



Dear bOHP Subscriber,

Welcome to the first bOHP newsletter of the year. We are excited to bring you an update on the current revision of fluoride recommendations for young children. Our featured interview with Dr. Tim Wright, James W. Bawden Distinguished Professor, and Chair of the Department of Pediatric Dentistry at UNC-Chapel Hill, offers his professional insight for fluoride use in young children. Dr. Wright is currently in the process of leading a systematic review looking at the science, safety, and effectiveness of fluoride use in young children. Stay tuned, the review will be published in the near future.

Warmest wishes through the new year,

The bOHP Team

#### **Featured Article:**

##### **Parents' Interpretation of Instructions to Control the Dose of Fluoridated Toothpaste Used with Young Children:**

Huebner, Thomas, and Scott of the University of Washington, Seattle conducted a study with parents to determine the average amounts of fluoridated toothpaste applied by a parent to a child's toothbrush. Their findings show parents consistently using too much toothpaste on their child's toothbrush. **To read more, continue to page three of the newsletter for the full article published in *Pediatric Dentistry*, May/June 2013.**

*Remember to remind parents that "a little is good, more must be better" does not pertain to use of fluoridated toothpaste for their children. Another tip is to use "tell, show, do" when educating parents and caregivers about how much toothpaste to put on their child's brush.*




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**SMEAR OR RICE SIZE**

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#### **New ADA Proposed Guidelines**

Brush teeth thoroughly twice per day (morning and night) or as directed by dentist or physician. Supervise children's brushing to ensure use of appropriate amount of toothpaste.

Caregivers should begin brushing their children's teeth as soon as they come into the mouth using no more than a smear or grain of rice size amount of fluoride toothpaste.



### **Interview with Dr. Tim Wright: Fluoride Recommendations for Young Children**

#### **Why is it important to perform a systematic review of fluoride dosage from toothpaste use in young children?**

The systematic review we performed was directed at evaluating the safety and effectiveness of fluoride toothpaste for children under the age of six. One way to do this is to evaluate all publications that address the science behind fluoridated toothpaste in a systematic way. Currently, there are no reviews focusing on both the aspects of safety and effectiveness in children under the age of six. This is why it was important to have the systematic review.

#### **What have been the political challenges of having a unified message of fluoridated toothpaste use in young children?**

The biggest challenge has been unifying multiple conflicting messages from different organizations and ensuring that the recommendation will result in both safe and effective use of fluoridated toothpaste. Current recommendations from different organizations range from the ADA saying to use no fluoridated toothpaste unless advised by dentist until using a pea size at age two, to the Canadian Dental Association advising to use a smear to age three only in high risk children, to the AAPD recommending a smear until age 2 and a pea sized amount in children ages two to five. The major challenges come from the differing opinions between organizations regarding both the timing and the dosage of fluoride for young children. These recommendations are quite different, with one of the most important differences being using plain water vs. using fluoridated toothpaste in children up to 2 years of age.

One of the challenges is to try and bring together the different groups that for their own reasons have come up with these policies and/or guidelines. The review will provide the scientific evidence for a more unified message about the safety and effectiveness of fluoride toothpaste in young children. There are long-term ramifications of overdosing kids with too much fluoridated toothpaste that can lead to fluorosis in the permanent teeth. Based on scientific evidence, our aim is to streamline the various fluoride guidelines to create a unified message for toothpaste use in children that optimizes caries prevention while minimizing the risk of fluorosis due to children eating too much toothpaste.

#### **What advice can you share with BOHP providers about fluoride use in early childhood?**

As a result of the systematic review, the new guidelines being proposed will be consistent related to the dosages and timing of fluoride being used with fluoride supplementation. Currently the ADA and AAPD guidelines are not consistent with their recommendation (supplementation dosage is not increased from .25mg F to .5mg when a child has no background while current use of a pea size amount that equals about .25 mg F is being recommended at age 2 years of age when children are most susceptible to fluorosis development in the permanent incisors).

Pediatric and General Dentists need to be diligent in talking to parents with children under three years of age about the use of fluoride in appropriate amounts. Using a smear and not a pea-sized amount is a critical message to inform parents about.

