Dental Providers' Attitudes Regarding the Application of Fluoride Varnish by Pediatric Health Care Providers

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Abstract

Objectives: *To ascertain what proportion of dental hygienists and dentists in Indiana, United States, support the application of fluoride varnish in medical offices, and to determine if support differed by dental provider characteristics, practice characteristics, a limited assessment of knowledge about fluoride, or use of fluoride.* ***Methods:*** *Practicing dental hygienists and dentists in 2005 were asked to fill out a mail questionnaire. Logistic regression models tested the association of independent variables with support for medical providers applying varnish.* ***Results:*** *Response rates were 36% (dental hygienists) and 37% (dentists); median year of graduation was 1988 and 1981. Sixty-six percent of respondents were in solo practices, 82% of dentists in general practice, 5% in dental pediatrics, and 13% were other specialists. While 51.2% of dental professionals agreed that medical practices could apply fluoride varnish, 29% responded "none" should be allowed, and 19% were undecided. In the multivariable logistic regression for support of medical practices applying fluoride versus not supporting it, three practice characteristics and two measures of fluoride use were significant. Provider characteristics and a limited assessment about knowledge about fluoride were not significant.* ***Conclusions:*** *Half of dental professionals felt that it was appropriate for medical providers to apply fluoride varnish; pediatric dental professionals were less supportive. A few dental practice characteristics were associated with acceptance of the use of fluoride varnish by medical care providers: targeting messages to dental hygienists and those with practices in mixed rural-urban areas may be a useful approach to garner greater support for this medical/dental partnership.*

Key Words: dental caries, fluorides topical, fluoride varnish, attitude, preventive treatment, questionnaires, United States

Introduction

Although the prevalence of dental caries has declined, early childhood caries remains a prevalent chronic condition in children (1). Barriers to dental care include many system factors such as a poorly distributed dental workforce (2-4), a mismatch of perceptions between expected and actual reimbursement rates resulting in a lack of dental providers willing to accept Medicaid (2), as well as diverse patient factors.

A significant proportion of low-income children do not receive dental care, and yet, many of these children are seen by medical providers. These providers are being encouraged to play a larger role in promoting and improving children's oral health (5). Medical care providers can deliver basic dental services within their practices – they may conduct oral health assessments, provide anticipatory guidance, educate patients, make referrals to dentists, and consider delivering some preventive treatments (6).

To provide more preventive oral health to low-income children, some states (7) have begun reimbursing medical providers for applying fluoride varnish. Although the cost-effectiveness of such a strategy has been called into question (primarily because many children do not seek dental care despite obvious need) (8), the efficacy of fluoride varnish is well proven (9-11). If such programs are to meet with success in a community, a partnership between medical and dental providers must be attained. There have been a few studies on medical providers' attitudes toward applying fluoride varnish (12,13), but none on dental providers' attitudes toward medical providers applying fluoride varnish.

The purpose of this study was to determine whether dental professionals support medical providers applying fluoride varnish, and to test the hypotheses that such support differs by dental provider characteristics, dental practice characteristics, and knowledge and use of fluoride in clinical practice.

Methods

This study was approved by the Institutional Review Board of Indiana University.

In 2005, 4 years after the release of the Centers for Disease Control and Prevention's *Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States* (14), a survey was conducted to determine knowledge and practices regarding the recommendations. The

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This work was funded in part by the Indiana State Department of Health.

DOI: 10.1111/j.1752-7325.2009.00129.x

cover letter for the survey was signed by the Indiana State Oral Health Director. Responses were anonymous. Postage-paid envelopes addressed to the Indiana State Health Department were enclosed. Addresses for the mailing questionnaires were obtained from Indiana's professional licensing agency. In 2005, 3,062 dentists and 3,241 dental hygienists were mailed the questionnaire.

