Fluoride Varnish Application in the Pediatric Population

Ellen Gnaedinger

Follow this and additional works at: https://scholarworks.umass.edu/nursing_dnp_capstone

Part of the Bacterial Infections and Mycoses Commons, Community Health and Preventive Medicine Commons, Dental Hygiene Commons, Dental Materials Commons, Dental Public Health and Education Commons, Interprofessional Education Commons, Nursing Commons, Pediatric Dentistry and Pedodontics Commons, Pediatrics Commons, Preventive Medicine Commons, and the Primary Care Commons
Fluoride Varnish Application in the Pediatric Population

Ellen Gnaedinger
University of Massachusetts Amherst

Capstone Chair: Terrie Black, DNP, MBA, CRRN, FAHA, FAAN
Capstone Committee Member: Pamela Aselton, PhD, MPH, FNP-BC
Capstone Mentor: Ashley Miller, MD, FAAP
Date of Submission: March 19, 2017
Table of Contents

Abstract ................................................................................................................................4
Introduction and Background ..............................................................................................6
Problem Statement ...............................................................................................................9
Purpose .................................................................................................................................9
Review of the Literature ....................................................................................................10
Theoretical Framework ......................................................................................................16
Project Design and Methods ..............................................................................................18
  Settings and Resources ................................................................................................18
    Description of population ......................................................................................18
    Organizational analysis of project site ...............................................................18
    Evidence of stakeholder support ............................................................................19
  Goals, Objectives and Outcomes .................................................................................19
Implementation Plan .......................................................................................................22
Cost Benefit Analysis .....................................................................................................24
Timeline .......................................................................................................................25
Ethics and Human Subjects Protection ........................................................................26
Results ................................................................................................................................27
Outcomes .....................................................................................................................27
Facilitators and Barriers ...............................................................................................38
Discussion ......................................................................................................................39
  Suggestions and Future Recommendations ............................................................44
Conclusion .....................................................................................................................45
References ......................................................................................................................47
Appendix A ........................................................................................................................55
Appendix B ........................................................................................................................56
Appendix C ........................................................................................................................60
Appendix D ........................................................................................................................62
Appendix E ........................................................................................................................64
Appendix F ........................................................................................................................65
Appendix G ........................................................................................................................66
Appendix H ........................................................................................................................67
Abstract

Purpose: The United States (U.S.) has a persistent problem of dental caries in primary teeth with a greater prevalence of dental caries found in minority and poor children. The majority of children in the U.S. experience dental caries in their primary teeth by age eight. This problem could be addressed by primary care providers applying fluoride varnish (FV) to children's teeth starting at the age of primary tooth eruption. The causes of dental caries in children’s primary teeth are multifactorial and therefore require multiple interventions. Around the world providers are utilizing FV as an effective and easily administered strategy. This author implemented a quality improvement project of a FV application program in a Vermont pediatric practice, based on a United States Preventive Services Task Force (USPSTF) guideline.

Methods: After thorough preparation a staff training in FV application was done for providers and staff along with the pre-project questionnaire. The DNP student consulted with providers, registered nurses (RNs), the billing person and the office receptionist to determine the number of eligible patients who received FV. Qualitative data about facilitators and barriers to FV application were collected. At the conclusion of 4 months a post-questionnaire was done and a debrief of the project.

Results: Fluoride varnish was applied during well child check-ups (WCC) for children aged 9, 18, 24, and 30 months. Over the course of the project study 56% of patients received FV at their WCCs. Findings included: the staffs thorough understanding of pediatric dental health issues, ease of adding FV application to the flow of WCCs, positive reception by parents, FV as a meaningful use quality measure for AthenaNet, Electronic Health Record (EHR), increased oral health education, consistent reimbursement for the treatment.

Conclusion: This quality improvement project successfully introduced a FV application program to a pediatric practice. Fluoride varnish was applied during WCCs for children aged 9, 18, 24,
and 30 months. Future suggestions include implementing similar programs in larger, more urban practices, considering safety studies to include children in the 6 to 12 month age range, and cohort studies to assess the efficacy of FV application programs.

**Keywords:** Fluoride varnish, dental caries, children, primary teeth
Introduction and Background

The United States has a complicated and persistent problem of dental caries in children’s primary teeth. In some pediatric populations the problem has worsened. Dye, Arevalo, and Vargas (2010) compared data from the 1988-1994 and 1999-2004 National Health and Nutrition Examination Surveys. They found the overall prevalence of caries did not increase significantly from 1988-1994 to 1999-2004 (35% to 38%). However, dental caries in poor children increased from 46% to 52% during this time. The actual number of caries per child among poor and “near-poor” children increased significantly. In addition, there was an unanticipated, concurrent nationwide statistically significant increase from 10% to 17% in caries in “non-poor” boys (Dye et al., 2010).

The American Academy of Pediatric Dentistry (2008) describes dental caries as plaque-induced acid demineralization of enamel or dentin mediated by the saliva. Early childhood caries (ECC) is a disease defined as the presence of one or more decayed, missing or filled teeth in a child who is 71 months or younger (Pitchika et al., 2013).

Restorative dental care is expensive. In 2012 the Centers for Disease Control and Prevention (2015) ascertained that the overall cost of dental care for children aged 0 to 21 was $25 billion per year. Nationally, there is recognition of the tremendous need for improved preventive pediatric dental care. North Carolina, like many other states, is trying to deal with the rising rate of early childhood caries, a limited pediatric dental workforce, and an increasing number of children born into poverty (Pahel, Rozier, Stearns, & Quinonez, 2011). North Carolina, the New England states, California, and Ohio are all investing time and money on dental caries prevention programs for primary teeth. These states are implementing oral hygiene programs and FV application programs in physicians’ clinics, Women Infant and Children
programs and dental offices (Biordi et al., 2015; From the First Tooth, 2015; Pahel et al., 2011; Weintraub et al., 2006).

Many minority children are in the high-risk group for developing dental caries, including non-Hispanic blacks, Native Americans, and Mexican American Hispanics (with both high and low poverty-income ratios). These children receive less preventive and restorative care than their white counter-parts. In addition, all economically disadvantaged children are at high-risk. (American Academy of Pediatric Dentistry, 2013; Borrell & Talih, 2011; Dye, Thorton-Evan, Li, & Iafolla, 2015; Moyer, 2014; Quissell et al., 2014).

Further compromise of primary teeth dentition occurs with poor nutrition and inadequate oral care. Inappropriate bottle-feeding, sugar exposure, sticky foods and frequent snacking all increase pediatric caries. Children whose mothers and siblings have caries are at risk for developing caries themselves. The failure to use fluoride toothpaste in conjunction with parents who do not understand how to clean their young children's teeth causes caries to develop (Biordi et al., 2015; Moyer, 2014; Pahel et al., 2011).

Both the American Dental Association and the American Academy of Pediatrics (AAP) state that children do not receive recommended preventive dental care. The American Academy of Pediatric Dentistry (2013) recommends children be seen by a dentist at the time of first tooth eruption and every 6 months thereafter. Nationwide almost half the pediatric population does not get the American Academy of Pediatric Dentistry recommended number of dental visits (Pahel et al., 2011). Seale and Casamassimo (2003) in a comprehensive, nationwide survey done by the American Dental Association, found that 91% of dentists report that they treat children ranging in age from birth to 14 years, yet children only made up 1-20% of their practices. Of these dentists, 73% did not treat children aged 6 to 18 months, and 28% did not treat children 19 months to 3 years of age. The statistics showed a further paucity of care if a child was on
Medicaid. Only 7% of the dentists treated children aged 6 months to 3 years on Medicaid and 50% never saw Medicaid-covered children aged 4-15 years (Seale & Casamassimo, 2003).

The AAP and the USPSTF recommend daily fluoride supplementation if the child’s drinking water is not fluoridated. Fluoride varnish should be applied after the emergence of the first tooth and every 6 months thereafter to receive at least four treatments before the age of four (American Academy of Pediatric Dentistry, 2013; From the First Tooth, 2014; Moyer et al., 2014). The USPSTF recommendations for FV application are not being followed by pediatrician and family practice clinics. Quinonez et al. (2014) found that 41.2% of pediatricians agreed they should apply FV, yet only 7.4% reported doing so at least once with greater than 75% of patients. Quinonez et al. note this is due to both a lack of pediatrician training and an inadequate number of dentists to receive patient referrals. O’Callaghan and Douglass (2013) determined that another reason primary care offices are not applying FV is difficulty with billing issues.

Economics play a large role in the disparity of pediatric dental care. In the U.S. dental care is expensive. Many middle-class children do not have dental insurance. Dye et al. (2010) wrote that this likely is the cause of the increase from 10% to 17% in caries seen in “non-poor boys” in the 1999-2004 National Health and Nutrition Examination Survey. Further, there exists an inequitable supply of dentists and many dentists do not accept Medicaid (Biordi et al., 2015). These factors adversely affect pediatric dental care. Decker (2011) found that higher Medicaid payments to dentists correlated with improved dental care among children and adolescents. Guarnizo-Herreno and Wehby (2014) contend that limited access to dental care in many areas of the country is one of the main causes of disparity in children’s oral health. Children, aged 1-10, experienced a dental health improvement of 50% when one additional dentist was added per 1000 children (Guarnizo-Herreno & Wehby, 2014).
Dental caries affect children’s quality of life in multiple ways (American Academy of Pediatric Dentistry, 2013). More than half of dental extractions are due to caries (Alsheneifi & Hughes, 2001). Children with caries experience toothache, tooth sensitivity, mild to sharp pain when eating or drinking something sweet, hot or cold, and pain when biting. Caries may lead to tooth abscesses, broken teeth, and chewing problems. The child’s pain may interfere with school-work (Moyer et al., 2014). Caries and teeth loss can affect the child’s nutrition, growth, weight gain, speech and self-esteem. When sleep is disturbed from tooth pain, glucosteroid and erythrocyte production may be disturbed. An abscessed tooth may cause a serious and potentially life-threatening infection (Mayo Clinic, 2016; Moyer et al., 2014; Sheiham, 2005). All these complications demonstrate the imperative need for early childhood dental care.

