% dental referrals rate reported by Vece et al. (2016) who integrated an evidence-based oral health program for children in three nurse-managed health centers in Northern Virginia. However, the rate of referral was much lower compared to Murphy and Larsson (2017) who had a dental referral rate of 80.56% when they integrated an oral health project in a nondental American Indian primary care setting. The difference in referral rate could be explained for this EBP project because 95% (n = 76) of children had a high risk of developing caries and 41% (n = 33) of the them had dental homes while others have already made dental appointments.

The participants in this project who were referred to a dentist were made up of those who did not have dental homes and those who were assessed to have high caries risk. The results of the *Chi*-square test for dental referral and parents' active decay were significant, ($\chi^2(1) = 29.13$, $p < .001$), which indicates there is a link between them. Parents or caregivers who have active decay are most likely to transmit Mutans streptococci - the pathogens that is found in saliva and associated with development of EEC (Smith & Riedford, 2013). It is possible that because their caregivers had active decay, these children had a higher risk for developing ECC hence the need for dental referral for dental preventive and curative services.

Access and utilization of oral health care is linked to ability to pay for the service. Referral of a child by a primary care provider to see a dentist is important, however, the ability to pay for the dental service with public or private insurance, or out-of-pocket influence the decision of caregivers to schedule and honor their dental appointment. The number of children who were referred to a dentist and were eligible for Medicaid were 46 (58%). The result for *Chi*-square test for dental referral and Medicaid eligibility was significant ($\chi^2(1) = 40.33$, $p < .001$). Medicaid eligibility ensures the children referred to a dentist have public insurance coverage or can acquire one.

There were 4 children who had FVA in the last 6 months and were referred to a dentist, while 49 children who did not have FVA in the last 6 months were also referred. Children who did not have FVA for the last 6 months and were referred to a dentist either do not have a dental home or had a high caries risk. The four children that had FVA in the last 6 months and were referred probably had a high caries risk. The result of *Chi*-square test for dental referral and FVA in the last 6 months was statistically significant ($\chi^2(1) = 10.27$, $p = .001$).

Findings showed that 87.5% of the participants did not drink fluoridated water or take fluoride supplement. Spencer et al. (2018) demonstrated the association between fluoridated water and development of early childhood caries. Their study supported the continued effectiveness of water fluoridation to prevent dental caries in children. The lack of fluoridated water consumption could have been one of the reasons accounting for the high proportion of the participants having high caries risk. Caregivers were encouraged to give their children fluoridated water readily available as tap water instead of most commercially available water in the form of mineral water.

Also, 30% of the participants had obvious decay and 48% had visible plaques. Such clinical findings indicate oral health problems that needed referral to a dentist. . A McNemar's Chi-square test for dental referral and obvious decay was statistically significant, ($\chi^2(1) = 15.29$, $p < .001$), as was the test comparing dental referral and visible plaque ($\chi^2(1) = 5.23$, $p = .022$). Children in this EBP project were more likely to be referred to a dentist if they had obvious decay or plaque. In this sample, a probable cause of these oral health problems included sippy cup use by participants who were predominantly toddlers (42.5%), frequent snaking especially by older children (81%), and inability of caregivers to brush the children's teeth at least twice daily (72%).

Oral health education given to the children and caregivers was relevant because of health practices reported by caregivers. Habbu and Krishnappa (2015) investigated the effectiveness of oral health education in children and confirmed that the educational intervention improve plaque, gingival, and knowledge scores, but the result was short-lived. On the contrary, there was less appreciable increase in attitude and behavior. However, toothbrushing skills of children increased significantly when demonstration and supervision was provided. The education provided as an intervention in this EBP project focused on encouraging healthy eating and demonstrating how sugar containing food and drinks become stuck to the teeth and serve as substrate for pathogens such as *S. mutans* who are implicated in the development of dental caries. The usefulness of toothbrushing in removing sugar from food eaten was also demonstrated. Behavioral change was also discussed with the caregivers using HBM as a framework.

Adherence to oral health recommendations was measured as participants who visited the dentist (2.5%, n = 2) because of the dental referral given. The result was

significantly lower when compared with 72.4% rate achieved by Murphy and Larsson (2017) in their quality improvement oral health project in a nondental American-Indian primary care setting. A distinct characteristic of the project by these authors was that the dental clinic was located across the hall from the pediatric clinic. The participants were also offered the same-day dental referral. Also, Sengupta et al. (2017) reported a 36% dental visit after referral to the dental clinic which is part of the health system and is located in the same complex as the pediatric clinic. Therefore, the low number of participants who visited the dentist for this project can be attributed to the absence of dental clinics near the pediatric clinics hence dental clinics that participants could visit were far away. Also, inability to offer the same-day dental referral to participant meant the dental referral could not be completed immediately but had to rely on the schedule of the clinics involved. Other factors that could have played a role in the low dental visit include the characteristics of the caregivers. Caregivers who did not attach much importance to oral health care may not complete their appointment on time.

