



Practice Patterns of Board-certified Pediatric Dentists: Frequency and Method of Cleaning Children's Teeth

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Abstract

Purpose: The purpose of this study was to assess the periodicity of the recall examination and frequency and most often used technique for cleaning children's teeth. The resulting data were compared to current scientific evidence and recommendations to determine the appropriateness of practices by board-certified pediatric dentists.

Methods: A 28-item questionnaire was mailed to the 1,034 members of the College of Diplomates of the American Board of Pediatric Dentistry residing in the United States. This report describes data pertaining to recall appointment periodicity, frequency and method of cleaning children's teeth, use of auxiliaries in prophylaxis, and instruction in oral hygiene.

Results: Six hundred twenty-nine surveys were returned, tabulated, and analyzed. Only 1% of dentists did not have an active recall program, 95% used a 6-month recall interval, and the remaining 5% had an interval ranging from 3 to 18 months. Hygienists were employed in 62% of pediatric dentistry practices. Pumice/rubber cup prophylaxis was employed routinely at recall by 67% of respondents; 24% reported the use of toothbrush and dental floss for cleaning; the other 9% reported no routine method for prophylaxis. The average fee for a pumice/rubber cup prophylaxis was \$42.55, and \$40.31 for a toothbrush prophylaxis. One hundred percent of pediatric dentists reported providing oral hygiene instruction for their patients. The instruction was directed to both parent and child in 97% of practices, child only in 2% of practices, and the parent only in 1% of practices.

Conclusions: Recall intervals were not based on specific criteria related to individual patient needs. The majority of pediatric dentists employed the pumice/rubber cup prophylaxis method for cleaning children's teeth. (*Pediatr Dent.* 2004;26:17-22)

KEYWORDS: TOOTHBRUSH PROPHYLAXIS, PUMICE/RUBBER CUP PROPHYLAXIS, PREVENTION, RECALL APPOINTMENTS, PEDIATRIC DENTISTRY

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Pediatric dentists spend a substantive portion of their practice time conducting periodic re-examinations (recalls), professionally cleaning children's teeth, and teaching children and parents proper oral health care through brushing and flossing. This research effort documented the manner and frequency in which board-certified pediatric dentists, diplomates of the American Board of Pediatric Dentistry (ABPD)(members of the College of Diplomates [COD]), utilized such techniques. The intention of the study was to determine to what extent board-certified pediatric dentists' practice patterns, in conducting a periodic oral examination and cleaning children's

teeth, are consistent with the scientific evidence regarding the efficacy of such.

Historically, rubber cup/pumice prophylaxis was recommended to clean children's teeth based on early studies conducted by Knutson,¹ who suggested that removal of plaque from the teeth would improve the fluoride uptake by the enamel during administration of high potency topical fluoride to reduce caries susceptibility. Melberg² advised removal of the organic matrix (plaque and acquired pellicle) to permit fluoride to react immediately with the enamel hydroxyapatite crystalline structure. Subsequent research has demonstrated that these beliefs are incorrect.

The presence of plaque or pellicle does not inhibit fluoride uptake.³⁻⁴ A Danish study demonstrated, “enamel of plaque-covered teeth acquired more than twice the amount of fluoride taken up by cleaned teeth.”⁵ Bruun and Stoltze⁵ also found that a 5-day growth of plaque does not reduce fluoride uptake by enamel. Joyston-Bechal et al⁶ demonstrated that artificially produced plaque and pellicle does not reduce the amount of fluoride taken up by enamel. Tinanoff et al⁷ also demonstrated that a pellicle coating on enamel does not reduce the amount of fluoride taken up by enamel.

Professional cleaning of the teeth with a pumice and rubber cup removes the acquired enamel pellicle—the biological film of salivary proteins and amino acids that affords protection to the tooth from acids found in foods and beverages. Transmission electron microscopy analysis shows that layers of the pellicle are dissolved continuously due to acid exposure. However, even after 5 minutes of exposure to 1% citric acid, a residual pellicle layer can be detected on the enamel surface.⁸ While the pellicle begins reforming immediately following a pumice/rubber cup prophylaxis, it requires at least 7 days to fully mature and possibly longer to once again be able to offer a buffering effect to dietary acids.⁹