**Problem Statement**

The risk of dental disease in children's primary teeth is indicated by the majority of children in the U.S. experiencing dental caries by age eight and results from primary care providers not applying FV to children's teeth starting at the age of primary tooth eruption. This is exacerbated by un-fluoridated water, socioeconomic and cultural discrimination, parents undervaluing preventive dental care, parents' poor understanding of dental hygiene, lack of dental insurance, a dearth of Medicaid dentists, inadequate dental office hours, lack of transportation, and parents' inability to take time off from work (American Academy of Pediatric Dentistry, 2013; Dye et al., 2010; Moyer et al., 2014).

**Purpose**

This project implemented a FV application program in a Vermont pediatric practice. Quinonez et al. (2014) together with O’Callaghan and Douglass (2013) found pediatricians value the application of FV for the prevention of caries in preschool children's teeth.
Review of the Literature

Method and Results

A comprehensive search of the literature for evidence addressing the use of FV to prevent and decrease pediatric caries was done. The search included PubMed of the National Library of Medicine, the Cumulative Index of Nursing and Allied Health Literature (CINAHL), and the Cochrane Database of Systematic Reviews. Key words or Medical Subject Headings (MeSH) included: fluoride varnish, fluoride topical, therapeutic use, clinical trials, dental caries, children, last five years and United States. This English only and full-text only search yielded 139 results published between 1986 and 2015, the majority were human subject studies with a few laboratory-based fluoride studies. Articles were deleted if not addressing FV application or some component of implementation such as venue, billing, or efficacy. Also deleted were abstracts, duplicates, articles of poor quality or lacking research designs, articles regarding adult dental health, or dated articles. After a review of the 139 articles, 25 were identified as meeting the inclusion criteria and were chosen for this review.

The John Hopkins Nursing Evidence-Based Practice research appraisal tool was used to evaluate the quality of each article (Newhouse, Dearholt, Poe, Pugh, & White, 2005). Nurses and faculty from Johns Hopkins University School of Nursing developed these guidelines to appraise the quality of research evidence (American Nurses Association, 2016). This review incorporated the highest level of evidence which was available. The selected 25 studies resulted in 17 research studies, two literature reviews, three meta-analyses, one meta-synthesis, one systematic review, and an Agency for Healthcare Research and Quality National Clearinghouse Guideline based on U. S. Preventive Service Task Force recommendations.
Causes of Pediatric Dental Caries

The causes of dental caries in children’s primary teeth are multifactorial and therefore require multiple interventions. Many health professionals in diverse venues are trying to ameliorate dental caries in primary teeth. Several interventions have successfully decreased caries including increasing Medicaid reimbursement and increasing the number of dentists providing care (Decker, 2011; Guarnizo-Herreno & Wehby, 2014). Slade et al. (2011), Lawrence et al. (2008) and Moyer (2014) found fewer caries when parents provided their children with good oral hygiene as well as nutritious food, minimizing snacks and sugar. Around the world providers are seeking an intervention which is effective and easily administered in various settings. One promising intervention is the application of FV.

Efficacy of Fluoride

Numerous studies of children aged eight and younger concluded that the application of FV to children's primary teeth prevents caries (Biordi et al., 2015; Lawrence et al., 2008; Mohammadi, Hajizamani, Hajizamani, & Abolghasemi, 2015; Slade et al., 2011; Weintraub et al., 2006). In these studies FV was applied every three, six, or twelve months. Dentists, physicians, dental hygienists, nurses and dieticians trained in caries assessment of this population evaluated the children’s teeth in these studies. These were large studies with the number of subjects ranging from 376 in the Weintraub et al. (2006) study to 4,360 in the Biordi et al. (2015) study. These studies, carried out over one to three years demonstrated an inhibition of initial caries lesions in primary teeth. Additionally, Slade et al. (2011) found remineralization of precavitated caries lesions.

Marinho, Worthington, Walsh, and Clarkson (2014), Chou, Canto, Zakher, Mitchell, and Pappas (2013), Moyer (2014), in their meta-analyses, along with Twetman and Dhar (2015) and Steel (2014) in their systematic literature reviews, documented the efficacy of FV.
application in inhibiting caries in primary teeth. These authors suggested the need for more random controlled trials to more precisely define the degree of caries inhibition from FV.

Weintraub et al. (2006) and Biordi et al. (2015) found attrition slightly affected the quality of their research studies. These authors found 67% (over 24 months) and 42% (over 2 FV applications) retention, respectively, in their studies. Pahel et al. (2011) stated that low-income families sometimes experienced challenges in keeping the WCC appointments for the children in their FV study. Despite minor quality issues, trials in Australia, Canada, Iran, Germany, and the United States, done by Biordi et al. (2015), Lawrence et al. (2008), Mohammadi et al. (2015), Pahel et al. (2011), Slade et al. (2011), Weintraub et al. (2006), and Winter et al. (2015) all demonstrated that in high-risk pediatric populations, FV application resulted in decreased dental caries.

**Mechanism of Action**

Most fluoride varnishes are lacquers containing 5% sodium fluoride in a resin base. Fluoride varnish is applied to the teeth with a small applicator brush, setting quickly when it comes in contact with the teeth and saliva. The FV provides a highly concentrated, temporary dose of fluoride to the surfaces of the teeth. The fluoride works in four ways: 1. It is incorporated into the tooth structure when small amounts are swallowed while the teeth are forming (systemic effect). 2. Fluoride is concentrated in the outer enamel of the tooth when applied after the teeth erupt (topical effect). 3. Dental plaque and saliva are fluoride reservoirs and sustain tooth remineralization (topical and systemic effect). 4. Fluoride interferes with the bacteria that cause decay and reduce the acid production of these bacteria, slowing tooth demineralization (topical effect). (Association of State and Territorial Dental Directors, 2014; From the First Tooth, 2015).
Safety of Fluoride Varnish in Children

With regard to the safety of FV, Moyer (2014) acknowledged there is little research-based evidence about the harms associated with FV. The USPSTF suggests the risks of FV in children are most likely small. The USPSTF further notes there are no specific studies on the risk of fluorosis with FV. However, the USPSTF did find that compared with other topical fluoride interventions, systematic exposure to fluoride is low after varnish application (Moyer, 2014). In the U.S. more than 99% of the cases of enamel fluorosis are classified as "mild cosmetic changes (Moyer, 2014)." Milgrom, Taves, Kim, Watson, and Horst (2014) note that the major risks with ingesting fluorides are renal toxicity and fluorosis. These authors wrote that fluoride varnishes are marketed for treatment of tooth sensitivity and are regulated as medical devices and not studied by the Food and Drug Administration for safety in preventing caries. The use of FV for preventing caries is an “off label” use. Milgrom et al. (2014) measured urinary fluoride for 5 hours after FV was applied to six toddlers who were between 12 and 15 months-old. Their study, although the number of subjects was quite small, concluded that exposure from FV was below the level of known toxicity. However, the authors cautioned that different inactive ingredients in FV and varying viscosities might affect absorption kinetics. Bergström, Birhed, Granlund, and Moberg-Sköld (2014) in a large Swedish study of 7,027 fluoride varnish applications over 3.5 years found no adverse effects from the FV on children, aged 12-16 years-old.

Variables

Biordi et al. (2015) and Winter et al. (2015) noted that there were variables, which were difficult to control for amongst the children enrolled in the studies. These factors were: brushing the teeth, frequency of visits to the dentist, dietary practices including sugar consumption, socio-economic background, acquisition of sealants, use of fluoridated table salt (in Germany), and consumption of fluoridated water. Despite these challenges Winter et al. (2015) found that,
independent from the FV application, an early start to teeth brushing, receiving sealants (from the dentist) and a higher socioeconomic status corresponded to fewer caries. While Moyer (2014) in her review done in preparation for USPSTF guideline asserted that brushing with fluoridated toothpaste helps prevent caries. Separating FV application out as an independent variable in randomized controlled studies is challenging due to other variables known to play a role in dental caries inhibition.

**Billing Concerns**

Quinonez et al. (2014) and O’Callaghan and Douglass (2013) reported pediatricians are not applying fluoride as per the guideline recommendation and one of the primary barriers is billing. O’Callaghan and Douglass (2013) found that providers will not use FV unless they have the ability to successfully bill. These authors stated that research has shown inadequate investigation of the role that billing plays in providers applying FV. One issue is variability of reimbursement. The combined reimbursement for FV and Oral Assessment ranges from $9.00 to $84.70 (O’Callaghan & Douglass, 2013). Quinonez et al. (2014) state that, the pediatricians inability to bill for and provide these services to all, presents an ethical dilemma and barrier to providing FV. In Vermont during 2015, Medicaid had one set of reimbursement criteria, private health insurers had another, and Northeastern Delta Dental would not reimburse pediatricians for FV application (Silk, 2015). In Vermont the primary reason the USPSTF guideline had not been followed was because of the complexity of billing issues (Silk, 2015). The Vermont Department of Health (VDH) has worked diligently with private insurance companies and providers to remedy billing inconsistencies; however, private insurers continue to not reimburse for the Oral Health Risk Assessment which confuses billing (Silk, 2015). As of 2016, the Affordable Care Act mandated that all private insurers cover FV application through age 5 (American Academy of Pediatrics, 2016).
On-going Research Regarding the Efficacy of Combined Intervention

Two on-going studies are currently evaluating the combined effectiveness of FV application together with a program, which includes caregiver education, and receiving toothbrushes and fluoride toothpaste. These are both large studies. Wright et al. (2015) have a trial under way with high-risk children in Scotland and Quissell et al. (2014) have an on-going study among Navajo children in Arizona. Although Moyer (2014) did not find statistically significant differences after caregiver education in decreasing caries in primary teeth, these authors postulate it does make a difference and hope to have research evidence that supports this premise. Yusuf, Wright, and Robertson (2015) in a qualitative study of a pilot oral health program of under-served in London found children aged 3 to 7 years-old readily accepted FV and enthusiastically learned how to brush their teeth.

Equivocation Regarding the Best Brand of Fluoride Varnish

The FV used varies among research trials. In a detailed study, Pitchika et al. (2013) found a new type of FV, 3M Clinpro White Varnish with 5% sodium fluoride, did not show a significant reduction in the number of caries in primary teeth. These authors recommended researchers continue to use Duraphat fluoride varnish which has been shown to be 38% effective. The on-going Quissell (2014) pediatric Navajo research trial, however, is utilizing the 3M Clinpro White Varnish which was discredited by Pitchika and colleagues (2013). Another effective FV was used by Mohammadi et al. (2015) in their randomized trial. The fluoride they used, Durashield 5% sodium fluoride, has been found to be efficacious worldwide by many researchers. Lippert, Hara, Martinez-Mier, and Zero (2014) in their in vitro study concluded that the optimal FV has yet to be determined. In their systematic review the Association of State and Territorial Dental Directors, (2014) concurred with Lippert et al.’s (2014) study noting that different brands of FV have differing preparations of fluoride resulting in varying release and
uptake of the fluoride. However, researchers are confident that FV is effective in preventing and arresting caries (Lawrence et al., 2008; Lippert et al., 2014; Sharma, Puranik, & Sowmya, 2015; Slade et al., 2011).

