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Report of the Council on Clinical Affairs

Proposed changes/additions to oral health policies and clinical recommendations of the American Academy of Pediatric Dentistry

3/29/2022

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These proposed changes/additions to oral health policies and best practices of the American Academy of Pediatric Dentistry will be considered at the General Assembly. These drafts do not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly.

These proposals are presented to the membership for their review and comment sixty (60) days prior to the General Assembly. Members may choose make comments directly to the council chair, Dr. Thomas R. Stark, any time prior to the Reference Committee hearings.

Circulation of these documents is limited to AAPD members.

Reference Committee hearings

These hearings will take place on **Saturday, May 28, 2022, at from 10:00 to 11:30 AM in Room 14AB**. The hearings are open to all AAPD members, as well as non-members. Members are strongly encouraged to participate. Non-members will be polled and asked to identify themselves by the chair, who also has the authority to determine whether a non-member may comment. The Reference Committees are intended to be the venue for member discussion on any formal resolutions before the General Assembly: Constitution and Bylaws amendments, and proposed changes/additions to oral health policies and best practices recommendations of the American Academy of Pediatric Dentistry. This is an opportunity for members to present testimony on these matters and other business to come before the General Assembly. Reference Committee Reports will be posted online following the hearings.

General Assembly

The General Assembly is a meeting of Active and Life members for the purposes of conducting the business of the AAPD. Any AAPD member is welcome to attend, although only Active and Life members may vote. Final action on recommendations from Reference Committees takes place at the General Assembly. The General Assembly will meet on **Sunday, May 29, 2022, from 9:30 to 11:30 AM local (Pacific) time in Room 6CF** at the San Diego Convention Center.

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Catherine Hong, Expert Consultant (Immunotherapy)
Janice Jackson, Expert Consultant (Abstracts)
William Stenberg, Expert Consultant (Periodontics)
Jenny Ison Stigers, Expert Consultant (Reference Manual)
Adriana Modesto Vieira, Expert Consultant (Diversity)

Staff Liaisons

Council on Clinical Affairs, 2021-2022

Robin Wright, Director, Pediatric Oral Health Research and Policy Center
Mary Essling, Dental Benefits Director
Rachel Wedeward, Research Project Manager
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Adriana Loaiza, Publication Senior Manager
Margaret A. Bjerklie, Governance and Operations Manager

Vision

The vision of the Council on Clinical Affairs (CCA) is to be a critical and vital aspect of American Academy of Pediatric Dentistry continuing as the world leader on children's oral health. Formed from a group of passionate, committed, and bright pediatric dentists, this council draws on its long history and responsibility to the organization and the children its members serve. With the common goal of providing the best and most current evidence-based science, documents are drafted that are relevant to healthcare providers and organizations, governmental bodies, and other industry stakeholders. With that bold platform, CCA is an invaluable resource for all of those parties that seek to impact the lives of children by vastly improving their oral health.

Duties

The duties of the Council on Clinical Affairs, Committee on Sedation and Anesthesia, as listed in the *AAPD Administrative Policy and Procedure Manual*, are to 1) advise the Board of Trustees on matters concerning the clinical practice of pediatric dentistry; 2) review and develop oral health policies and guidelines regarding the clinical practice of pediatric dentistry and submit recommendations through the Board of Trustees; 3) perform such other duties as assigned by the President of the Board of Trustees.

Standing Charges

Charge 1

Annually review the list of Reference Manual documents to be revised and provide a list of documents to be revised in the upcoming year to the board of trustees at its Winter Meeting. Include suggestions for new policies and best practices and tips for guidelines to be developed by the Evidence-Based Dentistry Committee.

Background and Intent: This is a standing charge to the Council. To be effective advocates for infants, children, adolescents, and persons with special health care needs, AAPD oral health policies and best practices must be supported by the best available evidence. Documents will be reviewed and revised/reaffirmed/retired in a cycle of not more than 5-year intervals. When there is sufficient reason (e.g., publications from a consensus conference), documents will be evaluated in advance of their scheduled review cycle. AAPD must delineate the organization's position on new and emerging health issues and translate science into clinical practice by developing new policies and best practices. CCA annually will monitor the policies and guidelines of other dental and medical healthcare organizations to determine when revisions have been made by the authoring group and the appropriateness of AAPD's continued endorsement. In addition, CCA will maintain a resource section within the Reference Manual that supplements AAPD oral health policies and best practices. An annual review will determine the accuracy of information and appropriateness for continued inclusion.

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Progress Report

The following is a list of documents approved by the board of trustees for development in 2021-2022. Members of the councils on Clinical Affairs and Scientific Affairs who comprised the workgroups are listed above.

2021-2022 CCA/CSA Documents
Definition of Dental Disability *The Council recommends retiring this document.* *Rationale: The decades-old definition was initially included in the Reference Manual before the American Disabilities Act. Following an exhaustive review, the definition was not found to be cited by professional organizations or used to inform health care policies. The consensus of the Workgroup and CCA/CSA members was that the definition was not relevant or necessary.*
Policy on Social Determinants of Health
Policy on Child Identification Programs
Policy on Mandatory School-entrance Oral Health Examinations
Policy on Role of Dental Prophylaxis in Pediatric Dentistry
Policy on Interim Therapeutic Restorations (ITR)
Policy on Management of the Frenulum in Pediatric Dental Patients
Policy on Dietary Recommendations for Infants, Children and Adolescents
Policy on Snacks and Beverages Sold in Schools
Policy on Use of Lasers for Pediatric Dental Patients
Policy on Acute Pediatric Dental Pain Management
Policy on Model Dental Benefits for Infants, Children, Adolescents, and Individuals with Special Health Care Needs
Policy on Third-party Reimbursement of Medical Fees Related to Sedation/General Anesthesia for Delivery of Oral Health Services
Policy on Third-party Fee Capping of Non-covered Services
Policy on Using Harvested Stem Cells
New Policy on Diversity, Equity, and Inclusion
New Policy on Use of Pacifiers
Endorsement, Healthy Beverage Consumption *The Council recommends retiring this document.* *Rationale: Workgroup and Council members pointed out that the Endorsement does not align with the format and reference style of the Reference Manual. The consensus was to combine text and recommendations from the endorsement with the Policy on Dietary Recommendations and move the charts to Resource Section of Reference Manual.*
Best Practices for Periodicity of Examination, Preventive Dental Services, Anticipatory Guidance/Counseling, and Oral Treatment for Infants, Children, and Adolescents

