

# Assessment of New York Primary Care Physicians' Knowledge, Attitudes, and Practices Related to Fluoride Varnish in an Urban Medical-Setting

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**Objective:** To determine changes in knowledge, attitudes, and practices of primary care physicians (PCPs) regarding fluoride varnish (FV). **Study Design:** Fifty-four PCPs at an urban medical center in New York completed a pre-intervention survey. A pediatric dental resident provided an hour-long educational lecture and a hands-on demonstration regarding FV application. Six months later, PCPs were sent a post-intervention survey via electronic mail. **Results:** Fifty-four PCPs participated in the pre-survey and FV training and 48% completed the post-survey. Prior to the FV training, 57% of PCPs knew that FV application by medical practitioners was reimbursable for children under 6-years-old and 2% of PCPs were applying FV. Post FV training, 62% of PCPs reported applying FV. Pre and post survey, barriers to FV application was not enough hands-on training (43% to 15% respectively) and not enough time (50% to 85% respectively). **Conclusions:** Post FV training, PCPs' knowledge, attitudes and practices in regard to FV changed. Interprofessional education may be one approach to increasing FV application participation.

**Keywords:** primary care, fluoride, fluoride varnish, interprofessional education

## INTRODUCTION

Dental caries is the most common chronic childhood disease, five times more common than asthma, four times more common than early childhood obesity, and twenty times more common than diabetes.<sup>1,2</sup> Yet, the effects of dental caries are not equal across populations and disproportionately affects children of low income and racial minorities where 70% of dental caries is found in 8% of the population in children age two to five years old.<sup>3</sup> While data from national survey report a decrease in caries prevalence from 50% (in 2011-2012) to 43% (in 2015-2016), continued efforts are needed to reinforce epidemiological decline in dental caries, particularly for vulnerable populations.<sup>4</sup>

One such effort is the use of topical fluoride varnish (FV) where the relative benefit of topical FV application seems to occur irrespective of baseline caries risk, baseline caries severity, background exposure to fluorides and application features such as prior prophylaxis, concentration of fluoride or frequency of application.<sup>5</sup> Most studies show a caries reduction rate ranging from 25-40%<sup>6</sup> and the American Academy of Pediatric Dentistry recommend FV application every 3-6 months for high caries risk,<sup>7</sup> low socioeconomic background, and other contributing dietary and oral hygiene factors.<sup>8</sup>

Since 2014, the US preventative task force, a national panel of experts systematically reviewing clinical efficaciousness, recommends topical FV application every 3-6 months regardless of risk due to overwhelming benefits.<sup>9</sup> Efforts have been made to increase access and practice in the medical-setting. Federal and

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state programs in the US remunerate medical practitioners for oral health screenings and topical FV applications in young children.<sup>10</sup> Kranz showed that children < six years old who received at least four topical FV applications in a medical-setting experienced, on average, a 17% reduction in dental caries-related visits than those without.<sup>11</sup> Further, only one in three children enrolled in federal and state programs visit a dentist annually<sup>12</sup> compared to medical-settings, where children are seen earlier and more frequently.

Interestingly, despite FV efficaciousness, a national survey found that only 4% of pediatricians have adopted this practice.<sup>13</sup> Barriers for not providing FV, according to literature, include lack of training and insufficient time to integrate additional services into well-child visits<sup>13</sup>, as well as other factors including resistance amongst medical colleagues and staff, challenges in topical FV application on a child, and difficulty in referral to a dentist.<sup>14</sup> Primary care medical-settings can play a role in the primary disease prevention with oral health maintenance. Primary care physicians (PCPs) can intervene early via topical FV application at scheduled well-child visits. This study aimed to evaluate change in knowledge, attitudes and practices of PCPs with respect to topical FV application at an urban medical center (in New York) following a lecture and a hands-on demonstration exercise.

## MATERIALS AND METHOD

Fifty-four total PCPs consisting of two groups (1- "resident" trainee physicians and 2- "attending" supervising physicians; collectively PCPs) at four pediatric and adolescent community clinic sites at an academic medical center in northern Manhattan, Washington Heights, New York, were invited to participate in the study. These four clinic sites promote health, wellness, and provides preventive measures for some of the most economically disadvantaged communities in New York City. This diverse community of approximately 200,000 persons is 71% Latino (the majority from the Dominican Republic), 17% white, 7% black, 3% Asian, and 1% other.<sup>15</sup> One-third of the community meets federal poverty guidelines standards.<sup>15-17</sup>