Another tip is to not assume that showing parents a picture is going to be enough for them to understand what a smear of toothpaste looks like. Studies show even after showing the parents a picture of a smear of toothpaste, they still use the wrong amount and often use too much. It is critical to have parents show you what a smear looks like. Having a discussion and demonstrating that they can put the appropriate amount of toothpaste on a toothbrush is important. Sometimes parents believe "a little is good, and more is better" regarding toothpaste. It is important they understand the potential issues such as fluorosis that come about in the permanent teeth due to excessive amounts of fluoride in young children.



## Parents' Interpretation of Instructions to Control the Dose of Fluoridated Toothpaste Used with Young Children

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**Abstract: Purpose:** The purpose of this study was to determine the average amounts of fluoridated toothpaste applied by parents to a child's toothbrush in response to instructions to limit the quantity to a "pea-sized" or "smear" amount. **Methods:** Fifty parents of 12- to 71-month-old children participated in this study. They were presented with three toothbrushes and asked to apply the amount of toothpaste they use typically with their child—a smear or a pea-sized quantity. The results were compared to the recommended weights of 0.25 g (pea-sized) and 0.125 g (smear). **Results:** The mean amount applied in response to a "smear" weighed  $0.21 \pm 0.19$  g, which differed from the recommended weight of 0.125 g ( $P=.002$ ). The mean amount applied in response to a "pea" weighed  $0.30 \pm 0.21$  g, which was greater than but not statistically significantly different from the recommended weight of 0.25 g ( $P=.10$ ). Parents applied, on average,  $0.33 \pm 0.24$  g of toothpaste when instructed to apply the amount they typically use with their child. **Conclusions:** Most parents use more fluoridated toothpaste than is recommended for young children and verbal instructions to limit the dose are ineffective. Education by demonstrating a smear and pea-sized amounts of fluoridated toothpaste is recommended. (*Pediatr Dent* 2013;35:262-6) Received August 31, 2011 | Last Revision February 9, 2012 | Accepted February 9, 2012

KEYWORDS: INFANT, CHILDREN, FLUORIDE, PARENT EDUCATION

Approximately one out of three 2- to 5-year-old children in the United States has experienced caries. National data indicate that caries is on the rise in this age group compared to past years.<sup>1</sup> As part of a preventative regimen for children with moderate to high caries risk, pediatric dentists recommend that parents begin using a small amount of fluoridated toothpaste prior to two years old.<sup>2</sup>

Using fluoride is a highly effective way to protect the teeth from dental caries.<sup>3</sup> Fluoride aids in remineralization of tooth structure by enabling calcium and phosphorous entry into the demineralized structure to create a more resistant crystalline lattice.<sup>4</sup> Fluoride ingested from toothpaste or other sources is available locally within dental plaque or saliva.<sup>5</sup> A balanced approach is needed to ensure that children receive sufficient fluoride to protect the teeth from caries while minimizing the risk of fluorosis,<sup>6</sup> a developmental defect that results in permanent intrinsic white-to-brown discoloration of enamel with varying degrees of severity.<sup>7</sup> Fluorosis can affect both permanent and primary dentitions but is more difficult to diagnose in the latter.<sup>8</sup> Mild fluorosis poses no harmful effects to tooth structure and can be so subtle that it is unnoticeable. An individual's risk of fluorosis is based on a multifaceted process that includes timing, duration, and amount of fluoride ingestion with respect to the developmental staging of the affected teeth.<sup>5</sup>

Use of fluoridated toothpaste provides a topical dosage of bioavailable fluoride.<sup>9</sup> Ideally, excess fluoride is expectorated, not swallowed, but children younger than three years old have immature expectorating skills and typically swallow, on average, 0.25 mg of fluoride per brushing with 1,000 to 1,100 ppm F toothpaste.<sup>9</sup> The amount of toothpaste children ingest decreases with age due to their maturing skills, including the increased control of

reflexes.<sup>5</sup> For this reason, caregivers are cautioned to limit the amount of fluoridated toothpaste used with children younger than six years old. Tooth-brushing advice is usually directed toward mothers who most often are the caregivers responsible for administering toothpaste and for brushing their children's teeth.<sup>10-12</sup> It is not uncommon, however, for young children to apply toothpaste and brush their teeth with little or no adult supervision.<sup>13</sup> With or without adult supervision, children dispense more toothpaste than adults,<sup>14</sup> and younger mothers dispense more than do older mothers.<sup>10</sup>

