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RESEARCH ARTICLE

Provision of Fluoride Varnish to Medicaid-Enrolled Children by Physicians: The Massachusetts Experience

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Objectives. To evaluate the impact of a 2008 Medicaid policy in Massachusetts (MA), regarding reimbursing physicians for providing fluoride varnish (FV) to eligible children in medical settings.

Data Source. Survey of a sample of primary care physicians in MA.

Study Design. Cross-sectional survey of a sample of physicians who provide care to MassHealth (MA Medicaid) enrolled-children. Dependent variables: history of completed preventive dental skills training, and FV provision. Independent variables: oral health knowledge, FV-attitudes, and physician and practice characteristics.

Principal Findings. Overall, 19 percent of respondents had completed the training required to be eligible to bill for FV provision. Only 5 percent of physicians were providing FV. Most respondents (63 percent) were not familiar with the new policy, and only 25 percent felt that FV should be provided during well-child visits. Most physicians (60 percent) did not feel that the reimbursement rate of U.S.\$26/application was sufficient; 17 percent said that they would not provide FV, regardless of payment. Most common barriers to FV provision were a lack of time and logistical challenges.

Conclusions. Our findings suggest that simply reimbursing physicians for FV provision is insufficient to ensure provider participation. Success of this policy will likely require addressing several barriers identified.

Key Words. Children, preventive dental care, fluoride varnish, Medicaid, physicians

Dental caries disproportionately affects low-income and minority children. Indeed, as much as 80 percent of tooth decay in permanent teeth occurs in only 25 percent of children (Brown et al. 1996; Kaste et al. 1996). These children are more likely to suffer consequences of untreated tooth decay, including pain, difficulty chewing, missed school days, infection, and costly

restorative dental treatments (Government Accountability Office 2000b; Siegal, Yeager, and Davis 2004; Clarke et al. 2006; Tickle, Blinkhorn, and Milsom 2008; Casamassimo et al. 2009). Although low-income and minority children bear a disproportionate burden of dental disease, they are less likely to receive dental care (Flores and Tomany-Korman 2008). Rates of dental caries are also high among children enrolled in Medicaid, despite the fact that comprehensive dental services are a covered benefit under the Early and Periodic Screening, Diagnosis and Treatment Medicaid program (Kaiser Commission on Medicaid and the Uninsured 2007). Only one in three Medicaid-enrolled U.S. children has a dental visit each year (Government Accountability Office 2008). Factors often cited as contributing to poor dental care access among Medicaid members include a geographic maldistribution of dentists, an inadequate supply of dentists who accept Medicaid payment and treat Medicaid-insured children, and administrative issues (Government Accountability Office 2000a; Mouradian, Wehr, and Crall 2000).

In Massachusetts (MA), although 73 percent of all children had a dental visit in 2005, <30 percent of children enrolled in MassHealth (MA Medicaid Program) saw a dentist (The Catalyst Institute. 2006). A 2000 report by the MA Special Legislative Commission on Oral Health revealed that only 14 percent of practicing MA dentists were active MassHealth providers (Report of the Special Legislative Commission on Oral Health 2000), further contributing to the state's dental care access problem. In that same year, reports of MassHealth enrollees' hardships accessing dental care led to a lawsuit filed by a MA-based advocacy group against the state. Following the Court's decision, both parties agreed to a remediation plan (United States District Court of Massachusetts 2005) and the MA Executive Office of Health and Human

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Services agreed to implement specific measures. One measure in the plan was a new policy specifying that MassHealth reimburse primary care physicians (PCPs) for providing fluoride varnish (FV) treatments to eligible MassHealth members <21 years old. The new policy became effective on October 1, 2008. To be eligible for reimbursement, physicians had to complete an approved training program on preventive dental care (PDC) skills (oral health examination, education, and FV application).

