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Preventive Oral Health Intervention for Pediatricians

Section on Pediatric Dentistry and Oral Health

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American Academy of Pediatrics
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POLICY STATEMENT

Preventive Oral Health Intervention for Pediatricians

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Section on Pediatric Dentistry and Oral Health

ABSTRACT

This policy is a compilation of current concepts and scientific evidence required to understand and implement practice-based preventive oral health programs designed to improve oral health outcomes for all children and especially children at significant risk of dental decay. In addition, it reviews cariology and caries risk assessment and defines, through available evidence, appropriate recommendations for preventive oral health intervention by primary care pediatric practitioners. *Pediatrics* 2008;122:1387–1394

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Key Words
pediatric oral health prevention, oral health intervention

Abbreviation
PATF—professionally applied topical fluoride

PURPOSE/INTRODUCTION

Review of Circumstances Leading to Development of This Policy

Oral health is an integral part of the overall health of children.[1] Dental caries is a common and chronic disease process with significant consequences. As health care professionals responsible for the overall health of children, pediatricians frequently confront morbidity associated with dental caries. Because caries is a nonclassic infectious process (arising from shifts in subpopulation ratios of established normal flora), pediatricians have an opportunity to prevent, intervene, and, in collaboration with dental colleagues, manage this disease.

Justification of Policy

The prevalence of dental caries for the youngest of children has not decreased over the past decade, despite improvements for older children.[2] Data from the Medical Expenditure Panel Survey revealed that 89% of infants and 1-year-olds had office-based physician visits annually, compared with only 1.5% who had dental visits. Consequently, visits to physicians outnumbered visits to dentists at 250 to 1 for this age group.[3] Because the youngest of the pediatric patient population visit the pediatrician more than the dentist, it is critical that pediatricians be knowledgeable about dental caries, prevention of the disease, and interventions available to the pediatrician and the family.

Rationale for Format

This policy statement is an effort to assist the primary care pediatric practitioner in addressing issues of dental caries and general oral health. The statement begins by building a knowledge base regarding the caries process that can serve as a foundation for understanding prevention and intervention strategies. After explaining the science of cariology, assessment of caries risk is described to assist the pediatrician in deciding which preventive and interventional strategies need to be used. Specific prevention and intervention strategies are then described and explained.

In addition, the concept and importance of the dental home as well as strategies for improving the connection of the medical and dental homes are presented. Last, recommendations are provided to assist the pediatrician with implementation of the provided information.

BACKGROUND CONCEPTS

Cariology

The most common oral disease encountered by children is dental caries. Dental caries is a nonclassic infectious disease[4] that results from an interaction between oral flora and dietary carbohydrates on the tooth surface. To adhere to tooth structure, oral flora utilize dietary sugars to create a sticky biofilm that is referred to as dental plaque. Dietary sugar can change the biochemical and microbiologic composition of dental plaque. In the presence of a high-carbohydrate diet, cariogenic organisms constitute a greater portion of the total bacterial population.[5,6] Acids

produced by bacterial fermentation of carbohydrates reduce the pH of dental plaque to the point at which demineralization of the enamel occurs. The initial carious lesion appears as an opaque white spot on the enamel, and progressive demineralization results in cavitations of the teeth. Dental caries is a process, and loss of tooth structure (a dental cavity) is an end stage in the process.[7]

Human dental flora, generally regarded as qualitatively stable once established and site specific to human dentition, is believed to consist of more than 1000 different organisms, of which only a limited number are associated with dental caries.[8] *Streptococcus mutans* is most strongly associated with dental caries and is considered to be an indicator organism of a subpopulation of cariogenic organisms. *S mutans*, like its related cariogenic cohorts, has the ability to adhere to enamel and is uniquely equipped to produce significant amounts of acid (acidogenic) and endure within that acidic environment (aciduric).