Measures

Dependent Variable. Dentists and dental hygienists were asked the following: "Babies and toddlers usually see pediatricians or family physicians many times before they see a dentist. In some states dentists support having physicians and/or their designee apply fluoride varnish to young children's teeth as part of their oral assessment. Who, if any, of the following do you think would be appropriate to apply fluoride varnish? Mark all that apply: [response options] Family physician, pediatrician, RN, LPN, unlicensed office staff, none, or undecided." The dependent variable was coded as none versus yes (at least one of the personnel options was checked) versus undecided.

Independent Variables

Professional's and practice characteristics. The following professional characteristics were examined: dentist versus dental hygienist and year of graduation. Practice characteristics were solo versus group practice; type of practice (general, pediatric dentist, specialist, or other); proportion (divided into quartile increments) of patients who lived in a city; and how frequently patients with fluorosis expressed dissatisfaction with the appearance of their teeth (*often*, *occasionally, seldom*, *never*).

Use of fluoride. Use of fluoride in the dental office was assessed by asking four questions. The first question asked whether children *with* active or recent caries received professionally administered topical fluoride applications. The second question was whether children *without* active or recent caries had received fluoride applications. Response options included *always*, *usually*, *seldom*, *never*, or *don't know.* The third question asked which type of professionally administered fluoride was used most often (*APF or NaF gel in trays*, *fluoride foam in trays*, *fluoride rinse*, *fluoride varnish*, *don't know*). A fourth question asked, "At what age do you recommend that children's teeth should be brushed with fluoride dentifrice?" (*as soon as they erupt*, *not before two years of age*, *not before six years of age*, or *other*).

Knowledge about fluoride. Four questions assessed knowledge of fluoride. One question related to continuing education: *How long it had been since attending continuing education that included information about fluoride?* (*within the past year*, *during the past 2-5 years*, *more than five years*, *never*). Another question asked whether the dental provider felt comfortable differentiating between fluorosis and other hypoplastic opacities (*yes* versus *no*). The third question asked approximately how many parts per million fluoride (ppmF) are usually in dentifrice (*5-100 ppmF*, *1,000 ppmF*, *5,000 ppmF*, *12,000 ppmF*, *50,000 ppmF*, and *don't know*). Finally, because accurate knowledge about fluoride's predominant posteruptive mode of action can be considered the basis for appropriate use of fluoride, respondents were asked to rank the importance of three mechanisms of fluoride in caries prevention. (The order of the three possible responses was scrambled in order to avoid position bias.) Choices were a) *Frequent, low concentrations of fluoride in the mouth remineralize incipient lesions*; b) *Fluoride ingested by drinking fluoridated water or consuming dietary fluoride supplements incorporates into, and strengthens enamel while the tooth is developing*; and c) *Intraoral fluoride interferes with bacterial metabolism.* Choice one was the predominant mode of action and the correct choice in the hierarchy of options.

Data Analysis. Returned questionnaires were collected for 3 weeks and examined for completeness and nonsensical responses. Responses for each question were summarized using basic frequencies. Two separate logistic regression models were examined. First, differences in characteristics between respondents who supported medical personnel applying fluoride with those who were opposed were tested. Second, the characteristics of those who supported medical personnel versus those who were undecided were examined. Variables that were significant at the 0.3 level in univariate logistic models were entered into a multiple regression logistic model. Backwards elimination was used until all remaining variables were significant at the 0.05 level.

Results

A total of 36% of dental hygienists and 37% of dentists responded to the survey. The median year of graduation for dental hygienists was 1988 and 1981 for the dentists. Sixty-six percent of the oral health professionals were affiliated with a solo practice type of dental office (63% of dental hygienists and 68% of dentists). Eighty-two percent of the dentists were in general practice, 5% in pediatric dentistry, and 13% were other specialists. Slightly more than half of dental professionals supported having medical practices applying fluoride varnish (51.4% of dental hygienists and 51% of dentists), whereas about a third (27.5% dental hygienists and 31.9% dentists) did not support, and nearly a fifth (21.1% of dental hygienists and 17.1% of dentists) were undecided.