Currently, 37 state Medicaid programs reimburse PCPs for providing one or more elements of PDC (Deinard and Cantrell 2010). These policies stemmed from a goal to reduce dental disease by encouraging shared responsibility for children's oral health among the medical and dental communities (Cantrell 2008). State reimbursement rates vary from U.S.\$9 to U.S.\$53.30 per application, with about two to six applications allowed per year, depending on the state (Deinard and Cantrell 2010). Some states also reimburse physicians separately for oral examinations and family oral health education. MA physicians are only reimbursed for FV applications. A few studies have demonstrated success of this Medicaid reimbursement strategy in increasing low-income children's access to FV treatments (Rozier et al. 2003; Okunseri et al. 2009). In Iowa, policy implementation was followed by a significant involvement of medical providers in FV delivery (Okunseri et al. 2009). Total claims for FV increased from 3,361 prepolicy to 28,303 postpolicy. Physicians accounted for 38 percent of the FV claims submitted after the policy was implemented (Okunseri et al. 2009). The North Carolina "Into the Mouth of Babes" program, developed in 2000, trained and reimbursed physicians for providing preventive dental services during medical visits (Rozier et al. 2003). By 2006, these services were provided during over 100,000 medical visits for children <3 years of age (Cantrell 2008). A few studies have documented some important factors determined to influence provision of FV in medical settings, including physician attitudes (e.g., perceived difficulty applying FV), and logistics (e.g., available practice systems used to identify eligible patients for FV application) (Lewis, Lynch, and Richardson 2005; Close et al. 2010). Because these studies targeted providers who had already completed the PDC skills training, their perspectives and experiences could differ from providers who had not been trained.

The goal of this study was to evaluate the impact of the new Medicaid policy in MA in regard to child health PCP's provision of FV treatments, one year after policy implementation. We sought to answer the following questions: (a) What are MA physicians' knowledge, practices, and attitudes about providing PDC among MassHealth-enrolled children?; (b) What are MA

physicians' knowledge, experiences, and attitudes related to FV?; (c) What percentage of MA physicians are aware of the new Medicaid FV reimbursement policy and what is their attitude toward the policy?; and (d) What are the rates of participation in the PDC skills training and FV provision among MA physicians, as well as associated barriers and facilitators? Findings could lend insight into the state's progress in encouraging physician integration of preventive dental services into routine delivery of medical care, highlight areas for improvement, and enable comparisons with other states.

METHODS

Study Design

We conducted a cross-sectional survey of child health PCPs who provide primary care to MassHealth-enrolled children <21 years.

Inclusion/Exclusion Criteria

The population eligible for the study included child health PCPs in MA who provide primary care (including well-child visits) to MassHealth-enrolled patients <21 years. We defined child health PCPs as pediatricians, family medicine, medicine/pediatrics, and general practice physicians. We identified this population from a list of physicians that had billed MassHealth for delivering medical care to children <21 years between July 2008 and January 2009. Because the MassHealth provider list also included pediatric subspecialists, we excluded subspecialist physicians (e.g., hospitalists, cardiologists, endocrinologists, surgeons) using three sources: the Folio physician directory; public records from the MA Board of Registration of Medicine; and publicly available websites. The survey cover page included an initial screening question to assess physician eligibility. Physicians who did not meet eligibility criteria were asked to check off a box and return the survey. Mid-level providers (nurse practitioners and physician assistants) were excluded.

Sampling Strategy

All eligible physicians, regardless of whether they completed the PDC skills training, comprised the sampling frame. This enabled an evaluation of factors that might have hindered certain physicians from participating in the training. We obtained a list of physicians that had completed the PDC skills training from MassHealth approved training programs. We stratified the list of eligible physicians based on history of completed PDC skills training. We drew a

simple random sample ($n = 699$) from the list of all MA physicians that had not been trained ($n = 1,711$) and targeted all physicians that had been trained ($n = 103$). We over-sampled physicians that had completed the PDC skills training in order to have a sufficient sample size to adequately evaluate the research questions.