It has also been demonstrated that rubber cup/pumice prophylaxis removes enamel up to 0.13 microns (+/- 0.04 microns)/mm²/10 seconds of treatment¹⁰, while normal tooth-brushing removes no enamel. The typical pumice/rubber cup prophylaxis removes the outer 0.6-4.0 microns of enamel.¹⁰⁻¹³ Although this would appear to be an insignificant amount, it is the enamel zone that is rich in fluoride, as a result of both pre- and post-eruptive exposure of the tooth to fluoride in the tooth's environment. Evidence indicates that this fluoride-rich enamel layer cannot be recovered, even with topical fluoride application, once removed with a pumice abrasive.¹⁴⁻¹⁵ Steele et al¹⁶ used gamma radiation to measure the concentrations of fluoride at varying depths of enamel. The highest fluoride concentrations were 2,000 to 3,000 ppm at a depth of .47 microns; these levels fell off sharply to 1,000 ppm at 8.48 microns. Fluoride concentrations were highest at all depths in teeth cleaned with a toothbrush and interproximal flossing, without dentifrice or prophylaxis paste.

The use of pumice and rubber cup to clean the teeth is effective in removing extrinsic stains from the teeth and smoothing roughened tooth surfaces following removal of calculus. However, extrinsic stains are not an etiologic factor in dental disease, and children only rarely have extrinsic tooth staining or have accumulated calculus.¹⁷ After following a group of children for 3 years, a Centers for Disease Control work group found no significant differences in DMFT/S scores among children who brushed their own teeth, had a “professional cleaning,” and those who had not had their teeth cleaned prior to fluoride application.¹⁸

Methods

A 28-eight-item questionnaire was developed to obtain information regarding the preventive dentistry practices of board-certified pediatric dentists. The Institutional Review Board of the University of Kentucky Medical Center approved the survey. Mailing labels for all ABPD-certified practitioners who are members of the COD were obtained from the American Academy of Pediatric Dentistry (AAPD). Only diplomates residing in the United States were included in the survey. No attempt was made to eliminate diplomates who were not currently in full-time clinical practice. One thousand thirty-four surveys were mailed; a self-addressed, stamped return envelope accompanied each. No follow-up mailings were utilized.

Survey topics addressed included:

1. time intervals between recall visits;
2. time intervals for exposing radiographs;
3. employment of hygienists;
4. type of professional prophylaxis performed;
5. person providing oral hygiene instruction, and to whom directed;
6. fluoride in community water;
7. type of fluoride applied professionally;
8. use of dental sealants;
9. dietary analysis use;
10. use of dental educational materials; and
11. percentage of gross practice income derived from preventive procedures.

Only data about the frequency of recall visits, frequency and type of prophylaxis, and information regarding patient/parent education are included in this report.

Results

Of the 1,034 surveys mailed, 729 (70%) were returned; 36 (5%) were returned as undeliverable; 49 (7%) were from diplomates who had retired; and 12 (2%) surveys were incomplete. These were eliminated from the study. The remaining 632 (61%) were tabulated and analyzed.

Only 3 (1%) of 632 pediatric dentists reported they did not have a recall program. Five hundred ninety-four (95%) routinely used a 6-month interval for periodic re-examination (recall) of children. The 35 (5%) pediatric dentists who did not use a 6-month recall interval employed a range of 3 to 18 months with an average of 8.1 months between visits.

Three hundred ninety-two (62%) pediatric dentists employed a dental hygienist. In some jurisdictions, trained dental assistants can perform a pumice/rubber cup prophylaxis on the coronal portion of teeth. In the tabulations, these individuals were not included as dental hygienists.

Four hundred twenty-four (67%) pediatric dentists responded that they routinely performed a pumice/rubber cup prophylaxis on their child patients. One hundred fifty-two (24%) responded that they routinely used only a toothbrush and dental floss to clean their child patients' teeth—the so-called “toothbrush prophylaxis.” The remaining 53 (9%) replied that they did nothing

“routinely.” The average professional fee charged for a pumice/rubber cup prophylaxis was \$42.55 (± 13.17), with a range of \$2 to \$120. The average professional fee for a “toothbrush prophylaxis” was \$40.31 (± 15), with a range of \$0 to \$120. One hundred percent of the pediatric dentists reported providing oral hygiene instructions for their patients/parents. Such instructions were directed toward both the child and parent in 610 (97%) practices, only the child in 10 (2%) practices, and to only the parent in 9 (1%) practices. Oral hygiene instructions were presented by the dental assistant 40% of the time, hygienist 33%, and dentist 27%. Thirty-nine (6%) dentists charged a professional fee for oral hygiene instruction. The average fee was \$24.92 (± 11.22), with a range from \$2 to \$44.

