Evidence-Based Dentistry

Assessment of Evidence-Based Dental Prophylaxis Education in Postdoctoral Pediatric Dentistry Programs


Abstract: The objective of the study was to investigate various aspects of evidence-based dental prophylaxis education in postdoctoral pediatric dentistry training programs in the United States. An anonymous nationwide postal survey of fifty-two postdoctoral pediatric dentistry program directors was conducted in September 2001. The survey had a response rate of 75 percent with all geographic regions of the nation represented and with a preponderance of university-based programs (62 percent). Most of the training programs (74 percent) routinely recommended dental prophylaxis for all recall patients. The proportion of programs that recommended dental prophylaxis for the following indications were: plaque, stain and/or calculus removal—97 percent; caries prevention—59 percent; prior to topical fluoride application—67 percent; prior to sealant application—62 percent; and for behavioral modification—77 percent. Most training programs (77 percent) defined dental prophylaxis as both rubber cup pumice prophylaxis and toothbrush prophylaxis. However, only one-half of the training programs (51 percent) had modified their teaching to substitute toothbrush prophylaxis in lieu of rubber cup pumice prophylaxis. In conclusion, only one half of postdoctoral pediatric dentistry training programs in the United States teach evidence-based practice of dental prophylaxis for recall patients.

The American Academy of Pediatric Dentistry’s oral health policy on the role of prophylaxis in pediatric dentistry lists “several indications for a dental prophylaxis, including:
1. Removal of plaque from teeth.
2. Removal of extrinsic stains from teeth.
3. Polishing teeth after removal of calculus.
4. Facilitation of a thorough clinical oral examination.
5. Education and introduction of the child to dental procedures.”

The role of dental prophylaxis in caries prevention has been pivotal since Knutson in 1948 advocated rubber cup pumice prophylaxis of the teeth.

Key words: dental prophylaxis, evidence-based medicine, pediatric dentistry, dental education

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prior to professional topical fluoride application. The rationale was intuitively sound by logically assuming that removal of the organic material would promote fluoride uptake. However, in the epistemology of science as propounded by Karl Popper, "sound scientific knowledge is based on the development of testable hypotheses, that may then be falsified by the new evidence that emerges from the process of testing." Thus, "Popper's model emphasizes the provisional or contingent nature of scientific knowledge—even a Newton awaits his Einstein, and any beautiful theory is vulnerable to an ugly fact." Similarly, the veracity of the contention regarding the role of dental prophylaxis in caries prevention has not withstood scientific scrutiny.

The lack of a cariostatic benefit in performing a rubber cup prophylaxis as compared to toothbrushing prior to professional topical fluoride application has been conclusively established. Following a systematic review, the Canadian Task Force on the Periodic Health Examination found "good evidence to recommend that such (rubber cup) prophylaxis be excluded from periodic dental examinations." Further, the notion that the rubber cup prophylaxis has an independent caries preventive effect has also been refuted. The same Canadian task force said there was "poor evidence to include (rubber cup) prophylaxis in recall dental visits strictly to prevent caries." Moreover, far from being benign, the procedure might result in transient iatrogenic harm. It has been shown that performing a rubber cup prophylaxis results in the loss of the fluoride-rich enamel surface layer.

Rubber cup prophylaxis has also been advocated as a necessary step prior to acid etching for sealant application. This recommendation can be traced to a single study done by Miura et al. in 1973. Again, the scientific evidence indicates that performing pumice prophylaxis has no effect on sealant retention rates in vivo. Logically, the use of rubber cup pumice prophylaxis might assist in removing gross debris. But this can be done even with simple toothbrushing or cleaning the fissures with a sharp explorer followed by air-water rinse.

Although scientific evidence has accumulated against the universal use of rubber cup prophylaxis, the extent to which dental educators have modified their teaching of this procedure is not known. It has been noted that clinicians are slow to modify their practice, with the estimated half-life for change being forty-five years among surgeons and twenty years among physicians. Therefore, the objective of our study was to investigate various aspects of evidence-based dental prophylaxis education in U.S. postdoctoral pediatric dentistry training programs.

**Materials and Methods**

In September 2001, we sent an anonymous nationwide survey by first class mail to all fifty-two postdoctoral program directors in pediatric dentistry in the United States. The list of programs was obtained from the National Matching Services Inc.'s Preliminary List of Participating Institutions (Pediatric Dentistry) of the Postdoctoral Dental Matching Program for 2002-2003 Positions. We obtained the list from the service's website (www.natmatch.com/dentres/index.htm) on September 8, 2001. Each survey form was mailed along with a stamped and pre-addressed return envelope. No follow-up mailing was done. Responses received within six weeks of the mailing were included in the data set.

The five-item survey measured the following aspects of dental prophylaxis education in postdoctoral pediatric dentistry training programs:

1. Recommendation of dental prophylaxis for recall patients: Routine or Selective.
2. Indications (Yes or No) taught for recommending dental prophylaxis: plaque, stain and/or calculus removal; caries prevention; prior to topical fluoride application; prior to sealant application; and for behavioral modification.
3. Definition of dental prophylaxis: rubber cup pumice prophylaxis only, toothbrush prophylaxis only, or both.
4. Modification of dental prophylaxis education (Yes or No) to teach toothbrush prophylaxis in lieu of rubber cup pumice prophylaxis.
5. Demographic characteristics: university- or hospital-based program and geographic location as per the American Academy of Pediatric Dentistry's District classification scheme.