**Number of Applications Necessary**

After concluding from their prospective cohort study that the application of FV to children’s primary teeth prevents the onset of caries and arrests existing caries, Pahel et al. (2011) addressed the issue of the number of applications of FV needed to see a consistent inhibition of caries in children’s primary teeth. They found that four visits by the age of four was required to obtain a detectable preventive benefit. This study has contributed to the current easy-to-remember mnemonic “4 by 4.” Their research has become part of the recommendation of *From the First Tooth* a FV program developed by the departments of health in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont (From the First Tooth, 2015).

Based on extensive research and meta-analysis, Moyer et al. (2014) developed the current 2014 “B” level National Guideline Clearinghouse recommendation which is that primary care clinicians should apply FV to the primary teeth of all infants and children starting with the first primary tooth. This DNP student has studied the issue of pediatric dental caries in several doctoral classes, problem-solved with school clinic hygienists, and worked with a local pediatric practice on dental issues. This background led to the implementation of this guideline in a pediatric clinic in Vermont (Gnaedinger, 2016).

**Theoretical Framework for Addressing Clinical Practice**

The Fisher-Owen et al.’s 2007 model, *Influences on Children's Oral Health: A Conceptual Model* was referenced for this capstone project (see Appendix A). This model corroborated the findings of the literature review. Fisher-Owen et al. (2007) explained that,
historically, biology and diet were looked upon as the sole influences on children's oral health. Today a broader framework is needed for predicting a child's oral health outcome. The newer conceptualization came in part from population health which proposed more complex determinants of health including genetics and biology, social environment, physical environment, health-influencing behaviors, and medical care. It demonstrated the integration of pediatric dental care, the complexity of the issue and how FV application fit into the model at the Oral, Child, Family, and Community-Levels.

The model demonstrated general health was connected to a child's oral health, and that oral disease was a risk for systemic illness. A child's risk of general illness and dental disease was not isolated from family and community disease risk. This model comprehensively demonstrated the multilevel perspective of children's oral health. This DNP student anticipated the FV application program at the selected pediatric practice would incorporate many facets of this model within the four different levels. Anticipated influences at the Oral Health-Level were: the child and his/her teeth, diet, and the microflora of the host. Expected issues at the Child-Level were whether a child had a dentist, dental insurance, biologic/genetic endowment, health behaviors and practice, and development. At the Family-Level, health behaviors, social support, socioeconomic status, culture, and family function, and family cooperation were expected influences on the child’s oral health. Finally, at the Community-Level: health care system characteristics, community oral health environment, social capital, social environment, and culture were anticipated to influence oral health.

The providers and staff at the clinic were enthusiastic about introducing the fluoride application project. This demonstrated support at the Community-Level and facilitated the implementation of this project.
Project Design and Methods

This DNP project was a quality improvement project in a clinical practice, working at the site, consulting with stakeholders, and implementing FV application at well child check-ups.

Setting and Resources

The DNP project took place at a health center in rural Vermont. It was a well-run, moderately large, independent, pediatric practice seeing children from newborns through young adulthood.

Description of population. The health center saw on average 600 patients per month, approximately 40% of those visits are well-child check-ups for patients from newborns to five year olds. The population was primarily Caucasian (96.2%) and from a lower socioeconomic background. Of the patients, 43% were part of Vermont's State Children's Health Insurance Program, Dr. Dynasaur. Children under 18 whose family income is 300% of the federal poverty level qualify for this program (Benefits.gov, 2016).

Patients seen in this practice mostly lived in the small rural towns in a large Vermont county. The county's average income in 2014 was $53,610; the number of people living in poverty was 12.1%. The population in 2015 was 55,737 (United States Census Bureau, 2015). The percentage of persons under 18 years old was 18.8%. The percentage of persons who graduated from high school was 93% and persons older than 25 who held a bachelor's degree was 34.3% (United States Census Bureau, 2016). This project involved working with the providers in the practice to implement this quality improvement project, but not working directly with patients and their parents or guardians.

Organizational analysis of project site. In this pediatric practice there were three pediatricians. One pediatrician, the owner of the practice, has 40 years of pediatric experience while the other two have 14 and 5 years, respectively. There was a receptionist, and an office
manager who was one of the two RNs, and a billing person. One RN has worked in the practice for 6 years; the other is the case manager and has been with the practice for two years. All of these individuals were integrally involved in the project as noted below. There was one full-time social worker who has been there for 3 years; she was not involved with the project.

The practice gap at this site was the lack of FV application with well-child visits. A focus group was conducted with all of the staff before the start and at the end of the project. At the initial focus group this DNP student described the USPSTF guideline and implementation strategies. An information sheet was distributed after staff did the pre-project questionnaire (see Appendices B and C). At the conclusion of this scholarly project, this DNP student met with the same staff to describe the progress with the implementation of the FV application, handed out a written summary and the staff completed a post-project questionnaire.

Evidence of stakeholder support. The practice fully supported this quality improvement project. A copy of the Key Stakeholder Letter of Agreement was signed by the pediatrician and owner of the practice.

Goals, Objectives, and Expected Outcomes

According to Issel (2014), goals are statements about the health impact or the status of the target audience in the study. Goals should apply to a longer time horizon, perhaps 3-5 years. Goals should not include a quantifiable measure, but discuss the most important effect of the project in broad terms. Zaccagnini and White (2014) describe objectives as clear, realistic, specific, measurable, and time-limited. They are statements of action and as they are completed they move the project towards its goal. The objectives for this project were specific, assignable, realistic, and time specific (Figure 1).
Goals and Objectives

<table>
<thead>
<tr>
<th>Goals</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of FV application with each 9, 18, 24, and 30 months well-child checks over a 4 month period at the pediatric practice in Vermont.</td>
<td>This DNP student met with her pediatrician mentor to plan the implementation, selecting, and ordering of the FV, the training, and the focus group meeting, May - July, 2016.</td>
</tr>
<tr>
<td></td>
<td>This DNP student described and distributed a two paged summary of the project regarding the USPSTF guideline and implementation strategies at a focus group with the providers and staff in the practice. August, 2016.</td>
</tr>
<tr>
<td></td>
<td>The training of fluoride application was done by a registered dental hygienist from the VDH. August, 2016 during the focus group.</td>
</tr>
<tr>
<td></td>
<td>Collaborating with her mentor she planned the steps to implement the guideline after the focus group met and after the project proposal was approved. September, 2016.</td>
</tr>
<tr>
<td></td>
<td>The FV application began at well-child visits after the focus group met, the Proposal was approved, and after IRB approval. September, 2016.</td>
</tr>
<tr>
<td></td>
<td>Assessment of FV application process with well-child checks over a 4 month period at the Vermont pediatric practice.</td>
</tr>
<tr>
<td></td>
<td>Problems with busy WCCs, parental questions, and billing issues were addressed as they arose, September, 2016 - January, 2017.</td>
</tr>
<tr>
<td></td>
<td>At the conclusion of the capstone project this DNP student had a second focus group with the staff to summarize the progress of the implementation of the USPSTF guideline (Appendix D). A post-project questionnaire was given. January 12, 2017 (Appendix B). The providers, RNs and biller decided to continue the FV program.</td>
</tr>
</tbody>
</table>

An evaluation of the DNP project ascertained whether FV was consistently applied at the prescribed well-child visits. The evaluation included both quantitative and qualitative data. The qualitative data was gathered in a similar manner to a study done by Meropol et al. (2014). This DNP student met at least once, often twice, weekly with the pediatric clinic staff applying the FV
along with the staff doing the billing and discussed how implementing the FV application was progressing.

The first source of quantitative data was the aggregate numbers of well-child visits (for 9, 18, 24, and 30 month children) recorded each week and the percentage who received FV. The expected outcome was to find an increasingly consistent intervention of FV application at well-child visits over the duration of this author’s scholarly project. The second source of quantitative data was collected from the Pre- and Post-Project Questionnaire (Appendix B). Names were initially excluded from the questionnaires however the process for recalling which provider did which questionnaire was faulty and the providers identified their pre and post-questionnaires so comparison could be made (Figure 2).

**Figure 2**

*Data and Analysis*

<table>
<thead>
<tr>
<th>Data</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative Data</strong></td>
<td></td>
</tr>
<tr>
<td>Practice RNs and the practice receptionist supplied aggregate numbers of well-child visits (for 9, 18, 24, and 30 months) each week and the percentage who received FV.</td>
<td>Quantify the number of children who were eligible for FV at their well-child visit and the actual number who received FV.</td>
</tr>
<tr>
<td><strong>Quantitative Data</strong></td>
<td></td>
</tr>
<tr>
<td>Pre- and Post-Project Questionnaires</td>
<td>Quantify providers understanding of FV and efficacy of implementation over the course of the project.</td>
</tr>
<tr>
<td><strong>Qualitative Data</strong></td>
<td></td>
</tr>
<tr>
<td>Met weekly with providers, RNs and the person doing the billing to receive feedback and problem solve</td>
<td>Qualitative data, which was gathered weekly to understand barriers and facilitators to implementation of the project. The literature review documents billing issues as the predominant barrier to this intervention.</td>
</tr>
</tbody>
</table>
Implementation Plan

The design for this DNP Scholarly Project is a quality improvement model, the Plan-Do-Study-Act (PDSA) model (Warren, 2014).

**Plan.** Implementation of the USPSTF’s guideline on FV application at a Vermont, pediatric practice. The goal was to begin a FV application project with all well-child check-ups for the indicated ages. This DNP student began the preparation for this project seven months in advance of its implementation. A day was spent with the pediatrician and staff of a large Vermont pediatric practice which had done FV application for 8 years. She learned their procedure for dental care: parents fill out a caries risk survey, medical assistants and RNs applying the FV at the end of the WCC and a part-time dental hygienist helped parents find dental homes for their children. Type of FV used and billing questions were also answered. Over the following months this author met with her mentor and developed a time frame to order FV from a manufacturer recommended by the VDH, determine the collect coding information from the VDH and schedule the Pre-project focus group. The FV application began at well-child visits within 6 weeks of the focus group meeting, acceptance of the proposal, and approval from the University of Massachusetts' Investigational Review Board (IRB).