Survey Design

To guide survey development, we developed a conceptual model that was informed by the Roger's Model of Stages in the Innovation-Decision Process (Rogers 2003) and the Conceptual Model of Fluoride Varnish Diffusion (Lewis, Lynch, and Richardson 2005). The conceptual model of FV diffusion incorporates various factors within and outside the practice setting (preexisting factors, communication, and logistics) associated with FV provision. Our conceptual model domains highlighted these processes and factors that could influence delivery of FV in medical offices. We also adapted questions from surveys conducted in prior studies related to provision of FV by physicians (Lewis et al. 2000; Slade et al. 2007). The survey addressed three main areas: (a) physicians' general oral health knowledge, experience, and attitudes; (b) FV-related knowledge, experience, and attitudes; and (c) perceived barriers and facilitators of FV provision by physicians. We collected data on physician demographic information and practice characteristics. We also asked physicians how familiar they were with the new MassHealth policy, and what they felt was an acceptable amount of reimbursement that physicians should be paid for providing FV. The lowest possible amount was U.S.\$26 (the amount that MassHealth currently reimburses physicians per FV application). We used a 5-point Likert scale (5 = strongly agree to 1 = strongly disagree) for most survey items. We pilot tested the survey with a small group of pediatricians and family medicine physicians in MA and modified it before it was fully administered.

Variable Description

Dependent Variables. The first dependent variable was a dichotomous variable (Yes/No) based on history of PDC skills training. The second dependent variable was a dichotomous variable derived by a history of FV provision among providers that had received training. We categorized this variable into two categories (History of FV provision: Yes/No).

Primary Independent Variables. We derived these variables from questions we adapted from previous surveys, used to assess physicians' general oral health

knowledge and attitudes (Lewis et al. 2000; Close et al. 2010). These primary independent variables were identified as physician characteristics that could be modified by targeted initiatives. They included:

1. Physician oral health knowledge: We asked physicians four questions to assess their oral health knowledge. We generated a physician knowledge score (0–4) based on responses to oral health knowledge questions; this was dichotomized as low (0–2) and high (3–4).

2. Physician FV attitude: This variable was a score (range 0–8) created based on physician response to eight questions that assessed attitudes toward provision of FV by physicians (e.g., FV should be a routine part of well-child visits). Given the sample size and distribution of the responses, we dichotomized the variable into two categories: “favorable FV attitude” for physicians with a score of >4 and “unfavorable FV attitude” for physicians with a score of 4 or less.

Model Covariates. Covariates considered for the models included physician characteristics: area of practice (pediatrics versus family medicine); gender, board certification, number of years in practice, and practice characteristics: number of full-time equivalent (FTE) medical providers (1–4, 5–8, and >8); type of practice (private practice, community health center, community or county hospital/university medical center); location of practice (urban, suburban, rural); availability of dentists at main practice site (Yes/No); and percentage of MassHealth patients (≤ 25 percent versus >25 percent).

Survey Administration. Data collection proceeded from October 2009 through April 2010. We mailed paper surveys to 801 MA physicians, including a cover letter co-signed by presidents of local chapters of the American Academies of Pediatrics and Family Physicians and the project principal investigators. We used a mixed mode approach to recruitment and data collection (paper and online administration), with each respondent receiving up to four contacts. The first wave of the survey included an offer for respondents to be entered into a lottery to win one of 10 U.S.\$100 gift cards, while the second mailing included a U.S.\$2 incentive. Waves 3 and 4 combined email and postal mail contact (with no incentives being offered).

Statistical Analyses

Because our sample was not a simple random sample, we created design-based weights. All physicians who were trained were selected with a probability of one.

We sampled 699 of the 1,711 physicians who were not trained. Fifty of the sampled physicians were determined to be ineligible. So the probability of selection for each physician was 649/1,711. The base design weight was the inverse of the probability of selection within each stratum. Sixty-three physicians from the list of trained physicians and 282 physicians from the list of nontrained physicians responded to the survey. We compared respondents and nonrespondents on available sample characteristics (area of practice, gender and type of practice) using two-sided χ^2 -tests of independence to test for group differences. We estimated the propensity to respond to the survey using a logistic regression model that included the area of practice and practice setting and used the inverse of the propensity as a nonresponse weight. Our final weight was a product of the design-based weight and the nonresponse weight. We also made a poststratification adjustment to ensure that the sum of the weighted survey respondents equals the population sizes in each stratum. This weight was used in all analyses, which were conducted in *SAS* 9.2 (SAS Institute 2002–2008) and *SUDAAN* 10.0.1 (Research Triangle Institute 2009).