Current guidelines of the American Academy of Pediatric Dentistry (AAPD) recommend teaching caregivers to use a "smear" of fluoridated toothpaste for children younger than two years old at moderate or high caries risk and a "pea-sized" amount for all children age two through five years.<sup>2</sup> Although the AAPD provides photographs illustrating these amounts as a point of reference, it is difficult to judge the depth of the toothpaste shown on the toothbrush, and the guidelines do not offer other cues such as the optimal weight or length of the quantity of toothpaste. Reliance on parents' understanding of the verbal labels "pea" and "smear" could lead either to over- or under-dosing of fluoridated toothpaste. In 2009, Ellwood and Curry<sup>5</sup> published a paper in which they quantified the recommended doses by weight. Accordingly, a thin smear is 0.125 g in weight and a small pea weighs 0.25 g.<sup>5</sup> Using toothpaste containing 0.243 percent sodium fluoride (common in commercially available toothpaste marketed for children in the United States), the amount of sodium fluoride present in 0.25 g of toothpaste is 0.6 mg (0.275 fluoride ion) and the amount present in 0.125 g is 0.3 mg (0.137 mg fluoride ion).

Bentley and colleagues<sup>6</sup> tested British mothers' interpretation of instructions to apply smear and pea-sized amounts of low- and high-concentration fluoridated toothpastes packaged in tubes with special nozzles. They found that mothers applied less toothpaste when asked to apply a smear (0.22 g) than when asked to apply a pea-sized quantity (0.30 g). Responses to the smear instruction resulted in wider variability than the instruction to apply a pea-sized amount.<sup>6</sup> A subsequent study, conducted in the United States by Levy and colleagues,<sup>14</sup> confirmed Bentley's findings that

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parents typically exceed the recommend dose of fluoridated toothpaste. In the Levy study, parents administered an average of 0.31 g of toothpaste in response to the pea-sized instruction.<sup>14</sup> The researchers did not test parents' responses to apply a smear amount.

The purpose of the present study was to determine the average amount of fluoridated toothpaste applied by parents to a child's toothbrush in response to verbal instructions to limit the quantity to a "pea" or "smear" on a child's toothbrush. It was hypothesized that parents would apply amounts that differed significantly from the recommended quantities associated with the terms "pea" (0.25 g) and "smear" (0.125 g). Secondly, parents were asked for alternate phrases to convey amounts corresponding to 0.25 and 0.125 g of fluoridated toothpaste.

## Methods

**Sample and study site.** Ethical approval for this study was granted by the Institutional Review Board of the University of Washington, Seattle, Wash. English-speaking primary caregivers ("parents") of 12- to 71-month-old children were invited to participate. Parents were recruited from a university-based pediatric dentistry clinic. They were identified in the clinic waiting area by office staff or the lead researcher, and oral consent was obtained.

Based upon sample size estimates with 80 percent power and standard deviation estimates obtained from two previous studies,<sup>14,15</sup> we determined that an enrollment of 46 was needed to detect statistically significant differences between the mean weight provided in response to instructions for a "pea" and the recommended weight of 0.25 g respectively. Fifty parents were enrolled to ensure adequate sample size.