Discussion

The American Dental Association (ADA)¹⁹ has developed “caries risk” guidelines and recommendations for preventive therapies, including frequency of visits to the dentist. The criteria for children at low dental caries risk are:

1. no caries in the previous year;
2. coalesced pits and fissures;
3. relatively plaque free;
4. fluoride in the water;
5. use a fluoride dentifrice;
6. regular dental visits.

The guidelines recommend that children at low caries risk be re-examined once yearly, have plaque routinely removed from their teeth, and use a fluoride dentifrice.

Criteria for children at moderate dental caries risk include:

(1) 1 carious lesion in the past year; (2) deep pits and fissures; (3) some plaque accumulation; (4) no fluoride in the water; (5) white spot lesions; (6) irregular dental visits; and/or (7) orthodontic treatment. The guidelines recommend that these children have sealants, education, dietary counseling, fluoride dentifrice, fluoride mouth rinse, high potency professional topical fluoride, and 6-month recalls.

Indicators of children at high dental caries risk are:

1. 2 or more carious lesions in the past year;
2. previous smooth surface lesions;
3. elevated *Streptococcus mutans* count;
4. deep pit and fissures;
5. no or little systemic and topical fluoride exposure;
6. plaque accumulation;
7. frequent carbohydrate intake;
8. irregular dental visits;
9. inadequate salivary flow;
10. inappropriate nursing habits (infants).

For these children, the guidelines recommend: (1) sealants; (2) education; (3) dietary counseling; (4) fluoride dentifrice; (5) fluoride mouth rinse; (6) professional topical fluoride every 3 to 6 months; (7) 3- to 6-month recalls; (8) monitoring *S mutans*; (9) antimicrobial agents (chlorhexidine); (10) fluoride supplements (depending on the age of the child and degree of water fluoridation).

In 2001-02, the AAPD clarified guidelines for periodic oral examinations, oral hygiene instructions, and dental prophylaxis. The 2001-02 AAPD Reference Manual²⁰ recommended that children be seen at 1 year of age and that parents be instructed about how to effectively clean plaque from their infant’s/child’s teeth. The guidelines recommend that children subsequently be seen every 6 months, or as indicated by the individual patient’s needs/susceptibility to disease, and that the teeth be cleaned, including the removal of stains and calculus—as dictated by the individual patient’s needs/susceptibility to disease. In the 2001-02 AAPD Reference Manual, no criteria were provided to determine the “individual patient’s needs or susceptibility to disease.”

However, in the AAPD 2002-03 Reference Manual, a new “policy on the use of a caries risk assessment tool (CAT) for infants, children, and adolescents” is included.²¹ CAT helps assess and assign caries risk into 1 of 3 categories: low, moderate, or high, based on clinical conditions, environmental characteristics, and general health conditions.

The ADA and AAPD guidelines differ in that the ADA guidelines offer more specific criteria for determining the appropriate interval for recall evaluation based on caries risk. ADA guidelines recommend dental recall visits every 3 to 6 months for children at high risk for caries, every 6 months for children at moderate risk, and yearly for children at low risk. The AAPD guidelines would seem to reinforce the traditional 6-month cycle for the periodic oral examination, as 6 months is expressed as a standard with the caveat being “or as dictated by the individual patient’s needs/susceptibility to disease.”

Caries prevalence for primary teeth can be measured by the epidemiological index of decayed, extracted, and filled teeth or surfaces (dmft/s), and for permanent teeth with a comparable index, the DMFT/S. The National Health and Nutrition Survey III (NHANES III)²² found that, in the age group of 2- to 5-year-old children, 19% had at least 1 decayed primary tooth, and 9% 1 filled primary tooth. In the 6- to 12-year-old group, 25% had at least 1 primary tooth with untreated caries, and 36% 1 filled primary tooth. Similarly, 11% of 6- to 14-year-old children had at least 1 permanent tooth with untreated decay, and 29% 1 permanent tooth filled.

NHANES also found that, in the age group 5 to 17 years, 55% of children have a DMFS score of 0 (they have no decayed, missing, or filled surfaces of their permanent teeth), and that 60% of children under age 10 had no decayed, missing, or filled primary teeth. Applying ADA criteria to these data suggest that a 1-year rather than 6-month periodic oral examination is indicated for the majority of children, depending on how recently their last carious experience occurred. In this study, 95% of board-certified pediatric dentists routinely follow a 6-month recall protocol. Only 35 (5%) of the study’s respondents reported using variable time frames from 3 to 18 months for periodic re-assessment.