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2021-2022 CCA/CSA Documents
Best Practices for Caries-risk Assessment and Management for Infants, Children, and Adolescents
Best Practices for Pain Management in Infants, Children, Adolescents, and Individuals with Special Health Care Needs
Best Practices for Restorative Dentistry
Best Practices for the Use of Antibiotic Therapy for Pediatric Dental Patients *This document was added to the review cycle due to the 2021 American Heart Association Scientific Statement on the prevention of Viridans Group Streptococcal Infective Endocarditis*
Best Practices for Antibiotic Prophylaxis for Patients at Risk for Infection *This document was added to the review cycle due to the 2021 American Heart Association Scientific Statement on the prevention of Viridans Group Streptococcal Infective Endocarditis*
Best Practices for Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Radiation Therapy
NEW Best Practices on Risk Assessment and Management of Pediatric Periodontal Conditions
Best Practices on Oral and Dental Aspects of Child Abuse and Neglect *This joint document with AAP is on the 2021-2022 CCA/CSA document cycle. The document is under development and has not been shared with the CCA/CSA to date.*

Charge 2

Review, revise, and update the AAPD Reference Manual annually according to the schedule prepared in Charge 1.
Background and Intent: This is a standing charge to the Council. To be effective advocates for infants, children, adolescents, and persons with special health care needs, AAPD oral health policies and best practices must be supported by the best available evidence.

Progress Report

Literature reviews were completed over the summer. Policies and Best Practice documents were discussed on November 5-6, 2021, during a hybrid in-person/virtual workshop. Post-Workshop revisions were completed for review by the Board of Trustees. The Board approved the Council's recommendation to retire *Definition of a Dental Disability* and to delete *Endorsement on Healthy Beverage Consumption in Early Childhood: Recommendations from Key National Health and Nutrition Organizations: Summary of Oral Health Considerations* from the AAPD Reference Manual but retained the charts from the *Endorsement on Healthy Beverage Consumption* as a new resource document in the Resource Section of the AAPD Reference Manual. The Board approved title changes from *Policy on Snacks and Beverages Sold in Schools* to "Policy on Snacks and Sugar-Sweetened Beverages Sold in Schools" and "*Policy on Acute Pediatric Pain*

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Management" to "Policy on *Pediatric Pain Management*." Finally, the board approved the Council's recommendation to craft a document for the Resource Section of the AAPD Reference Manual on *Systemic Diseases and Conditions Related to Periodontal Disease.*

February 12, 2022 – CCA/CSA workgroup members provided feedback and comments on revised drafts of the documents during a 5-hour virtual workshop.

The Council on Dental Benefits provided feedback on the policies on *Third-party Reimbursement of Medical Fees Related to Sedation/General Anesthesia for Delivery of Oral Health Services* and *Third-party Fee Capping of Non-covered Services*.

March 29, 2022 - revisions submitted for review by the Membership 60 days before the General Assembly. Members were alerted to the availability of documents via AAPD E-news.

Charge 3

Advise the Committee on Communications of any updates to AAPD pamphlets, brochures, and other AAPD publications required for consistency with AAPD oral health policies and clinical recommendations.
Background and Intent: This is a standing charge to the Council to ensure that the publications and promotional and educational materials offered to our members, other professionals, and the public are scientifically accurate and consistent with our Policies and Guidelines.

Progress Report

No new AAPD pamphlets, brochures, or other AAPD publications were presented for review.

Charge 4

Review position papers prepared by the AAPD Pediatric Oral Health Policy and Research Center for consistency with AAPD oral health policies and clinical recommendations.
Background and Intent: This is a standing charge to the Council to ensure that any definition, policy, guideline, or other publication offered to our members, other professionals, and the public are scientifically accurate and consistent with our Policies and Guidelines.

Progress Report

Pediatric Oral Health and Research Policy Center documents were shared during the November 5-6, 2021 workshop. Policy Center documents including the recently published *Silver Diamine Fluoride Policy and Fact Summary*; *Are your Kids Covered? - Medicaid Coverage for the Essential Health Benefits;* and *Denial of Access to Operating Room Time in Hospitals for Pediatric Dental Care* were circulated and reviewed by CCA members for consistency with AAPD oral health policies and clinical recommendations. These documents were identified as potential resources and sources for additional references for the assigned documents.

The Council is anticipating involvement and collaboration with the EBD Committee regarding the document on behavior management and, eventually, the document on frenectomy and lactation. The CCA expects to maintain close communication as the EBD process progresses.

CCA members were also directed to review the recently constructed "*Disaster Preparedness Resource Hub*" link on the AAPD website.

Charge 5

At the request of the Executive Committee of the AAPD, provide a timely review of children's oral health policies and clinical recommendations prepared by other organizations, with particular attention to conformity with AAPD oral health policies and clinical recommendations.
Background and Intent: This is a standing charge to the Council. This mechanism implements the intent of the Memorandum of Understanding with the AAP Section on Oral Health to review proposed documents for consistency with AAPD policies and guidelines. The Council will review these documents with sensitivity to the embargoed status of the drafts. A summary report will be submitted to the Executive Committee.

Progress Report

Best Practices on Oral and Dental Aspects of Child Abuse and Neglect. This joint document with AAP is on the 2021-2022 CCA/CSA document cycle. However, the paper is under development and has not been shared with the CCA/CSA to date. CCA decided to table the joint Best Practice for the 2022-2023 CCA/CSA document cycle.

Special Acknowledgment

The Council would like to recognize Dr. William Stenberg for sharing his time and expertise with the Council over the past several years. Dr. Stenberg's extensive clinical experience as a periodontist and vast knowledge of the periodontal literature helped shape the best practice documents for periodontal classification and risk assessment, and management of pediatric periodontal conditions.