Table 1. CHARACTERISTICS OF PARENTS AND CHILDREN BY CHILDREN'S AGE (N=50)

Characteristic	Child's age (mos)			Total No. (%)
	12-35 No. (%)	36-9 No. (%)	60-71 No. (%)	
Child's gender				
Male	11 (65)	14 (74)	5 (36)	30 (60)
Female	6 (35)	5 (26)	9 (64)	20 (40)
No. of children in the family <6 ys old				
1 child	11 (65)	12 (63)	10 (71)	33 (66)
2-3 children	6 (35)	7 (37)	4 (29)	17 (34)
Parent's gender				
Male	4 (24)	4 (21)	7 (50)	15 (30)
Female	13 (76)	15 (79)	7 (50)	35 (70)
Parent's age (ys)				
<35	11 (65)	6 (32)	4 (29)	21 (42)
≥35	6 (35)	13 (68)	10 (71)	29 (58)
Parent's education				
High school or less	4 (24)	6 (32)	2 (14)	12 (24)
Some college	13 (76)	13 (68)	12 (86)	38 (76)
Primary language spoken at home				
English	9 (53)	11 (58)	7 (50)	27 (54)
Other	8 (47)	8 (42)	7 (50)	23 (46)
Insurance status				
Private or self-pay	5 (29)	3 (16)	1 (7)	9 (18)
Medical coupon	12 (71)	16 (84)	13 (93)	41 (82)
Who brushes child's teeth				
Child	2 (12)	7 (37)	8 (57)	17 (34)
Adult	15 (88)	12 (63)	6 (43)	33 (66)
Parent's prior instruction in use of toothpaste				
Yes	11 (65)	13 (68)	4 (29)	28 (56)
No or don't remember	6 (35)	6 (32)	10 (71)	22 (44)

**Procedure.** The order of instruction for the application of toothpaste was determined at the time of recruitment. One of 50 cards was selected, at random, prior to approaching a potential participant. The card contained a script for the researcher to read aloud following the consent procedures. All cards began with the instruction asking the parent to apply the "typical" amount of toothpaste used with their child. On 25 cards, the order of the next instruction was to apply a smear followed by pea; the order of instructions was reversed on the other 25 cards.

The toothpaste used in the study was a commercially available toothpaste marketed for children; it contained 0.243 percent sodium fluoride (0.15 percent w/v fluoride ion). The toothbrushes were small, child-size brushes. Each toothbrush and a corresponding plastic storage bag were weighed prior to data collection.

Following consent, parents were asked to provide sociodemographic information about themselves and their family (ie, age of each child in the household younger than six years old, insurance status, parental age and level of education, language spoken at home, and relationship to the child). Additional questions about home tooth-brushing habits were asked following the toothpaste application.

Each parent was given three child-sized toothbrushes, one at a time. With the first toothbrush, the researcher asked the parent to apply the amount of toothpaste they typically use at home when brushing their young child's teeth. This toothbrush was then removed from sight and placed in its preweighed plastic bag. The researcher continued with the second and third instructions. Following each, the toothbrush was removed from sight and placed in its preweighed plastic bag. The parent was then shown sample brushes with premeasured amounts of toothpaste corresponding to the quantities of "pea" and "smear" and asked to suggest better terms to describe each amount. The bagged toothbrushes were weighed on an electronic lab scale, and weights were recorded on a separate day.

**Data analyses.** For purposes of data analyses, only one child per family was included in tests of associations with child's gender and child's age. This "focal child" was the first child younger than 72 months old, as described by the parent. Also, for purposes of data analysis, the child's insurance status was categorized as "public" or "private or self-pay." All analyses were conducted using Stata 11.0 software (StataCorp, College Station, Texas, USA).

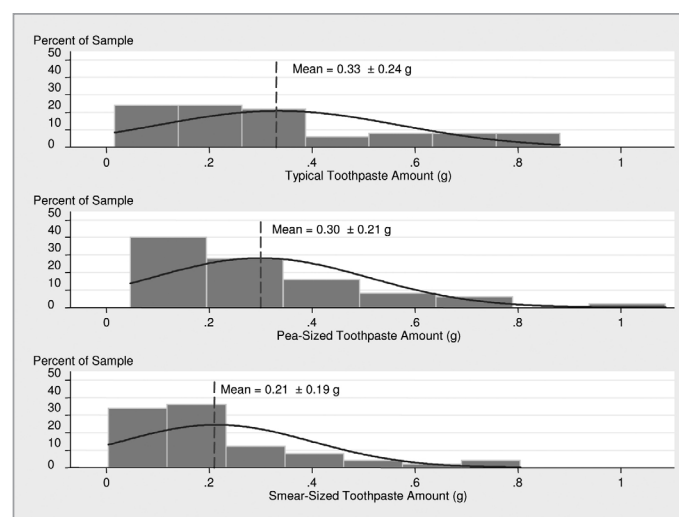


Figure 1. Parents' responses to instructions to apply a typical, pea-sized, and smear amount of toothpaste to a child's toothbrush.