Perhaps due to the health education provided, a self-reported change in oral health behavior (5%, n = 4) was statistically significant ($\chi^2 = 32.529$, df = 2, $p < .001$). Change in oral behavior was undertaken to assess how the interaction between the project team and the caregivers and their children may have led to significant oral health behavioral change. Although there were no data in literature to compare the result obtained from the EBP project with, the statistical significance of the differences among the categories indicates that the observed result was different from expected result. Probably, time is needed to effect change in oral behavior because the old behavior was not acquired instantaneously but over a period. The first step for establishing a

change in oral behavior is to initiate the conversation and continuing to remind caregivers of the important role they can play in taking charge and also encouraging their children to choose healthy behaviors such as avoiding sugar-containing food and brushing their teeth twice daily.

A secondary outcome observed was the participants' caries risk. Participants exhibited a high caries risk of 95% (n= 76) and a *Chi*-square test was significant, χ^2 = 64.800, df = 1, $p < .001$. This value is closer to the 91.1% recorded by Murphy and Larsson (2017) but much higher than the 54% high caries risk obtained from screening results from a study undertaken by Sengupta et al. (2017). Caries risk is determined by a combination of risk factors such as primary caregiver had active decay in the past 2 years, and clinical findings such as white spots, obvious decay, and restoration present. Also, high caries risk is a major reason for dental referral. A possible reason for the difference in the result obtained in this project and those undertaken by Sengupta et al. (2017) could be the difference in the demographic composition of participants and sample size. Although Sengupta et al. (2017) did not report the demographic composition of their project, the sample size included 1,840 children. Murphy and Larsson (2017) however conducted their study in an Indian Health Service pediatric clinic serving an American-Indian reservation community in northwestern United States. This population is a racial minority as well as socioeconomic disadvantaged and very similar to the characteristics of majority of the EBP project thereby yielding similar results.

Evaluation of Applicability of Theoretical and EBP Frameworks

The Project Leader used theoretical frameworks for understanding oral health behaviors, educating caregivers and the children, and guiding the EBP process. These frameworks were used to plan and execute the project in a systematic order. It is relevant to assess how these frameworks fit the design and implementation of the project.

Theoretical Framework

The HBM (Hochbaum et al., 1952) was chosen as the theoretical framework for this project. The model provided the idea for developing the project and educating caregivers and children on good oral health behaviors. The six major concepts include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. These components of HBM were incorporated in the caregiver education component of the intervention.

Perceive susceptibility and perceived severity were integrated into the discussion of dental caries and other diseases associated with the mouth and throat, the risk factors, and the consequence of bad oral hygiene and dietary choices. Some caregivers were aware of factors that encourage dental caries in children and were making the effort to overcome them. Apart from not having dental homes, most caregivers were aware of frequent snacking and not brushing the teeth at least twice daily as some reasons for the development of dental caries. Many acknowledge the difficulty in reducing frequent snacking and high sugar-containing food. However, there were a few caregivers who erroneously hold the view that there was no point in brushing a child milk tooth and keeping them healthy because they will lose them anyway.

The perceive benefit (Hochbaum et al., 1952) of adopting good oral health behaviors such as twice daily brushing of teeth, dental flossing, and eating less sugar containing food especially in the night were also discussed. The barriers of adopting good oral health behaviors and prompt dental visits were also discussed. Cultural practices and beliefs were identified as barriers to good oral health care. Other barriers identified include cost of buying toothbrushes and paste for children which result in adult toothpaste sometimes being used to brush children's teeth.

Cue to action as a concept of the HBM (Hochbaum et al., 1952) is related to the trigger that caregivers, and the children derived after they have been exposed to educational component of the intervention. This is the trigger that moved the caregivers to take action to exhibit good oral health behavior after encounter with the health care provider. Caregivers were making the effort to ensure their children develop the habit of continual toothbrushing and good oral health behaviors. However, the low follow up rate and low result obtained from caregivers who self-reported of change in behavior (5%, n=2) implied that the trigger was not strong enough to produce the desired outcome.

It was evident that the HBM (Hochbaum et al., 1952) was useful during interaction and educating caregivers. However, the theory was limited because it was not employed in the designing the instrument for gathering data. Also, it only focused on the children and their caregivers and did not link the project with the organizational factors that had an impact on the project implementation and its adoption. A theory specific to integrating oral health in organization would have been the best fit for the project. However, such a theory is not available at this moment.

EBP Framework

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017) was utilized to aid and guide the EBP Project. The steps in the Iowa Model Revised include, identifying triggering issues or opportunities, stating the question or purpose, determining organizational priority, forming a team, assembling, appraising and synthesizing a body of evidence, designing and piloting the practice change, integrating and sustaining the practice change, and disseminating results (Iowa Model Collaborative, 2017).

All the steps of the model were very useful from the time the idea for the project was considered to the end of the project. For example, in the first step of the model which is identifying the triggering issues or opportunities, the doctoral student identified the need for the oral health program in the pediatric primary care clinic while completing clinical hours within the setting. The occurrence that triggered the project was the observation that most of the children who attended well-child visit had dental caries. A discussion with a provider at the setting confirmed the observation and iterated the need for this practice change. The purpose of the project was formulated, and PICOT question was generated as the second stage.

In the third stage the Iowa Model Revised (Iowa Model Collaborative, 2017), the project was discussed with the management to determine if it is a priority area. The management of the clinic expressed interest in the project but wanted to know how it will contribute to the profitability of the practice. The main concern was how the oral health program would be billed for reimbursement from insurance companies and Medicaid. Reimbursement for the oral health services were not pursued for the project

but it is an important factor that will determine the whether the practice change will be integrated and sustained at the clinic. A team was formed by the Project Leader and it had other members such as a pediatric provider as the Project Facilitator and six members of staff. Team formation was the fourth stage. The team members helped in executing the project, but their contributions were hindered by patient load and other commitments at the clinical site.