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2022-2023 Documents

Council on Clinical Affairs
2022–2023

Definition of a Dental Home
Policy on Minimizing Occupational Health Hazards Associated with Nitrous Oxide
Policy on the Role of Pediatric Dentists as Both Primary and Specialty Care Providers
Policy on Use of Fluoride
Policy on the use of silver diamine fluoride
Policy on Prevention of Sports-related Orofacial Injuries
Policy on the Dental Home
Policy on Selecting Anesthesia Providers for the Delivery of Office-Based Deep Sedation/General Anesthesia
Policy on Patient's Bill of Rights and Responsibilities
Policy on Use of Dental Bleaching for Child and Adolescent Patients
Policy on Third-party Payor Audits, Abuse, and Fraud
Policy on School Absences for Dental Appointments
Best practice on Fluoride Therapy
Best practice on the use of Nitrous Oxide for Pediatric Dental Patients
Best practice on the use of Anesthesia Providers in the Administration of Office-based Deep Sedation/General Anesthesia to the Pediatric Dental Patient
Best practice on Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures
Best practice on Informed Consent
Best practice on the use of Local Anesthesia for Pediatric Dental Patients
Best practice on behavior Guidance for the Pediatric Dental Patient
Endorsement on Management of Patients with Cleft Lip/Cleft Palate

Policy on Social Determinants of Children's Oral Health and Health Disparities

~~Adopted~~Revised

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **SDH**: Social determinants of health.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes the influence of social factors on children's oral health including access to care, dental disease, behaviors, and oral health inequalities. The AAPD encourages oral health professionals and policymakers to formally acknowledge the role that social determinants of health (**SDH**) have in producing and perpetuating poor oral health and oral health inequalities in children. Moreover, AAPD encourages the implementation of oral health promotion strategies that account for ~~the~~ SDH and appropriate clinical management protocols informed by and sensitive to ~~the~~ SDH. All relevant stakeholders (e.g., health professionals, researchers, educators, policy makers) are encouraged to develop strategies that incorporate SDH-related knowledge to improve oral health behaviors, prevent dental disease, and address oral health inequalities in children.

Methods

This policy, developed by the Council on Clinical Affairs and adopted in 2017 (AAPD 2017), is based on a review of the current literature, including a search of PubMed®/MEDLINE database using the terms: social determinants AND dental; fields: all; limits: English, age birth-18 years. A total of 1485 ~~405~~ articles matched these criteria. Articles for review were selected from this list, the references within selected articles, and other articles from the literature.

Background

The World Health Organization defines social determinants of health as "the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life".(WHO 2021 ~~2016~~) ~~The concept of~~ Life circumstances are heavily influenced by social behaviors, cultural practices, government policies, and economic and political systems (da Fonseca and Avenetti, 2017). The term SDH implies ~~is based on the premise~~ that improving social conditions is ~~a~~ necessary ~~precursor for improving~~ to ~~improve~~ optimize health outcomes for vulnerable populations, narrow ~~ameliorteing~~ inequalities, and achieve~~ing~~ health equity and social justice. Health equity may be ~~is~~ defined as the "fair and just opportunity to be as healthy as possible" (Braveman, P. 2019), a concept that requires elimination of those societal factors (e.g., poverty, discrimination, lack of access to healthcare) that unfairly result in poorer health for at-risk social groups. Social groups can be identified by many characteristics including ethnicity, religion, socioeconomic status, gender identity, age, disability status, sexual orientation, or geographic location (Braveman 2014; Baker 2018.)"~~the absence of systematic disparities in health between and within social groups that have different levels of under-lying social advantages or disadvantages".(Braveman & Bruskin 2003)~~ From a social justice perspective, addressing ~~the~~ SDH is essential to achieving ~~a longer-term aspirational goal to~~ improved oral health outcomes and ~~reduce~~ reducing inequalities for children from historically disadvantaged groups (Braveman, P. 2014). ~~socioeconomic vulnerable families and communities. A more immediate~~ One strategy is to prioritize ~~ensure that~~ interventions, programs, and policies that properly acknowledge and account for ~~the~~ SDH.

Past work has demonstrated gradients in oral health outcomes based on socioeconomic position.(Knorst et al, 2021; da Fonseca and Avenetti, 2017; Sabbah et al. 2007) Measures of socioeconomic position include income, educational attainment, occupation, and race/ ethnicity.(Chalub et al. 2014; Joury et al. 2016; Stein et al. 2021) SDH are influenced by socioeconomic position and more broadly embody the social environment and context in which individuals live and make health-related decisions over the life course (da Fonseca and Avenetti 2017; Schwendicke 2015). Various conceptual models from dentistry include SDH as upstream factors that influence oral health behaviors, dental disease rates, and oral health outcomes.(Patrick et al. 2006; Fisher-Owens et al. 2007; Marmot & Bell 2011; Chi 2013; Casamassimo et al. 2014; Lee & Divaris 2014) ~~From a social justice perspective, addressing the SDH is achieving a longer-term aspirational goal to improve oral health outcomes and reduce inequalities for children from socioeconomic vulnerable families and communities. (Braveman, P. 2014) An more immediate strategy is to ensure that interventions, programs, and policies properly acknowledge and account for the SDH~~. In 2013, the American Academy of Pediatrics published a policy statement ~~entitled *Community Pediatrics: Navigating the Intersection of Medicine, Public Health, and Social Determinants of Children's Health*~~ that acknowledged the influence of SDH on chronic diseases including dental caries. (Gorski et al. 2013) Since then, the body of scientific research addressing SDH and oral health has grown substantially. ~~This statement included a reference to dental caries, which is an important acknowledgement of SDH and~~

~~children's oral health. However, the statement did not include references from the scientific literature that provide empirical evidence for SDH, which has grown substantially in dentistry since 2013.~~ Findings from the social determinants of children's oral health literature can be organized into categories that provide guidance on how dentists, other health professionals, researchers, educators, and policy makers can account for ~~the~~ SDH to improve children's health outcomes. Examples are provided of past efforts and future opportunities to address children's oral health inequalities through SDH-based interventions, programs, and policies.

SDH are commonly measured at the caregiver- or household-level. The same SDH that affect a caregiver's oral health outcomes also affect his~~their~~ children's oral health directly and indirectly.(Moimaz et al. 2014) Caregiver level of education influences both material and non-material components of a child's oral health, including access to and utilization of preventive services, dental knowledge, and oral health behaviors (Schwendicke, 2015; Duijster 2014; Sun, 2020; Rai and Tiwari 2018). Socioeconomic status was found to mediate the influence of maternal psychological factors (e.g. depression, external locus of control, self-efficacy) on oral health in offspring (Knoblauch 2019; Pappas et al, 2020; Arora, A et al 2021; Costa, FDS et al 2017; Sun, L et al 2020). Examples of SDH at the household level include food insecurity (defined as reduced quality, variety, or desirability of diet, and disrupted eating patterns with or without reduced food intake)(US Dept of Agriculture) and overcrowding.(Chi et al. 2014; Paula et al. 2015) These factors can make it difficult for families to afford non-cariogenic food and preventive oral hygiene products or to have designated spaces in the home for important routines like toothbrushing (Angelopoulou, 2019; Hill, 2020; da Fonseca and Aveneti 2017). Children living in settings with multiple social risks are at substantially greater risk for caries.(Yang et al. 2016) SDH may be reflected by a heavy allostatic load (biological markers of chronic stress) among household members, with implications for poor oral health behaviors and higher caries rates (Masterson & Sabbah, 2015). This is particularly worrisome from a life course perspective (Boyce 2014). A small cross-sectional study suggests associations between the adverse effects of socioenvironmental stressors, neuroendocrine factors, and levels of intraoral cariogenic bacteria in children, ~~that chronic stress is related to higher levels of dental caries in children potentially by affecting intraoral bacteria,~~(Boyce et al. 2010), findings that need to be validated with additional studies. ~~There~~ Examples of ways in which chronic stress associated with socioeconomic status leads to negative physiologic effects on oral health include pro-inflammatory, endocrine, and microbiological responses. (Gomaa,2016). Furthermore, poverty and stress could influence child temperament (Strickhouser, 2020) and behaviors in dental settings (Quinonez 2020),