**Do.** This DNP student, at the end of July, started determining which FV to purchase. She consulted with a VDH dental hygienist regarding brands of FV and was given a list of brand names with volume of FV per packet 0.4ml and 0.25 ml. This DNP student spoke with her mentor and the owner/pediatrician of the practice and researched three brands on the list: the one used in the pediatric office consulted by this author, the one the VDH uses in their WIC program and a product from Medical Lab Products (this author knew their reputation having ordered fluoride rinse for the school clinic for which she works). The products considered were: Vella, ClearShield, and VarnishAmerica. As the VDH stated all were of equal quality the least
expensive brand was chosen, VarnishAmerica, bubble gum flavor. As per the VDH hygienist’s recommendation and the Milgrom (2014) safety study, the smaller quantity packages (0.25 ml) were chosen. The cost for 200 individual units, packets with FV and a small brush applicator, was $149.99 plus $28.99 shipping resulting in a cost per unit of $0.89.

This DNP student coordinated the FV application training done by a VDH registered dental hygienist. The process was described, handouts were distributed, and all applying FV were required to watch an online video. The video was Course 6, Caries Risk Assessment, Fluoride Varnish and Counseling, http://www.smilesforlifeoralhealth.org. After consulting with the owner of the practice this author researched three FVs all recommended by the VDH. This DNP student then consulted with the practice office manager who then ordered the FV.

Effective timing of FV application is during the 9-, 15- or 18-, 24- and 30-month well-child checks according to the pediatrician whose practice has done FV application for 8 years (personal communication, January 18, 2016). This DNP student and the providers wanted to choose 4 ages (following the four applications by age four recommendation of the VDH) (From the First Tooth, 2015). During the initial focus group, the pediatricians decided to eliminate the 15 month visit in favor of the 18 month visit as less immunizations are required. The EHR used by the practice was programmed to offer a reminder to have the provider offer the FV treatment with these well child visits. The project began on September 23, 2016.

Study. The effect of the change and the determination of level of success was assessed weekly. Similar to Meropol et al. (2014), this DNP student collected data weekly on percentage of patients receiving FV application at their WCCs. This author also spoke with providers, RNs and the billing staff to ascertain difficulties/barriers to fluoride application and then determine what changes needed to be made and what actions needed to be taken. This author developed a system of checking in by phone, email, or in person usually on a Monday or Tuesday and then
following-up in person on Friday to speak with providers, RNs, the biller if available, and work with the receptionist to corroborate the enumerated list of FV recipients for that week.

**Act.** After each weekly check-in any issue that was brought up was addressed. This DNP student monitored: the caries risk assessment form, collection of FV at WCC data by RNs, patient flow, reaction by parents and patients, EHR issues, and billing/coding issues. This DNP student implemented additional PDSA cycles as needed until the objective of FV application occurred routinely (Warren, 2014). Any concern that providers, RNs, or the biller had were addressed through the steps of Plan, Do, Study, Act.

Initially in the implementation this DNP student had set-up a data collection sheet for the two RNs to record FV applied at WCC (see Appendix E). What she found after two weeks of data collection was that when the RNs were busy (which was often the case) they might forget to log a FV application, or note a patient in for WCC who did not receive FV. Utilizing PSDA this author asked the practice's receptionist to double check what the RNs recorded each Friday. The DNP student did not observe patient names, but verified (with the receptionist) the information the RNs had recorded for the week (i.e. did they or did they not receive FV, their age, and gender). This author kept the providers, RNs, and biller informed of this and any concern or issue as it arose.

**Cost Benefit Analysis**

The costs for this project were $149.99 for one box of 200 packets of Varnish America, FV, produced by *Medical Products Laboratory* and $28.99 for shipping. This cost was borne by the Vermont practice. One hundred patient education handouts (in color) for parents were photocopied. The cost was $52.00 and was borne by the author. There were no capital investments. There was in-kind cost of clinic staff time to learn about the project and how to apply the FV.
Implementing the project had some cost in personnel time. However, as the project progressed, FV application became part of the routine of each well-child check-up and took no more than 2-3 minutes of personnel time for the application. Providers spent a few minutes at the beginning of the appointment discussing this new treatment and doing oral health education, however, a discussion of oral health had previously been included in each WCC visit thus this education time was only slightly prolonged. The main cost savings was anticipated to be to parents who have fewer expenses for restorative treatment of dental caries. This savings was ascertained by using gross costing (Barnett, 2009), estimating the cost per filling. Johnstone (2016) report the average cost of a filling is between $110 and $240 dollars depending on the type of filling. If even one of these visits is avoided in the future this would be a marked cost benefit.

Several factors existed which added value to this project. Patients and parents had less anxiety about dental care as they partook of a preventive intervention. Parents and children will have less stress when there are fewer dental visits for restorative care for dental caries. Improved caries prevention had monetary value, but more importantly value for better health, better quality of life, and a life-skill which resulted in better oral health through childhood and into adulthood. This was invaluable. There was value to the pediatricians and nursing staff, having confidence that the patient and family had a reliable method for dental caries prevention. This project as it continues is anticipated to result in both cost benefits and value by demonstrating improved quality management of pediatric oral health.

**Timeline**

Much preliminary organization occurred before the project began. The focus group met in August. The Proposal and IRB paper work were completed by September. Commencement of
the project began in September and ran through January 12, 2017. Compilation and data analysis was completed February 28, 2017. A summary of key milestones is included below (Figure 3).

**Figure 3**

*Project Timeline*

<table>
<thead>
<tr>
<th>Jan 2016</th>
<th>February-July</th>
<th>August</th>
<th>September-January</th>
<th>January-February</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met with pediatrician and members of her staff at a large pediatric practice in Vermont regarding how their practice implemented FV application over the previous 8 years.</td>
<td>Talked with VDH hygienist/MPH, regarding training, and which FV to choose. Discussed timing of implementation of project with mentor.</td>
<td>Focus group for staff at pediatric clinic. Included: project information handout and pre-project questionnaire. Training done by VDH. Met with VDH who did training and biller to discuss coding and billing. Ordered VarnishAmerica, fluoride varnish.</td>
<td>Began FV application quality improvement project. Weekly follow-up of project at clinic with providers, RNs, and biller. Collected data on percentage of subjects receiving FV and qualitative data about effectiveness of program implementation.</td>
<td>Focus group for staff at pediatric clinic, including post-project questionnaire. Compiled and analyzed the data. Completed first draft of paper.</td>
</tr>
</tbody>
</table>

**Ethics and Human Subjects Protection**

The Determination of Human Subject Research was submitted to the University of Massachusetts' IRB (Appendix F). This DNP student did not have direct contact nor did she know any identifying information about children who received fluoride at the child's well child check. This DNP student utilized a questionnaire, which asked questions of the clinic staff with no identifying staff or patient information. Additionally, the clinic nurse manager and practice receptionist provided information regarding the percentage of patients who received FV for the
different age categories: ages 6 months through age 6 years-old without identifying
patient information.

Results

Outcomes

Over the course of the project from mid-September through mid-January multiple data
were collected. Information was collected about what the providers, nurses and billing staff knew
about pediatric oral health and FV. This information was collected in the form of a pre- and post-
project questionnaire. Over the course of the project, the number of subjects who did and did not
receive FV was tallied weekly (See form used for record keeping in Appendix E). The
information sheet used to gather this data also had a column for comments e.g. patient had no
teeth. Each week this author with the help of the receptionist verified the numbers tallied by the
RNs over the course of the week. Each week this author spoke with the RNs and providers to
obtain informal feedback and determine how the project was going. Examples of inquires made
were: impact of FV on patient flow, parent reaction and ease of FV application. The author also
was in contact every 2-3 weeks with the office manager and the billing person regarding coding
questions and later in the project reimbursement for the FV treatment. Below the quantitative
data, the data from the questionnaires, and the qualitative data will be enumerated.

Quantitative data. Total number of children in the study. This study had 93 (84 with
teeth) participants. See Figure 4. The total number of children who received FV during the
project was 40 (48%). The subjects' ages were 6, 9, 12, 15, 18, 24, 30 months-old, and 3, 4, 5,
and 6 year-olds. Forty-four children did not receive FV. The proposal was initially designed to
include only 9, 18, 24, and 30 month-olds. Unexpectedly, within the first week of implementing,
the project, providers found that there were subjects outside of this age range to whom they
wished to apply the FV. In consultation with this author the decision under the principle of beneficence was taken to apply FV to any child in need.

*Number of subjects.* The number of subjects who fit the age criteria for the study (9, 18, 24, and 30 months) was 54. Of the 9 month-olds, 5 had no teeth and one had 2 partial teeth. These six were not able to be actual candidates for inclusion in the proposal, so the actual number of potential subjects in this age range was 48. Of these, 27 (56%) received FV and 22 did not.

*Three year-olds.* Three year-olds within the group were not included in the initial age range. Providers voiced concern about three-year-olds who did not yet have a dental home. Three-year-olds were not technically in the proposal, but it is worth mentioning that of the 15 three-year-olds seen, 7 received FV. This is a surprising 47% of three-year-olds seen for WCCs who received FV – in most instances because they were not receiving FV at a dentist (Figure 4).

Figure 4

*Number of Subjects by Age*

<table>
<thead>
<tr>
<th>Total subjects recorded for study</th>
<th>Subjects aged 9, 18, 24, and 30 months</th>
<th>Three-year-olds (36 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>93 (84 with teeth)</td>
<td>54 (48 with teeth)</td>
<td>15</td>
</tr>
<tr>
<td>40 received FV</td>
<td>27 received FV</td>
<td>7 received FV</td>
</tr>
<tr>
<td>Note: 53-9 = 44 did not receive FV (4, 6-months-old and 5, 9 month olds = 9 potential subjects did not receive FV secondary to no teeth, but received teaching.</td>
<td>Note: 27-6=21 did not receive FV (27, 5 of whom didn't have teeth, 1 of whom had only 2 partial teeth)</td>
<td>Note: 8 did not receive FV All received FV teaching and some parents had help finding a dentist.</td>
</tr>
</tbody>
</table>

*Dental Caries Risk Assessment Tool.* This author developed an updated caries risk assessment tool based upon a tool this practice had used and a tool used by the Vermont pediatric practice which has applied FV for the past eight years (Please see Appendix G). Forty nine surveys were collected. Nineteen of the subjects (39%) had dentists. The majority of
subjects had medium or high risk for developing caries. Ten subjects (20%) were low risk, 22 subjects had a medium risk (45%), and 17 subjects had a high risk (35%).