Frequent references were made by the responding pediatric dentists to “following the ADA guidelines” for recall time intervals. Yet, the guidelines would not seem to recommend 6-month recall appointments for most pediatric dental patients. It is possible that the practice patterns found in this study are related to the frequency with which the dental insurance industry will reimburse for a recall examination.

The AAPD guidelines further recommend that, “a dental prophylaxis be used as part of a comprehensive preventive program designed to improve children’s ability to maintain their personal oral health. The use of dental prophylaxis should be considered as an educational tool to allay fears regarding the manipulation of oral tissues. A patient-appropriate dental prophylaxis should be performed when indicated, in conjunction with oral hygiene instruction, periodic oral examination visits, and other indicated preventive care.” While the term prophylaxis is not defined, it is assumed that the term is consistent with that employed by the insurance industry, the cleaning of the teeth with pumice and rubber cup.

While both the ADA and AAPD recommend the professional cleaning of the teeth, neither defines how it should be done—that is, with a pumice/rubber cup, the traditional “prophylaxis,” or with a toothbrush and dental floss. The scientific evidence suggests the use of a toothbrush and dental floss is an effective plaque removal method; does not disrupt the protective enamel pellicle; and does not remove the outer, fluoride-rich enamel.

In the past, it had been recommended that pumice/rubber cup prophylaxis be used to remove plaque so that topically applied fluoride would be better adsorbed by enamel. However, as the literature demonstrates, plaque removal is not a prerequisite to fluoride therapy. Cleaning (polishing) selected areas of the teeth with pumice and a rubber cup is indicated when extrinsic staining is present, or there is a rough enamel surface following scaling to remove calculus.²³

Mathewson and Primosch recommend a toothbrush/dental floss prophylaxis as preferable to the pumice and rubber cup as it “is more educational for the patient. The time normally devoted to delivering a pumice prophylaxis can be used for patient instruction and motivation while simultaneous removal of plaque occurs.”¹⁷

Redford-Badwal and Nainar reported on a survey of dental prophylaxis education in postdoctoral pediatric dental programs in the United States.²⁴ They reported that 74% of the teaching programs routinely recommend dental prophylaxis for all recall patients, but that “only 51% of the training programs had modified their teaching to substitute toothbrush prophylaxis in lieu of rubber cup pumice prophylaxis.” They concluded, “only one half of the postdoctoral education programs in the United States teach evidenced-based practice of dental prophylaxis for recall patients.”

In this study, 67% of board-certified pediatric dentists routinely performed a pumice/rubber cup prophylaxis on their child patients, 24% routinely perform a “toothbrush prophylaxis,” and 9% indicated they do nothing “routinely.” A frequent comment by the respondents was that they did not perform toothbrush/dental floss prophylaxis because insurance companies and Medicaid programs did not pay for this procedure.

There was no significant difference between the professional fees for the pumice/rubber cup prophylaxis (\$42.55) and a toothbrush/dental floss prophylaxis (\$40.31). The professional fee data found in this study raises the question as to whether some pediatric dentists are performing a toothbrush/dental floss prophylaxis and billing the insurance company for a “prophylaxis,” which is generally defined as the use of pumice and rubber cup.

Another issue is the effect, on the enamel pellicle and outer zone of fluoride-rich enamel with frequent use (every 6 months), of a pumice and rubber cup prophylaxis used by most board-certified pediatric dentists. Evidence suggests that such use not only removes the protective enamel pellicle, but also the outer few microns of enamel which is fluoride-rich as a result of exposure to fluoride during both enamel formation and in the oral environment (fluoride dentifrices and water fluoridation). The scientific evidence suggests that the child is potentially rendered more susceptible to dental caries as a result of this common procedure.

Parents have come to accept that cleaning of their children’s teeth every 6 months with a rubber cup and pumice is therapeutic, a benefit to the child’s oral health, and will be performed regularly. Yet, the scientific evidence does not support the need for or benefit of such a procedure. Plaque removed by a professional is the same plaque that must be removed daily by the child and parent with a toothbrush and dental floss. It is the same plaque that forms again in 24 to 36 hours after removal by the child or pediatric dentist. This raises the question as to whether the significant professional fee assessed (in the \$40 range) for either type of professional cleaning, in the absence of extrinsic staining or calculus, is justified on the basis of cost/benefit analysis. By continuing to offer and encourage this procedure, pediatric dentists are reinforcing to the parent that the professional cleaning of the teeth has unique therapeutic value. Ironically, the literature would seem to suggest the opposite is true.