We explored the characteristics of the dependent and independent variables by characterizing the means, ranges, and distributions of the variables. Bivariate analyses between dependent and independent variables, as well as model covariates, identified significant associations ($p < .05$). To evaluate the association between the independent variables and history of PDC skills training, we fit a multivariable logistic regression model. We examined model covariates for confounding and collinearity by identifying variables that, when added to the model, changed the β -coefficients or standard errors by more than 10 percent. Variables included in the final model were physician oral health knowledge, FV attitude, area of practice, type of practice, and number of FTE medical providers. We obtained odds ratios and 95 percent confidence intervals from the model. Bivariate analyses testing the association between FV provision and independent variables yielded only one significant association, and so multivariable analyses were not conducted. This study was considered exempt in review by the Institutional Review Boards at Massachusetts General Hospital and the University of Massachusetts Medical School.

Response Rate Calculation

To calculate our response rate, we used standards developed by the American Association for Public Opinion Research (AAPOR) (AAPOR 2010). The response rate we report (AAPOR Category 3) includes all completed surveys divided by the number of physicians known to be eligible and a proportion of

those of unknown eligibility. Of the 801 sampled respondents, 50 physicians were determined to be ineligible (e.g., not a primary care child health provider or had moved out of state), 7 refused, 36 could not be contacted, and 363 did not complete the survey.

RESULTS

Sample Description

The response rate was 64 percent. Overall, approximately 55 percent of survey respondents were pediatricians, 41 percent family medicine physicians, and 4 percent Medicine/Pediatrics physicians. The average number of years in practice of all respondents was 21.8 (SD = 0.7) years. Forty-four percent of respondents worked in practices where >25 percent of the patient population was enrolled in MassHealth, and 46 percent worked in suburban-based practices. Table 1 shows the characteristics of survey respondents and their practices, by PDC skills training. Respondents differed significantly from the nonrespondents on the area of practice (primary care pediatrics/family medicine/Med/Peds/Other) and practice setting (University Medical Center/Other Hospital/Community Health Center/Other).

Physicians' General Oral Health Knowledge, Experience, and Attitudes

Seventy percent of all respondents reported receiving between 1 and 5 hours of total instruction in oral health (including medical school, residency, and continuing medical education [CME]). Most respondents answered some oral health knowledge questions correctly, though only 39 percent had an oral health knowledge score of ≥ 3 out of 4 (Table 2). Physicians' attitudes toward PDC varied, depending on history of completed training; 15 percent of respondents that had not been trained (30 percent of trained respondents) agreed that a 12 month old should be referred to a dentist, while 88 percent of not trained respondents (91 percent of trained respondents) agreed that a dental referral should occur at 3 years (Table 3). Overall, 73 percent responded that they were likely to assess a child's fluoride intake, while 11 percent said they inquire about the mother's dental health. While most (81 percent) physicians reported that they were likely to examine and identify early signs of tooth decay, only 42 percent reported being confident in their ability to do so (data not shown).

Most respondents agreed that low participation of local dentists in MassHealth was a barrier to dental care for MassHealth-enrolled children

Table 1: Characteristics of Survey Respondents and Their Practices, by Preventive Dental Care Skills Training