The fifth stage of the Iowa Model Revised (Iowa Model Collaborative, 2017), involved obtaining the best practice recommendations for the project through assembling, appraising and synthesizing a body of evidence. In the sixth stage, the best practice recommendations obtained from literature was employed in designing and piloting the practice change. The planning and implementing the practice change was tedious and very challenging. Some of these challenges include obtaining IRB approval for the project, designing a procedure for the implementation, obtaining supplies for the project, and data collection. The seventh and eighth stages, integrating and sustaining the practice change, and disseminating results respectively are in the process of being executed.

Overall, the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017) was an effective and appropriate framework that guided this EBP project because the model provides a step by step approach to the design, implementation, and evaluation of EBP project. Also, the model provides the opportunity to involve organizations and incorporate their quality improvement priorities into the project. Furthermore, the formation of a project team as suggested by the model ensures a project can be undertaken with the help of others.

Finally, the ease of utilizing the model and the non-linear nature imply even a novice to EBP project can successfully use the Iowa Model Revised as a guide for EBP projects.

This model in conjunction with the HBM (Hochbaum, Kegels, & Rosenstock, 1952) as a theoretical framework ensured the EBP project was properly designed and implemented systematically from stage to stage. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017) is therefore an ideal model that help to implement an evidence-based practice change. This view is supported by Titler et al. (2001).

Strengths and Limitations of the EBP Project

The EBP project was evaluated by the doctoral student and several strengths and weaknesses were revealed. This evaluation will provide an awareness of factors that have enhanced the design and implementation of this EBP project. Also, lessons can be learned to improve similar project in the future by maximizing the strengths of this project while minimizing the shortfalls.

Strengths

One of the strengths of this EBP project was its relevance. Offering oral health services for children at the primary care is an effective method of oral health promotion and preventive care. Oral health is one of the top nine health indicators for Healthy People 2020 (CDC, 2013). Also, the Institute of Medicine (IOM, 2011) suggested the roles family physicians and other non-dental health care providers can play in advancing oral health care in the USA.

The second strength of the EBP project is the ease of incorporating oral health care services into well-child visits at the pediatric primary care clinic. The process

involved determining how the service will be paid for, undertake caries risk assessment, oral examination, application of fluoride varnish, dental referral, and caregiver education. All these activities can be undertaken in less than 10 minutes. Also, because it is possible for providers to be reimbursed for this service it serves as an added source of revenue.

Finally, the children were excited to receive toothbrushes and toothpaste after their interaction with the project team. Also, most of the caregivers expressed their appreciation for the oral examination, application of fluoride varnish, oral health education, and assistance in making dental appointment. Also, the caregivers participated in the discussion that preceded the oral health educational sessions and were willing to share the challenges they face to instill good oral health behaviors in the children.

Limitations

The EBP project had some limitations despite the strengths extolled earlier. Some of the limitations involved organizational barriers. It was challenging obtaining permission from organizational leadership to implement the project. Even after gaining permission from the leader of the organization, it took a while to get the provider on board. A pertinent impediment was the perception of increased workload for the provider without commensurate increased in remuneration. However, the impediment was overcome after it was explained to the provider that the Project Leader will be responsible for the assessment of the participants and interviewing them. Also, it was difficult to agree on applying fluoride varnish to the children's teeth. The disagreement was about who should be responsible for the procurement of the varnish, and whether

we should bill the children for the varnish. The issue was resolved when the varnish was procured by the Project Leader and a decision was made not to charge the children.

Another limitation was the short time frame for the project which had an impact on duration for data collection and evaluation. The process leading to obtaining approval from IRB for the project implementation to take place was time consuming because of the workload, and delay in submitting documents earlier. The delay in obtaining approval from IRB set off a chain reaction that affected the time for implementation and evaluation. With the benefit of hindsight, application form for approval to commence the project should have been submitted earlier. Also, the Project Leader should have anticipated the qualms the organizational leaders and healthcare provider would have about the project and addressed their concerns from the onset.

Furthermore, another barrier that needed time to resolve was getting the supplies from the America's Tooth Fairy (National Children's Oral Health Foundation) after they accepted a request for sponsorship of the project. The implementation of the project was delayed for a while because the suppliers were not delivered on time. If the Project Leader had the opportunity to implement another EBP project, would be important to get all the supplies on time and far ahead before the time for implementation.

Also, the duration of the implementation affected the data collection and thereby the sample size. More so, the period for follow-up was short making it difficult to adequately evaluate the change in oral health behavior of caregivers over time. A long-term follow-up with families to learn whether they continued to brush the teeth at least twice daily with fluoride containing toothpaste, reduce snacking and consumption of high sugar containing food, and regular visits to the dentist would have been ideal. Data

collected was dependent on caregivers and children. Caregivers provided information on behalf of the children. Self-reporting by caregivers had the possibility of bias.

Although the intervention was quick and reimbursable, it was performed by the Project Leader who is the doctoral student. Because the intervention was not implemented by the staff of the clinic, sustainability of the project is questionable. In hindsight, it would have been wiser to involved staff in the EBP project, so they could have embraced it. The staff were more interested in executing their duties and did not take any interest in the EBP project.