Descriptive statistics were computed to describe family demographics and determine the mean amount of toothpaste applied in each of the three conditions (typical, smear, pea). One-sample *t* tests were conducted to test if parents' responses to the instructions to apply a "pea" or a "smear" yielded weights of toothpaste that differed significantly from the recommendations of 0.25 g and 0.125 g, respectively. Analysis of variance tests were used to assess differences between family demographics, report of prior instruction in toothpaste use, and the amount of toothpaste applied to the toothbrushes in each of the three conditions.

## Results

Fifty parents participated in this study (Table 1). Their mean age was 36.3±8.5 years old, and the range was from 21 to 65 years old. Fifteen (30 percent) parents were fathers of the children. Twelve (24 percent) parents had a high school diploma or fewer years of schooling, and 38 (76 percent) had at least some college or vocational training. Most children (82 percent) were covered by Medicaid insurance; 18 percent had private insurance or paid out-of-pocket for dental services. All parents were fluent in English and did not need interpretive services for the dental appointment;

however, nearly half reported they preferred speaking a language other than English at home.

**Quantity of toothpaste applied by parents in each condition.** There were wide ranges in parents' responses to the instructions to apply a "typical," "pea"-sized, and "smear" amount (Figure 1). The "typical" amount of toothpaste that parents demonstrated using at home weighed, on average, 0.33±0.24 g; the range was from 0.02 to 0.88 g (Table 2). A 1-sample *t* test was used to compare the mean weight applied when parents were instructed to apply a "pea"-sized amount compared to the recommended weight of 0.25 g. The mean quantity in response to the "pea" instruction was 0.30±0.21 g, which was greater but not significantly different than the recommended amount of 0.25 g (*P*=.10). The weights for the "pea" instruction ranged widely, from 0.05 to 1.09 g. A 1-sample *t* test was used to compare the mean weight applied when parents were instructed to apply a "smear" sized amount compared to the recommended weight of 0.125 g. The mean quantity applied to the toothbrush in response to a "smear" was 0.21±0.19 g, which was significantly different than the recommended amount of 0.125 g (*t* [49]=3.35; *P*=.002). The weights for the "smear" instruction ranged from 0.004 g to 0.81 g.

Table 2 provides the results of tests of associations that compare the amount of toothpaste applied in response to each instruction with parent and child sociodemographics. For example, the amount applied by parents of males vs parents of females did not differ when parents were instructed to provide the amount they use with their child—either a typical, pea-sized, or smear amount. The largest difference, 0.12 g more toothpaste applied by parents of males in response to the instruction to apply a typical amount, approached statistical significance (*P*=.07).

To summarize the results presented in Table 2, there were no statistically significant associations between the amount of toothpaste applied in each of the three conditions and the following: child's age; child's gender; number of children in the family younger than six years old; parent's age; parent's education level; primary language spoken at home; or who (caregiver or child) usually brushes the child's teeth. There was a statistically significant association between the amount of toothpaste applied in response to the "smear" instruction and the parent's gender. Specifically, in this condition, fathers applied more toothpaste than did mothers (0.32±0.23 g vs 0.17±0.14 g; *P*=.005). There was also a statistically significant association between the amount of toothpaste applied in response to the "pea" instruction and insurance status. Parents of children with private insurance or self-pay status applied more toothpaste than those whose children were covered by public insurance. The mean amount applied was 0.45±0.28 g among the private insurance or self-pay group vs 0.26±0.18 g applied by parents of children covered by public insurance (*P*=.01).