Characteristics	Respondents (n = 345)		
	Weighted %		p-Value*
	Not Trained	Trained	
Physician characteristics			
Area of practice			NA
Primary care pediatrics	57.8	42.9	
Family medicine	38.5	54.2	
Medicine/pediatrics	3.7	3.0	
Female	51.3	58.9	.34
Years in practice mean (SD)	22.8 (0.7)	18.2 (1.5)	<.01
Total hours of oral health instruction (medical school, residency, CME)			<.01
None	22.6	1.3	
A little (1–5 hours)	71.2	81.0	
A lot (> 5 hours)	6.2	17.8	
Practice characteristics			
Type of practice			<.01
Private practice (Group/Solo)	73.0	23.1	
Community Health Center	7.3	42.2	
Community or County Hospital/University Medical Center	9.9	25.8	
Other	9.8	8.9	
Location of practice			<.01
Urban	27.5	67.8	
Suburban	58.7	25.9	
Rural	13.8	6.3	
Number of full-time equivalent (FTE) medical providers			<.01
1–4	52.1	20.3	
5–8	26.5	24.2	
> 8	21.4	55.5	
Dentists available at main practice site	19.7	27.6	.31
Proportion of practice patients with the following characteristics			
Covered by MassHealth (Medicaid)			<.01
≤ 25%	60.6	12.4	
> 25%	39.4	87.6	

*p value based on two-sided χ^2 -tests of independence dichotomous/categorical variables) or *t*-tests (continuous variables).
NA, not reported due to low prevalence rates (<5 observations) in some cells.

(Table 3). Other factors that the majority of respondents perceived influenced Masshealth-enrollees dental care access included family logistics (e.g., transportation) and parental resistance to professional dental care for young children.

Table 2: Physicians' Responses to Oral Health Knowledge Questions, by Preventive Dental Care Skills Training

	<i>Correct Response</i>	<i>Weighted % Responding Correctly (Not Trained)</i>	<i>Weighted % Responding Correctly (Trained)</i>	<i>p-Value</i>
The bacteria that cause cavities can be transmitted from mother to infant	True	86.0	98.9	NA*
A 9-month-old healthy infant who is formula-fed (made with nonfluoridated water) should receive fluoride supplements	True	90.6	90.9	.95
White spots on primary teeth may indicate early decay	True	42.5	88.0	<.01

**p* value not reported due to low prevalence rates (<5 observations) in some cells.

Physicians' FV-Related Knowledge, Experience, and Attitudes

Only a third (34 percent) of all respondents reported being familiar with the risks and benefits of FV. Sixty-four percent of trained physicians (19 percent of not trained physicians) were confident in their ability to provide FV to a child <5years old (Table 4). Nearly one in five (17 percent) of all physicians were categorized as having a favorable attitude toward FV treatments in medical settings. Although 46 percent of all physicians agreed that provision of FV during well-child visits was an effective way to reduce dental caries among MassHealth-enrolled children, only 25 percent believed it should be a routine part of these visits. However, these responses differed significantly by history of completed PDC skills training (Table 4). The most commonly reported perceived barriers to FV provision were a lack of time and logistical challenges integrating FV into the practice routine.

We asked physicians how much they felt was a fair reimbursement rate per FV application for physicians, realizing that the current rate is U.S.\$26. Thirteen percent of physicians stated that U.S.\$26 was a fair amount, while more than one-half (60 percent) stated that a fair reimbursement was >U.S.\$30. Seventeen percent of physicians responded that they would not provide FV regardless of payment.

PDC Skills Training and FV Provision

Overall, 19 percent of respondents had completed PDC skills training, while only 5 percent were providing FV to eligible children. The most common

Table 3: Physicians’ General Oral Health Knowledge, Experience, and Attitudes, by Preventive Dental Care Skills Training

Should physicians perform the following during well-child visits (WCVs)?	<i>Weighted %</i>		<i>p</i> -Value
	Strongly agree/agree (not trained)	Strongly agree/agree (trained)	
Referral to a dentist by 12 months of age	14.7	30.2	.04
Referral to a dentist by 3 years of age	88.4	90.7	.59
Routine assessment for early signs of cavities during the physical exam	81.2	90.0	.06
Counseling on the prevention of cavities	88.6	91.8	.44
During a WCV for a child <5 years, how likely are you to do each of the following?	Percent responding very likely/likely (not trained)	Percent responding very likely/likely (trained)	
Assess a child’s fluoride intake to determine the need for supplementation	74.6	69.0	.47
Counsel parents on preventing cavities in their children (e.g., tooth brushing, fluoride)	87.6	87.9	.95
Inquire whether a child is taking a bottle to bed	83.2	90.2	.13
Examine and identify early signs of tooth decay	81.2	84.8	.50
Inquire about the mother’s dental health	11.7	11.6	.98
Perceived barriers to dental access for MassHealth patients	Strongly agree/agree (not trained)	Strongly agree/agree (trained)	
There is a lack of local dentists who see very young children	56.6	68.2	.13
There is a lack of local dentists accepting MassHealth	72.4	66.3	.40
Parents do not feel their young children need to see a dentist	47.0	61.1	.08
There are long wait times to see the dentist	33.4	39.5	.45
Family logistics play an important role (e.g., transportation, distance)	57.2	65.1	.30
Dental referrals take too much of my time to explain/set up	10.5	22.0	.08