Primary care physicians were asked to complete a 15-item pre-intervention survey shown in **Figure 1**. Survey items included prior training in and knowledge about oral health and current clinical practices and perceived barriers with regard to FV application. One dental resident provided a 45-minute scripted educational lecture and a hands-on demonstration on topical FV application on a mannequin. The educational lecture used was obtained from a fluoride module developed by the American Academy of Pediatrics (AAP) and includes modules (for non-oral health professionals) on oral health evaluation and management including the application of FV in the medical-setting.<sup>18</sup> After the didactic portion and exercise, the PCPs practiced applying FV to one another. These training sessions were scheduled once at four clinic sites over a period of two months for a total of four training sessions. Six months after the training session, PCPs received via electronic mail an identical post-intervention survey. After one month, a second request via email was sent to PCPs to complete a post-intervention survey. Univariate and bivariate analysis was conducted through SPSS (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY) to evaluate PCPs knowledge, attitudes, and practices regarding FV.

## RESULTS

Nineteen attendings and 35 residents (1st-3rd year) participated in the pre-survey and FV training. Of 54 initial PCPs, 26 PCPs (14 attendings, six first year residents, six second year residents) completed the post-survey, for a 48% response rate. There were eight attendings who graduated from medical school less than 20 years ago and eleven attendings who graduated from medical school greater than 21 years ago. Sixty seven percent (n=36) of respondents reported receiving a didactic component on oral health topics in medical school or residency. For oral health shadowing amongst respondents, only 7% (n=4) reported receiving it in medical school, and only 4% (n=2) of respondents received it during residency. (**Table 1**).

Prior to the FV training, 57% (n=31) of PCPs knew that FV application by medical practitioners was a Federal and State benefit for children under age six years old. One PCP was applying FV at the clinic, 2% of PCPs (n=1). After the FV training, 85% (n=22) of PCPs had knowledge of the Federal and State benefit, and there was an increase in numbers of PCPs providing the FV at the clinic (62%, n=16). Of the PCPs who provided FV at well-child visits, 100% reported applying the FV, on average, one to five times a week. When attendings and residents were compared, no residents were applying FV prior training and 75% after FV training (n=9) while 5% of (n=1) attendings were applying FV prior and 50% (n=7) after FV training (**Table 1**).

Respondents were asked questions in regard to challenges and barriers of FV application. Prior to FV training, only 11% (n=6) of PCPs "felt adequately trained to apply FV", and only 19% (n=10) "feel comfortable in order to provide information to parents regarding the risks and benefits of FV." There was an increase in the number of PCPs who felt prepared in applying FV and equipped to give information regarding FV, 77% (n=20) of respondents respectively. In regard to barriers for FV application, top reasons changed pre- and post-FV training. The number of PCPs who reported, "not having enough hands-on training" decreased from 43% (n=23) to 15% (n=4). "Not having enough time" remained the key barrier for implementation pre- and post-training, 50% (n=27) and 85% (n=22) respectively (**Table 1**).

In post-surveys, respondents improved knowledge in four (out of five) questions about the benefit of fluoride (88%, n=23), risk of fluorosis (77%, n=20), topical fluoride modalities (85%, n=22) and policy on fluoride varnish application (62%, n=16). There was no change observed in questions pertaining to mechanism of action. There was no statistically significant change in questions assessing knowledge from pre- to post-training test (**Table 2**).

Figure 1. Pre- and post-intervention survey to PCPs.

**Assessment on Awareness, Practices & Knowledge of Fluoride**

1) What is your position?

- a) Attending
- b) 1st year Resident
- c) 2nd year Resident
- d) 3rd year Resident

2) How many years ago did you graduate from medical school?

- a) 0-3 years
- b) 4-10 years
- c) 11-20 years
- d) 21-30 years
- e) +31 years

3) Please indicate with an "X" the type(s) of oral health education you received at different levels of your medical training. (Mark all that apply)

Training Level	Type of Education		
	Didactic lecture/ seminar	Shadowing	Hands-on training
Medical school			
Residency			
Post-residency			

4) Are you aware that fluoride varnish is a Medicaid benefit for children under 6 years of age?

- a) Yes
- b) No

5) Do you provide fluoride varnish to patients on a regular basis?

- a) Yes
- b) No (skip to question #8)

6) On average, how many fluoride varnish applications do you provide in a week?

- a) 1-5
- b) 6-10
- c) 11-20
- d) +21

7) During fluoride varnish administration, what do you find most challenging? **Select all that apply**

- a) Patient cooperation
- b) Patient head/ body positioning
- c) Achieving adequate tooth isolation
- d) Post-application issues with patient
- e) Parental concerns
- f) Other, please specify: \_\_\_\_\_

8) Do you feel adequately trained in order to apply fluoride varnish?