Table 1 shows the percentage of dental hygienists and dentists who said yes, no, or were undecided as to whether medical practices should be allowed to apply fluoride varnish by each of the independent variables. A plurality of dental professionals (both dental hygienists and dentists) supported medical practices applying fluoride varnish and had the following *practice characteristics*: were in solo practice; in general practice; more than half of their patients lived in cities or towns (>50,000

Table 1
Percentage of Dentists and Hygienists Who Said Yes, No, or Were Undecided Regarding Medical Practices Applying Fluoride Varnish by Professional and Practice Characteristics, Fluoride Use, and Knowledge about Fluoride

		DH $n = 1,180$			DDS $n = 1,111$		
		No (%) $n = 324$ (27.5)	Undecided (%) $n = 249$ (21.1)	Yes (%) $n = 607$ (51.4)	No (%) $n = 354$ (31.9)	Undecided (%) $n = 190$ (17.1)	Yes (%) $n = 567$ (51.0)
Personal and practice characteristics							
Graduation year	Median year	1986	1985	1991	1979	1991	1982
Practice	Solo Practice	15.2	13.7	34.6	20.8	12.8	34.7
	Group Practice	12.2	7.4	16.8	11.1	4.3	16.3
Specialty	General Practice	N/A	N/A	N/A	25.3	14.0	42.8
	Pediatric Dentist	N/A	N/A	N/A	2.4	0.7	1.6
	Other (non-pediatric) Specialist	N/A	N/A	N/A	4.1	2.3	6.6
City dwellers	<50%	5.2	4.1	8.6	5.0	2.9	10.1
	51-75%	12.1	10.3	21.5	11.8	7.7	20.2
	76-100%	10.2	6.7	21.3	15.1	6.5	20.7
Patient's dissatisfaction with fluorosis	Often	11.3	8.1	21.8	11.4	5.7	18.0
	Occasionally	10.5	8.8	21.9	13.6	7.9	24.4
	Seldom	4.7	3.7	7.4	6.0	3.0	7.5
	Never	1.2	0.6	0.9	0.8	0.6	1.2
Use of fluoride							
In child *with* active cavities	Always	24.9	19.7	47.8	25.9	12.9	40.5
	Usually	1.8	0.9	2.4	3.6	2.3	6.3
	Seldom	0.2	0.0	0.2	0.2	0.3	0.8
	Never	0.2	0.2	0.1	0.8	0.1	0.7
	DK/NA	0.4	0.3	1.0	1.4	1.6	2.9
In child *without* recent or active cavities	Always	20.3	16.1	40.4	19.6	8.9	31.4
	Usually	5.2	3.8	8.8	7.8	5.3	13.9
	Seldom	1.2	0.7	1.0	1.3	1.0	1.9
	Never	0.3	0.3	0.3	1.2	0.3	1.1
	DK/NA	0.4	0.3	1.0	1.9	1.6	2.7
Type of applied fluoride	APF/NaF	9.8	5.6	16.5	12.1	6.4	18.0
	Foam	14.0	12.6	27.6	14.1	6.0	21.5
	Rinse	2.8	2.4	5.9	3.5	2.8	6.5
	Varnish	0.2	0.3	1.5	1.1	0.6	2.2
	DK/NA	0.6	0.2	0.0	1.1	1.4	2.9
Age recommended to brush teeth with fluoridated toothpaste	At eruption	6.6	5.0	14.1	14.4	7.3	24.0
	>2 years	14.6	11.9	30.0	14.0	7.5	21.5
	>6 years	2.0	1.1	2.3	1.5	0.7	1.6
	DK/NA	4.3	3.1	5.0	2.0	1.6	4.0
Knowledge of fluoride							
Continuing education course	Within past year	1.7	0.4	2.1	1.7	0.5	3.3
	Past 2-5 years	11.6	7.4	19.7	8.1	4.1	11.8
	>5 years	9.3	9.2	21.3	15.9	9.1	25.1
	Never	4.8	4.2	8.3	6.1	3.4	10.9
Confident differentiating fluorosis?	Yes	12.7	9.0	24.1	18.1	9.0	29.1
	No	14.7	12.1	27.3	13.8	8.1	21.9
ppm F in dentifrice?	5-100	3.2	2.4	7.8	4.3	2.9	8.4
	1,000	9.2	5.7	16.2	9.4	4.8	16.8
	5,000	0.4	0.5	2.1	1.1	0.1	1.5
	12,000	0.4	0.1	0.6	0.5	0.3	0.7
	50,000	0.2	0.1	0.1	0.2	0.0	0.4
	DK	14.1	12.3	24.8	16.4	9.1	23.2
Most important mechanism of action of fluoride?	Remineralization	9.1	5.8	17.6	9.8	4.3	16.5
	Developing tooth	17.7	14.3	29.2	19.9	11.6	30.5
	Interferes bacteria metabolism	0.7	1.0	4.6	2.2	1.2	4.0