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including the ability to cooperate for dental procedures, (da Fonseca 2014; Fisher-Owens 2014). ~~which has not yet been tested empirically. are other oral health examples of social and biological interactions.~~

~~Weak social ties and social networks are associated with poor oral health outcomes.(Zini et al. 2012; Duijster et al. 2014; Fontanini et al. 2015; Vettore et al. 2016, Vettore et al. 2019) Potential mechanisms include reduced health information that is transmitted through social ties and networks and increased allostatic load or stress, which is implicated in poor oral health behaviors and higher caries rates.(Masterson & Sabbah 2015) This is particularly worrisome from a life course perspective.(Boyce 2014) A small cross-sectional study suggests that chronic stress is related to higher levels of dental caries in children potentially by affecting intraoral bacteria,(Boyce et al. 2010) findings that need to be validated with additional studies. Furthermore, poverty and stress could influence child behaviors in dental settings, including the ability to cooperate for dental procedures,(da Fonseca 2014; Fisher-Owens 2014) which has not yet been tested empirically. There are other oral health examples of social and biological interactions.(Gomaa et al. 2016) Other examples of SDH include household food insecurity (defined as disrupted eating patterns with or without reduced food intake)(US Dept of Agriculture-No date) and overcrowding.(Chi et al. 2014; Paula et al. 2015) These factors can make it difficult for families to purchase healthy foods and to have designated spaces in the home for important routines like toothbrushing. Children living in settings with multiple social risks are at substantially greater risk for caries.(Yang et al. 2016) Many of these relationships need to be elucidated with additional studies.~~

~~Weak social ties and social networks are associated with poor oral health outcomes.(Zini et al. 2012; Duijster et al. 2014; Fontanini et al. 2015; Vettore et al. 2016, Vettore et al. 2019) Potential mechanisms include reduced health information that is transmitted through social ties and networks and~~ SDH are also measured within neighborhoods and communities. Neighborhood income is positively associated with oral health-related behaviors like improved oral hygiene practices and lower dental disease levels for children.(Duijster et al. 2014; Martens et al. 2006; Mathur et al. 2014; Mathur et al. 2016; Priesnitz et al. 2016) In addition, higher levels of income inequality within a community are associated with poorer oral health outcomes.(~~Pattussi et al. 2001~~, Moeller 2017))

Social capital, a term that encompasses social support, social networks, and social cohesion, is an important SDH that affects both individuals and communities (Duh-Leong, C 2020). Social support is tied to emotional development in adolescents, including self-efficacy, trust, and avoidance of detrimental oral health behaviors (Fontanini, 2015). Weak social ties and social networks are associated with poor oral health outcomes, (Zini et al. 2012; Duijster et al. 2014; Fontanini et al. 2015; Vettore et al. 2016, Vettore et al. 2019). ~~Another important SDH is social capital, which is defined as resources that result from networks(Carpiano 2006) and other sources like community centers.~~ Social capital may manifest as neighborhood resources such as community centers that benefit the oral health of members (Guedes et al. 2014) ~~Over 60 percent of women of childbearing age reside in neighborhoods with very poor or poor levels of social capital.(Ebrahim et al. 2009)~~ Studies generally have reported positive health outcomes associated with greater levels of social capital,(Iida & Rozier 2013; Santiago et al. 2013; Reynolds, JC 2015; Knorst, 2019) but at least one study found negative outcomes.(Chi & Carpiano 2013) These findings suggest that enhancing social capital is beneficial, but that social norms can influence the way in which resources are deployed, which can lead to suboptimal oral health behaviors and poor outcomes.

Structural determinants of health are formed by the economic, political, and social policies that modulate SDH (Baker, 2018). Economic policies affect employment to population ratios, standard of living, and individual cost of living, which in turn influence access to health insurance or ability to pay for healthcare expenses. Policies that have expanded Medicaid access, reduced influences of neighborhood poverty, and invested in education quality have demonstrated long-term positive health outcomes for youth (Venkataramani 2020). The determination of public insurance coverage for specific procedures, including the cost of general anesthesia during dental treatment, is at the discretion of individual states rather than the federal government. Depending on individual state Medicaid policies, out-of-pocket costs may be prohibitive and divert patients toward less ideal treatment options for behavior management (Edelstein, 2014). Inability to pay for services may preclude some children from receiving treatment at all. Sociolegal policies that regulate insurance coverage, including those related to preauthorization and informed consent, have been shown to delay or prevent adolescents from obtaining health services (Garney, 2021).

Translational science has led to the development of pediatric oral health interventions that address SDH. For example, *Baby Smiles* was a community-based randomized trial that implemented motivational interviewing in conjunction with age one dental visits for those with Medicaid (Milgrom, 2013). The program focused on improving the health of the mothers as well as on prevention for their at-risk children. Other initiatives, such as school-based sealant programs, have developed strategies to overcome socioenvironmental barriers to oral healthcare and reach at-risk children (Siegal, 2010). A recent evaluation found that school-based sealants programs resulted in benefits that outweighed costs, including reduced rates of dental caries, untreated decay, and school absenteeism (Griffin, 2017). It is imperative

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that future oral health interventions account for SDH and aim to achieve greater health equity for all children.