**Qualitative data.** The project's qualitative data was broken down into themes. There exists some overlap between themes. The following themes were derived from speaking with the providers, the RNs, and the billing person. These themes were repeatedly brought to the attention of this author over the course of the 4-month project. Themes included: reasons patients did not receive FV, EHR systems issue, medical-dental collaboration, level of caries risk, ease of applying FV/reaction of patients, flow of the visit, time taken to apply FV, parent reaction, age of children who received FV, and unexpected bonuses.

**Reasons patients did not receive FV.** During the course of the project there were multiple reasons children did not receive FV. These were the recurrent reasons: parents declined the FV, the child lacked teeth, the provider assessed child as low-risk for caries, parents did not believe in fluoride, too much was happening at the appointment, the child was handicapped, the child already received FV at his/her dentist, and the pediatrician or RN was too busy due to many sick calls. Fifteen parents declined, these parents did not believe fluoride a healthful intervention.

Some parents declined the FV because there were too many things going on at the appointment, some declined because they wanted their child to have more teeth (than 2) and wanted the FV at the next appointment. Occasionally a provider assessed a patient as low risk and decided not to offer the FV. Sometimes other priorities during a visit, e.g. lead testing, immunizations, flu shots interfered and the RN simply forgot to do the FV. Examples of why FV not received included: FV not received at 9 months will do at 12 months; this occurred twice. One child had a handicap and the FV was tried, but the RN had to stop midway through and a final example was a three year-old already getting FV at her dentist. In November and December, this area of Vermont suffered an outbreak of pertussis and community acquired
pneumonia. On many days the RNs and providers were exceedingly busy and sometimes there was not time to provide FV at a WCC.

**EHR Systems Issue.** There was also an EHR systems issue which was a barrier to providers providing the FV treatment. If a provider wanted to apply FV during a visit that was not a WCC (for example a child was seen for eczema) the EHR did not have an adequate selection of words that could be typed in to bring up the procedure to have the pediatrician order FV. One of the pediatricians stated that AthenaNet did not bring up the "Fluoride Varnish Application," when he typed in either *procedure* or *dental*. So, if the provider was seeing a patient for another reason he had a more difficult time bringing up the FV treatment. If the provider was in a hurry, he would not bother with FV. This occasion presented itself only rarely during this project.

**Medical-Dental Collaboration.** Anecdotally, a difference of preventive oral health care was noted. One pediatrician stated some parents want to speak to their child's dentist before getting FV. This pediatrician made the generalization that some dentists have a different mindset regarding pediatric preventive oral health care. He felt some dentists do not care if decay occurs because the dentists make more money on restorative care. “They are not in favor of prevention, they are more interested in the business side as opposed to staying current on literature recommended best practice.” This practice did reach out to area dentists. Providers and RNs sometimes helped a parent make a dental appointment from the office and often gave parents lists of local dentists who would accept Vermont Medicaid.

**Subject's level of caries risk.** Many parents completed a caries risk assessment form before the WCC. The pediatricians also did the Oral Health Risk Assessment for all children up to age three which included caries risk assessment. One of the providers sometimes did not offer
FV if the risk was low. The risk was low as noted above approximately 20 percent of the time. Other providers offered FV no matter the level of risk.

**Ease of applying FV/ reaction of children receiving FV.** Over the four months the RNs gave consistently positive feedback regarding applying FV. The RNs noted some children less than three years old had a difficult time keeping their mouths open or opening their mouths wide enough during application; specifically, the RNs commented on occasional difficulty of child keeping mouth open three times over course of four months. Sometimes RNs had difficulty opening the FV container (noted twice). Some children were noted to be uncooperative/didn’t like flavor (nine times). Comments included, “child struggled some, very squiggly, mildly non-cooperative.” One RN noted if the child was screaming it was easy to apply FV. Some subjects were noted to be cooperative/liked FV flavor (19 times). Comments included: “very cooperative, wanted more (FV), great, loved it.” Two months into the project one of the RNs had the parent apply the FV and that went well. From RNs perspective if FV was ordered it was always applied.

**Flow of the visit.** The addition of FV application to the well child visit was discussed with providers and the RNs in August before the project began. It was decided that FV would be applied toward the end of the visit. Providers and nurses felt FV readily fit into the flow of a well-child visit. The pediatrician and owner of the practice noted, “FV application did not interfere with overall work flow.” One of the RNs noted, “flow was not impaired by extra service provided.” When this DNP student asked about patient flow the RNs consistently said “no problem, no issues.” The typical flow at the end of a WCC visit was: FV application, lead screening and immunizations.

**Time it took to apply fluoride.** The RNs found that the time it took to apply FV varied depending on how many teeth the child had. They noted that when a child has four teeth it took less than 60 seconds to apply FV. With a three year-old it took about 3 minutes to apply FV. One
RN said, “What took the most time was convincing parents that (FV) is beneficial and not harmful.”

**Parent reaction.** Parent reaction was varied. Some parents declined because they did not believe in fluoride as a healthy treatment for their children. One RN noted anecdotally that some parents who might be hesitant about immunizations for their children seemed hesitant about FV. The providers and RNs noted many parents were very excited about the FV program, some parents whose children did not yet have teeth wanted their children to receive FV when their children had teeth. Providers and RNs noted this was an ideal time to educate parents about FV. One parent was glad his 19 month-old child could receive FV at pediatrician’s office because the child was hesitant to go back to the dentist after a challenging experience.

**Age of children who actually received fluoride (some outside of study ages).** From the first week of the project, pediatricians wanted more flexibility in the ages of children receiving FV. They also had questions of what was the upper age limit for FV reimbursement. It is through age five. Again this was a billing/reimbursement issue which needed to be addressed. It did not stop the providers from applying FV to those to whom they wished to apply it. These pediatricians chose to provide the FV even if they knew they might not be reimbursed.

**Unexpected bonuses.** A great deal of teaching was done regarding oral health. One provider noted a 28 month-old needed restorative care, applied FV and instructed the parent about scheduling a dentist appointment. A 6 year-old had never been to the dentist, the provider, had the child receive FV, did teaching and provided the parent with a list of area dentists who take Medicaid. Another bonus was FV becoming *a meaningful use quality measure* for AthenaNet, EHR. This occurred in December.

**Billing issues.** Billing and coding issues were the most frequently discussed of all the themes. Initially the FV application program was set to start the week of September 12th.
The pediatrician who programmed AthenaNet for the FV thought the coding information had been correctly entered, but when it was trialed during the week it did not work. The same pediatrician fixed the programing problem over the following weekend and the project began the week of September 19th.

Initially this author tried to contact the billing person each week through email. This project took place in rural Vermont and the biller is part-time and also has a gardening business and flower beds needed to be put to bed for the winter just as the project began. During November through January this author had frequent contact with the biller.

One initial billing issue which arose immediately in September was whether the practice’s Case Manager (one of the RNs) could be reimbursed for applying FV on a home visit. The biller was not available and the FV was subsequently applied at an office visit.

At the end of October the biller did find that that an incorrect modifier was used during a well-child check regarding the Oral Health Risk Assessment not fluoride varnish. This was corrected and re-submitted and billing was received. At the same time there was minor confusion among the pediatricians and RNs about the billing code for FV and the Oral Health Risk Assessment. This author emailed the VDH for clarification and the biller and this author both checked with the American Academy of Pediatrics (2016) coding page and talked to the pediatricians and office manager (one of the RNs). The issue was resolved. The Oral Health Risk Assessment is only covered by Medicaid, not private insurers with children up to age 3. FV is covered up through age 5 and covered by Medicaid and private insurers this is a provision of the Affordable Care Act.

In December the biller re-confirmed for the final time that the correct billing code was 99188. This author had ascertained this code in August before the project began, however, questions among providers and one insurance company were raised about whether this was a
“dental” code and all players were convinced that it was not and this on-going discussion was
finally laid to rest.

In December the biller determined Vermont Medicaid was reimbursing $18.00 per
application and Vermont Blue Cross and Blue Shield (VT BC & BS) paid $12.96. A subsidiary
of VT BC & BS had not paid for one child’s treatment. Reimbursement was received for all
other FV applications. The biller did not have any concern that billing for FV was any more
burdensome than any other treatment or procedure offered. She felt the implementation of billing
for the new FV treatment went well. She noted the majority of patients either had Medicaid or
standard VT BC & BS.

There were two minor billing/coding issues. In November the biller reminded providers
that in the event that FV was given at a visit other than a WCC, FV needed to be ordered in order
for it to be billed. The biller did find one child ineligible because the parent needed to re-instate
Medicaid, the parent did re-instate it, and the FV application was covered retroactively by
Medicaid. The owner (one of the pediatricians) of the practice did note that there is a cost to a
slightly longer WCC visits when FV is applied.

In January at the conclusion of the project the biller and this DNP student spent time
verifying coverage of various children included in the project. Most were covered by standard
VT BC & BS (not a subsidiary) and the clinic was reimbursed for the FV. The biller spoke with
AthenaNet and got a print-out using the 99188 code, and she verified reimbursement of all
children in the study. As of January 12, 2017, 32 visits for FV had been billed and payment
received on 28. Of the 4 not received, one was self-pay and 3 were from a subsidiary of VT BC
& BS that the biller had had billing issues with previously for other types of procedures.
Eighteen were Medicaid and the remaining 10 were standard VT BC & BS.
Presentation data gathered from pre- and post-project questionnaires. A pre-project questionnaire was done in August before the project was begun. This was done to get a sense of the providers, RNs and the biller’s knowledge about pediatric dental health and their knowledge about FV. At the conclusion of the project on January 12th a post-project questionnaire was completed by the same individuals. Open ended questions were added to the post-questionnaire to allow respondents to add final impressions on the project (please see Appendix B).

The following are questions one through five, six, and nine with a graph of their results. Most responders had a good initial understanding of pediatric oral health (Figure 5).