Dental flora adheres to the teeth by creating a tenacious and highly complex biofilm referred to as dental plaque. Dental plaque is capable of concentrating dietary sugars; therefore, the chronic consumption of sugary foods and liquids will continually recharge the plaque matrix, resulting in copious supplies of sugars within the plaque matrix. *S mutans* and other cariogenic flora will then ferment available sugars, resulting in high levels of lactic acid, a decreased local pH (~5.0), and demineralization of dental enamel (at an approximate pH of ≤5.5). Because *S mutans* and its aciduric cohorts continue to thrive at low pH, the resulting environment selects against nonaciduric flora, creating a shift in the subpopulation ratio of benign to aciduric flora. As this process continues over multiple generations, aciduric organisms incur an upregulation of virulence genes that allow them to thrive at even lower pH (4.0). Diet-mediated shifts in subpopulation ratios of dental flora are instigated by significant sugar intake (environmentally selecting for carious organisms). Therefore, significant sugar intake is a driving cause of the caries process.

Preventive Strategies

An understanding of normal dental flora serves as a foundation for the development of preventive strategies, with 2 important considerations. First, dental flora exists in a symbiosis with the human species. Second, only a small number of the organisms within dental flora cause caries. Therefore, our objective is not to eliminate all dental flora but to suppress the cariogenic bacteria within the flora.

Preventive strategies can be differentiated into 2 distinct categories. Primary prevention involves optimization of maternal dental flora before and during colonization of the oral flora of the infant (during eruption of the primary dentition). This invaluable mode of prevention provides an opportunity for a reduction in the mother's constitutionally virulent, aciduric flora and downregulation of virulence genes within the aciduric flora, decreasing the child's risk of dental decay, and is the basis for first dental visit recommendations at 1 year or earlier made by various medical and dental organizations. This mode of prevention and its adjuncts are reviewed in detail in a policy statement from the American Academy of Pediatrics, "Oral Health Risk Assessment Timing and Establishment of the Dental Home."[9]

Secondary prevention is the continual and ongoing management of subpopulation ratios of benign and aciduric flora within dental plaque. This mode of prevention consists of managing the balance between causative factors and protective factors and is critical for preventing and reversing the caries process. Secondary preventive strategies are hierarchical and currently consist of dietary counseling, oral hygiene instruction, and judicious administration of fluoride modalities. Therefore, although all preventive modalities are important, modification of diet is most important, followed by oral hygiene compliance and then administration of fluorides.

By controlling risk factors before disease occurs, the probability of preventing disease, both in the immediate future and the long-term, is improved. Preventive strategies for this complex, chronic disease require a comprehensive and multifocal approach that begins with caries risk assessment.

Caries Risk Assessment

Caries risk assessment, based on developmental, biological, behavioral, and environmental factors, evaluates the probability of enamel demineralization exceeding enamel remineralization over time. The goal of risk assessment is to anticipate and prevent caries initiation before the first sign of disease. During the period of 1999–2002, 41% of US children 2 to 11 years of age had caries in primary teeth.[2] An earlier study noted that 25% of children 5 to 17 years of age had 80% of carious permanent teeth.[10] Assessing each child's risk of caries and tailoring preventive strategies to specific risk factors are necessary for improving oral health in a cost-effective manner.

Caries risk assessment is very much a work in progress. In a systematic review of literature regarding risk factors in primary teeth of children aged 6 years and younger, a paucity of studies of optimal (ie, longitudinal) design was noted.[11] A study that evaluated the reliability of multiple risk indicators determined that there is no consistent combination of risk variables that provide a good predictor of caries risk when applied to different populations across different age groups.[12] The authors concluded that the best predictor of caries in primary teeth was previous caries experience, followed by parents' education and socioeconomic status.[12] Although previous caries experience cannot be used as a risk indicator for the predentate or very young child, white-spot lesions, as precursors to cavities, can be considered analogous to previous caries experience when assessing the risk of a very young patient. An analysis of National Health and Nutrition Examination Survey (NHANES) III data revealed that children from households with low income levels are more likely to experience caries and have higher levels of untreated caries than their counterparts from higher-income households.[13] Collectively, children enrolled in Special Supplemental Nutrition Pro-

gram for Women, Infants, and Children (WIC) programs, Head Start, or Medicaid are at higher risk than are children in the general population.

