CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care

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Maintaining and Improving the Oral Health of Young Children

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Oral health is an integral part of the overall health of children. Dental caries is a common and chronic disease process with significant short- and long-term consequences. The prevalence of dental caries remains greater than 40% among children 2 to 19 years of age. Although dental visits have increased in all age, race, and geographic categories in the United States, disparities continue to exist, and a significant portion of children have difficulty accessing dental care. As health care professionals responsible for the overall health of children, pediatricians frequently confront morbidity associated with dental caries. Because the youngest children visit the pediatrician more often than they visit the dentist, it is important that pediatricians be knowledgeable about the disease process of dental caries, prevention of disease, interventions to maintain and restore health, and the social determinants of children's oral health.

INTRODUCTION

Dental caries is the most common chronic disease of childhood, despite increased dental visits.[1] Twenty-three percent of US children 2 to 5 years of age, 52% of children 6 to 8 years of age, and 57% of youth 12 to 19 years of age have caries.[2] Total prevalence of dental caries in youth 2 to 19 years of age in 2015 to 2017 was 45.8%.[3] Significant disparities persist in the receipt of childhood preventive dental care, with young children, uninsured children, children living in poverty, non-Hispanic Black children, children from non–English-speaking households including immigrants and refugees, and children with special health care needs less likely to receive needed preventive oral health care.[2–5] American Indian/Alaska Native children have the highest rates of dental caries in the United States.[6] The reasons for these disparities are multifactorial and further explained in the Indian Health Service Data Brief "Oral Health of American Indian and Alaska Native Children Aged 1–4 Years: Results of the 2018–19 IHS Oral Health Survey" and in the American Academy of Pediatrics (AAP) policy

abstract

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statement "Early Childhood Caries in Indigenous Communities," which focuses on the specific challenges within this population.[6,7] There have been slight improvements over time. There has been a 10-percentage point decrease in untreated tooth decay in the primary teeth of children 2 to 5 and 6 to 8 years of age and the permanent teeth of adolescents 12 to 19 years of age when comparing 2011–2016 data with 1999–2004. Mexican American children, children near the poverty line, and children below the poverty line saw improvements in untreated tooth decay; however, disparities continue to persist.[2]

THE ETIOLOGY AND PATHOGENESIS OF DENTAL CARIES

A dynamic process takes place at the surface of the tooth that involves constant demineralization and remineralization of the tooth enamel (the caries balance).[8,9] Multiple factors affect that dynamic process and can be manipulated in ways that tip the balance toward disease (demineralization) or health (remineralization). These factors include bacteria, sugar, saliva, and fluoride. Because these factors can be manipulated, it is possible for pediatricians and families to prevent, halt, or even reverse the disease process.

Different oral structures and tissues have different and distinct microbial communities (microbiomes).[10] The oral microbiome at the surface of the tooth is referred to as dental plaque. During the disease process of dental caries, bacteria that are aciduric and acidogenic predominate in the dental plaque. *Streptococcus mutans* is most commonly associated with dental caries, although a larger pathogenic community exists.[11] When environmental factors make it possible to select for these pathogenic bacteria in dental plaque, the disease process begins.

A key environmental factor that allows for selection and proliferation of these pathogenic bacteria is dietary sugar intake. Because these bacteria have the ability to ferment sugars, produce acid, and decrease the pH of the dental plaque, they make possible the selection of other aciduric, acidogenic bacteria that will contribute to disease. As more bacteria produce more acid, the pH at the surface of the tooth decreases. This process causes the demineralization of the tooth enamel. Unimpeded, these long periods of low pH and demineralization will result in cavitation.

Saliva is an important factor in buffering the low pH and bringing these demineralization pressures back to a balance with remineralization.[12] In addition to acting as a buffering agent, saliva also flushes the oral cavity of food particles, provides an environment rich in calcium and phosphate to aid in remineralization, and includes proteins that have antimicrobial activity. When salivary flow is impeded (eg, by disease, iatrogenic), the pH is able to decrease to a lower level, tipping the scales toward demineralization (disease). In addition, the time it takes to buffer back to a normal pH is longer.[12]

Another important factor that can affect the balance of demineralization and remineralization is fluoride. More in-depth reviews of fluoride are available elsewhere.[13–15] It is important, however, for pediatricians and other child health care providers to understand how fluoride influences the caries balance. Fluoride has 3 key effects on the caries balance: (1) inhibition of demineralization at the tooth surface, (2) enhancement of remineralization, which results in a more acid-resistant tooth surface, and (3) inhibition of bacterial enzymes.[15] The primary effect of fluoride is topical, via fluoridated toothpastes, mouth rinses, varnishes, and silver diamine fluoride, although there is still value in systemic fluoride exposures via fluoridated water and supplements.[15–17]