Table 4: Physicians Knowledge, Attitudes, and Self-Efficacy Regarding Fluoride Varnish, by Preventive Dental Care Skills Training

<i>Proportion of physicians who strongly agree/agree with the following statements:</i>	<i>Respondents (n = 345)</i>		
	<i>Weighted %</i>		<i>p-Value</i>
	<i>Not trained</i>	<i>Trained</i>	
FV knowledge/self-efficacy			
I am familiar with the risks and benefits of FV*	25.3	77.1	<.01
I feel confident that I can effectively apply FV for a child <5 years old	19.3	64.2	<.01
I know how to obtain FV for my office	11.6	50.9	<.01
Proportion who report being very familiar/somewhat familiar with the MassHealth FV reimbursement policy	25.3	81.0	<.01
Attitudes toward FV			
Fluoride varnish can be applied relatively easily and quickly (within 3 minutes) during a well-child visit (WCV)	28.7	84.3	<.01
Fluoride varnish applications should be a routine part of WCVs	17.7	63.4	<.01
Reimbursing <i>medical providers</i> for FV application during WCVs is an effective way to prevent tooth decay among MassHealth patients	43.8	65.4	.01
There is enough time to apply FV during a WCV	21.9	26.7	.48
My patients have many problems other than tooth decay. I need to focus on these other problems rather than FV	40.1	44.5	.59
The way we see patients (flow) makes it difficult to integrate FV applications into my practice routine	49.0	54.4	.50
There is a lack of parental interest in FV for their children	17.7	22.0	.59

*Included in oral health knowledge score.

reasons reported for participating in the training included the oral health needs of their patients, followed by personal interest/professional development (data not shown). Most providers preferred to receive the PDC skills training in their own office, instead of the online or a group-based CME format. Sixty-three percent of respondents reported that they were not familiar with the new MassHealth policy on physician reimbursement for FV applications. Of those that were aware of the initiative, over one-half (54 percent) participated in the PDC skills training. Various physician and practice characteristics were found to be independently associated with physician participation in PDC skills training (Table 5). These included physician area of practice, oral health knowledge, and FV attitude scores. Significantly associated practice characteristics included

Table 5: Factors Associated with Physician Participation in Preventive Dental Care Skills Training

<i>Variables</i>	<i>OR</i>	<i>95% CI</i>	<i>p</i>
Oral health knowledge score			
0–2	Ref	Ref	Ref
3–4	16.23	6.33–41.61	<.01
Fluoride varnish attitude score			
0–4	Ref	Ref	Ref
5–8	3.48	1.10–10.96	.03
Physician area of practice			
Primary-care pediatrics	Ref	Ref	Ref
Family medicine	2.46	1.01–5.99	.05
Type of practice			
Private practice (Group/Solo)	Ref	Ref	Ref
Community health center	5.98	1.86–19.27	<.01
Community/county hospital/university medical center	4.21	1.30–13.66	0.02
Number of full-time equivalent (FTE) medical providers			
1–4	Ref	Ref	Ref
5–8	2.18	0.79–6.07	0.13
> 8	3.28	1.09–9.84	0.03

physicians working in practices with >8 FTE providers, community health centers, and university medical center/other hospital.