Conventionally, the term “dental prophylaxis” has referred to rubber cup prophylaxis using pumice (prophy) paste. However, the American Academy of Pediatric Dentistry has observed that “dental prophylaxis can be performed using a brush or rotary cup.” In contemporary pediatric dental practice, the term has been used to mean both rubber cup pumice prophylaxis and toothbrush prophylaxis. This study was thus circumstantially limited by this ambiguity about the definition of the term. However, a twofold attempt was made to overcome this perceived problem by asking the respondents:
• their definition of dental prophylaxis, and
• whether their training program had modified the
teaching of dental prophylaxis to substitute tooth-
brush prophylaxis in lieu of rubber cup pumice
prophylaxis.

Frequency distribution analyses and Chi-square
tests were performed. Statistical significance was set
at p=0.05.

Results

Thirty-nine questionnaires were returned for a
response rate of 75 percent. Both types of training
programs were well represented. Twenty-four of
thirty-five university-based programs responded, and
fourteen of seventeen hospital-based programs re-
sponded. One respondent did not indicate his or her
program type.

All the geographic regions of the United States
were represented as denoted by the response tabu-
lated using the following American Academy of Pe-
diatric Dentistry District classification scheme:
District I (CT, ME, MA, NH, NY, RI, VT) = 9/14
District II (DE, DC, MD, NJ, PA) = 6/7
District III (AL, FL, GA, KY, MS, NC, SC, TN,
VA, WV, PR) = 7/8
District IV (IL, IN, IA, OH, MI, MN, NE, ND,
SD, WI) = 8/11
District V (AR, CO, KS, LA, MO, NM, OK, TX) = 6/6
District VI (AK, AZ, CA, HI, ID, MT, NV, OR,
UT, WA, WY) = 3/6

The denominator refers to the total number of
training programs surveyed in each district.

Most of the training programs (74 percent) rou-
tinely recommended dental prophylaxis for all recall
patients. Almost all of the programs (97 percent)
taught dental prophylaxis for plaque, stain and/or
calculus removal. A majority of them advocated den-
tal prophylaxis for caries prevention (59 percent),
 prior to topical fluoride application (67 percent), prior
to sealant application (62 percent), and for behav-
ioral modification (77 percent).

Most training programs (77 percent) defined
dental prophylaxis as both rubber cup pumice pro-
phylaxis and toothbrush prophylaxis. However, only
one half of the programs (51 percent) had modified
their teaching to substitute toothbrush prophylaxis
for rubber cup pumice prophylaxis. Further, one third
of the programs (36 percent) persisted with unmodi-
ied teaching of rubber cup pumice prophylaxis even
as they routinely recommended dental prophylaxis
for all recall patients.

Notable proportions of the training programs
had not modified their teaching to substitute tooth-
brush prophylaxis in lieu of rubber cup pumice pro-
phylaxis, even as they taught dental prophylaxis for
caries prevention (26 percent), prior to topical fluo-
ride application (36 percent), and prior to sealant ap-
lication (33 percent).

There were no differences between university-
based and hospital-based training programs in their
routine/selective recommendations of dental prophy-
laxis for recall patients; definition of dental prophyl-
xaxis; or modification of teaching to substitute tooth-
brush prophylaxis for rubber cup pumice prophylaxis.

Discussion

Three-fourths of the training programs in our
study routinely recommended dental prophylaxis for
all recall patients. At first glance, this teaching ap-
pears contrary to the American Academy of Pedia-
tric Dentistry’s recommendation that advocates “the
continuity of care based on the individualized needs
of the child.” However, a closer look suggests that
these training programs may not be at variance with
their specialty organization’s norm. Rather, the
misperception may be due to the ambiguity of the
term “dental prophylaxis.” Three out of four training
programs defined dental prophylaxis as both rubber
cup pumice prophylaxis and toothbrush prophylaxis.
Therefore, it is possible that their teaching of tooth-
brush prophylaxis as part of preventive positive re-
inforcement for the child at recall visits might have
resulted in this misperception. This data buttresses
a recently expressed viewpoint highlighting the need
to precisely define the term to distinguish rubber cup
prophylaxis from toothbrush prophylaxis.15

Another possible reason for the high propor-
tion of programs routinely recommending dental pro-
phylaxis for all recall patients might be the uniform-
ity of their patient populations. A 1997 survey of
postdoctoral pediatric dentistry program directors
found that two-thirds of patients in the training pro-
grams were Medicaid (low-income) patients.16 Chil-
dren from low-income families have a higher prevan-
ance of dental caries and thus can be considered at
high risk for the disease. It is, therefore, plausible that these high-risk children were being routinely prescribed dental prophylaxis—either a toothbrush prophylaxis as a health promotion measure or a rubber cup prophylaxis on the misguided notion that it is a caries prevention measure.

