Spring 5-25-2024

Keep Our Children Smiling: Fluoride Varnish Education in the Pediatric Primary Care Setting

Isabella Mortola
University of San Diego, bellamortola@gmail.com

Keep Our Children Smiling: Fluoride Varnish Education in the Pediatric Primary Care Setting

Isabella J. Mortola

Isis Y. Cunningham

Hahn School of Nursing, University of San Diego

Abstract

Background: Dental caries is the most common chronic childhood disease. In early childhood, it is associated with many negative factors such as pain, loss of teeth, and impaired growth. Fluoride varnish (FV) is a protective resin coating treatment that is reimbursable by most insurances and is recommended by the American Academy of Pediatrics (AAP), United States Preventative Services Task Force (USPSTF), and the American Dental Association (ADA) due to its high efficacy in preventing dental caries. FV is a low-cost treatment that can be easily applied in 1-2 minutes during a well-child visit in the primary care setting, where children are seen frequently by primary care providers in the first few years of life.

Objectives: To educate pediatric primary care providers on FV treatment and increase their willingness to provide these treatments in clinical practice, therefore setting the foundation for FV implementation in the pediatric primary care setting.

Methods: A one-time FV treatment educational session was given to pediatric primary care providers. A pre- and post-survey was provided to the providers to measure knowledge level and willingness to provide FV treatment before and after the educational session.

Results: Results concluded that the pediatric primary care providers had and increased knowledge of FV treatments and were more willing to offer these treatments in their clinical practice at the 1-week post-education mark.

Conclusions: Future research is needed to further assess the implications and outcomes of FV education and treatment implementation in the pediatric primary care setting.

Keywords: fluoride varnish treatment, dental caries, chronic childhood disease

Introduction

Dental caries, otherwise known as tooth decay or cavities, is the most common chronic childhood disease in the United States (Clark et al., 2020). In fact, according to the 2011-2016 National Health and Nutrition Examination Survey (United States Preventative Services Task Force et al., 2021), approximately 23% of children ages 2 to 5 years had dental caries in their primary teeth. Of these children, the prevalence of dental caries has been found to be higher in children of minority and low socioeconomic groups, with 33% of caries occurring in Mexican American children, 28% in non-Hispanic Black children, and 18% in non-Hispanic White children (United States Preventative Services Task Force et al., 2021). Furthermore, over half of the children in California will have experienced dental caries by the time they enter Kindergarten, reaching over 70% of children by 3rd grade (Department of Healthcare Services, n.d.).

Dental caries is an infectious disease that is caused by bacteria that has accumulated on the tooth's surface (Clark et al., 2020). These bacteria produce acid after metabolizing carbohydrates, which then starts to dissolve tooth enamel (Clark et al., 2020). If this process continues without mitigation, it can progress all the way through the tooth and into the tooth pulp, resulting in pain and tooth loss (Clark et al., 2020). If left untreated, it can continue to progress even further and lead to local infections such as dental alveolar abscesses or facial cellulitis, systemic infection, and even death in rare cases (Clark et al., 2020). Dental caries is especially important to prevent in early childhood due to its association with pain, loss of teeth, impaired growth, decreased weight gain, negative effects on quality of life, and poor school

performance (Department of Healthcare Services, n.d.). Additionally, early childhood caries has been found to be the single greatest risk factor for the development of caries in the permanent dentition later in life (Clark et al., 2020). Dental caries also greatly affects the amount of school hours that a child misses due to dental-related illness, with numbers reaching 51 million school hours lost per year in the United States (Clark et al., 2020). This further translates into lost work hours in the adult caregiver of the child affected by dental disease (Clark et al., 2020). Prevention of dental caries and good oral health is a necessary part of overall health, as studies have demonstrated the many adverse effects of poor oral health on multiple chronic conditions, including diabetes control (Clark et al., 2020).