Finally, language barrier was a major limitation during the implementation of the EBP project. Most of the caregivers speak only Spanish and it was difficult to communicate with them without the help of bilingual staff. Language barrier curtailed in-depth interaction with caregivers and follow-up after the project implementation. In the future, it would be helpful to have a project assistant who is bilingual and is well-informed about the project.

Implications for the Future

This EBP project integrated an evidence-based oral health program in a pediatric primary care. The long-term goal was to have this practice change adopted and incorporated into the well-child visit at the clinical setting so that the children who patronize the clinic can receive oral health care services. The EBP project in oral health care for children in primary care setting has implications for the future in practice, theory, research, and education

Practice

Pediatric primary care providers are well-positioned to use children health care visits such as well-child visits, immunization visits, and sick visits to promote oral health care (Sengupta et al., 2017). The frequency of these visits and the large numbers of children that primary care practitioners attend to imply access to oral health care will increase. This EBP project has demonstrated that incorporating an evidence-based oral health care program is feasible and can be achieved with minimal disruption to the workflow. Furthermore, the oral health care program does not require significant time. More so, primary care providers can bill for oral health care services rendered and would be reimbursed. According to Braun et al. (2017) all state Medicaid programs reimburse nondental health care providers for the provision of oral health promotion. Provision of oral health care services in primary care therefore can become an opportunity to expand the type of services delivered and generate revenue. Primary care providers need training in oral health promotion, learn oral health examination, and application of fluoride varnish. These are requirements that can be easily learned online whiles earning continuing education credit.

Family nurse practitioners (FNP) can meet the oral health care needs of children arising from shortage of dentists in the United States. These practitioners can use oral health risk assessment tool to assess caries risk of children to prevent dental caries. Also, they can play an important role in educating families on the appropriate tooth brushing techniques, limiting high sugar-containing snacks, and promoting overall oral health of children and their families.

Theory

This EBP project about oral health promotion was linked to the HBM (Hochbaum et al., 1952) because the model is used to explain and predict preventive health behavior. EBP projects that are geared towards change in health behaviors can be designed with the six concepts of HBM in mind. The theory has been useful to explain the factors that limit as well as promote oral health behaviors.

Although, there is an absence of specific nursing theory that can be applied to oral health promotion and oral health behaviors, there is a drive towards laying the foundation for integrating maternal and children's oral health promotion to into nursing and midwifery practice. This development may lead to the development of conceptual frameworks and models and eventually lead to the development middle range theories and practice theories.

Research

While working on this EBP project, the need for future research and EBP projects was identified. It is evident that there are disparities in access to and utilization of oral health services in the country. Strategies proposed to reduce the disparities include bridging the gap between general health and dental health care delivery. Primary care settings are the conduits for this integration. Nurses in general, and advanced practice nurses (APNs) in particular, have been a major force in care delivery in this setting. Research is therefore needed to determine the ideal curriculum to prepare nurses and APNs to spearhead access to oral health in the primary care setting.

Studies should be undertaken to determine the barriers to the integration of oral health in primary care and how these barriers can be overcome. Also, future EBP

projects should focus on adherence of primary care providers to oral health assessment of children. In addition, EBP project should be designed to evaluate the impact of fun smartphone apps such as *Brush DJ* and *Chomper Chums* which are employed to encourage adherence to tooth brushing by children and their caregivers. The result of such research will give providers the confidence to either recommend them to caregivers.

Education

The project has laid bare the shortcomings in the educational preparedness of the APN in providing oral health care services. Nurses and APNs working in the primary care need to be prepared adequately to provide oral health care to patients across life spans. This is necessary because of the clamor to have oral health care services integrated into primary care. Although, there are curricula online, a standardized curriculum especially by National Organization of Nurse Practitioner Faculties and American Colleges of Nursing Faculty will greatly enhance the acquisition of the skills required for oral health care delivery.

Therefore, oral health care curriculum should be added to all level of nursing education to equip nurses and APNs to provide care for all age groups. Training should focus on nurses being able to acquire knowledge about the etiology and transmission of infection, conducting oral health assessment, and being able to teach caregivers about toothbrushing and flossing. APNs should also be able to apply fluoride varnish to the teeth of children.

Conclusion

This EBP project was designed to integrate an evidence-based practice oral health program for children at a pediatric primary care setting. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017) and HBM (Hochbaum et al., 1952) were ideal fit for the project and played a part in its success. Three primary outcomes were measured. The fluoride varnish application rate was 52% (n = 42). The result of the *Chi*-square goodness fit for children who received fluoride varnish and those who did not were not significant (χ^2 = 0.200, df = 1, p = .655). The dental referral rate was 66% (n=53). A *Chi*-square of goodness fit test children who were referred and those who were not been significant ($\chi^2(1) = 8.45$, $p = .004$). Adherence to oral health recommendations was measured as participants who visited the dentist (2.5%, n= 2) and self-reported change in oral health behavior (5%, n=2) based on a follow-up response rate of 48.75%. Self-reported change in oral health behavior was significant (χ^2 = 32.529, df = 2, p < .001). Secondary outcomes include children with high risk of developing dental caries were 61.25% (n=49) and it was significant, χ^2 = 64.800, df = 1, p < .001.