Of the physicians who had completed PDC skills training, 29 percent reported that they or someone in their practice was currently providing FV to MassHealth-enrolled patients. The only variable significantly associated with provision of FV on bivariate analyses was physicians' FV attitudes. Compared with physicians with unfavorable FV attitudes, physicians with favorable FV attitudes had an increased odds of providing FV to eligible children (3.44 OR [*p* .03; CI 1.09, 10.78]) (data not shown). We asked physicians who provided FV which office routines had been helpful in ensuring that their eligible MassHealth patients received FV applications. The most commonly cited helpful routine was having a FV office champion, followed by a reminder system in the patients' charts/records that prompted the physician to offer the oral health education and FV to eligible patients (data not shown).

DISCUSSION

We embarked upon this study to evaluate the impact of a new MA Medicaid policy that provided physician reimbursement for FV delivery to eligible

MassHealth-enrolled children. We found that only 5 percent of respondents reported providing FV treatments to eligible MassHealth children and several barriers impeded physician adoption of FV delivery in medical settings. Many of these factors could be addressed through targeted interventions. One significant barrier was a lack of awareness; most respondents reported not being familiar with the new MassHealth policy. Physicians who knew about the policy were more likely to participate in the training, and about a third of trained physicians were providing FV. These findings suggest that increasing physician awareness of the program may result in a greater rate of physician participation in FV delivery. Physicians who worked in larger practices, community health centers, or hospital-based practices were more likely to participate in the training. These types of practices might serve a larger percentage of MassHealth-enrolled children and could potentially be targeted for on-site training programs.

Another important factor was physicians' attitudes toward preventive dental services in general, and specifically provision of FV treatments in medical settings. Most respondents had negative attitudes toward incorporating FV treatments into routine medical care and did not feel that the current reimbursement rate was a sufficient incentive to encourage provider participation. It was interesting to note that among physicians that had completed the training, having a favorable attitude toward FV was the only factor significantly associated with providing FV.

Our findings of low FV participation rates are similar to those documented in a 2007 national survey of pediatricians (Lewis et al. 2009). In that study, only 3.8 percent of pediatricians surveyed reported providing FV to more than half of their patients. Barriers to provision of PDC identified by pediatricians in that study included a lack of oral health training, inadequate time, and inability to bill for oral health examinations and education separately (Lewis et al. 2009). In our study, time constraints and inadequate oral health education were also important barriers perceived by providers. Several providers stated that providing FV was one more service among many that had to be squeezed into a brief 15-minute visit.

To increase physician participation in FV provision in MA and ensure program success, identified barriers must be addressed. This process can be informed by previous studies that have assessed effective strategies to change provider behavior in primary care practices. Examples of some effective strategies identified to increase provider knowledge and change behavior include educational outreach visits, interactive workshops, and reminders (Bero et al. 1998; Grimshaw et al. 2002; Sohn, Ismail, and Tellez 2004). A systematic

review by Grimshaw et al. (2002) revealed that multipronged interventions targeting identified barriers to change are more likely to be effective than a single intervention.

Findings from our study suggest three areas that the state could focus on. First, expand marketing and outreach. Providers were informed about the new MassHealth policy by mail, and additional information was made available on the MassHealth website. Although previous studies have suggested that passive dissemination (mail outreach) could be used to raise provider awareness of a desired behavior change (Grimshaw et al. 2002), this strategy was inadequate in the MA FV experience. To increase provider awareness of the program, a social marketing campaign could be implemented, specifically targeting practices that serve large percentages of MassHealth enrolled children. This could also include a parental outreach to educate and empower them about how to optimize their child's oral health.