One way that dental caries can be prevented in early childhood is via fluoride varnish (FV) treatment in the pediatric primary care setting. FV is a protective resin coating that has been shown in the research to help prevent tooth decay, slow it down, or stop it from getting worse (Cabelen et al., 2022). It is made from fluoride, which is a mineral that can strengthen tooth enamel, or the outer coating on teeth (Department of Healthcare Services, n.d.). Fluoride's three main mechanisms of action include promoting enamel remineralization, reducing enamel demineralization, and inhibiting bacterial metabolism and acid production (Clark et al., 2020). FV is a highly effective form of fluoride application due to its high concentration of fluoride and its ability to hold the fluoride close to the tooth's surface for a longer period of time than other concentrated fluoride products such as fluoride toothpaste, foams, and gels (Department of Healthcare Services, n.d.). It has been shown to cut the risk of dental decay in half with just one application of the varnish treatment (Weintraub et al., 2006). Not only is FV well-supported in systematic review and meta-analysis studies as an effective way to prevent and treat dental disease, but it is also a low-cost treatment that is covered by Medi-Cal and most other insurances

and can be applied easily in only 1 to 2 minutes during a clinical visit (Department of Healthcare Services, n.d.). It has also been recommended by the Unites States Preventative Services Task Force (USPSTF) to be applied by primary care providers to the teeth of all infants and children starting at the age of primary tooth eruption as a grade B recommendation (United States Preventative Services Task Force et al., 2021). The American Academy of Pediatrics (AAP) has also recommended that FV in the primary care setting be applied at least once every 6 months for all children and every 3 months for children at high risk for caries, starting when the first tooth erupts until the establishment of a dental home (Clark et al., 2020). Similarly, the American Dental Association (ADA) has also recommended the application of FV at least every 6 months to both primary and permanent teeth of those at elevated caries risk (Weyant et al., 2013).

Over the recent years, FV treatment has been recognized as being an important treatment to provide young children in the primary care setting. This is because many children do not receive dental care at young ages and are seen by a medical provider an average of 9 times before they ever visit a dentist (Department of Healthcare Services, n.d.). Due to the USPSTF grade B recommendation for FV in the primary care setting, most insurances are covering this treatment and Medicaid is reimbursing for it in all 50 states (Department of Healthcare Services, n.d.). Therefore, pediatric primary care providers are in a unique position to influence the dental health of young children by providing this simple and effective treatment as a part of their routine patient care.

Based on the evidence outlined above, this pilot project was created to educate pediatric primary care providers on the effectiveness of FV treatment in preventing dental caries in young children when applied in the primary care setting. This evidence-based education project was carried out with the goal of educating providers on the subject matter of FV treatment, raising

awareness of recommendations on when to provide this treatment in the primary care setting, and increasing the willingness of these providers to implement this treatment into their clinical practice. The education for this project was carried out via a Zoom presentation at a Children's Primary Care Medical Group (CPCMG) staff meeting.

Methods

Participants and Setting

For this evidence-based project, 25 pediatric primary care providers from the main campus of CPCMG in San Diego, California were invited to participate in the educational zoom presentation. Prior to initiating this educational presentation, Institutional Review Board (IRB) approval was obtained from the University of San Diego and a letter of approval was obtained from the CPCMG Director of Education.

Data Collection

One week prior to the educational zoom presentation on FV treatment, a pre-survey was sent out to CPCMG providers via email. This survey consisted of 10 questions that aimed at assessing providers' knowledge of dental caries and FV treatment, how often they currently referred children to a dentist, and their current willingness to provide FV treatment in their clinical practice. Of the 25 providers surveyed, 9 completed the pre-survey.

A Zoom educational presentation on FV treatment in the pediatric primary care setting was then conducted during a CPCMG staff meeting in which 9 providers attended. The educational PowerPoint zoom presentation was given over the course of approximately 15 minutes. The presentation included information on what dental caries are and why they are important to treat in young children, what FV treatment is and how it works to prevent and treat dental caries, safety of FV treatment, how to apply the treatment in clinical practice,

recommendations from organizations such as the AAP and USPSTF regarding FV treatment in primary care, insurance coverage and reimbursement, and instructions to give families for after-care of their children's teeth post-FV treatment application.

One week following the educational presentation, the same 11-question survey was sent out as a post-survey to the 9 providers that attended the educational session and who had also completed the pre-survey. This was again carried out via email. Of the 9 providers surveyed, 3 completed the post-survey.

Data Analysis

Unfortunately, due to the low number of total survey participants, statistical analysis was unable to be carried out. However, the change in percentage of correct answers from pre- to post-survey was analyzed.