population); and often or occasionally had patients express dissatisfaction with fluorosis. A plurality of dental professionals had the following *fluoride use* characteristics and supported medical practices applying fluoride varnish: always used fluoride in children with or without dental cavities; and used fluoride foam. Many dental hygienists (30%) recommended brushing teeth with fluoridated dentifrice at greater than 2 years of age, but the larger proportion of dentists (24%) recommended brushing at eruption. In examining the *knowledge of fluoride* variables, many dental professionals supported medical practices applying dental varnish. They had the following characteristics: continuing education greater than 5 years ago; did not know the concentration of fluoride in dentifrice; and reported (incorrectly) that the most important mechanism of action of fluoride is in the developing tooth. Of note is that across all levels of support for medical providers providing fluoride varnish, 31% of dental hygienists and 31% of dentists reported the correct answer of 1,000 ppm of NaF in dentifrice. A slightly higher proportion of dental hygienists supported medical providers administering fluoride varnish but was not confident identifying fluorosis (27.3%), while a higher proportion of dentists (29.1%) supported medical providers administering fluoride varnish and were confident identifying fluorosis.

Multivariable Logistic Regression Models. The first multiple logistic regression model in Table 2 for supporting versus not supporting medical providers applying fluoride varnish revealed that being in solo practice, being a general practitioner (versus pediatric dentist), having patients who express dissatisfaction with fluorosis on their teeth, using fluoride varnish as opposed to another type of professionally applied fluoride, and treating with fluoride a child without active caries, significantly increased the odds of supporting medical personnel to apply fluoride varnish.

The second multiple logistic regression model in Table 2 showed the odds of responding that medical personnel should be allowed to apply fluoride varnish versus being undecided. The odds of supporting it increased if the respondent was a dentist, if between 76 to 100% of practice patients lived in the city (as opposed to 51 to 75%), and if the respondent always or usually treated with fluoride a child without active caries.

Discussion

In light of the short supply of dental providers serving low-income populations (2,15) and the reluctance of dentists to provide services for very young children, an approach to expand some basic services to children who would otherwise go without dental care is for medical providers to take on an additional role in applying fluoride varnish (12).

The present study showed that approximately half of dental professionals felt that it is appropriate for medical providers to apply fluoride varnish, a third were not supportive, and a fifth were undecided. Our hypothesis was that such support would differ by provider and practice characteristics, by patterns of fluoride use, and in terms of a limited assessment of the knowledge relevant to the mechanism of action of fluoride. Practice characteristics and fluoride use variables were significantly associated with such support, but knowledge about fluoride's predominant mechanism of action was not. Those in solo practice were more likely to be supportive. Solo

Table 2
Multivariable Logistic Regression Models to Examine Dental Personnel Supporting and Not Supporting Medical Practices Applying Fluoride Varnish