The project has provided useful evidence that the utilization of an evidence-based practice interventions of caries risk assessment, fluoride varnish application, caregiver education, and dental referral for establishment of dental home and or care for children at risk of developing dental caries can lead to oral health promotion in children. Caregivers and children received oral health care service and education to help them improve their oral health behaviors.

Doctoral-prepared nurse practitioners especially FNP are providing care to populations that have health disparities and, in most cases, do not have access to physicians and dentists. Acquiring knowledge and competencies in providing oral health care to children will expand the roles FNPs play and promote the oral health of children and their families. This project has demonstrated that it is possible for FNPs to incorporate oral health care into their practice. This initiative will expand the role of FNPs and even increase profitability for those who own their practice.

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Wilson, A. R., Brega, A. G., Campagna, E., Braun, P. A., Henderson, W. G., Bryant, L. L., … Albino, J. (2016). Validation and impact of caregivers' oral health knowledge and behavior on children's oral health status. *Pediatric Dentistry*, *38*(1), 47–54.

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BIOGRAPHICAL MATERIAL

Ms. Yusif graduated from 37 Military Hospital's Nurses' Training College in Accra, Ghana in 2004 as a registered nurse. She pursued a course in the University of Ghana to obtain a diploma in nursing. After working at the neonatal intensive care unit (NICU) of 37 Military Hospital for two years, she enrolled in an 18-month course in Critical Care Nursing at Korle-Bu Teaching Hospital's School of Peri-operative & Critical Care Nursing School where she graduated in 2008 with an Advanced Diploma in Critical Care Nursing. She was subsequently employed as a critical care nurse at Korle-Bu Teaching Hospital in 2009. In 2012, Ms. Yusif received training as pediatric cardiothoracic critical care nurse at Netcare Sunninghill Hospital in South Africa. In 2013, Ms. Yusif graduated from Central University College in Ghana with a Bachelor of Science in Nursing. She later enrolled in Valparaiso University and graduated in 2015 with a Master of Science in Nursing Education. Ms. Yusif is currently pursuing Doctor of Nursing Practice in Valparaiso university with an expected graduation in May of 2019. She works as a critical care nurse in Kindred Hospital in California. She is a member of Sigma Theta Tau Zeta Epsilon chapter since 2014 and a student member of American Association of Nurse Practitioners. Her research interest includes the concept of caring in nursing, patient care technology, and pediatrics. She hopes to present a report on her EBP Project at the 26th National Evidence-Based Practice Conference on "Navigating the Highway of Health Care: Patient Engagement and Care Coordination in Coralville, Iowa on April 2019.

ACRONYM LIST

AAPD: American Academy Pediatric Dentistry

APN: Advanced Practice Nurse

CDC: Centers for Disease Control

CINAHL: Cumulative Index to Nursing and Allied Health Literature

DMFT: Mean Number of Decayed Missing or Filled Teeth

EBP: Evidence-Based Practice

ECC: Early Childhood Caries

EPSDT: Early and Periodic Screening, Diagnostic and Treatment

FNP: Family Nurse Practitioner

FVA: Fluoride Varnish Application

HBM: Health Belief Model

IOM: Institute of Medicine

IRB: Institutional Review Board

JBI: Joana Briggs Institute

JHNEBP: Johns Hopkins Nursing Evidence-Based Practice

MEDLINE: Medical Literature Analysis and Retrieval System Online

PCP: Primary Care Provider

USDHHS: United States Department of Health and Human Services

USPSTF: United States Preventive Services Task Force

WHO: World Health Organization

Appendix A

Put summary grid from Chapter 2 here. I have set this up as landscape for you.

Citation	Purpose	Sample	Design/ Intervention	Measurement /Tool	Results/Findings	LOE/ Gra-de
Agouropoulos, A., Twetman, S., Pandis, N., Kavvadia, K., & Papagiannoulis, L. (2014). Caries preventive effectiveness of fluoride varnish as adjunct to oral health promotion and supervised tooth brushing in preschool children: A double-blind randomized controlled trial. *Journal of Dentistry, 42*(10), 1277-1283. doi:10.1016/j.jdent.2014.07.020	To investig-ate the effect of bi-annual fluoride varnish applicat-ion on oral health preventive program in school children.	Sample of 328 out of 424 preschool children aged 2-5 years	Double-blind randomized controlled trial design was employed. The interventions were biannual fluoride varnish application, school-based oral health promotion, and supervised tooth brushing.	Dental caries prevalence and increment were primary outcomes measured. Secondary outcomes were gingival health, mutans streptococci growth, and salivary buffer capacity. Questionnaire was the instrument used.	The two groups were similar - test (37.5) and control groups (37.8) at baseline. After year 1 and 2, there were no significant difference between test (63 and 64.8) and control (64.8 and 65.8)	II. Good.
American Association of Pediatric Dentistry. (2016a). Guideline on perinatal and infant oral health care. *Pediatric Dentistry, 38*(5), 54-58.	To develop a new guideline on perinatal and infant oral health care.	Two guidelines were merged, and a number of articles were used for the update	Review.	Caries risk.	Parents were urged to establish a dental home for infants by 12 months of age. Counseling	I. High