Results

Of the 9 providers that received the FV treatment education, 9 (100%) completed the pre-education survey, and 3 (33%) completed the post-education survey. When analyzing the survey questions of the 3 providers that completed both the pre- and post-survey, a positive change was observed in all questions except for question 5, where no change was observed. Questions 1-4 were answered by the 5-point Likert scale, with answer options ranging from 'strongly disagree' to 'strongly agree' (Table 1, Figure 2). Mean scores increased for questions 1-4 on the post-survey scores. This indicates that after the 15-minute educational intervention, providers felt more strongly in agreement with their confidence in their knowledge of FV treatments, that FV treatments are important to children's dental health, that they currently refer children to the dentist annually beginning at age 1, and that they are willing to offer FV treatment for children under 6 who are at risk for dental caries (Table 1, Figure 2). Questions 5-10 assessed provider's

knowledge of FV treatment and recommendations (Table 1). When analyzing pre- and post-survey results, no difference in percentage score was noted for question 5, which asked if dental caries is the most common chronic childhood disease (Figure 3). However, an increase in percentage of providers that answered correctly can be seen for questions 6-10 (Figure 3). This indicates that overall, providers were more likely to answer correctly on knowledge-based questions about FV treatment and recommendations after they received the 15-minute educational intervention.

Discussion

Although only 3 pediatric primary care providers were able to answer both the pre- and post-educational survey, an increase in their overall knowledge of FV treatment and its recommendation guidelines was noted. An increase in provider's confidence of their knowledge of FV treatments, that FV treatments are important to children's dental health, and their willingness to provide FV treatments in their clinical practice were also noted. Overall, results indicated that the 15-minute educational intervention improved provider's knowledge of FV treatments and their willingness to offer these treatments in clinic.

Practice Implications

Implications from the results of this evidence-based project indicate that education on FV treatments and how they benefit children's health may lead to higher willingness to provide these treatments in the pediatric primary care setting. This, in turn, could lead to decreased prevalence of dental caries in early childhood due to higher levels of prevention and adherence to dental care. Results from the pre-education survey also indicated that providers had lower knowledge of FV treatment benefits and the recommendations on when to provide FV treatments in the

pediatric primary care setting. These findings indicate that more widespread education on FV treatment and its benefits may be needed among pediatric primary care providers.

Limitations

The most substantial limitation in this project was the small sample size. Although 25 providers were originally sent the pre-education survey, only 9 responded. Of these 9 providers that filled out the pre-education survey and attended the educational zoom session, only 3 filled out the post-education survey. Due to this small sample size, statistical significance was not able to be analyzed.

Additionally, the survey used for pre- and post-education assessment was not a validated questionnaire. Thus, it is possible that some of the questions may have been confusing and may not have been as accurate in assessing provider's true knowledge and feelings.

Conclusion

Dental caries is the most common chronic childhood disease and affects about a fourth of children ages 2-5 years old. This disease process has found to have many negative effects on quality of life in young children, such as pain and impaired growth. FV is a low-cost, topical treatment that can be easily applied in the pediatric primary care clinic setting and has been shown in multiple research studies to be effective in reducing the risk of dental caries from occurring and preventing progression once the disease process has occurred. As this pilot study has demonstrated, a one-time educational session given to pediatric primary care providers resulted in an increased knowledge of how to prevent dental caries via FV treatment and an increased willingness to provide this treatment in the primary care setting. These findings implicate that education of more pediatric primary care providers could lead to a widespread

increase in knowledge of FV treatment and willingness to implement these treatments in clinic, which may lead to increased prevention of dental caries in early childhood.

Conflicts of Interest

The authors have identified no conflicts of interest.

Acknowledgements

This project was supported by University of San Diego and Children's Primary Medical Group (CPCMG).

References

Atkins, C. Y., Thomas, T. K., Lenaker, D., Day, G. M., Hennessy, T. W., & Meltzer, M. I. (2016). Cost-effectiveness of preventing dental caries and full mouth dental reconstructions among Alaska Native children in the Yukon–Kuskokwim delta region of Alaska. *Journal of Public Health Dentistry*, *76*(3), 228–240. https://doi.org/10.1111/jphd.12141

Cabalén, M. B., Molina, G. F., Bono, A., & Burrow, M. F. (2022). Nonrestorative Caries Treatment: A Systematic Review Update. International dental journal, 72(6), 746–764. https://doi.org/10.1016/j.identj.2022.06.022

Clark, M. B., Keels, M. A., & Slayton, R. L. (2020). Fluoride Use in Caries Prevention in the Primary Care Setting. *Pediatrics, 146*(6), e2020034637. https://doi.org/10.1542/peds.2020-034637

Department of Health Care Services (DHCS). (n.d.). CHDP Dental Training: Fluoride Varnish. https://www.dhcs.ca.gov/services/chdp/Pages/CHDPDentalTraining.aspx