We found that some physicians have already begun to provide preventive dental services in their offices. These providers could be encouraged to serve as local FV champions to engage, educate, and motivate their peers to buy-in to the initiative. Second, re-design the training program curriculum and provide better support for physicians. Survey respondents preferred in-office trainings to online or group-based training. Traditional CME programs in large group settings have not been found to be effective in changing provider behavior (Sohn, Ismail, and Tellez 2004). Current training programs that educate physicians to provide preventive dental services should be delivered in providers' offices. They should also be re-designed to include practical tips and resources to help physicians deal with office flow concerns. Although FV applications are relatively easy and quick, the logistics associated with seamlessly integrating it into routine practice could be challenging. Training programs can develop and distribute helpful resources for practices, such as FV kits (including FV, gauze, patient handouts, billing information, etc.) that could be stocked in exam rooms, decision support tools, and standardized oral health assessment templates that can be incorporated into electronic medical records. Lastly, enhance the policy. The present MassHealth policy is voluntary and this may be an issue. While getting physicians to want to provide FV is preferred, a parallel can be drawn from the success of another MassHealth policy that requires that all MA child health PCPs conduct behavioral health screens on children during well-child visits. This program is mandatory, and although physicians receive only U.S.\$9 per screen, currently 53.6 percent of MA physicians are compliant with the policy (Kuhlthau et al. 2011). MassHealth could mandate that participating providers at least complete the PDC

skills training, which may help improve oral health knowledge and foster favorable attitudes. In addition, with over 50 percent of respondents expressing dissatisfaction with current reimbursement rates, MassHealth could consider increasing FV reimbursement rates or providing additional reimbursements for delivery of other components of PDC. The state can also continue to make efforts to reduce its paperwork burden and facilitate quick processing of claims. Finally, private insurers should be encouraged or required to reimburse physicians for FV provision to privately insured children as well.

Simply focusing on reimbursing physicians for FV provision may not be enough; it is a necessary, but insufficient strategy to increase access to PDC among low-income children. Lessons learned from Washington state's experience underscore this point. After the policy (expanding children's access to dental services by primary care providers) was enacted in Washington in 1998, only 145 Medicaid-enrolled children <6 years received FV in 2000 (Riter, Maier, and Grossman 2008). A statewide multilevel strategy was subsequently implemented that included oral health training for physicians and medical students, demonstration projects, a public awareness media campaign promoting the importance of children's oral health and the establishment of the Access to Baby and Child Dentistry program that aimed to expand access to dental care for Medicaid-enrolled children <6 years old. A key component of this state strategy was the passage of new legislation that was not a stand-alone oral health bill, but a broad-based bill to ensure increased health care coverage for all children (Riter, Maier, and Grossman 2008). The legislation also included provisions for additional physician reimbursement for oral screenings and oral health education. These combined efforts resulted in an increase in FV applications by physicians from 145 applications in 2000 to 9,098 in 2007 (Riter, Maier, and Grossman 2008). Likewise, MA and other states should consider employing a comprehensive, multilevel health promotion strategy that incorporates children's oral health as an integral piece of their overall health and well-being.

This study has several limitations. We had to construct a sample list of child health PCPs participating in MassHealth, because we did not have a single verified list of all eligible physicians. Although we accounted as best we could for ineligible, the final sample could still have included ineligible physicians. The response rate of 64 percent, though consistent with other physician surveys, may also have led to bias, because respondents may have had different experiences and perceptions from nonrespondents. Data are based on provider self-report, which may also introduce bias. Because it was a

cross-sectional survey, causality cannot be established. We were unable to ascertain actual rates of FV provision at a provider or practice level. Further, results are based on responses from physicians in one state and may not be generalizable to other states. We conducted the survey one year after implementation of the new policy, and this may not have been sufficient time for significant changes to be documented. However, this assessment allowed us to identify unique and common barriers to adoption of FV earlier in the process so that appropriate changes can be implemented. Lessons learned could help inform the development of strategies to improve children's access to PDC in MA as well as in states yet to adopt the policy.

CONCLUSIONS

One year after implementation of a policy to increase children's access to PDC by reimbursing physicians for FV provision, only 5 percent of physicians are providing FV to MassHealth-enrolled children. Several barriers identified that impeded success of this policy could be addressed through targeted efforts. However, simply focusing on reimbursing physicians for FV provision may be insufficient to ensure sustained physician involvement. Comprehensive, multilevel approaches to health promotion that incorporate children's oral health as an integral part of their overall health and well-being hold promise of producing long-term solutions to the problem.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix SA2: Characteristics of Respondents and Non-Respondents.

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