- a) Yes
- b) No, please explain: \_\_\_\_\_

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Figure 1. Pre- and post-intervention survey to PCPs (continued).

**Assessment on Awareness, Practices & Knowledge of Fluoride**

9) Do you feel adequately trained in order to provide information to guardians about benefits and risks of fluoride varnish?  
a) Yes  
b) No, please explain: \_\_\_\_\_

10) What do you think is the most significant barrier for providing fluoride varnish during well child visits? **Please rank in order (1-5), with (1) being most significant to (5) being least significant:**  
\_\_\_\_ Not having enough hands-on training  
\_\_\_\_ Not having enough information to answer guardians' questions  
\_\_\_\_ Not enough time  
\_\_\_\_ Do not think this is within my scope of practice  
\_\_\_\_ Reimbursement rate is not great enough incentive

11) How does topically applied fluoride help prevent dental caries?  
a) Inhibiting tooth remineralization  
b) Enhancing remineralization  
c) Enhancing bacterial metabolism

12) Which of the following is not a benefit of fluoride varnish?  
a) Cost-effective and inexpensive  
b) 30-35% elimination of existing dental caries  
c) Can be easily integrated in medical practice  
d) Slows progression of active dental caries  
e) Medicaid and many private insurers reimburse application by primary care clinicians in a majority of states

13) Topical fluoride is the most beneficial when it is obtained through which modalities?  
a) Water fluoridation  
b) Fluoride toothpaste  
c) Fluoride varnish  
d) Dietary fluoride supplements  
e) A and B  
f) B and C  
g) C and D

14) True or False: The May 2014 United States Preventive Services Task Force recommendations stated that fluoride varnish periodicity should be dependent on patients' caries risk assessment. Low caries risk patients should receive fluoride varnish every 6-12 months, while high caries risk patients should receive fluoride varnish every 3-6 months.  
a) True  
b) False

15) Fluorosis occurs with:  
a) Chronic and excess fluoride exposure to developing teeth  
b) When a child <8 years old intakes 0.01 mg fluoride/kg of body weight per day  
c) Applying fluoride varnish up to 4 times a year

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**Table 1. Pre and post-survey demographics and attitude and practice questions for resident and attending physicians.**

	Pre N	Pre %	Post N	Post %
Residents – postgraduate year in training				
1st year	12	34%	6	50%
2nd year	12	34%	6	50%
3rd year	11	31%	0	0%
Total	35		12	
Attendings – years graduated from medical school				
4-10	3	16%	1	7%
11-20	5	26%	5	36%
21-30	7	37%	4	29%
> 31	4	21%	4	29%
Total	19		14	
Pre- & post-survey response rate				
Residents	35		12	34%
Attendings	19		14	74%
Total	54		26	48%
Type of training received during medical school (residents and attendings)				
Didactic	36	67%	11	42%
Shadowing	4	7%	0	0%
Hands on	3	6%	0	0%
Type of training received during residency (residents and attendings)				
Didactic	36	67%	17	65%
Shadowing	2	4%	0	0%
Hands on	1	2%	9	35%
Type of training received during post-residency (attendings only)				
Didactic	11	58%	12	86%
Shadowing	2	11%	0	0%
Hands on	2	11%	5	36%
Number(s) of PCPs that know fluoride varnish is a reimbursable Medicaid benefit				
Residents	17	49%	11	92%
Attendings	14	74%	11	79%
Total	31	57%	22	85%
Number(s) of PCPs that apply fluoride varnish on a regular basis				
Residents	0	0%	9	75%
Attendings	1	5%	7	50%
Total	1	2%	16	62%
Number(s) of PCPs that apply fluoride varnish 1-5 times in one week				
Residents	0	0%	9	75%
Attendings	1	5%	7	50%
Total	1	2%	16	62%
PCPs that feel adequately trained to apply fluoride varnish				
Residents	3	9%	12	100%
Attendings	3	16%	8	57%
Total	6	11%	20	77%

	Pre N	Pre %	Post N	Post %
PCPs that feel adequately trained to inform guardians about fluoride varnish				
Residents	6	17%	12	100%
Attendings	4	21%	8	57%
Total	10	19%	20	77%
Most significant barrier for providing fluoride varnish amongst all PCPs				
Not enough hands-on training	23	43%	4	15%
Not enough information to answer guardians' questions	2	4%	0	0%
Not enough time	27	50%	22	85%
Not within scope of practice	1	2%	0	0%
Reimbursement rate not great enough incentive	1	2%	0	0%

**Table 2. Pre and post-survey results for resident and attending physicians' knowledge questions.**

Knowledge Questions	Pre N	Pre %	Post N	Post %
Fluoride mechanism of action	48	89%	23	88%
Benefits of topical fluoride	30	56%	23	88%
Risks of topical fluoride	27	50%	20	77%
Topical fluoride modalities	31	57%	22	85%
Policy on fluoride varnish application	21	39%	16	62%