~~An example of a public health intervention that circumvents the SDH is the Childsmile program in Scotland.(Gibson et al. 2016) The Childsmile program distributes free toothbrushes and toothpaste to children in communities during early childhood and to first and second graders living in disadvantaged areas. Within severely disadvantaged areas, at-risk children are referred to dental care support workers who provide dietary counseling. In addition, children in these areas receive twice yearly school-based fluoride varnish treatments. The Childsmile program does not attempt to modify SDH but circumvents the SDH by delivering more intense intervention activities within the neediest areas. The Bolsa Família Program is a conditional cash transfer program in Brazil, part of a larger initiative aimed at improving use of primary care services for disadvantaged children.(Petrola et al. 2016) It does not have a formal oral health component even though there is high support by local Bolsa Família Program supervisors. The study recommendation was to make child dental visits a mandatory precursor to participating families receiving cash transfer payments, which would provide additional opportunities to influence parent and child behaviors and improve oral health outcomes.~~
~~Similar programs requiring meaningful health care investments from central governments are more prevalent in countries in which there is less income inequality(Bhandari et al. 2015) as well as the political will to address oral health inequalities.~~

~~Directly addressing the SDH will involve~~ ~~s~~Systematic policies and environmental changes that improve living conditions and alleviate poverty are necessary to address SDH. Examples include universal housing programs, emergency rental assistance, public health insurance programs like Medicare, ~~for older Americans~~ ~~and~~ Medicaid, and Children's Health Insurance Program (CHIP), ~~for children~~, and programs that mediate ~~prevent~~ food insecurity such as Supplemental Nutrition Assistance Program (SNAP) and the National School Lunch Program (NSLP). Broader policies are likely to have the long-term impact needed to improve the conditions in which vulnerable families and children live.

Policy Statement

Recognizing the importance of the social determinants of oral health for children, the AAPD:

- supports broader policies and programs that help to alleviate poverty and social inequalities.
- encourages dentists and the oral health care team to collect a social history from patients, provide anticipatory guidance that is sensitive to ~~the~~ SDH, and connect patients with helpful resources

(e.g. social service organizations, food banks) as appropriate. ~~which involves collecting a social history from patients.(AAPD BP_Caries Risk Assessment)~~

- supports inter-professional educational approaches to train students as well as practicing dentists and health professionals on the social determinants of health.(Lapidos & Gwozdek 2016; Lévesque et al. 2015; Lévesque et al. 2016; Foster Page et al. 2016)
- endorses interdisciplinary ~~theory-based~~ ~~intervention~~ approaches to improve oral health that account for ~~the~~ social determinants of chronic diseases ~~oral health~~. (Newton 2012; Watt & Sheiham 2012)
- supports additional research to understand mechanisms underlying the social determinants of oral health.(Newton & Bower 2005)

References

American Academy of Pediatric Dentistry. ~~Guideline on~~ ~~c~~Caries-risk assessment and management for infants, children, and adolescents. 2022.

American Academy of Pediatric Dentistry. Policy on social determinants of children's oral health and health disparities. Pediatr Dent 2017;39(6):23-6.

Angelopoulou MV, Shanti SD, Gonzalez CD, Love A, Chaffin J. Association of food insecurity with early childhood caries. J Public Health Dent 2019;79(2):102-8.

Arora A, Lucas D, To M, et al. How do mothers living in socially deprived communities perceive oral health of young children? A qualitative study. Int J Environ Res Public Health 2021;18(7): 3521.

Baker SR, Foster Page L, Thomson WM, et al. Structural determinants and children's oral health: A cross-national study. J Dent Res 2018;97(10):1129-36.

~~Bhandari B, Newton JT, Bernabé E. Income inequality and use of dental services in 66 countries. J Dent Res 2015;94(8):1048-54.~~

Boyce WT, Den Besten PK, Stamperdahl J, et al. Social inequalities in childhood dental caries: The convergent roles of stress, bacteria and disadvantage. Soc Sci Med 2010;71(9):1644-52.

Boyce WT. The lifelong effects of early childhood adversity and toxic stress. Pediatr Dent 2014;36(2):102-8.

Braveman P. What are health disparities and health equity? We need to be clear. Public Health Rep 2014;129(Suppl 2):5-8.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Braveman PA. Swimming against the tide: Challenges in pursuing health equity today. Acad Med 2019; 94(2):170-1. ~~Braveman P, Gruskin S. Defining equity in health. J Epidemiol Community Health 2003;57(4):254-8.~~

~~Carpiano RM. Toward a neighborhood resource-based theory of social capital for health: Can Bourdieu and sociology help? Soc Sci Med 2006;62(1):165-75.~~

Casamassimo PS, Lee JY, Marazita ML, et al. Improving children's oral health: An interdisciplinary research frame-work. J Dent Res 2014;93(10):938-42.

Chalub LL, Borges CM, Ferreira RC, et al. Association between social determinants of health and functional dentition in 35-year-old to 44-year-old Brazilian adults: A population-based analytical study. Community Dent Oral Epidemiol 2014;42(6):503-16.

Chi DL, Carpiano RM. Neighborhood social capital, neighborhood attachment, and dental care use for Los Angeles Family and Neighborhood Survey adults. Am J Public Health 2013;103(4):e88-95.

Chi DL, Masterson EE, Carle AC, et al. Socioeconomic status, food security, and dental caries in U.S. children: Mediation analyses of data from the National Health and Nutrition Examination Survey, 2007-2008. Am J Public Health 2014;104(5):860-4.

Chi DL. Reducing Alaska Native paediatric oral health disparities: A systematic review of oral health interventions and a case study on multilevel strategies to reduce sugar-sweetened beverage intake. Int J Circumpolar Health 2013;72:21066.

Costa FDS, Azevedo MS, Ardenghi TM, et al. Do maternal depression and anxiety influence children's oral health-related quality of life? Community Dent Oral Epidemiol 2017;45(5):398-406.

da Fonseca MA. Eat or heat? The effects of poverty on children's behavior. Pediatr Dent 2014;36(2):132-7.

da Fonseca MA, Avenetti D. Social determinants of pediatric oral health. Dent Clin North Am 2017;61(3):519-32.

Duh-Leong C, Dreyer BP, Huang TT, et al. Social capital as a positive social determinant of health: A narrative review. Acad Pediatr 2021;21(4):594-9.

Duijster D, van Loveren C, Dusseldorp E, Verrips GH. Modelling community, family, and individual determi-nants of childhood dental caries. Eur J Oral Sci 2014;122(2):125-33.

~~Ebrahim SH, Anderson JE, Correa-de-Araujo R, et al. Overcoming social and health inequalities among U.S. women of reproductive age—Challenges to the nation's health in the 21st century. Health Policy 2009;90(2-3): 196-205.~~

Edelstein BL. Insurers' policies on coverage for behavior management services and the impact of the Affordable Care Act. Pediatr Dent 2014;36(2):145-51.

Fisher-Owens S. Broadening perspectives on pediatric oral health care provision: Social determinants of health and behavioral management. Pediatr Dent 2014;36(2): 115-20.