					about teething and non-nutritive oral habits should be undertaken	
American Association of Pediatric Dentistry. (2014). Guideline on caries-risk assessment and management for infants, children, and adolescents. *Pediatric Dentistry, 38*(6), 142-149.	To update an existing guideline on the use of a caries-risk assessment tool for infants, children, and adolescents.	75 articles were used for the current update	Review.	Risk of caries development.	Age-based dental caries-risk assessment should be part of a routine oral health examination undertaken by oral health and medical providers.	I. High
Arthur, T., & Rozier, G. (2016). Provision of preventive dental services in children enrolled in Medicaid by nondental providers. *Pediatrics*, *137*(2), 17.doi:10.1542/peds.2015-3435	To determine-ne the association between dental services provider and services rendered.	Children aged from birth to 5 years enrolled in Medicaid in all the 50 states and District of Columbia during 2010 to 2013.	Time-series cross-sectional design.	Proportion of children enrolled in Medicaid who received any preventive dental services(from dentists and non-dentists.	44 states having reimbursement policy for primary care providers reported 4.38% of children aged 0 to 5 years received oral health	IV. Good.

					services per state per year.	
Braun, P. A., Widmer-Racich, K., Sevick, C., Starzyk, E. J., Mauritson, K., & Hambidge, S. J. (2017). Effectiveness on early childhood caries of an oral health promotion program for medical providers. *American Journal Of Public Health*, 107(S1) S97-S103. doi:10.2105/AJPH.2017.303817	To examine the impact of an oral health promotion intervention on ECC.	775 children aged 3 to 4 years.	A quasi-experimental design. Oral health examination and instruction, dental referral, and fluoride varnish application.	Decayed, missing, filled tooth surface and decayed tooth surface counts.	Fluoride varnish application's mean(range) for the three periods were 0.0 (0), 1.1 (0-7) and 4.5 (4-7) in 2009, 2011, and 2015 respectively.	III. High.
Jackson, E. B. (2015). Outcomes of a quality improvement project examining early childhood caries and improving identification of at risk patients in a pediatric medical home setting. *Journal Of Pediatric Nursing, 304* (4), 543-549 doi:10.1016/j.pedn.2014.10.020	To implement a quality improvement project at a primary care setting to identify children at risk of developing ECC and refer them to a dentist	A total of 106 pediatric patients Seen during a 3-month period.	Quality improvement with retrospective chart review.	Early childhood caries risk using Caries-risk screening tool.	Patients classified as high-risk of developing ECC at three age groups-9, 12, and 18-month were 62%, 78%, and 62%.These figures were higher than the baseline data.	VI. Good.

Kaesler-Smith, C. (2016). Evidence summary. Dental caries prevention (children and adolescents): Topical fluoride therapy. *The Joanna Briggs Institute EBP Database*. JBI@Ovid. JB136	To identify best available evidence to support the effectiveness of topical fluoride therapy such as varnish in dental caries prevention in children.	A review of 271 studies involving a total of 74,021 participants.	Evidence summary from systematic reviews of randomized controlled trials.	Topical fluoride effectiveness.	Application of fluoride gels or varnish two to four times a year in permanent or milk teeth reduces tooth decay in children.	I. High
Kierce, E. A., Boyd, L. D., Rainchuso, L., & Palmer, C. A. (2016). Association between early childhood caries, feeding practices and an established dental home. *Journal Of Dental*	To examine the link between the establishment of a dental home and prevalence of	A convenience sample of 132 medicaid-enrolled children	An observational cross-sectional survey	A validated questionnaire.	Children with an established dental home had lower rates of biofilm	IV. Good

Hygiene, 90(1), 18-27.	ECC in preschooled children enrolled in Medicaid and their feeding practices	between ages 2 to 5 years.			(*79.2%, p< 0.05*) compared to higher biofilm rates (96.8%, p<0.05) in children who do not have a dental home	
Kranz, A. M., Rozier, G., Preisser, J. S., Stearns, S. C., Weinberger, M., & Lee, J. Y. (2014).Comparing medical and dental providers of oral health services on early dental caries experience. *American Journal of Public Health,* 104(7), e92-99 doi:10.2105/AJPH.2014.301972	To examine the relationship between clinicians who provide preventive oral health services to Medicaid enrollee before age 3 and age 5 years.	A sample size of 5235 children with 2 or more oral health visits from PCP, dentist, or both.	Retrospective cohort study.	Caries experienced (dmft) and proportion of dmft that were untreated at the time of assessment	Children who received services from dentist and PCPs reported similar overall mean dmft.	IV. Good
Marinho, V.C.C., Worthington, H.V., Walsh, T., & Chong, L.Y. (2015). Fluoride gels for preventing dental caries in children and adolescents. *Cochrane Database of Systematic Reviews*, Issue 6. Art. No.: CD002280. doi:	To assess the effectiveness and safety when using fluoride gels for dental caries prevention in children and	28 studies involving 9140 participants.	Design was randomized and quasi-randomized controlled trials. The studies compared topical fluoride gel with placebo or no treatment in	Increased in dental caries was measured.	Results showed that the D(M)FS pooled prevented fraction (PF) estimate was 28% (95% confidence	I High

10.1002/14651858.CD002280.pub2	adolescents.		children and adolescents up to the age 16.		intervals (CI) 19% to 36%; P < 0.0001; with substantial heterogeneity (P < 0.0001; I^2 = 82%); moderate quality evidence) .	