Figure 5

*Pre- and Post-Project Questions One through Six and Nine*
The next questions, 7, 8 and 12, utilized a Likert scale to ascertain how important providers and staff felt FV intervention was (question 7), percentage of children they anticipated would receive FV at well-child check ups (question 8), and how likely they thought the FV would be to help prevent caries (question 12). The pediatricians and the RNs understood the importance of the FV and anticipated the percentage of children likely to receive FV at their WCCs (Figure 6).

Figure 6

Importance of FV and Percentage of Children Receiving FV

**Question 10** asked respondents *What was the most positive feature of the fluoride varnish you used*: (choices included: Packaging/delivery, Material viscosity/consistency, Ease of application, Color, Patient comfort, Flavor, and Fluoride release). Respondents indicated *Ease of application* and *Patient comfort* as being the most positive features of this pre-packaged FV.

**Question 11** asked respondents *What was the least positive feature of the fluoride varnish you used*: (choices included: Packaging/delivery, Material viscosity/consistency, Ease of application, Color, Patient comfort, Flavor, and Fluoride release). In the pre-questionnaire respondents concerns were about the flavor, ease of application, the color, the packaging and the patient’s comfort. In the post-questionnaire respondents noted: no concerns, two were still concerned about patient’s comfort, and one was still troubled by the packaging (Figure 7).
**Figure 7**

**Most Positive and Least Positive Features of FV Noted by Staff, Pre and Post Project**

<table>
<thead>
<tr>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10. Most positive feature FV</strong></td>
<td><strong>10. Most positive feature FV</strong></td>
</tr>
<tr>
<td>A. Ease of application</td>
<td>A. Ease of application</td>
</tr>
<tr>
<td>B. Fluoride release</td>
<td>B. Left blank</td>
</tr>
<tr>
<td>C. Ease of application</td>
<td>C. Ease of application</td>
</tr>
<tr>
<td>D. Ease of application</td>
<td>D. Ease of application</td>
</tr>
<tr>
<td>E. Ease of application &amp; Patient</td>
<td>E. Patient comfort</td>
</tr>
<tr>
<td>F. Patient comfort</td>
<td>F. Left blank (noted she does billing)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>11. Least positive feature FV</strong></th>
<th><strong>11. Least positive feature FV</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Flavor</td>
<td>A. Patient comfort</td>
</tr>
<tr>
<td>B. Ease of application</td>
<td>B. Left blank</td>
</tr>
<tr>
<td>C. Color</td>
<td>C. None (hand written)</td>
</tr>
<tr>
<td>D. Packaging /delivery</td>
<td>D. Packaging /delivery (Just occasionally difficult to open, hand written)</td>
</tr>
<tr>
<td>E. Flavor</td>
<td>E. Patient comfort</td>
</tr>
<tr>
<td>F. Patient comfort</td>
<td>F. Left blank (noted she does billing)</td>
</tr>
</tbody>
</table>

Question 13 was asked to see if providers and RNs knew of recommendations regarding frequency of FV application:

13. The Vermont Department of Health's preschool dental health program, *From the First Tooth*, has developed a mnemonic to remind pediatricians of the number of times to apply fluoride varnish (This is corroborated by this author’s review of the literature). The mnemonic is __________ applications by age four.

The correct response is “4.” Three out of 6 on the pre-questionnaire and 5 out of 6 answered correctly on the post-questionnaire.

The open-ended questions at the end of the Post-project Questionnaire indicated important issues to the providers and RNs. Some examples of comments included: the teaching-handout for parents was helpful, the FV project offered a time to teach about FV, with greater caries’ risk providers encouraged FV application, FV did not affect the flow of the visit, billing was sometimes an issue. Figure 8 shows the questions and answers in their entirety.
Open-ended Questions from Post-project Questionnaire

**Please write-down what facilitated the fluoride varnish application e.g. was the FV kit easy to use, etc.:**

- Great handout (teaching handout for parents) (Please see Appendix H.)
- Great handout with info. for parents
- A bit difficult to open (container) at times.
- It was easy, fast. Time was not an issue, it was very quick. Very excited to help. Prevents cavities.

**Please write-down barriers to fluoride varnish application e.g. cost, time-consuming, etc.:**

- Time, discussing fluoride varnish-family misconceptions/fixed beliefs
- Some parents didn't want to take the time.
- Parents not agreeing, but for those who do - all good.
- Not able to suction the spit. (This had been discussed by me with this RN during the implementation of project. She did not think it would be worth hooking up suction.)

**How did the level of caries risk influence whether you offered the fluoride varnish?**

- Most often it was helpful to convince families that there was appropriate risk for the treatment.
- Definitely influenced how strongly I recommended the application of FV; we offered to all.
- Higher risk - pushed more for varnish, but I offered to everyone.
- None - I offered no matter what.
- Offered to everyone, but risk is definitely a factor.

**Any other comments?**

- Very helpful. Thank you.
- FV application did not interfere with overall work flow (MD owner of practice).
- Flow was not impaired by extra service provided.
- What took the most time was convincing parents that (it) is beneficial and not harmful.
- Billing with some insurers is a battle. (Biller).

Facilitators and Barriers

Both facilitators and barriers to the implementation of the project were present. The primary facilitator was the tremendous enthusiasm for implementing this guideline among the
providers, RNs, and office staff. Another facilitator was having the support and assistance of a Burlington, Vermont, pediatric practice, which had done FV application for eight years. Three other professionals helped facilitate this project, the head of the Vermont Department of Health dental hygiene program, a registered dental hygienist with a masters degree in public health, the VDH hygienist who did the FV application teaching, and another Vermont pediatrician. All were working statewide to get the From the First Tooth FV program started in pediatricians’ offices and gave expert help to this DNP student regarding FV products and assisting with coding and billing issues.

Barriers included difficulties with billing, which was the reason the practice had not previously started this program. As O’Callaghan and Douglass (2013) noted, billing problems often inhibited the implementation of FV programs. Other barriers were parents who did not believe in the efficacy of FV and pediatricians and RNs being overwhelmingly busy and not having time to apply the FV. For the most part the overwhelmingly positive support of the staff counter-balanced the challenges presented by the barriers.

Discussion

Thorough preparation for the project and support of the clinic staff facilitated the ease of implementing this quality improvement project. The quantitative data indicate that 56% of children in the designated age ranges received FV at their WCCs, and the qualitative data indicated the primarily positive response parents had to the new FV program, the ease of adding this procedure to the flow of the visit, and that billing issues were quite manageable. Additionally, model used for this project predicted many of the themes found in the qualitative data.

This project corroborated findings of the Fisher-Owens et al. (2007) model the Influence’s on a Children's Oral Health: A Conceptual Model. This project showed that a child's
risk of general illness and dental disease was not isolated from family and community disease risk. The FV application program at the selected pediatric practice incorporated many facets of this model within the four different levels of influence. An example of a characteristic present at the **Oral Health-Level** was a child’s *diet* i.e. one pediatrician noted her concern when a two year-old came in with a can of Sprite. At the **Child-Level** several of the influences were present in this study. Some children had no *dentist*, a *dental insurance* accepted by few dentists (Medicaid), a *predisposition for caries*, (the risk survey asked about parental caries), and/or poor *health behaviors and practice*, the risk survey asked if the the child’s teeth were cleaned daily. The *developmental* level of children influenced their ability to cooperate with affected FV application. At the **Family-Level**, *socioeconomic status* was a factor. Some parents whose children were on Medicaid had trouble finding a dentist and were glad to have FV applied. *Culture*, some parents did not value FV for their child’s health. *Family function and cooperation* were involved; sometimes a parent thought there was too much going on at a visit and one mom applied the FV herself. Finally, at the **Community-Level**: *health care system characteristics* were a factor in this project, in 2015 the Affordable Care Act mandated private insurers cover FV application through age 5, the *community oral health environment* fostered the project, the VDH actively participated with their support of this project, and *community culture*, the providers at the clinic, looked to by the community for health guidance, were enthusiastic about introducing the FV application project and were integral to the implementation of this project.

With extensive preparation and planning and understanding and buy-in from the practice, a successful FV project can be implemented in a pediatric practice. This DNP student began preparing for this project by focusing on pediatric oral health in her doctoral classes and then nine months before the project began met with a large pediatric practice, frequently spoke with
the dental hygienist at the VDH and her mentor to make sure that the implementation of the project would be successful.

**Number of FV Applications**

The quantitative data describing the number of subjects receiving FV indicated that more than half of children of the targeted ages received FV over the course of the project. The results indicated of the subjects (aged 9, 18, 24, and 30 months) that this project set out to study 56% of patients received FV at their WCCs. Further, 48% of the over-all patients seen for WCCs received FV, in an age range of 6 months to 6 years-old. An unanticipated finding was that some three year-old patients did not have dental homes. Of the subjects (whose parents who completed caries risk surveys) only 39% had dental homes. Forty-seven percent of the three-year olds received FV during their WCCs.

**Qualitative Themes**

Reasons children did not receive FV broke down into two categories: 1) parents did not believe in FV as a treatment and 2) other factors which interfered with the FV and those included the providers or RNs being busy, too much going on at a visit, and a handicapping condition. In this second group many of those children will receive FV at their next visit, so likely FV applications will increase to a certain extent. Additionally, for the children without teeth, both pediatricians and RNs remarked that several parents of these children received oral health teaching and were enthused about having their children receive FV once the child actually had teeth.

The staff expressed multiple times over the course of the project that the addition of FV to a WCC went smoothly. They reported the flow going well, it did not take overly long to apply the FV, between 30 seconds to 3 minutes. The RNs were flexible allowing a parent to apply the FV, doing the best they could if the child was “squiggly.” The providers and the RNs were
positive and reported many parents were enthused and grateful to have the FV available at the pediatrician’s office. There were no significant glitches in getting the program up and running.

There were some positive un-anticipated findings. One was that the providers quickly realized they wanted to offer the FV to children of ages outside of the range initially selected for the study. Everyone was flexible about that, this author and mentor included. This was an issue of beneficence and any child a provider deemed in need of FV received it. Along the same lines pediatricians and RNs found themselves doing additional teaching about oral health at WCCs. Both providers and RNs were involved in helping parents find dentists that would take the child’s insurance. Another unexpected benefit was a discussion among providers and RNs about caries risk, a new caries risk assessment tool was developed for the practice. There was a productive discussion among providers about what the caries risk level should be when FV is offered at a WCC. A final unexpected bonus was that AthenaNet chose to use FV application as a meaningful use quality measure for AthenaNet, EHR.