Fisher-Owens SA, Gansky SA, Platt LJ, et al. Influences on children's oral health: A conceptual model. Pediatrics 2007;120(3):e510-20.

Fontanini H, Marshman Z, Vettore M. Social support and social network as intermediary social determinants of dental caries in adolescents. Community Dent Oral Epidemiol 2015;43(2):172-82.

Foster Page LA, Chen V, Gibson B, McMillan J. Overcoming structural inequalities in oral health: The role of dental curricula. Community Dent Health 2016;33(2): 168-72.

~~Gibson LB, Blake M, Baker S. Inequalities in oral health: The role of sociology. Community Dent Health 2016;33 (2):156-60.~~

Garney W, Wilson K, Ajayi KV, et al. Social-ecological barriers to access to healthcare for adolescents: A scoping review. Int J Environ Res Public Health 2021;18(8):4138.

Gomaa N, Glogauer M, Tenenbaum H, et al. Social-biological interactions in oral disease: A 'cells to society' view. PLoS One 2016;11(1):e0146218.

Gorski PA, Kuo AA, Granado-Villar DC, et al. Community pediatrics: Navigating the intersection of medicine, public health, and social determinants of children's health. Pediatrics 2013;131(3):623-8.

Griffin SO, Naavaal S, Scherrer C, et al. Community Preventive Services Task Force. Evaluation of school-based dental sealant programs: An updated community guide systematic economic review. Am J Prev Med 2017;52(3):407-15.

Guedes RS, Piovesan C, Antunes JL, et al. Assessing individual and neighborhood social factors in child oral health-related quality of life: A multilevel analysis. Qual Life Res 2014;23(9):2521-30.

Hill, B. Evaluating the association between food insecurity and dental caries in US children 1-19 years: Results from the National Health and Nutrition Examination Survey (NHANES) 2013-2014. J Public Health Dent 2020;80(1)14-7.

Iida H, Rozier RG. Mother-perceived social capital and children's oral health and use of dental care in the United States. Am J Public Health 2013;103(3):480-7.

Knoblauch U, Ritschel G, Weidner K, et al. The association between socioeconomic status, psychopathological symptom burden in mothers, and early childhood caries of their children. PLoS One 2019;14(10):e0224509.

Knorst JK, Menegazzo GR, Emmanuelli B. et al. Effect of neighborhood and individual social capital in early childhood on oral health-related quality of life: A 7-year cohort study. Qual Life Res 2019;28:1773-82.

Knorst JK, Sfreddo CS, de F Meira G. et al. Socioeconomic status and oral health-related quality of life: A systematic review and meta-analysis. Community Dent Oral Epidemiol 2021;49(2):95-102.

Joury E, Khairallah M, Sabbah W, et al. Inequalities in the frequency of free sugars intake among Syrian 1-year-old infants: A cross-sectional study. BMC Oral Health 2016;16(1):94.

Lapidos A, Gwozdek A. An interprofessional approach to exploring the social determinants of health with dental hygiene students. J Allied Health 2016;45(3):e43-7.

Lee JY, Divaris K. The ethical imperative of addressing oral health disparities: A unifying framework. J Dent Res 2014;93(3):224-30.

Lévesque M, Levine A, Bedos C. Humanizing oral health care through continuing education on social determinants of health: Evaluative case study of a Canadian private dental clinic. J Health Care Poor Underserved 2016;27 (3):971-92.

Lévesque MC, Levine A, Bedos C. Ideological roadblocks to humanizing dentistry, an evaluative case study of a continuing education course on social determinants of health. Int J Equity Health 2015;14:41.

Marmot M, Bell R. Social determinants and dental health. Adv Dent Res 2011;23(2):201-6.

Martens L, Vanobbergen J, Willems S, et al. Determinants of early childhood caries in a group of inner-city children. Quintessence Int 2006;37(7):527-36.

Masterson EE, Sabbah W. Maternal allostatic load, care-taking behaviors, and child dental caries experience: A cross-sectional evaluation of linked mother-child data from the Third National Health and Nutrition Examination Survey. Am J Public Health 2015;105(11):2306-11.

Mathur MR, Tsakos G, Millett C, et al. Socioeconomic inequalities in dental caries and their determinants in adolescents in New Delhi, India. BMJ Open 2014;4(12): e006391.

Mathur MR, Tsakos G, Parmar P, et al. Socioeconomic inequalities and determinants of oral hygiene status among Urban Indian adolescents. Community Dent Oral Epidemiol 2016;44(3):248-54.

Milgrom P, Riedy CA, Weinstein P, et al. Design of a community-based intergenerational oral health study: "Baby Smiles". BMC Oral Health 2013;13:38.

Moeller J, Starkel R, Quinonez C, Vujicic M. Income inequality in the United States and its potential effect on oral health. J Am Dent Assoc 2017;148(6)361-8.

Moimaz SA, Fadel CB, Lolli LF, et al. Social aspects of dental caries in the context of mother-child pairs. J Appl Oral Sci 2014;22(1):73-8.

Newton JT, Bower EJ. The social determinants of oral health: New approaches to conceptualizing and researching complex causal networks. Community Dent Oral Epidemiol 2005;33(1):25-34.

Newton JT. Interdisciplinary health promotion: A call for theory-based interventions drawing on the skills of multiple disciplines. Community Dent Oral Epidemiol 2012;40(Suppl 2):49-54.

Pappas A, Raja S, da Fonseca MA, Stanford CM, LeHew CW. Female caregiver's depression risk affects children's attendance to dental appointments: A pilot study. Pediatr Dent 2020;42(6):464-9.

Patrick DL, Lee RS, Nucci M, Grembowski D, Jolles CZ, Milgrom P. Reducing oral health disparities: A focus on social and cultural determinants. BMC Oral Health 2006;6(Suppl 1):S4.

~~Pattussi MP, Marcenes W, Croucher R, Sheiham A. Social deprivation, income inequality, social cohesion and dental caries in Brazilian school children. Soc Sci Med 2001;53(7):915-25.~~

Paula JS, Ambrosano GM, Mialhe FL. The impact of social determinants on schoolchildren's oral health in Brazil. Braz Oral Res 2015;29:1-9.

~~Petrola KA, Bezerra ÍB, de Menezes ÉA, et al. Provision of oral health care to children under seven covered by Bolsa Família Program. Is this a reality? PLoS One 2016;11(8): e0161244.~~

Priesnitz MC, Celeste RK, Pereira MJ, et al. Neighbourhood determinants of caries experience in preschool children: A multilevel study. Caries Res 2016;50(5):455-61.