Moyer, V. A. (2014). Prevention of dental caries in children from birth through age 5 years: US Preventive Services Task Force Recommendation Statement. *Pediatrics*, 133(6) , 1102-1111. doi:10.1542/peds.2014-0483	To update a 2004 USPSTF recommendation about prevention of dental caries in preschool-aged children	Update of 2004 USPSTF recommendations using evidence from 20 studies.	Recommendation from systematic review of randomized controlled-trials.	Fluoride application.	Primary care clinicians should apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption.	I. High
Murphy, K. L., & Larsson, L. S. (2017). Interprofessional oral health initiative in a nondental, American Indian setting. *Journal Of The American Association Of Nurse Practitioners, 29*(12), 733-740. doi:10.1002/2327-6924.12517	To incorporate and assess the success of a pediatric oral health project in an American-Indian pediatric	A sample of 47 caregiver/child dyads of children from birth to 5 years.	Non-experimental quality improvement project. Caregiver education, caries risk assessment, same-day dental referral were the interventions.	Caries risk and protective factors, white spots or visible decalcification , decay, restorations, and plaque accumulation.	91.1% of the children were identified as having high risk of developing ECC. . Out of 80.6% of the children	VI. Good

	primary care setting.			Tools included customized data collection sheet, dental referral tracking slip, oral health risk assessment tool.	referred to the dentist, 72.4% completed their appointment.	
Sengupta, N., Nanavati, S., Cericola, M., & Simon, L. (2017). Oral health integration into a pediatric practice and coordination of referrals to a co-located dental home at a federally qualified health center. *American Journal Of Public Health,107*(10), 1627-1629. doi:10.2105/AJPH.2017.303984	To design and implement an oral health in pediatric primary care program	3400 children.	Interventions include caries risk screening and oral health education, application of fluoride varnish for all eligible children, and expedited referral to a dental clinic nearby for children without dental homes.	Fluoride varnish application rate and dental home referral.	There was an increase in caries screening from 0 before implementation to 60% in the first month, and to 85% in 24th month. Fluoride varnish application rates increased to more than 80% after 18 months and 79 after month 24. Fifty two percent of	VI. Good

					children referred to dentists successfully made appointments and 36% completed their appointment.	
Vece, L., Sutter, R., Sutter, C., & Toulouse, C. (2016). Impacting vulnerable populations through integrating oral health care into nurse-managed health centers. *Journal For Nurse Practitioners, 12*(9), 629-634. doi:10.1016/j.nurpra.2016.07.028	To execute an evidence-based oral health care project in 3 nurse-managed health centers	A convenience sample of 116 parents and 221 children from 2 months to 18 years of age,	A mixed method, non-randomized, cross sectional design. Participants received oral health risk screening, oral examination, oral health education, and dental referrals when required.	Demographic data and oral health background information. Questionnaire for project engagement and satisfaction.	Majority of families were Hispanics (61%) followed by Asians (21), and blacks (10%) and whites (5%). Baseline data show 11.2% of families do not have toothpaste or a toothbrush for everyone. 46% of parents reported sending their children to the dentist.	VI. Good

					60% of families required urgent dental referral for at least 1 child.	

Appendix B

Introductory letter

I am completing my Doctor of Nurse Practice course at the Valparaiso University. I am required to develop an evidence-based practice project as a partial fulfilment of the requirement for my degree. I have chosen an oral health program for children at the primary care setting for my evidence-based practice project. This project aims to add oral health care services to the well-child-visits. Children will be screened for risk of developing dental caries, receive fluoride varnish application to the teeth, receive oral health education, and referral to dentists for those who do not have dental homes. Parents will also receive education about oral health care.

Accompanying this letter is a flyer on oral health for children. Please, take some time to go through this flyer for information about oral health for children. The health care provider will have a brief interaction with you and your child about your child's oral health care status. You have the option not to allow your child to engage in the oral health program by notifying the health care provider when she enters the examination room.

Thank you for your cooperation. If you have any question, kindly call Salamatu Yusif on 219-707-3138.

Appendix C

Consent form

Evidence-Based Practice Project

Salamatu Yusif, MSN, RN

EBP Project Title: Incorporating Children's Oral Health Care in a Non-Dental Primary Care Practice

Project Leader: Salamatu Yusif, MSN, RN

Purpose: I ……., understand that I and my child are being asked to participate in an evidence-based practice project about oral health for children in a primary care practice. This project is part of the Project Leader's course work for a doctoral degree at Valparaiso University.

Procedure: The Evidence-Based Practice Project Leader/ DNP student will lead a team to undertake an oral health risk assessment using caries risk assessment tool, provide education about preventive oral health care and strategies to promote oral health, apply fluoride varnish to eligible children, and refer children with high risk of developing dental caries and or without dental home to a dentist. The project implementation will take place between November 2018 to January 2019 at the three clinical sites of Paramount Care in Garden Grove and Santa Ana, California.

Risks: There are no anticipated physical risk or other known risks to those participating in this Evidence-Based Practice project. The EBP project does not involve any invasive technique. The project is designed to integrate oral health care to the care children are already receiving at these clinics. The pre-implementation and post implementation data will be compared to determine the effectiveness of the project.