Fluoride varnish: What parents need to know. HealthyChildren.org. (n.d.). https://www.healthychildren.org/English/healthy-living/oralhealth/Pages/Fluoride Varnish-What-Parents-Need-to-Know.aspx

Goodman, D., Ogrinc, G., Davies, L., Baker, G. R., Barnsteiner, J., Foster, T. C., Gali, K., Hilden, J., Horwitz, L., Kaplan, H. C., Leis, J., Matulis, J. C., Michie, S., Miltner, R., Neily, J., Nelson, W. A., Niedner, M., Oliver, B., Rutman, L., … Thor, J. (2016). Explanation and elaboration of the SQUIRE (Standards for Quality Improvement

Reporting Excellence) Guidelines, V.2.0: examples of SQUIRE elements in the healthcare improvement literature. *BMJ Quality & Safety*, *25*(12). https://doi.org/10.1136/bmjqs-2015-004480

Herndon, J. B., Tomar, S. L., & Catalanotto, F. A. (2015). Effect of training pediatricians and family physicians in early childhood caries prevention. *The Journal of pediatrics*, *166*(4), 1055–61.e1. https://doi.org/10.1016/j.jpeds.2014.12.040

Jullien S. (2021). Prophylaxis of caries with fluoride for children under five years. *BMC pediatrics*, *21*(Suppl 1), 351. https://doi.org/10.1186/s12887-021-02702-3

Nicolae, A., Levin, L., Wong, P. D., Dave, M. G., Taras, J., Mistry, C., Ford-Jones, E. L., Wong, M., & Schroth, R. J. (2018). Identification of early childhood caries in primary care settings. *Paediatrics & child health*, *23*(2), 111–115. https://doi.org/10.1093/pch/pxx155

US Preventive Services Task Force, Davidson, K. W., Barry, M. J., Mangione, C. M., Cabana, M., Caughey, A. B., Davis, E. M., Donahue, K. E., Doubeni, C. A., Kubik, M., Li, L., Ogedegbe, G., Pbert, L., Silverstein, M., Stevermer, J., Tseng, C. W., & Wong, J. B. (2021). Screening and Interventions to Prevent Dental Caries in Children Younger Than 5 Years: US Preventive Services Task Force Recommendation Statement. *JAMA*, *326*(21), 2172–2178. https://doi.org/10.1001/jama.2021.20007

Wang, Z., Rong, W., & Xu, T. (2022). Effect of Fluoride Varnish in Preventing Dental Caries of First Permanent Molars: A 24-Month Cluster Randomized Controlled Trial. *International journal of environmental research and public health*, *19*(24), 16656. https://doi.org/10.3390/ijerph192416656

Weyant, R. J., Tracy, S. L., Anselmo, T. (Tracy), Beltrán-Aguilar, E. D., Donly, K. J., Frese, W.

A., Hujoel, P. P., Iafolla, T., Kohn, W., Kumar, J., Levy, S. M., Tinanoff, N., Wright, J. T., Zero, D., Aravamudhan, K., Frantsve-Hawley, J., & Meyer, D. M. (2013). Topical fluoride for caries prevention. *The Journal of the American Dental Association*, *144*(11), 1279–1291. https://doi.org/10.14219/jada.archive.2013.0057

Weintraub, J. A., Ramos-Gomez, F., Jue, B., Shain, S., Hoover, C. I., Featherstone, J. D. B., & Gansky, S. A. (2006). Fluoride varnish efficacy in preventing early childhood caries. *Journal of Dental Research*, *85*(2), 172–176. https://doi.org/10.1177/154405910608500211

Table 1

Fluoride Varnish Pre/Post-Education Survey

1. I feel confident in my knowledge of fluoride varnish treatments
   - Strongly agree
   - Agree
   - Neither agree or disagree
   - Disagree
   - Strongly disagree
2. Fluoride varnish treatments are important to children's dental health
   - Strongly agree
   - Agree
   - Neither agree nor disagree
   - Disagree
   - Strongly disagree
3. I currently refer children to the dentist at least annually beginning at age one
   - Strongly agree
   - Agree
   - Neither agree or disagree
   - Disagree
   - Strongly disagree
4. I am willing to offer fluoride varnish application for children under 6 who are at risk for dental caries
   - Strongly agree
   - Agree
   - Neither agree or disagree
   - Disagree
   - Strongly disagree
5. Dental caries (tooth decay) is the most common chronic childhood disease
   - True
   - False
6. Fluoride varnish is reimbursable for eligible children
   - True
   - False
7. Fluoride varnish treatment only takes 1-2 minutes to apply
   - True
   - False
8. Application of Fluoride Varnish treatments in the primary care setting is recommended by:
   - USPSTF