Rai NK, Tiwari T. Parental factors influencing the development of early childhood caries in developing nations: A systematic review. Front Public Health 2018;6:64.

Reynolds, JC, Damiano PC, Glanville JL, et al. Neighborhood and family social capital and parent-reported oral health of children of Iowa. Community Dent Oral Epidemiol. 2015;43(6):569-77.

Sabbah W, Tsakos G, Chandola T, et al. Social gradients in oral and general health. J Dent Res 2007;86(10): 992-6.

Santiago BM, Valença AM, Vettore MV. Social capital and dental pain in Brazilian northeast: A multilevel cross-sectional study. BMC Oral Health 2013;13:2.

Schwendicke F, Dörfer CE, Schlattmann P. et al. Socioeconomic inequality and caries: A systematic review and meta-analysis. J Dent Res 2015;94(1):10-8.

Siegal MD, Detty AM. Do school-based dental sealant programs reach higher risk children? J Public Health Dent 2010;70(3):181-7.

Stein C. Cunha-Cruz J, Hugo FN. Is dietary pattern a mediator of the relationship between socioeconomic status and dental caries? Clin Oral Investig 2021;25(9):5441-7.

Strickhouser JE, Sutin AR. Family and neighborhood socioeconomic status and temperament development from childhood to adolescence. J Pers 2020;99(3):515-29.

Sun L. The association between postpartum depression and early childhood caries. Acta Odontol Scand 2020;78(5):352-7.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

U.S. Department of Agriculture Economic Research Service. Definition of Food Security. Available at: "https: //www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx". Accessed ~~March 1, 2017.~~ July 1, 2021. ~~(Archived by WebCite® at: "http://www.webcitation.org/6sifGxRGQ")~~

Vettore MV, Faerstein E, Baker SR. Social position, social ties and adult's oral health: 13 year cohort study. J Dent 2016;44:50-6.

Vettore MV, Ahmad SFH, Machuca C, Fontanini H. Socio-economic status, social support, social network, dental status, and oral health reported outcomes in adolescents. Eur J Oral Sci 2019;127(2):139-46.

Venkataramani AS, O'Brien R, Whitehorn GL, Tsai AC. Economic influences on population health in the United States: Toward policymaking driven by data and evidence. PLoS Med 2020;17(9):e1003319.

Watt RG, Sheiham A. Integrating the common risk factor approach into a social determinants framework. Community Dent Oral Epidemiol 2012;40(4):289-96.

World Health Organization (WHO). 2021. ~~2016~~. Social Determinants of Health. Available at: "https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1" "~~http://www.who.int/social_determinants/sdh_definition/en/~~". Accessed October 14, 2021. ~~October 1, 2016. (Archived by WebCite® at: "http:// www.webcitation.org/6siehxcIB")~~

Yang AJ, Gromoske AN, Olson MA, Chaffin JG. Single and cumulative relations of social risk factors with children's dental health and care-utilization within regions of the United States. Matern Child Health J 2016;20(3): 495-506.

Zini A, Sgan-Cohen HD, Marcenes W. Religiosity, spirituality, social support, health behaviour and dental caries among 35- to 44-year-old Jerusalem adults: A proposed conceptual model. Caries Res 2012;46(4):368-75.

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Policy on Child Identification Programs

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **CHIP**: Child Identification Program. **FBI**: Federal Bureau of Investigation.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**), recognizing the role that dental records play in forensic identification, encourages dental practitioners and administrators of child identification programs to implement simple practices that can aid in identification of unknown infants, children, and adolescents. The AAPD recommends that parents establish a dental home, where clinical data is gathered, stored, and updated routinely and can be made available to assist in identification of missing and~~/or~~ abducted persons.

Methods

This document was developed by the Council on Clinical Affairs, ~~and~~ adopted in 2003(AAPD 2003), and last revised in 2017 (AAPD 2017). ~~The last revision occurred in 2008 and was reaffirmed in 2012.~~ This policy revision included a new literature search of the PubMed®/MEDLINE electronic database using the terms: child, forensic, dental, and identification; fields: all; limits: within the last 10 years, English. One hundred ~~twenty-nine~~ twelve articles matched these criteria. Papers for review were chosen from this list and from references within selected articles. When information from these articles did not appear sufficient or was inconclusive, policies were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background

~~More than 800,000 children in America are reported missing each year.(NCIP-About us)~~ Nearly 350,000 reports of missing children and approximately 900 unidentified person records were submitted to the Federal Bureau of Investigation's National Crime Information Center in 2021.(FBI 2022) Since the passage of the Missing Children Act in 1982 and the creation of the National Crime Information Center, the dental profession has provided much of the information used to compare missing persons with unidentified individuals.(Sperber 1986; Kavanaugh & Filippi 2013) *The Manual on Forensic Odontology* utilized by the American Society of Forensic Odontology demonstrates the vital role of dentistry in identification of missing and unknown persons.(Kavanaugh & Filippi 2013) Numerous cases have been published in which law enforcement agencies called upon dentistry to provide information that proved vital to the identification process.(Chen & Jain 2008; Debnath et al. 2016) Dental records used for identification purposes have included dental radiographs (Du H et al 2021), facial photographs, study casts, dental examinations documenting teeth present and distinguishing features of oral structures, and histories documenting appliances (prosthetic and orthodontic) in place, orthodontic treatment, restored surfaces and materials used, and bite registrations.(Cardoza & Wood 2015; Berman et al. 2013; Shanbhag 2016)

Nondental sources of distinguishing information currently include fingerprints, photographs, physical descriptions, and DNA from blood, saliva, and other tissue. (Conceição et al. 2015) Some of these nondental sources have practical limitations. Few children have fingerprint records. DNA sampling, while being state of the art, can be difficult to access as well as protracted and costly. (Aidar & Line 2007) While not routinely collected, saliva may be useful tool in profiling age and gender determination for forensic experts. (Bhuptani D. et al. 2018). Dentists may provide many non-invasive tools that help in the identification and tracking of children. (Vij N et al. 2016)~~can provide data without many of these limitations~~.