Caries risk factors unique to infants and young children include perinatal considerations, establishment of oral flora and host-defense systems, susceptibility of newly erupted teeth, dietary transitioning from breast and bottle feedings to cups and solid foods, and establishment of childhood food preferences. Although preterm birth per se is not a risk factor, a child with low birth weight may require a special diet or have developmental enamel defects or disabilities that increase caries risk. Early acquisition of *S mutans* is a major risk factor for early childhood caries and future caries experience.[14] A reduction of the salivary level of *S mutans* in highly infected mothers can inhibit or delay colonization of their infants.[15] Although evidence suggests that children are most likely to develop caries if *S mutans* is acquired at an early age, this may be compensated in part by other factors such as good oral hygiene and a noncariogenic diet.[11] High-risk dietary practices seem to be established early, probably by 12 months of age, and are maintained throughout early childhood.[16] In addition to the amount of sugar consumed, frequency of intake is important.[17] Sugar consumption likely is a more significant factor for those without regular exposure to fluorides.[18] Children experiencing caries as infants and toddlers have a much greater probability of subsequent caries in both the primary and permanent dentitions.[19]

Early risk assessment targets infants and young children who traditionally have yet to establish a dental home. Unrecognized disease and delayed care can result in exacerbated problems, leading to more extensive, costly, and time-consuming care.

Risk-assessment strategies most applicable for screening purposes include those that are acceptable to patients, reliable, inexpensive, and performed easily and efficiently and require limited equipment/supplies. The American Academy of Pediatric Dentistry (AAPD) has developed a caries risk-assessment tool for use by dentists and primary care practitioners familiar with the clinical presentation of caries and factors related to caries initiation and progression (see www.aapd.org/media/Policies_Guidelines/P_CariesRiskAssess.pdf).[20] Radiographic assessment and microbiologic testing have been included in the caries risk-assessment tool but are not required. In addition, the American Academy of Pediatrics has created *Oral Health Risk Assessment Training for Pediatricians and Other Child Health Professionals*, which provides a concise overview of the elements of risk assessment and triage for infants and young children (see www.aap.org/commpeds/dochs/oralhealth/screening.cfm).[21]

The chronic, complex nature of caries requires that risk be reassessed periodically to detect changes in the child's behavioral, environmental, and general health conditions. All available data must be analyzed to determine the patient's caries risk profile. Periodic reassessment allows the practitioner to individualize preventive programs and optimize the frequency of recall and dental radiographic examinations.

SPECIFIC PREVENTIVE STRATEGIES

Dietary Counseling

Dietary counseling for optimal oral health in children should be an essential part of general health counseling. The recent policy statement from the American Academy of Pediatrics on prevention of pediatric overweight and obesity highlighted concerns about health problems in overweight children, including cardiovascular, endocrine, and mental health problems, and the importance of promoting healthy eating behaviors. Consumption of juice and sugar-sweetened beverages has been linked to childhood obesity and caries development.[22–25]

Sugars are a critical factor in caries development. Caries risk is greatest if sugars are consumed at high frequency and are in a form that remains in the mouth for longer periods.[26] Sucrose is the most cariogenic sugar, because it can form glucan, which enables bacterial adhesion to teeth and limits diffusion and buffering of acids. Although starch-rich foods pose a low caries risk, mixtures of finely ground, heat-treated starch and sucrose (eg, cereals, potato or corn chips) are also cariogenic.[27]

Human milk by itself does not promote tooth decay.[28] However, breastfed infants are at risk of caries when they receive sugary liquids or eat foods with sugars and fermentable carbohydrates.[26]

Parents and caregivers should be counseled on the importance of reducing exposure to sugars in foods and drinks. To decrease the risk of dental caries and ensure the best possible health and developmental outcomes, it is recommended that parents do the following:

- Breastfeed infants during the first year of life and beyond as is mutually desired.[29]
- After nursing, remove the breast from a sleeping infant's mouth and cleanse the gums and teeth after feedings and before bedtime.
- Discourage a child's sleeping with a bottle; any bottle taken to bed should contain only water.
- Limit sugary foods and drinks to mealtimes.
- Avoid carbonated beverages and juice drinks (juice drinks contain high-fructose corn syrup and <100% natural juice).
- Encourage children to drink only water and milk between meals.
- Encourage children to eat fruits.
- Limit the intake of 100% fruit juice to no more than 4 oz per day.
- Foster eating patterns that are consistent with MyPyramid guidelines from the US Department of Agriculture.[30]

Optimal Use of Fluorides

Fluoride, a naturally occurring element, has been instrumental in the widespread decrease in dental caries.[31,32] The mechanisms of fluoride are both topical and systemic, with evidence pointing to a greater topical effect.[33]

Fluoride reduces enamel dissolution while it encourages remineralization.[34] Antimicrobial effects of fluorides at low pH are also significant.[35]

The delivery of fluoride includes community-based, professionally applied, and self-administered modalities. Water fluoridation is a community-based intervention that optimizes the level of fluoride in drinking water, resulting in preeruptive and posteruptive protection of the teeth.[36] Water fluoridation is a cost-effective means of preventing dental caries, with the lifetime cost per person equaling less than the cost of 1 dental restoration.[37,38] In short, fluoridated water is the cheapest and most effective way to deliver anticaries benefits to communities.

Professionally applied topical fluorides (PATFs) have their greatest effect preventing caries and must be applied at regular intervals.[39] PATFs include gel, foam, in-office rinse, and varnish. PATFs are safe and efficacious, with varnishes having the advantage of adherence to the tooth surface, decreasing likelihood of ingestion, and increasing time of contact between the fluoride and tooth surface.[37,39] In the primary dentition, varnish effectiveness (measured by percent of caries reduction) ranges from 30% to 63.2%,[40,41] and an analysis of the number of fluoride-varnish applications received resulted in a dose-response effect that was enhanced when coupled with counseling.[42] Finally, self-administered fluorides, including dietary fluoride supplementation and fluoridated toothpaste, have proven effective, providing low but protracted elevation of fluoride concentrations.[35,43] Caries reduction associated with self-administered fluoride supplementation ranges from 32% to 72% in the primary dentition.[40] In children and adolescents, fluoride toothpastes, mouth rinses, and gels reduce dental caries to a similar extent.[44]

The decision to use fluoride therapies must balance the risk of caries against the risk of enamel fluorosis (hypomineralization of the developing enamel caused by excess fluoride ingestion). Patients determined to be at increased risk of dental caries are candidates for more aggressive fluoride therapy utilization. Caries susceptibility and sources of dietary fluoride (eg, water supplies, beverages, prepared food, toothpaste) should be considered before recommending fluoride therapies.[45–48] Enamel fluorosis develops before tooth maturation and emergence, typically in children younger than 8 years.[49] The risk of enamel fluorosis is an aesthetic concern, with very mild or mild forms most commonly observed in the general population.[2,50]

ANTICIPATORY GUIDANCE

Anticipatory guidance is the process of providing practical, developmentally appropriate information about children's health to prepare parents for significant physical, emotional, and psychological milestones.[51] Anticipatory guidance during well-child visits is an effective tool to educate parents about maintaining children's health. Mirroring the pediatric model, the American Academy of Pediatric Dentistry advocates oral health anticipatory guidance.[52–55] Anticipatory guidance focused on oral health disease should be an integral part of preventive pediatrics. Information concerning the impact of diet on dental health and counseling in regards to oral hygiene, nonnutritive oral habits, and dental safety should be shared with parents. Therefore, in addition to dietary counseling and optimizing fluoride exposure, anticipatory guidance for oral health includes:

1. Infant oral hygiene instruction: Teeth should be brushed at least twice daily with caregiver supervision and assistance for children. For children with elevated dental caries risk, consider using a pea-sized amount of toothpaste or an amount equivalent to the child's fifth-digit fingernail. Flossing should begin as soon as adjacent teeth are in contact and for surfaces at which 2 teeth touch and they can no longer be cleansed with a toothbrush.
2. Counseling regarding nonnutritive oral habits: Use of pacifiers in the first year of life may prevent sudden infant death syndrome.[56] Sucking habits (eg, pacifiers or digits) of sufficient frequency, duration, and intensity may be associated with dentoalveolar deformations. Some changes persist past cessation of the habit. Professional evaluation is indicated for nonnutritive sucking habits that continue beyond 3 years of age.[53]
3. Age-appropriate information regarding dental injury prevention: Parents should cover sharp corners of household furnishings at the level of walking toddlers, ensure use of car safety seats, and be aware of electrical cord risk for mouth injury. Properly fitted mouth guards are indicated for youths involved in sporting activities that carry a risk of orofacial injury.

Anticipatory guidance is valuable, because it emphasizes prevention of dental problems rather than surgical or restorative care. Anticipatory guidance and well-child visits during the first 2 years of life decrease the number of hospitalizations among poor and near-poor children irrespective of race and health status.[57] Oral health anticipatory guidance can reduce dental expenditures.[58] In light of this evidence, oral health anticipatory guidance should be integrated as a part of comprehensive counseling during well-child visits.[59]

INTERPROFESSIONAL COLLABORATION AND ESTABLISHMENT OF A DENTAL HOME

To be successful in preventing dental disease, interventions must begin within the first year of life. Pediatricians are well positioned to initiate preventive oral health care by providing early assessment of risk, anticipatory guidance, and timely referral to establish a dental home. The American Academy of Pediatric Dentistry, the American Dental Association, and the American Association of Public Health Dentistry recommend that infants be scheduled for an initial oral examination within 6 months of the eruption of the first primary tooth but by no later than 12 months of age.

The pediatric community promotes the concept of a medical home to improve families' care utilization, seeking appropriate and preventive services with optimal compliance to recommendations. The concept of the

dental home is based on this model and is intended to improve access to oral care. A dental home is the ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family-centered way.[52,60,61] A dental home should be able to provide the following:

1. an accurate risk assessment for oral diseases and conditions;
2. an individualized preventive dental health program based on risk assessment;
3. anticipatory guidance about growth and development issues (eg, maxillofacial and dentoalveolar development);
4. a plan for emergency dental trauma management;
5. information regarding care of teeth and oral soft tissues;
6. nutrition and dietary counseling;
7. comprehensive oral health care in accordance with accepted guidelines and periodicity schedules for pediatric oral health; and
8. referrals to dental specialists such as endodontists, oral surgeons, orthodontists, and periodontists when care cannot be provided directly within the dental home.

Lack of access to dental care can be a barrier to establishment of a dental home. Because of the specialized training and expertise, the dentist provides an ideal dental home; however, when a dentist is not available, the pediatric medical provider should fulfill the dictates of preventive oral health care until a dentist can be accessed and a dental home can be established. Therefore, primary care pediatric practitioners are an integral community component in the overall effort to address oral health issues (eg, access to care, preventive intervention). With the continuing challenges of access to dentistry coupled with preschool-aged children making many more visits to medical offices than to dental offices, primary care practitioners with oral health training have reported that they have provided preventive oral health services for their pediatric patients.[51,52] North Carolina primary care practitioners were able to integrate preventive dental services into their practices, increasing preventive services for young children who receive Medicaid benefits and whose access to dentists is restricted (eg, geographically or because of nonparticipation of dentists).[62] Often, the first step of timely establishment of a dental home is a referral from the physician. Although a report from the US Preventive Services Task Force on physicians' roles in preventing dental caries in preschool-aged children found referral by a primary care practitioner only partially effective in increasing dental visits,[40] another study[63] reported that dentists were more likely to see young children referred by primary care practitioners.