- AAP
- American Dental Association (ADA)
- All of the above
- None of the above

9. It is recommended to order Fluoride Varnish treatment in the pediatric primary care setting:
   - In **eligible** infants and children starting at the age of primary tooth eruption
   - In **all** infants and children starting at the age of primary tooth eruption
   - In **eligible** infants and children starting at the age of 1 year old
   - In **all** infants and children starting at the age of 1 year old
10. In the primary care setting, fluoride varnish should be applied at least every __ months for children at high risk for caries?
    - 3 months
    - 6 months
    - 9 months
    - 12 months

Figure 1

Mean scores of pre-education and post-education survey questions 1-4

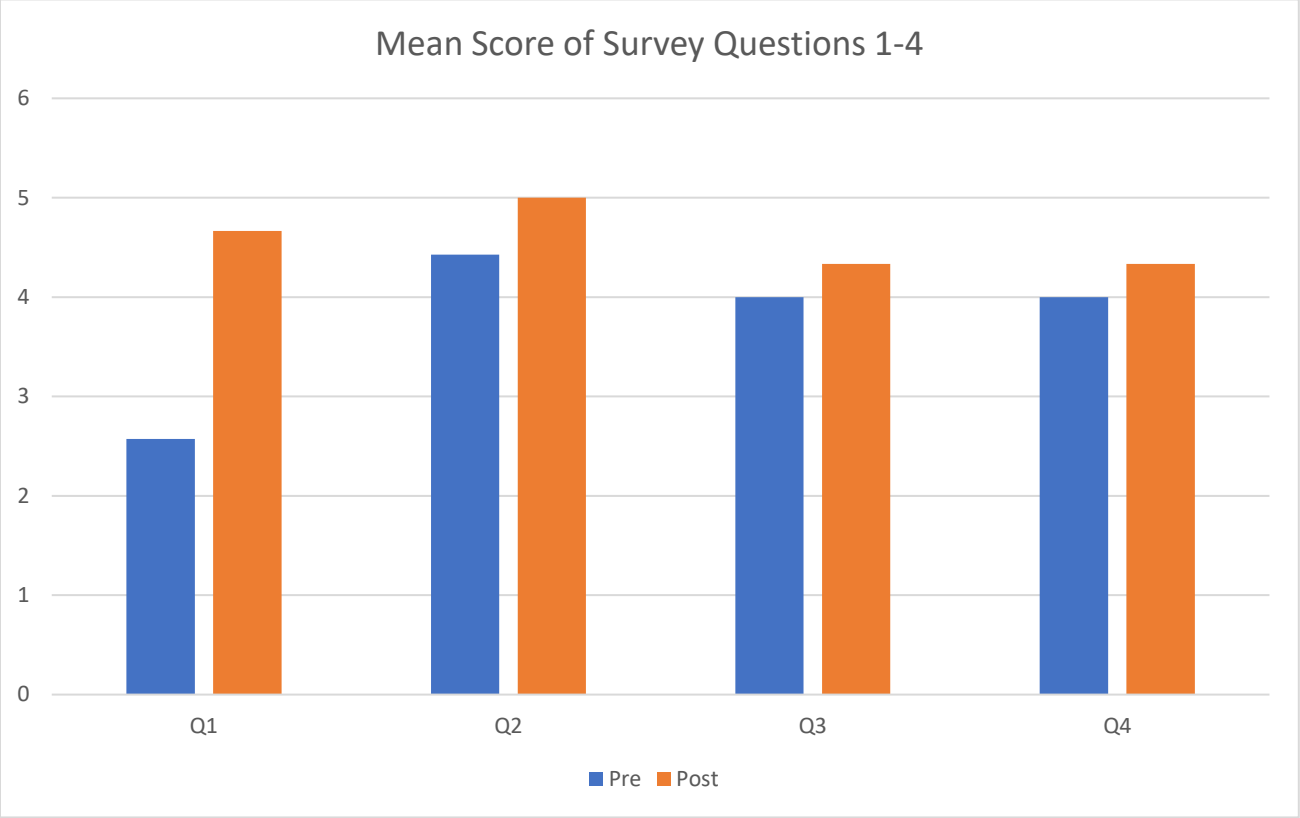

Figure 2

Percentage correct scores of pre-education and post-education survey questions 5-10