**Prior instruction in brushing a young child's teeth with toothpaste.** Twenty-eight (56 percent) parents reported they had received prior instruction in the amount of toothpaste to use for a young child. Of these, 24 (86 percent) said they were taught by a dentist, two (7 percent) were taught by a pediatrician, and two (7 percent) learned on their own by reading the toothpaste label or baby book. Parents who reported prior instruction applied less toothpaste

Table 2. ASSOCIATIONS BETWEEN CHILD AND PARENT CHARACTERISTICS AND THE AMOUNT OF TOOTHPASTE IN GRAMS APPLIED BY PARENTS IN RESPONSE TO THREE VERBAL INSTRUCTIONS

Characteristic	Instruction					
	"Typical" amount (g)		"Pea-sized" (g)		"Smear" (g)	
	Mean±(SD)	<i>P</i> -value*	Mean±(SD)	<i>P</i> -value*	Mean±(SD)	<i>P</i> -value*
Child's age (mos)		.41		.30		.40
12-35	0.36±0.26		0.34±0.24		0.19±0.17	
36-59	0.28±0.19		0.24±0.14		0.19±0.16	
60-71	0.38±0.26		0.32±0.25		0.27±0.23	
Child's gender		.07		.27		.39
Male	0.38±0.26		0.33±0.21		0.19±0.17	
Female	0.26±0.18		0.26±0.20		0.24±0.22	
No. of children <6 ys old		.18		.62		.13
1	0.37±0.23		0.29±0.19		0.18±0.19	
2-3	0.27±0.23		0.32±0.25		0.27±0.18	
Parent's gender		.21		.35		
Male	0.40±.24		0.34±.21		0.32±.23	.005†
Female	0.31±.23		0.28±.21		0.17±.14	
Parent's age (ys)		.43		.94		.69
<35	0.37±0.28		0.30±0.16		0.20±0.19	
≥35	0.31±0.20		0.30±0.24		0.22±0.18	
Parent's education		.23		.12		.07
High school or less	0.41±0.27		0.38±0.20		0.30±0.24	
Some college	0.31±0.22		0.27±0.21		0.19±0.16	
Primary language spoken at home		.76		.38		.30
English	0.32±0.22		0.32±0.22		0.19±0.11	
Other	0.35±0.26		0.27±0.21		0.24±0.25	
Insurance status		.22		.01†		.21
Private or self-pay	0.25±0.20		0.45±0.28		0.14±0.09	
Medical coupon	0.35±0.24		0.26±0.18		0.23±0.20	
Who brushes child's teeth		.66		.89		.17
Child alone	0.34±0.26		0.30±0.18		0.24±0.21	
Adult or with child	0.31±0.19		0.30±0.27		0.16±0.11	
Prior instruction in use of toothpaste		.03†		.18		.02†
Yes	0.27±0.19		0.26±0.20		0.16±0.13	
No or don't remember	0.42±0.26		0.34±0.21		0.28±0.22	

\* The magnitude of group differences was tested using analysis of variance.

† Statistically significant at *P*<.05.



than those without instruction. The differences between those with and without prior instruction were statistically significant in response to the smear instruction ( $0.28 \pm 0.22$  g vs  $0.16 \pm 0.13$  g;  $P=.02$ ) and the amount they typically use ( $0.42 \pm 0.26$  g vs  $0.27 \pm 0.19$  g;  $P=.03$ ). When asked about the type of toothpaste they used at home, 36 (74 percent) parents said they used toothpaste designed for children and 45 (90 percent) reported the toothpaste they used contained fluoride. In verifying this information by brand, we found that three parents who reported using fluoridated toothpaste named brands that do not contain fluoride.

**Suggested alternative terms.** Child-size toothbrushes containing amounts of toothpaste corresponding to a smear (0.125 g) and a pea-sized (0.25 g) weight were used to prompt discussion of alternate terms or phrases. The most common suggestions to describe the amount of a smear were “smudge” ( $N=2$ ) and “little” ( $N=4$ ). Some terms offered by just one parent were “minimal,” “apple-seed size,” and “thin coating.” Most parents remarked they had never heard the term “smear” in reference to a dose of toothpaste. When asked to provide alternate terms for “pea,” the most common suggestion was “drop” ( $N=4$ ). Other suggestions, less common, were “green pea,” “bead,” and “child’s pinky fingernail size.” Some parents commented that “pea-sized” is not easily understood because there are different sizes of peas.