## DISCUSSION

The World Health Organization, the Institute of Medicine and the AAP now have guidelines and initiatives for interprofessional collaboration for oral health disease prevention and education.<sup>19,20</sup> Dissemination of oral health information by PCPs may increase patient awareness, knowledge and access since parents of young children access medical care at a greater frequency and at a younger age compared to dental professionals.<sup>11</sup> About 23.4% of Hispanic children and 12.0% of black children have fair or poor oral health in comparison to 6.5% of non-Hispanic white children after adjusting for age, gender, education, poverty level, dental insurance, and parental preventive care attitude.<sup>20</sup> High disease burden and access to dental care issues in low income, Hispanic and black populations was the rationale for this study population.

From the perspective of the primary caregiver, studies report that access to dental care for children is challenging due to barriers such as lack of knowledge about the consequences of oral disease, dental anxiety, and negative experiences with the dental care system such as difficulty with finding providers, scheduling appointments, and transportation.<sup>21,22</sup> Consequently, the implementation of prevention education and early intervention in primary care medical-setting holds strong promise where there are fewer barriers to care.

Previous literature suggests lack of training as one such barrier.<sup>23</sup> Similar to a national survey conducted by Quinonez et al

(2014), our study found that 67% (n=36) received didactic training about oral health topics in medical school and/ or residency, while very few 6-7% (n=3-4) reported any type of oral health training in the form of shadowing or hands-on training.<sup>24</sup> Initiatives to boost PCP participation in oral health have been implemented to target this lack of training. In 2008, the AAP launched an oral health advocate training program to provide oral health education and training in oral health activities. Further, the AAP developed and launched web-based trainings such as “Smiles for Life” to educate physicians and other health professionals.<sup>23</sup> Despite this increased attention to training, Clark et al, in 2017, found that 50% of respondents routinely identify dental caries, 30% routinely conduct oral screenings, and only 7% routinely apply topical FV suggesting further work and attention needed.<sup>25</sup>

“Not having enough time” was another barrier for not applying FV in the medical-setting and results were comparable to other studies.<sup>24</sup> While efforts focusing on efficient processes may be helpful, the literature on physician assistants and nurses applying topical FV, is currently limited and use of auxiliaries to improve efficiency is another area for further study.

Findings from this study suggest that providing PCPs with a one-hour training session on oral health and a hands-on demonstration of FV application can be one effective method to change their knowledge, attitudes and practices for a period of time. The proportion of PCPs applying FV post-training increased from 2% to 62%, six months post-training. The modules and curriculum by the AAP can be utilized as a tool to encourage PCPs to incorporate FV into practice.<sup>23</sup> The differences in application of topical FV by resident physicians compared to attending physicians may be due perhaps to adaptability and is certainly an area for more study. Further, the increase from 11% to 77% of PCPs who “did feel adequately trained” suggest that the training session did provide some confidence to change practice.

Amongst the knowledge-based questions, PCPs demonstrated improved knowledge in 4 of 5 questions, highlighting the effectiveness of a brief didactic session on oral health over a six month duration. In a study of Maryland physicians' knowledge relating to dental caries etiology revealed similar results as ours and the majority of family physicians and pediatricians were uncertain about fluoride's benefits in relation to the dental caries disease process post-testing.<sup>27</sup> Efforts in knowledge reinforcement periodically is needed and an oral health curriculum may also be incorporated into continuing education. Many resources are available online and easily accessible

which could foster widespread adoption. Further, initial assessment and caries risk assessment by PCPs and early intervention via topical FV application may be the first step in appropriate referral and establishment of a dental home.

In sum, this study evaluated the knowledge, attitudes and practices of PCPs' topical FV application in an urban, community-based, academic medical center in New York following a lecture and simulation. One major limitation was the small sample size limiting generalizability. Further, pre-survey results were not matched with post-survey results and there was a low post-survey response related to resident physician graduation by the time post-surveys were sent. Nevertheless, our findings suggest that through a brief intervention, PCP knowledge and attitudes improved (for a period of time) and topical FV application increased (for a period of time). Interprofessional trainings for PCPs in topical FV application may be one approach to use at other medical centers located in populations at risk for dental caries.

## CONCLUSION

1. Six months after a short FV didactic and hand-on training exercise, PCPs' knowledge, attitudes, and practices changed. This may be one approach to increasing FV application in the primary care medical-setting.
2. Interprofessional training in FV application can be adapted to medical centers located in areas of need.

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## STATEMENT

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