It should be noted that the AAPD guidelines suggest that the rubber cup/pumice prophylaxis can be a valuable tool in introducing the child to rotary instruments. While this may be an advantage in initial behavior management, such would be a one-time use of the procedure, not a routine component of continuing recall appointments.

Teaching children how to properly brush with a fluoride dentifrice and floss between their teeth is of significant value in a program of prevention. This study documented that pediatric dentists are providing such care in their offices. All pediatric dentists surveyed reported providing oral

hygiene instructions for their patients and parents. In almost all practices, instructions were directed to both the parent and child. In the majority of practices (73%), instructions were given by the dental hygienist or dental assistant; only 27% of the time did the pediatric dentist provide them. Interestingly, only 39 of the surveyed pediatric dentists charged for oral hygiene instructions. This may be due to third-party payers' unwillingness to reimburse for such activities.

It appears that the system of reimbursement, operationally, creates a barrier for the transfer of science to practice and for the practice of evidenced-based preventive dentistry. However, professional organizations such as the ADA and the AAPD have a duty, to both society and the professionals they serve, to develop appropriate practice guidelines based on scientific evidence. Furthermore, they have an obligation to advocate that third-party payers provide reimbursements that are appropriate based on the value of the service rendered. The failure to reimburse for oral health education/promotion and oral hygiene instruction, which are of significant benefit to the child, leads to a shifting of such costs to the questionable use of the professional "prophylaxis."

Conclusions

1. Board-certified pediatric dentists, in general, do not conduct their periodic oral examinations (recalls) based on specific criteria of individual need, such as suggested by the caries risk guidelines of the ADA and the recently developed AAPD caries risk assessment tool. Rather, they appear to establish office protocols that result in the re-examination of each child every 6 months. This may be due to reimbursement policies of third-party payers.
2. Essentially all responding pediatric dentists routinely perform a professional cleaning of children's teeth at the regular 6-month recall and charge a significant fee for this service. The cost/benefit of doing so, apart from it being a component of reinforcing oral hygiene instructions, is questionable.
3. Most pediatric dentists use pumice and rubber cup to accomplish the professional cleaning, in spite of evidence that doing so potentially injures the teeth by removing the protective enamel pellicle and outer fluoride-rich layer of enamel. They indicated they do so because it is the type of cleaning procedure for which third-party payers will reimburse.
4. All pediatric dental practices provide oral hygiene instruction, typically by dental auxiliaries.

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ABSTRACT OF THE SCIENTIFIC LITERATURE



CLINICAL TRIAL OF A SELF-ETCHING ADHESIVE FOR SEALANT APPLICATION: SUCCESS AT 24 MONTHS WITH PROMPT-L-POP

This is a clinical report of a 24-month follow-up evaluation of a self-etching primer (Prompt-L-Pop) as the sole etching and adhesive step prior to sealant application. This method was compared to a standard technique (phosphoric acid etch) in a split-mouth, matched-pair design study. Children 7 to 12 years old having contralateral pairs of newly erupted first or second permanent molars were enrolled (total=36 pairs). Sealant placement was performed under careful cotton roll isolation with a chairside assistant. Time to complete the treatment was recorded. Sealant retention was scored under rigorous criteria and performed by 2 observers blinded to the treatment method used at sealant placement after 1, 3, and 6 months and every 6 months until 24 months. A retention rate of 61% for occlusal surfaces for both methods was observed. For buccal/lingual surfaces, the retention rate was 62% for Prompt-L-Pop vs 54% for the standard technique. Time to perform the sealant using Prompt-L-Pop was short by one third than with phosphoric acid. The authors attributed the relatively low rates of success for both experimental and control groups to the strict criteria of failure used in the study.

Comments: Reduction in operative time and simplification of techniques maintaining high standards of care are always in the minds of dentists. Although more clinical and long-term studies are necessary to test the efficacy of this new method, the results presented are very encouraging. MG

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Feigal RJ, Quelhas I. Clinical trial of a self-etching adhesive for sealant application: Success at 24 months with Prompt-L-Pop. *Am J Dent*. 2003;16:249-251.

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