PREVENTIVE STRATEGIES

Caries Risk Assessment

Ideally, primary prevention efforts will anticipate and prevent caries before the first sign of disease. Preventive strategies for this multifactorial, chronic disease require a comprehensive and multifocal approach that begins with caries risk assessment. Assessing each child's risk of caries and tailoring preventive strategies to specific risk factors are necessary for maintaining and improving oral health. There is no single tool that takes into consideration all risk factors and accurately predicts an individual's susceptibility to caries. However, pediatricians can monitor oral health, both in the office and via telehealth, by focusing on the key risk factors for dental caries associated with diet, bacteria, saliva, and status of the teeth (ie, current and previous caries experience). Consistent with *Bright Futures* guidelines, pediatricians can perform an oral health screening examination of the mouth at each well-child visit to look for signs of caries. Each visit is an opportunity to assess risk, discuss risk reduction, modify behaviors, and identify goals for improving oral health. The AAP/*Bright Futures* Oral Health Risk Assessment Tool, which includes photographs of clinical findings on the examination of the oral cavity, can be found at https://downloads.

aap.org/AAP/PDF/oralhealth_RiskAssessmentTool.pdf.18.

Sugars (but not sugar substitutes) are a critical risk factor in the development of caries.[19,20] This does not include sugars that are naturally occurring and present in whole fruit and vegetables or dairy products. The risk of caries is greatest if sugars are consumed at high frequency (and, thus, high amount) and are in a form that remains in the mouth for long periods of time.[19] Examples of key behaviors that place a child at high risk for caries include continual bottle/sippy cup use (with fluids other than water), sleeping with a bottle (with fluids other than water), frequent between-meal snacks of sugars/cooked starch/sugared beverages, sticky foods (raisins, fruit snacks, and gummy vitamins for example), and frequent intake of sugared medications.

The most important and predictive risk factor for caries is previous caries experience. This finding is not surprising, considering the factors that initiated the disease process often continue to exist over time. Early acquisition of *S. mutans* is also a major risk factor for early childhood caries and future caries experience.[21] Strong evidence demonstrates that mothers are a primary source of *S. mutans* colonization for their children (eg, utensil sharing, cleaning pacifier with mouth).[22] Thus, an important factor associated with caries risk in young children is the recent or current presence of active dental decay in the primary parent/caregiver. Because it is likely that bacteria will be vertically transmitted, prevention, diagnosis, and treatment of oral diseases in the child's parent/caregiver are highly beneficial, especially during pregnancy. Dental care and treatment can be provided and is encouraged during pregnancy. There is no additional fetal or maternal risk compared with the risk of not providing dental care.[23]

Abnormalities in salivary flow and the structure of the teeth are associated with caries development. Diseases (eg, diabetes mellitus, Sjögren's syndrome, cystic fibrosis) and medications (eg, antihistamines, anticonvulsants, antidepressants) result in xerostomia (decreased salivary flow). Xerostomia causes reduced availability of saliva to buffer the acid produced by pathogenic bacteria, thus enhancing their ability to damage the tooth enamel. Variations in the anatomic structure of the teeth can also increase the risk of decay. For example, teeth with enamel defects, frequently found in children born preterm, are at increased susceptibility for disease, as are molars with deep pits and fissures. Finally, there is increasing evidence of an association between secondhand smoke exposure and dental caries in children.[24,25]

Anticipatory Guidance

Pediatricians can target anticipatory guidance to assist families in preventing dental caries by having a clear understanding of its etiology and the risk factors that lead to and facilitate the spread of this disease. Because the disease of dental caries is multifactorial, anticipatory guidance can also be multifaceted, with a focus on decreasing the risk of disease.

Dietary Counseling

Because intake of sugars is such an important risk factor for dental caries, pediatricians can incorporate anticipatory guidance associated with preventing dental caries into conversations about dietary habits and nutritional intake. Risk of caries may be lower with exclusive breastfeeding for 6 months and continued breastfeeding as complementary foods are introduced for 1 year or longer, as mutually desired by the infant and breastfeeding parent.[26] To decrease the risk of dental caries and increase the chances for the best possible health and developmental outcomes, pediatricians can educate and provide guidance to families on establishing a bedtime routine conducive to optimal oral health (eg, the AAP Brush, Book, Bed program for parents).[27,28] Pediatricians can discourage parents/caregivers from putting a child to bed with a bottle to limit sugars on the teeth after brushing and encourage them to wean infants from a bottle by 1 year of age. Parents/caregivers can be counseled on the importance of reducing the frequency of exposure to added sugars in foods and drinks.[29] By limiting the amount and frequency of intake of foods with added sugars, as well as avoiding sugared beverages and juice drinks, caries risk is decreased. Pediatricians can encourage children to drink only water between meals, preferably fluoridated tap water, while discouraging 100% juice intake before 1 year of age, limiting juice to 4 ounces daily for children 1 to 3 years of age and to 4 to 6 ounces daily for children 4 to 6 years of age.[30] Lastly, providers can counsel families to foster eating patterns consistent with guidelines from the US Department of Agriculture.[31]