There were some professional and technology related issues. Two pediatricians raised concerns about the level of investment their dental colleagues had in preventative pediatric oral health care. Hopefully, pediatricians and dentists alike value a decrease in suffering caused by untreated caries and hopefully both professions will work more closely together to ameliorate this readily treated disease. Technologically, there continue to be ways that EHRs can be improved so that when patients are seen for reasons other than WCCs and providers want to order FV, the system allows for words like “dental” or “teeth,” in the search for the FV procedure not solely the complete statement, “dental varnish procedure.” One pediatrician noted providers will not waste time searching for the correct term and will instead forego the FV treatment.
As anticipated by the review of the literature discussions about billing arose several times during the project. First and foremost the Affordable Care Act mandate which required private insurance companies to cover this treatment made the implementation possible. Previously, pediatric practices had to decide whether to charge parents for FV application or absorb the cost if the child was not a Medicaid patient and the private insurance did not cover this. One concern is as the Affordable Care Act is revised will this procedure mandatorily be covered as a preventive health treatment. Other issues were of a more minor nature, assuring that the code for the treatment was correct, clarifying insurance coverage for the FV treatment versus the Oral Health Risk Assessment these questions were clarified for all staff. Finally, despite the mandate to cover this treatment one insurer, a subsidiary of Vermont Blue Cross and Blue Shield persisted in telling the biller that this was a dental procedure and could not be done at a pediatrician’s office. The biller did address this issue with this insurer. As of January 12, 2017 the practice had received $422.70 in reimbursement for 32 FV treatments that had been submitted for billing. The out-of-pocket cost for 32 packages of FV was $28.48.

**Pre- and Post-project Questionnaires**

The pre- and post-project questionnaires indicated that the providers, RNs, and the biller at the practice had a good understanding of dental caries risk in the pediatric population, recommendations and frequency of FV application, and insurance coverage related to FV. The staff valued FV as an intervention, anticipated the approximate percentage of children who would receive FV (56%), and anticipated efficacy of the FV. Regarding positive and least positive features of FV providers and RNs indicated that they valued ease of application and the comfort of the patient. The staff’s concluding comments indicated that FV application went smoothly, did not interfere with patient flow, and offered an opportunity for pediatricians and RNs alike to do teaching about oral health, FV, and finding a dental home.
Suggestions and Future Recommendations

While overall successful, it is important not to generalize from this small FV quality improvement project. Useful information would be gained from replicating this project in other settings i.e. larger pediatric practices, family practices, and practices in suburban and urban settings. The following can be suggested: thorough preparation before the implementation of the project, buy-in from the staff, excellent preparatory teaching of the staff, not only how to apply the FV, but teaching re: the USPSTF recommendations, and teaching with the practice’s billing staff. If all these steps are followed the implementation can be expected to be smooth.

With the increasing use of FV further safety studies should be considered given that the FDA does not regulate FV for caries prevention, safety has not be studied in the 6-12 month-old population, and there are multiple fluoride varnishes with different inactive ingredients and viscosities. Care should be taken that not too much FV is used and the 0.25 ml packages (versus the 0.4ml packages) should be utilized.

As more FV programs are implemented, it would be important to do a comparison study similar to the Winter et al.’s (2015) study which compared a test group from a deprived rural area (similar to where this project was done) who received oral hygiene education and FV and a control group that received solely preventive care, no FV. Examining children at a practice similar to the one used in this project with the goal of determining the percentage of children who developed caries by age eight and a prospective study looking at the number of children developing caries status post the implementation of a project similar to this one would yield beneficial data. One would hope to see a marked decrease in caries. Work needs to continue to be done to determine treatments that are effective in decreasing the incidence of pediatric dental caries in the United States.
Conclusion

The United States has a complicated and persistent problem of dental caries in children’s primary teeth. Dental disease in children's primary teeth is indicted by over 50% of children experiencing dental caries and results from primary care providers not applying FV to children's teeth. A review of the literature supported the efficacy of FV. The model, *Influences on Children's Oral Health: A Conceptual Model* gave accurate insight into the causes and remedies needed to ameliorate pediatric dental caries.

This quality improvement project successfully introduced a FV application program into a pediatric practice in rural Vermont. Fluoride varnish was applied during WCC for children aged 9, 18, 24, and 30 months. Over the course of the project study 56% of patients received FV at their WCCs. Findings included: the pediatricians thorough understanding of pediatric dental health issues, ease of adding FV application to the flow of WCCs, positive reception by parents, FV as a *meaningful use quality measure* for AthenaNet, EHR, increased oral health education, consistent reimbursement for the treatment. Going forward the primary concern will be if the Affordable Care Act is altered, will it continue to mandate that private health insurance companies reimburse for FV application. Future suggestions include implementing similar programs in larger, more urban practices, considering safety studies to include children in the 6 to 12 month age range, and cohort studies to assess the efficacy of FV application programs.

For dissemination strategies, a brochure will be developed for parents describing the effectiveness of the project. For local pediatric and primary care practices a summary brochure describing the results of the study and how FV application can be implemented will be shared.

At the state level the results will be shared with the VDH, the Vermont chapter of the AAP, and the Vermont Nurse Practitioner Association. This project will be published at the national level in conjunction with this project's mentor and University of Massachusetts' Amherst
faculty. Disseminating the results of this project will hopefully help lead to further decrease in pediatric dental caries.
References


Appendix A

Influences on Children's Oral Health: A Conceptual Mode

---

Figure 1
Child, family, and community influences on oral health outcomes of children. The triad was adapted from Keyes PH. *Int Dent J.* 1962; 12:443-464; and the concentric oval design was adapted from the National Committee on Vital and Health Statistics. *Shaping a Health Statistics Vision for the 21st Century.* Washington, DC: Department of Health and Human Services Data Council, Centers for Disease Control and Prevention, National Center for Health Statistics; 2002:viii. (Fisher-Owens, et al., 2007).
Appendix B

Pre- and Post-project Questionnaires

Fluoride Varnish Pre-project Questionnaire for Clinic Providers and Staff, August 5, 2016

1. The majority of children in the U.S. experience dental caries by age eight.   T   F

2. Over the past decade there has been an increase in pediatric dental caries among minority children, poor children, and many children from middle class families.   T   F

3. Fluoride varnish application is not recommended by the American Academy of Pediatrics starting with the child's first tooth eruption.   T   F

4. Application of fluoride varnish takes longer than 3 minutes to apply to a child's tooth.   T   F

5. All health insurance companies are now required to reimburse for fluoride varnish application at well-child check-ups before age 5.   T   F

6. Have you ever been involved with encouraging parents to have fluoride varnish applied to their children's teeth?   Yes   No

7. How important do you think a fluoride varnish intervention is for children in our area on a scale of 1-5 (with 1 being least likely and 5 very likely):  1  2  3  4  5

8. What percentage of infants and toddlers do you anticipate will receive fluoride varnish at their well-child check-ups once this project has been implemented (with 1 being a low percentage and 5 being a high percentage):   1  2  3  4  5

9. Do you have concerns about applying fluoride varnish in the pediatric practice setting? Circle: Yes/No
   If so what are they:_________________________________

10. What do you anticipate will be the most positive feature of the fluoride varnish you use:
    Packaging/delivery
    Material viscosity/consistency
    Ease of application
    Color
    Patient comfort
    Flavor
    Fluoride release
11. What do you anticipate will be the least positive feature of the fluoride varnish you use:
Packaging/delivery
Material viscosity/consistency
Ease of application
Color
Patient comfort
Flavor
Fluoride release

12. How likely is it that fluoride varnish will prevent cavities in the children you see in the practice on a scale of 1-5 (with 1 being least likely and 5 very likely):

1  2  3  4  5

*From the First Tooth* a fluoride varnish program developed by the departments of health in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

13. From the First Tooth has developed a mnemonic to remind pediatricians and family practice providers of the number of times to apply fluoride varnish. The mnemonic is __________ applications by age four.

Questions 10 and 11 adapted from Survey Monkey: https://www.surveymonkey.com/r/KJK7NT8
Fluoride Varnish Post-project Questionnaire for Clinic Providers and Staff
Gnaedinger Capstone Project January 12, 2017

1. The majority of children in the U.S. experience dental caries by age eight.  T  F

2. Over the past decade there has been an increase in pediatric dental caries among minority children, poor children, and many children from middle class families.  T  F

3. Fluoride varnish application is not recommended by the American Academy of Pediatrics starting with the child's first tooth eruption.  T  F

4. Application of fluoride varnish takes longer than 3 minutes to apply to a child's tooth.  T  F

5. All health insurance companies are now required to reimburse for fluoride varnish application at well-child check-ups before age 5.  T  F

6. Is encouraging parents to have fluoride varnish applied to their children's teeth part of your WCC teaching?  Yes  No

7. How important do you think a fluoride varnish intervention is for children in our area on a scale of 1-5 (with 1 being unimportant and 5 very important): 1 2 3 4 5

8. What percentage of infants and toddlers do you think received fluoride varnish at their well child check-ups over the course of this project (with 1 being a low percentage and 5 being a high percentage): 1 2 3 4 5

9. Do you have any remaining concerns about applying fluoride varnish in the pediatric practice setting? Circle:  Yes  No
If yes, what are they: __________________________________________

10. What was the most positive feature of the fluoride varnish you used:
Packaging/delivery
Material viscosity/consistency
Ease of application
Color
Patient comfort
Flavor
Fluoride release
11. What was the least positive feature of the fluoride varnish you used:
   Packaging/delivery
   Material viscosity/consistency
   Ease of application
   Color
   Patient comfort
   Flavor
   Fluoride release

12. How likely is it that fluoride varnish will help prevent cavities in the children you see (with 1 being least likely and 5 very likely): 1 2 3 4 5

13. The Vermont Department of Health's preschool dental health program, *From the First Tooth*, has developed a mnemonic to remind pediatricians of the number of times to apply fluoride varnish. The mnemonic is ___________ applications by age four.

Please write-down what facilitated the fluoride varnish application e.g. was the FV kit easy to use, etc.:

Please write-down barriers to fluoride varnish application e.g. cost, time-consuming, etc.:

How did the level of caries risk influence whether you offered the fluoride varnish?

Any other comments?