## Discussion

This is the first known study in the United States to test the effectiveness of two verbal instructions to control the dose of toothpaste used by parents of young children. We found that parents, on average, applied significantly more toothpaste than recommended by the professional guidelines. To date, there has been only one known study, conducted in the United Kingdom, of parents’ response to apply a “smear” of toothpaste. In that study, the researchers provided parents with two concentrations of fluoridated toothpaste, neither of which are commercially available in the United States. The response to the instruction to apply a smear resulted in a mean weight of 0.22 g.<sup>6</sup> Our finding was similar; the mean in response to a “smear” was  $0.21 \pm 0.19$  g, well in excess of the recommended 0.125 g of fluoridated toothpaste.

Our finding regarding parents’ response to the “pea-sized” instruction ( $0.30 \pm 0.21$  g) is also consistent with earlier reports. Bentley and colleagues<sup>6</sup> reported a mean amount of 0.30 g applied by mothers in response to the “pea” instruction, and Levy et al.<sup>14</sup> reported a mean amount of  $0.31 \pm 0.12$  g.<sup>6,14</sup> Taken together, these three studies, conducted in three different locations and over longer than a 10-year time span, provide strong evidence that the “pea size” instruction is not effective to limit the dose of fluoridated toothpaste to the recommended amount of 0.25 g.

In the present study, parents who reported receiving prior instruction in the use of toothpaste used less toothpaste in all three conditions; however, the average amounts were still in excess of the intended dose. The finding that parents with private or self-pay insurance applied more toothpaste than those with public insurance has not been documented previously. It suggests that all parents, regardless of socioeconomic status, could benefit from additional instruction.

Research is needed to identify the most effective way to communicate information about controlling the dose of fluoridated toothpaste used with young children. As demonstrated here, a simple verbal instruction is not sufficient and few parents were able to offer alternative terms. Perhaps actual demonstration, graphical displays, or 3-dimensional models would be more effective oral health education strategies. Additionally and anecdotally, several parents reported that a dentist had told them to avoid using fluoridated toothpaste until their child was at least four years old

and able to expectorate properly. This recommendation is out of date. Continuing education in early childhood oral health for medical and dental providers could aid in dispelling misinformation about using fluoridated toothpaste.

Several limitations to the generalizability of this study’s findings should be noted. First, participants were a convenience sample of parents able to speak and understand English. Most were mothers, consistent with other studies conducted in similar settings regarding toothpaste application and oral hygiene habits.<sup>6,11-13</sup> Second, participants volunteered for this study about tooth-brushing. Together, these factors may explain why the sample was more highly educated and may have had a greater interest in the topic than is typical. A third limitation to generalizability is that the sample was recruited from a pediatric dental clinic. More than half (56%) of the participants said they had been taught how much toothpaste to use with young children, and most said they received this information from dentists. Despite all these possible advantages, on average, parents applied more toothpaste than recommended for young children. At the high end of the range, the amount was much more: 0.81 g and 1.09 g were the largest amounts provided as a smear and a pea, respectively. Thus, it is likely that the results of this study underestimate the actual amount of toothpaste used by less-informed parents.

## Conclusions

Based on this study’s results, the following conclusions can be made:

1. The amount of toothpaste parents typically use with their young children exceeds the amount of fluoridated toothpaste recommended for children younger than two years old and for children younger than six years old (0.125 g and 0.25 g, corresponding to 0.6 mg and 0.3 mg sodium fluoride, respectively).
2. In this study of parents of 1- to 5-year-old children, the typical amount of toothpaste used per brushing weighed, on average  $0.33 \pm 0.24$  g.
3. Our test of verbal instructions to parents to limit the amount to a “smear” or a “pea size” amount did not result in the recommended amounts; however parents who reported receiving prior instruction in the correct amount of toothpaste to use with children applied less toothpaste than parents without prior instruction.
4. Our findings suggest there is some value in instruction, but that verbal instruction alone is not enough.
5. The use of visual aids and demonstration are recommended as strategies to further improve parent education.

## Acknowledgments

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