Oral Hygiene

The value of good oral hygiene lies in controlling the levels and activity of disease-causing bacteria in the oral cavity and delivering fluoride to the surface of the tooth. It is important to remember that pathogenic bacteria can be passed from parent/caregiver to child.[22] Thus, anticipatory guidance for both parent/caregiver and child is important. Pediatricians can encourage parents/caregivers to

model and maintain good oral hygiene, including regular brushing, flossing, and having a relationship with their own dental provider. Parents/caregivers should be counseled on brushing of a child's teeth twice a day as soon as the teeth erupt with a grain-of-rice–sized amount of fluoridated toothpaste. After the third birthday, a pea-sized amount can be used. Pediatricians can also encourage parent/caregiver assistance and supervision of brushing children's teeth until mastery is obtained, usually at around 10 years of age.[32,33]

Fluoride

The delivery of fluoride to the teeth includes community-based options (water fluoridation), self-administered modalities (fluoride toothpaste, rinses, and supplements), and professional applications (fluoride varnish and silver diamine fluoride). Fluoride is a critically important primary care preventive measure for families, especially those who do not have early and/or consistent ongoing dental care. As part of well-child anticipatory guidance, pediatricians can assess fluoride intake at each preventive visit, including the consumption of fluoridated tap water, and encourage families to protect their child's teeth with regular delivery of oral and topical fluoride.

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.[34] 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.[35,36] Most bottled waters do not contain an adequate amount of fluoride. Many families at higher risk for dental caries consume primarily bottled water, reducing potential exposure to fluoridated tap water. Fluoride supplements can be prescribed for children 6 months or older whose primary source of drinking water is deficient in fluoride.[16]

Fluoride toothpaste is an important way to deliver fluoride to the surface of the tooth. Fluoride toothpaste has been shown to be effective in reducing dental caries in both primary and permanent teeth.[37,38] Fluoride mouth rinses are another strategy for topical fluoride application and are associated with reduction in caries in the permanent teeth of children and adolescents, most particularly in a school setting.[39]

Fluoride varnish is a professionally applied, sticky resin of highly concentrated fluoride. Application of fluoride varnish 2 to 4 times a year, to either the primary or permanent teeth, is associated with a substantial reduction in dental caries.[40,41] In most states, pediatricians can apply fluoride varnish onto the teeth of young children and be paid for the service. The US Preventive Services Task Force recommends that primary care clinicians apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption (B recommendation).[16] More details and recommendations on fluoride can be found in the AAP clinical report "Fluoride Use in Caries Prevention in the Primary Care Setting."[14]

Silver diamine fluoride is a colorless ammonia solution containing silver and fluoride ions that is applied to the tooth. It is used to arrest caries lesions in primary and permanent teeth, including those that have already cavitated to the dentin, and has been shown to be effective in arresting caries in children.[42] When applied to the tooth or any surface, it will stain the surface black. Pediatricians may see more children with such staining and should be aware of its source. Silver diamine fluoride treatment is best used as part of an ongoing caries management plan with the aim of optimizing individualized patient care consistent with the goals of a dental home. 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 manner.[43]

Other Important Anticipatory Guidance Topics

A frequent topic of discussion with parents/caregivers is nonnutritive oral habits, such as use of pacifiers and thumb/digit sucking. The AAP recommends that parents/caregivers consider offering a pacifier at naptime and bedtime because of a protective effect of pacifiers on the incidence of sudden infant death syndrome after the first month of life.[44] Evaluation by a dentist is indicated for nonnutritive sucking habits that continue beyond 3 years of age. Pacifier suckers are less likely to develop malocclusions (ie, overjet) compared with digit suckers; however, longer duration of pacifier or digit sucking is associated with an increased risk of developing malocclusions.[45] Breastfeeding also decreases the risk of malocclusions.[46]

Dental injuries are common. Twenty-five percent of all school-aged children experience some form of dental trauma.[47] Pediatricians can help prevent such trauma by encouraging parents/caregivers to cover sharp corners of household furnishings at the level of walking toddlers, recommend use of car safety seats, and be aware of electrical cord risk for mouth injury.