Would it be appropriate for medical staff to apply fluoride varnish?			
Outcome Variable	Odds ratio	95% CI	*P*-value
Yes versus no:			
Practice characteristics:			
Solo practice versus larger practice	1.46	1.18, 1.81	0.0006
Type of dentist			
Pediatric dentist versus general practitioner	0.41	0.25, 0.68	0.0006
Other specialist versus general practitioner	1.36	0.60, 3.06	0.4599
Patients often express dissatisfaction with fluorosis on teeth	1.32	1.02, 1.72	0.0365
Fluoride use:			
Uses varnish versus other type of professionally applied fluoride	2.71	1.32, 5.56	0.0065
Treats child without active caries with fluoride (usually or always)	1.96	1.21, 3.17	0.0064
Yes versus undecided:			
Dentist (versus dental hygienist)	1.35	1.08, 1.70	0.0097
Percent patients city dwellers (51-75% reference group)			
(<50%)	1.14	0.84, 1.56	0.4052
(76-100%)	1.33	1.03, 1.71	0.0262
Treats child without active caries with fluoride (usually or always)	1.69	1.03, 2.78	0.0392

practitioners may already be busy and have established relationships with medical professionals in the community. Pediatric dentists and dental hygienists were less likely to be supportive than general dental professionals. On the one hand, this is somewhat surprising as they are strong advocates for children. On the other hand, there may be a perceived economic impact or concerns about duplicative preventive services being provided to a child. Another concern may be that such care by medical practices may undermine the child developing a "dental home" (where comprehensive oral health care needs could be addressed). As states increasingly adopt policies and payment mechanisms that allow medical practices to apply fluoride varnish, understanding how to build better partnerships between the medical and dental community is necessary to optimize children's care.

Increased support in practices where a higher proportion of patients expressed dissatisfaction with fluorosis is more difficult to explain. Little research had evaluated the public's perceptions about the esthetics of fluorosis until recently (16-21). These studies demonstrated that the lay public and dental professionals report increased esthetic concerns as fluorosis scores increase. It is possible that our results represent dental professionals who recognize the risk of fluorosis (however small) entailed by using the systemic fluorides that pediatricians have historically prescribed to babies, and think that changing the mode of fluoride use to varnish may decrease that risk.

Two fluoride use variables (use of fluoride varnish and treatment of children with fluorides even without active caries being identified) were associated with support for medical practices applying fluoride varnish. We interpreted this situation in light of past research. In a previous study, we found that fluoride treatment recommendations by dentists were not related to caries risk (22), and while an oversimplification, it might be said that some dental personnel prescribed fluoride to almost everybody, while others prescribed it to few patients – regardless of clinical need. Hence, the *fluoride use* variables in this study may represent dental professionals' own experience, familiarity, and ease of use of fluoride (23), which translates into confidence that medical practices can safely provide the service.

A limitation of the present study is that dental professionals were not directly asked why they support or do not support medical practices applying fluoride varnish. Setting aside the fact that even a direct question may fail to provide an accurate description of the mechanism and factors involved in complex professional behaviors, from the present data and the review of the literature, it may be postulated that the reasons may be economic, access-related, concerns or confidence with regard to ease of use, and related to the safety of fluoride use (24). Increased support may emerge from more recent American Dental Association recommendations promoting the use of fluoride varnish, specifically proposing the use of varnish as a vehicle for fluoride treatments in children younger than 6 years of age (25).

As insurance carriers or clinical systems are considering implementing fluoride varnish programs, it may also be important to garner the support of dental professionals who are undecided as to whether medical practices should apply fluoride varnish. Even though data collection took place in 2005 and thus some changes may have occurred since then in the attitudes and perceptions with regard to fluoride varnish usage, the present data suggest that targeting messages to dental hygienists and those with practices in mixed rural–urban areas may lead to the most fruitful investment of effort to gain momentum for this change. If all of the undecided dental professionals were to sympathize with this expanded care provider model, then it is estimated that three-quarters of dental professionals would be supportive, and the possibilities for building collaborative relationships between the dental and medical professionals would increase. Further research is necessary to ascertain what modalities of training and reimbursement are more effective in creating such a collaborative relationship (26-28).

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