Primary care practitioners are able to identify children in need of a referral to a dentist.[64] After 2 hours of training in infant oral health, primary care pediatric practitioners accurately identified children with cavities with good specificity (92%–100%) and sensitivity (87%–99%).[40,63] These results suggest that dental screening can be incorporated into a busy pediatrics practice and that primary care pediatric practitioners can contribute significantly to the overall oral health of young children by encouraging parents to enroll their children in a dental home as early as possible.

In summary, the ideal setting for administration of oral health care is the dental home. When there is no access to a dentist, the pediatric medical provider should consider administering risk-based preventive oral health measures until a dental home can be made available. With preparation, primary care practitioners are routinely able to screen accurately and provide oral health anticipatory guidance for children. Furthermore, they are ideally positioned to refer children to a dental home in a timely manner. Establishing collaborative relationships between physicians and dentists at the community level is essential for increasing access to dental care for all children and improving their oral and overall health.

RECOMMENDATIONS FOR PRIMARY CARE PEDIATRIC PRACTITIONERS

1. An oral health risk assessment should be administered periodically to all children.
2. Oral health risk-assessment training should be recommended for medical practitioners who are in training programs and those who currently administer care to children.
3. Dietary counseling for optimal oral health should be an intrinsic component of general health counseling.
4. Anticipatory guidance for oral health should be an integral part of comprehensive patient counseling.
5. Administration of all fluoride modalities should be based on an individual's caries risk. Patients who have a high risk of caries are candidates for consideration of more intensive fluoride exposure after dietary counseling and oral hygiene instruction as compared with patients with a lower risk of caries (see Figs 1 and 2).
6. Supervised use of fluoride toothpaste is recommended for all children with teeth.
7. The application of fluoride varnish by the medical practitioner is appropriate for patients with significant risk of dental caries who are unable to establish a dental home.
8. Every child should have a dental home established by 1 year of age.
9. Collaborative relationships with local dentists should be established to optimize the availability of a dental home.

CONCLUSIONS

Oral health is an integral part of the overall health and well-being of children. A pediatrician who is familiar

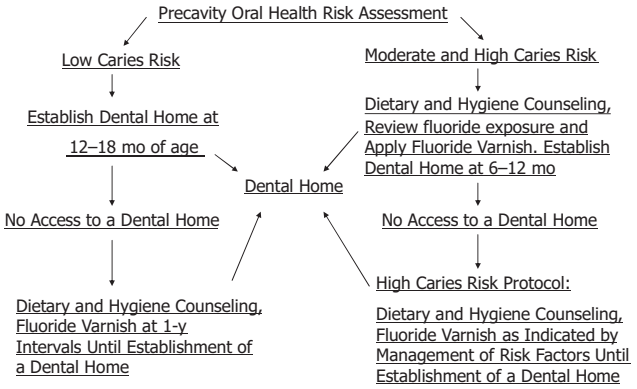

FIGURE 1
Pediatric medicine: oral health intervention algorithm.

- Appoint patient at 1-mo intervals × 3.
- Review dietary intake of sugars sources (juices, etc) at each appointment.
- Assess oral hygiene at each appointment, (plaque/inflammation).
- Review fluoride exposure and apply fluoride varnish at each appointment if risk factors persist.
- At the third 1-mo visit, if all risk factors are well managed: Reappoint at 3 mo, review diet, hygiene, fluoride exposure, and apply fluoride varnish. If risk factors are not controlled: Continue with 1-mo recalls until risk factors are managed.
- At 3-mo recall interval, if all risk factors are well managed: Reappoint every 6 mo, review diet, hygiene, fluoride exposure, and apply fluoride varnish.

FIGURE 2
High caries risk protocol.

with the science of dental caries, capable of assessing caries risk, comfortable with applying various strategies of prevention and intervention, and connected to dental resources can contribute considerably to the health of his or her patients. This policy statement, in conjunction with the oral health recommendations of the American Academy of Pediatrics *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*, 3rd edition,[65] serves as a resource for pediatricians and other clinicians to be knowledgeable about addressing dental caries. With dental caries being such a common and consequential disease process in the pediatric population, it is essential that pediatricians include oral health in their daily practice of pediatrics.

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