Benefits: Participants in this project will receive oral health education and dental kit to aid them improve their oral health. Another benefit will be referral to a dentist and establishment of a dental home for those without one so they can have continual dental care.

Voluntary participation/withdrawal: I understand that participating in this project is my choice, and I am free to stop at any time.

Questions: In case I have any questions now or in the future about being a participant in this project, I will contact Salamatu Yusif at 219-707-3138. If I have any questions about my rights as a participant in this project that cannot be addressed by the Project Leader, I will contact the Chair of the of the Institutional Review Board of Valparaiso University at 219-464-5798.

Confidentiality/anonymity: While the information and answers provided by will be used by the EBP Project Leader for the project, I have been given the assurance that my name and other identifying information would be kept strictly confidential.

Consent to participate in this EBP Project: I have read or someone had read to me all the above information about the EBP project, the procedure, possible risks, and potential benefits to me, and I understand them. The questions I have had been answered. I give my consent freely, and offer to participate in this project.

……..	……
Participant signature & Date	Project Leader/DNP Student & Date

Appendix D

Assent form

Evidence-Based Practice Project

EBP Project Title: Incorporating Children's Oral Health Care in a Non-Dental Primary Care Practice

Project Leader: Salamatu Yusif, MSN, RN

What the project is about: I am doing an evidence-based practice project about adding oral health program to the care children receive at the clinic. This project is looking at ways those who take care of you at the clinic can help children to have a healthy mouth, teeth, and throat.

You get to decide to join: You have a choice to be a part of the project. You can say 'Yes'- to be a part of the project or 'No'- you do not want to be a part. Also, you can always change your mind at any time. If you say Yes now, you can say no later and you will not be a part of the project again.

What will happen if you join: You would be asked some questions that you may answer. We would also look at your information about past visit to the clinic. We will teach you what to do to have a healthy teeth. We would also look into your mouth, look at your teeth, and may apply a fluoride varnish to protect your teeth. Also, we would refer you to a dentist if we think you need more help or if you do not have a dentist.

Could you be harmed if you join? We will look into your mouth and may apply a polish on your teeth. These may be uncomfortable, but we will make sure we do not harm you.

Could the research help me? The project may help you if you have any problem with your mouth, teeth, or throat because we would refer you to a dentist and may teach you what to do to become better.

Other things to know about the project: You have a choice of being part of the project or not. If you do not want to be a part of the project, you should not feel bad about it. However, if you want to be a part, that is also fine. You can also stop at any time you decide. You just have to tell us, and we will continue it. To thank you for being part of the project, we would give you $5.00 gift card. You have to talk to your parents about how you would like to use it.

Anything else: If you want to be a part of the project, please write your name below. I will also write my name too. Writing our names shows that we talked about the project and you want to be a part.

Name of participant:…….
Date:……
(To be written by child)

Name of Project Leader: …….

Signature of Project Leader ……

Date:……..

Time: ……

Appendix E

Questionnaire

Code # ……..

Child and Parent/Caregiver Characteristics

Please circle the best option for each question from 1- 21

1. Age of child:
2. Gender: Female Male
3. Race: Hispanic African-American Asian White Other, specify
4. Insurance: Public Private Other, specify
5. Parent/Caregiver Education: Below high school High school College
6. Number of persons in household: 2 3 4 5 6 7 or more
7. Annual household income: Less than 45,000 45,000 – 49,999 50,000 – 59,999

60000 or more

8. Fluoride Vanish Application count:
9. Dental caries: Present Absent
10. Cavity in past 2 years: Yes No Don't know or not sure

Oral Health Risk Assessment tool

11. Visit: 6 months 9 months 12 months 15 months 18 months 24 months 30 months 3 year 4 year 5 year 6 year Other, specify
12. Mother or primary caregiver had active decay in the past 12 months: Yes No
13. Mother or primary caregiver does not have a dentist: Yes No

14. Continual bottle/sippy cup use with fluid other than water: Yes No
15. Frequent snacking: Yes No
16. Special health care needs: Yes No
17. Medicaid eligible: Yes No
18. Existing dental home: Yes No
19. Drinks fluoridated water or takes fluoride supplements: Yes No
20. Fluoride varnish in the last 6 months: Yes No
21. Has teeth brushed twice daily: Yes No

Clinical findings

22. White spots or visible decalcifications in the past 12 months: Yes No
23. Obvious decay: Yes No
24. Restorations (fillings) present: Yes No
25. Visible plaque: Yes No
26. Gingivitis (swollen/bleeding gums): Yes No
27. Teeth present: Yes No
28. Healthy teeth: Yes No
29. Caries risk: Low High
30. Anticipatory guidelines : Yes No
31. Fluoride vanish : Yes No
32. Dental Referral: Yes No

Appendix F

Project Implementation Timetable

ACTION PLAN

Activity	Target Date	Resources required	Lead person	Results	Progress notes
IRB Application	September 2018	Filled application form	Project Leader	Approval given in November	
Procurement of supplies	October, 2018	Meeting with representative of America's Tooth Fairy	Project Leader	All supplies were received in November, 2018	
Educating team members	October 2018	Smiles for life curriculum	Project Leader	Meeting was successful	
Implementation	November 2018-Feb 2019	Questionnaire,	Project Leader	Was successful	
Post implementation follow-up	February-March, 2019	Data collection forms	Project Leader	Was successful	