Pediatricians can also encourage mouthguard use during sports activities in which there is a significant risk of orofacial injury (basketball, field hockey, and baseball, for example).[48,49] More information on dental trauma is available in the AAP clinical report "Management of Dental Trauma in a Primary Care Setting."[50]

COLLABORATION WITH DENTAL PROVIDERS

The AAP, the American Academy of Pediatric Dentistry, the American Dental Association, American Dental Hygienists' Association, and the American Association of Public Health Dentistry all recommend a dental visit for children by 1 year of age. Although pediatricians have the opportunity to provide early assessment of risk for dental caries and anticipatory guidance to prevent disease, it is also important that children establish a dental home.

Depending on where a pediatrician's practice is located, there are different members of the dental team with whom they may need to coordinate care and may even include as part of their office staff.[51] In addition to dentists, dental hygienists, and dental assistants, some states have expanded scope of practice or even developed new oral health professionals. Such professionals include expanded function dental assistants, dental health aide therapists, dental therapists, advanced dental therapists, independent practice dental hygienists, community dental health coordinators, registered dental hygienists in alternative practice, public health dental hygienists, expanded practice dental hygienists, and others.

There are emerging data regarding pediatric health care providers' dental referral behaviors and patterns. One study found that children 2 to 5 years of age who received a recommendation from their health care provider to visit the dentist were more likely to have a dental visit.[52] Another study found that children with more preventive well-baby visits between ages 1 and 2 years and ages 2 and 3 years were more likely to have earlier first dental examinations than children with fewer well-baby visits.[53,54] However, the number and timing of well-baby visits before 1 year of age were not significantly related to first dental examinations. The US Preventive Services Task Force found no study that evaluated the effects of referral by a primary care clinician to a dentist on caries incidence.[55] Early dental visits have been associated with decreased costs in most[56–58] but not all studies.[59]

With early referral to a dental provider, there is an opportunity to maintain good oral health, prevent disease, treat disease early, and potentially decrease cost. Establishing such 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.

SOCIAL DETERMINANTS OF CHILDREN'S ORAL HEALTH

The determinants of oral health, like oral health itself, are multifaceted. The driving determinants of oral health include genetic and biological factors, health behaviors, access to care, physical environment, and social environment.[60] The focus of this clinical report, to this point, has been focused on biological factors, health behavior, and access to oral health services. The AAP, however, also recommends screening for risk factors related to social determinants of health during all patient encounters.[61] It is important for pediatricians to understand that an approach to children's oral health must also address social determinants. These social determinants, such as poverty, racism, education, access to healthy foods, culture, and physical environment, as well as access to medical and dental care influence oral health status and oral health inequities in much the same way as they influence overall health and health inequity. Pediatricians can consider and address determinants of oral health at the child, family, and community level.[62] With a robust understanding of how social determinants influence oral health, pediatricians can advocate for policy, system, and environmental changes that create sustainable, comprehensive improvements in children's oral health and oral health equity. Appropriate payment for screening for social determinants is necessary to facilitate the implementation of screening in pediatric practices.

CONCLUSIONS

Oral health is an integral part of the overall health and well-being of children.[63] Pediatricians who are familiar with the science of dental caries, capable of assessing caries risk, comfortable with applying various strategies of prevention and intervention, connected to dental resources, and familiar with the social determinants of children's health can contribute considerably to the health of their patients. This clinical report, in conjunction with the oral health recommendations of the fourth edition of the AAP *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*, serves as a resource for pediatricians and other pediatric primary care providers to be knowledgeable about addressing dental caries.[64] Because dental caries is such a common and

consequential disease process in the pediatric population and such an integral part of the overall health of children, it is essential that pediatricians include oral health in their daily practice of pediatrics.

RECOMMENDATIONS FOR PEDIATRICIANS

1. Assess children's oral health risks at health maintenance and other relevant visits.
2. Include anticipatory guidance for oral health as an integral part of comprehensive patient counseling.
3. Counsel parents/caregivers and patients on ways to reduce the frequency of exposure to sugars in foods and drinks.
4. Encourage parents/caregivers to maintain their own good oral health and to brush a child's teeth at least twice a day as soon as teeth erupt with a smear or a grain-of-rice–sized amount of fluoride toothpaste, increasing to a pea-sized amount at 3 years of age.
5. Advise parents/caregivers to assist in and monitor brushing until 10 years of age.
6. Refer to the AAP clinical report, "Fluoride Use in Caries Prevention in the Primary Care Setting,"[14] for fluoride administration and supplementation decisions.
7. Be aware of the dental resources in your community as sources of referral and consultation.
8. Build and maintain collaborative relationships with local dental providers.
9. Recommend that every child has a dental home by 1 year of age.
10. Promote policy, system, and environmental changes that address social determinants of children's oral health.
11. Advocate for insurance coverage by all payers for fluoride varnish as a preventive service, as recommended by the US Preventive Services Task Force.

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ABBREVIATION

AAP: American Academy of Pediatrics

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