Questions 10 and 11 adapted from Survey Monkey: https://www.surveymonkey.com/r/KJK7NT8
Appendix C

Information Sheet for Clinic Staff at Pre-project Focus Group

Focus Group Information Sheet

Focus Group  
Fluoride Varnish


The U.S. Preventive Services Task Force recommends that pediatricians apply fluoride varnish to the primary teeth of all infants and children starting with the eruption of the first primary tooth (Moyer et al., 2014). Almost 50% of pediatricians agree fluoride varnish should be applied but only 7% have been able to implement the guideline (Quinonez et al., 2014). The Vermont Department of Health is encouraging pediatricians to implement this program as well, their program is called From the First Tooth (From the First Tooth, 2015).

Let's Apply Fluoride Varnish (Ellen's Doctoral Project)

The goal is to begin the fluoride varnish application with well-child check-ups in August/September of 2016.

• The guideline and implementation strategies are explained at the focus group (August) with the providers and staff in the practice.

• Collaborating with Dr. Foulk, and Dr. Miller, Ellen will plan the steps to implement the guideline after the focus group has met.

• The prediction is that the fluoride varnish application can begin at well-child visits within 1-2 months after the focus group meeting.

2) With the approval of the practice, Ellen will coordinate the training, ordering and billing.

• The training of fluoride varnish application will be done by the Vermont Department of Health and Area Health Education Center (AHEC).
• Ordering and billing issues will be coordinated by Ellen, Dr. Foulk, and the office staff. Dr. Frankowski’s practice and Dr. Laura Murphy have said they can help.

• Effective timing of fluoride varnish application is during the 9-month, 15- or 18-month, 2-year and 30-month well-child checks per pediatrician, Dr. Barbara Frankowski.

• Problems with training, ordering, billing and implementation will be addressed as they arise.

3) Ellen will study the effect of the change and determine how things are going.

• Ellen will develop a Post-teaching and Implementation Questionnaire. This will be given at the end of the project.

• Ellen will review weekly the data from well-child visits from the previous week and ascertain difficulties/barriers to fluoride application.

• Ellen in consultation with the providers, nurses and office staff will work on changes as they need to be made.

4) Each week Ellen will meet informally with the providers, registered nurses, and billing staff, getting feedback and tailoring fixes to the practice’s specific needs.

References


7-28-16
Appendix D

Summary of Project for Clinic Staff at Post-project Focus Group

Summary of Ellen Gnaedinger's Fluoride Varnish Program

The fluoride varnish (FV) project was started on September 23, 2016 after proposal approval by UMass Amherst faculty, Dr. Black and Dr. Aselton. The project ran through January 11, 2017.

The initial focus group, including project pre-test and fluoride varnish application training, was done on August 4, 2016. All clinic staff participated in the pre-test. Linda Greaves, RDH, from the Vermont Department of Health, presented information on fluoride varnish application to the staff. For her training material, Ms. Greaves referenced the From the First Tooth Program (2015). This program came from the United States Preventive Services Task Force (USPSTF) guideline recommendation upon which Ellen based her project. The clinic pediatricians and registered nurses practiced the application of fluoride varnish on each other to become comfortable with the process. The day concluded with Ms. Greaves, Pauline, and Ellen ensuring the correct billing information was understood.

Since then, Ellen worked with Ashley, Becky, Sam, Sabra, Jennifer, Pauline, and Kim. We collaborated on ordering the fluoride varnish. Sam programmed the billing code into AthenaNet. He programmed it so that FV is an expected treatment with well-child check-ups (WCC) at 9, 18, 24, and 30 months. The providers, billing system, and Ellen were ready by the third week in September. Ellen met with the Kim every Friday. Kim checked the EHR for patients who had the fluoride varnish treatment and we compared it to the nurses' FV data sheet. Everyone was helpful and supportive of the project and this was greatly appreciated.

Qualitative data

The first fluoride varnish was applied to a 9 month-old on September 23rd. The qualitative data was broken down into themes. The first theme was: not receiving fluoride, with the following sub-themes: parents decline, lack of teeth, provider assesses child as low-risk for caries, parents don't believe in fluoride, too much going on at the appointment, child uncooperative, and pediatrician or registered nurse too busy due to many sick calls.

Other themes include: billing and coding issues, flow of the visit, time it took to apply fluoride, reaction of children receiving FV, inconsistent reporting of data, parent reaction, age of children who actually received fluoride (some outside of study ages), and unexpected bonuses such as more teaching about dental homes and FV being a meaningful use quality measure for AthenaNet, EHR.
Quantitative data

<table>
<thead>
<tr>
<th>Total subjects recorded for study</th>
<th>Subjects aged 9, 18, 24, and 30 months</th>
<th>Three-year olds (36 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>54</td>
<td>15</td>
</tr>
<tr>
<td>40 received FV</td>
<td>27 received FV</td>
<td>7 received FV</td>
</tr>
<tr>
<td>53 did not receive FV</td>
<td>27 did not receive FV (5 didn't have teeth)</td>
<td>8 did not receive FV</td>
</tr>
</tbody>
</table>

**Number of children in the study:** 93. Total children who received FV during the project: 40 children aged 6, 9, 12, 15, 18, 24, 30 months, 3, 4, 5, and 6 year-olds received FV. Fifty children did not receive FV. The study was initially designed to include only 9, 18, 24, and 30 month-olds.

**Number of children** who fit the age criteria for the study (9, 18, 24, and 30 months) is 50. Five of these children were 9 month olds with no teeth. Of the 54, 27 received FV and 27 did not.

**Three year-olds** were not technically in the study, but it is worth mentioning that 15 three year-olds were recorded. Of these, 7 received FV.

**Billing Issues**

Pauline and Ellen spent time verifying coverage of various children included in the project. Most were covered by Vermont Medicaid or Vermont Blue Cross and Blue Shield and the clinic has been reimbursed for the FV. Pauline spoke with AthenaNet and got a print-out using the 99188 code, and she verified reimbursement of all children in the study. Pauline is planning to get Ellen this data sheet, but states most all FV has been reimbursed. (Please note, oral health screenings are only covered by Medicaid. The Affordable Care Act mandated that all insurance companies pay for FV.)

Heartfelt thanks for everyone's help on this project!! Ellen

January 12, 2017
Appendix E

Data Collection Sheet for Clinic RNs to Record FV Applications

Fluoride varnish applications –
Well-child checks

<table>
<thead>
<tr>
<th>Date</th>
<th>Age</th>
<th>FL applied yes/no</th>
<th>Sex</th>
<th>Any comments e.g. absence of teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

University of Massachusetts Amherst IRB Memorandum

University of Massachusetts Amherst
108 Research Administration Building
70 Butterfield Terrace
Amherst, MA 01003-9242

Telephone: 545-3428    FAX: 577-1728

Human Research Protection Office
Research Affairs

MEMORANDUM

To: Ellen Gnaedinger, College of Nursing
From: Human Research Protection Office
Date: August 4, 2016

Project Title: Quality Improvement Project – Fluoride Varnish Application in Vermont Pediatric Practice

IRB Number: 16-81

The Human Research Protection Office (HRPO) has evaluated the above named project and has made the following determination:

☐ The activity does not involve research that obtains information about living individuals.

☐ The activity does not involve intervention or interaction with individuals OR does not use identifiable private information.

☒ The activity is not considered research under the human subject regulations. (Research is defined as “a systematic investigation designed to develop or contribute to generalizable knowledge.”)

☐ The activity is determined to meet the definition of human subject research under federal regulations and requires submission of applicable materials for IRB review.

For activities requiring review, please see our web pages for more on types of review or submitting a new protocol. For assistance do not hesitate to contact the Human Research Protection Office at 545-3428 for assistance.
Appendix G

Dental Caries Risk Assessment Tool

South Royalton Health Center

DENTAL CARIES RISK ASSESSMENT

Cavities are the leading chronic health condition in children. Please answer the following questions to help us determine whether your child is at high risk for dental problems.

PART A: For Parent or Guardian to complete:

Does your child have a dentist? □ Yes □ No
If yes, the dentist's name: __________________________

Date of child's last visit: __________________________

Does your drinking water have fluoride in it? □ Yes □ No □ Unsure

If no, does your child take fluoride supplements? □ Yes □ No □ Unsure

Do you clean your child's teeth with fluoride toothpaste daily? □ Yes □ No

1. Does more than one day go by without brushing or wiping your child's teeth/gums? □ Yes □ No

2. Does your child go to bed with a bottle or at the breast? □ Yes □ No

3. Does your child carry around a bottle or sippy cup with milk/juice or breast feed on-demand during the day? □ Yes □ No

4. Does your child eat sweets or drink juice between meals? □ Yes □ No

   If yes, how many glasses of juice daily? ____________

5. Has your child had cavities or dental problems before? □ Yes □ No

6. Have you, or anyone in your family, had cavities or dental problems this year? □ Yes □ No

7. Have you ever seen white spots or decay on your child's teeth? □ Yes □ No

"If my child is referred to a dentist for follow up care, I give my permission to share this information with the dentist."

Parent/Guardian signature: __________________________

PART B: For Pediatrician to complete:

Risk assessment: □ L (no yeses) □ M (any yes #1 thru #4) □ H (any yes #5 thru #7)

□ Routine referral to dentistry* (L) □ Referral to Case Manager for dental appointment assistance (M or H)

*All children should be referred to a dental home by age 24-36 months with appropriate follow-up as determined by the dentist.

Comments: ______________________________________

____________________________________________

Pediatrician: _________________________________
Appendix H

FV Information Sheet for Parents

Fluoride Varnish
Protecting Your Child's Teeth

Fluoride Varnish
Fluoride varnish is applied two to four times a year. It strengthens teeth and protects them from cavities.

Who Needs Fluoride Varnish?
Any child who has:
- Cavities or white spots
- Defects of the teeth
- Red or puffy gums
- Difficulty keeping their teeth clean
- Two or more drinks or snacks containing sugar between meals
- Sleeps with a baby-bottle
- No fluoridated drinking water
- No regular dentist
- Family members with dental decay
- Special health care needs

What Do I Do After the Varnish Has Been Applied?
Your child's teeth will be a light yellow color for the rest of the day.

Your child can eat but avoid hard foods and hot drinks for the rest of the day.

Do not brush the teeth until the next morning. The teeth will then return to their normal color.

Developed by JM Douglass, BDS DDS,
University of Connecticut School of Dental Medicine
Funded by Connecticut Department of Social Services