Almost all of the training programs taught that plaque, stain and/or calculus removal was an indication for dental prophylaxis, while three out of four programs taught dental prophylaxis for behavioral modification. These practices are in accordance with the American Academy of Pediatric Dentistry’s policy on the role of prophylaxis in pediatric dentistry. However, despite that endorsement, the evidence of the positive role of dental prophylaxis for behavioral modification remains anecdotal for the most part. Further, a randomized controlled trial demonstrated no measurable beneficial effect of an introductory rubber cup prophylaxis on child anxiety. But then again, the results of a single randomized controlled trial in twenty-seven matched pairs of children must be interpreted with caution.

Three out of five training programs taught dental prophylaxis for caries prevention. This reflects a concept initially promoted in the 1970s based on studies involving intensive rubber cup pumice prophylaxis at two-week to one-month intervals. However, this cariostatic effect of the rubber cup prophylaxis reportedly diminishes as the interval between the prophylaxes is increased. Further, intensive rubber cup prophylaxis was more effective in reducing caries on approximal tooth surfaces than on the occlusal surfaces of the teeth. The decline in dental caries among U.S. children has been disproportionate, with a greater reduction on the approximal surfaces of the posterior teeth than the pit and fissure surfaces. Therefore, the provision of semi-annual rubber cup pumice prophylaxis for caries prevention retains no scientific validity in contemporary practice. The Canadian Task Force on the Periodic Health Examination has aptly observed that there is “poor evidence to include (rubber cup) prophylaxis in recall dental visits strictly to prevent caries.”

Two-thirds of the training programs recommended dental prophylaxis prior to professional topical fluoride application. However, it has been shown that there is no cariostatic benefit of performing a rubber cup prophylaxis as compared to toothbrushing prior to topical fluoride application. It is likely that some of the training programs recommending dental prophylaxis prior to topical fluoride application might be referring to toothbrush rather than rubber cup prophylaxis. But it is certain that other training programs were recommending rubber cup prophylaxis since one-third of them taught dental prophylaxis prior to topical fluoride application even though they had not modified their teaching to substitute toothbrush for rubber cup pumice prophylaxis.

The situation regarding sealants is comparable. Three out of five training programs in our study advocated dental prophylaxis prior to the application of sealants. It has been shown that undertaking pumice prophylaxis prior to the sealant procedure has no effect on sealant retention rates in vivo. It is possible that some of the training programs were referring to toothbrush prophylaxis when recommending dental prophylaxis prior to dental sealants. However, it is certain that other training programs were recommending rubber cup prophylaxis since one-third of them taught dental prophylaxis prior to sealant application even though they had not modified their teaching to substitute toothbrush for rubber cup pumice prophylaxis. This notion of inappropriate teaching of pumice prophylaxis prior to the placement of sealants is confirmed by a recent study reporting that more than half (55 percent) of pediatric dentistry departments in U.S. dental schools cleaned teeth with pumice/paste prior to sealant application.

Traditionally the term “dental prophylaxis” has been used to refer to rubber cup prophylaxis. But of late, it has also referred to toothbrush prophylaxis. Therefore, there exists some uncertainty in interpreting the results of the present study due to this semantic ambiguity. But one-half of the training programs did report that they had not modified their teaching to substitute toothbrush for rubber cup pumice prophylaxis. Therefore, it is clear that some of the training programs have continued traditional advocacy of rubber cup prophylaxis in caries prevention, prior to professional topical fluoride application, and prior to the application of sealants. This finding is similar to another evidence-based assessment wherein a majority of the pediatric dentistry departments in U.S. dental schools “reported that they placed sealants regardless of the child’s caries risk, especially when permanent molars were considered.”

It appears that a proportion of the training programs we surveyed were not in synchrony with American Academy of Pediatric Dentistry policy and/or evidence-based recommendations. Some of the programs were teaching contrary to the specialty organization’s stand to promote individualized rather
than standardized preventive pediatric dental care.\(^1\)

One-third of the training programs persisted with unmodified teaching of rubber cup pumice prophylaxis even as they routinely recommended prophylaxis for all recall patients. This resistance to adopt the evidence-based paradigm by some dental educators does not bode well for the movement to make the foundations of clinical practice less dogmatic and more science-based. Dental organizations need to ensure conformity in teaching practices to develop a generation of practitioners uniformly groomed to meet contemporary clinical practice guidelines.

On a positive unequivocal note, one-half of the training programs in our study were teaching evidence-based practice of dental prophylaxis. And one out of four training programs reported teaching dental prophylaxis selectively for some recall patients. Given the recent advent of evidence-based practice, it was heartening to note this early adoption of the new paradigm by a sizeable proportion of the programs.

_conclusions_

The major findings of our study are:

- One-half of the postdoctoral training programs in pediatric dentistry teach evidence-based practice of dental prophylaxis.
- There is a need to precisely define “dental prophylaxis” to distinguish rubber cup pumice prophylaxis from toothbrush prophylaxis.

**references**