Many programs have been developed and sponsored by community groups that use various child identification methods. Examples are:

- Child Identification Program (**CHIP**), sponsored by the Masons. This program gathers a physical description and features ~~care,~~ fingerprinting ~~cared or scanned print~~, several still photos of various profiles, a video recording or mannerisms with voice interview, and various DNA samples collected on dental impressions and/or cheek swabs. (MYCHIP-No date)
- The National Child Identification Program, sponsored by the American Football Coaches Association with the Optimist International and Clear Channel Int. They provide an identification kit which includes an inkless fingerprinting card, DNA collection envelope, and cut out wallet card. (NCIP-ID Kit; NCIP-Swab Instructions)
- New England Kids Identification System (KIDS) sponsored by the Massachusetts Free Masons and the Massachusetts Dental Society, which incorporates dental bite impression and cheek

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swabs to gather DNA material into the CHIP events. (MYCHIP-No date; Ellis et al. 2007; Tesini & Harte 2005)

- The Federal Bureau of Investigation (**FBI**) has a free mobile telephone application (app) "FBI Child ID", available for download on both iTunes and Google Play. This application provides an easily accessible means to electronically store photos and vital information about children. Additionally, there is a special tab on the app that allows quick and easily access to e-mail to send information to authorities, if necessary. (FBI-No date)

Policy statement

The AAPD recognizes the importance of dentistry's role in the provision of data for identification of missing ~~and/~~or deceased children and encourages dental professionals to assist in identifying such individuals through dental records and other mechanisms. The AAPD also encourages community identification programs to include a dental component documenting the child's dental home (AAPD P_Dental Home) and encouraging consistent dental visits. A dental home should be established for every child by 12 months of age. (AAPD P_Dental Home; AAPD BP_Perinatal/Infant) A detailed dental record, updated at recall appointments, economically establishes an excellent database of confidential, state-of-the-art child identification information that can be retrieved easily, stored safely, and up-dated periodically. The dental record may contain a thorough description of the oral cavity documenting all anomalies, a record of restorative care delivered including materials used, appropriate dental radiographs, (ADA 2012) photographs, study casts, and bite registration.

References

Aidar M, Line SR. A simple and cost-effective protocol for DNA isolation from buccal epithelial cells. Braz Dent J 2007;18(2):148-52.

American Academy of Pediatric Dentistry. Policy on Child Identification Programs. Pediatr Dent 2003;25(7):13.

American Academy of Pediatric Dentistry. Policy on Child Identification Programs. The Reference Manual of Pediatric Dentistry. Chicago Ill.: American Academy of Pediatric Dentistry; 2017: 53-54.

American Academy of Pediatric Dentistry. ~~Guideline on p~~Perinatal and infant oral health care. ~~Pediatr Dent 2016;38(special issue):150-4. Accessed June 10, 2017.~~The Reference Manual of Pediatric Dentistry. Chicago,Ill.: American Academy of Pediatric Dentistry; 2021:262-6. ~~(Archived by WebCite® at: "http://www.webcitation. org/6o4vSI8lV")~~

American Academy of Pediatric Dentistry. Policy on the dental home. ~~Pediatr Dent 2016;38(special issue):25-6. Accessed June 10, 2017.~~ The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:15. ~~(Archived by WebCite® at: "http://www.webcitation.org/6o4vJ67uy")~~

American Dental Association, U.S. Department of Health and Human Services. Dental radiographic examinations: Recommendations for patient selection and limiting radiation exposure. Rockville, Md.: Food and Drug Administration; 2012. Available at: "http://www.fda.gov /downloads/Radiation-EmittingProducts/Radiation EmittingProductsandProcedures/MedicalImaging/ MedicalX-Rays/UCM329746.pdf". Accessed ~~June 10, 2017~~ August 5, 2021. ~~(Archived by WebCite® at: "http://www.webcita tion.org/6tHkUmUn3")~~

Berman GM, Bush MA, Bush PI, Freeman AJ, et al. Dental identification. In: Senn DR, Weems RA, eds. Manual of Forensic Odontology. 5th ed. Boca Raton, Fla.: CRC Press; 2013:75-127.

Bhuptani D, Kumar S, Vats M, Sagav R. Age and Gender Related Changes in Salivary Total Protein Levels for Forensic Application. J Forensic Odontostomatol 2018;36(1)26-33.

Cardoza AR, Wood JD. Atypical forensic dental identifications. J Calif Dent Assoc 2015;43(6):303-8.

Chen H, Jain AK. Automatic forensic dental identification. In: Jain AK, Flynn P, Ross AA, eds. Handbook of Biometrics. New York, NY: Springer Science+Business Media, LLC; 2008:231-51.

Conceição L, da Silveira IA, Lund RG. Forensic dentistry: An overview of the human identification's techniques of this dental specialty. J Forensic Res 2015;6(1):1.

Debnath N, Gupta R, Nongthombam RS, Chandran P. Forensic odontology. J Med Soc 2016;30(1):20-3.

Du H, Li M, Li G, Lyu T, Tian X. Specific oral and maxillofacial identifiers in panoramic radiographs used for human identification. J Forensic Sci 2021;66(3):910-8.

Ellis MA, Song F, Parks ET, Eckert GJ, Dean JA, Windsor LJ. An evaluation of DNA yield, DNA quality and bite registration from a dental impression wafer. J Am Dent Assoc 2007;138(9):1234-40.

Federal Bureau of Investigation. The FBI's Child ID app putting safety in your hands. Available at "https://www. fbi.gov/file-repository/child-id-app-full-content.pdf." Accessed ~~June 10, 2017.~~ August 5, 2021. ~~(Archived by WebCite® at: "http://www.webcitation.org/6o4zqog7Z")~~

Federal Bureau of Investigation National Crime Information Center. 2021 National Crime Information Center (NCIC) Missing Person and Unidentified Person Statistics Pursuant to the Requirements of the Crime Control Act of 1990, Pub. L. No. 101-647, 104 Stat. 4789. February 2, 2022. Pages 5,10. Available at: "https://www.fbi.gov/file-repository/2021-ncic-missing-person-and-unidentified-person-statistics.pdf". Accessed March 26, 2022.

Kavanaugh SA, Filippi JE. Missing and unidentified persons. In: Senn DR, Weems RA, eds. Manual of Forensic Odontology. 5th ed. Boca Raton, Fla.: CRC Press; 2013:195.

Masonic Youth Child Identification Program (MYCHIP). Available at: "http://www.mychip.org". Accessed ~~June 10, 2017.~~ August 5, 2021. ~~(Archived by WebCite® at: "http://www.webcitation.org/6o4uW4HhZ")~~

National Child Identification Program. Swab Instructions. Available at: "http://www.childidprogram.com/the-id-kit/swab-instructions". Accessed ~~June 10, 2017.~~ August 5, 2021. ~~(Archived by WebCite® at: "http://www.webcitation.org /6o4ujbJKe")~~

National Child Identification Program. The ID Kit. Available at: "http://www.childidprogram.com/the-id-kit". Accessed ~~June 10, 2017.~~ August 5, 2021. ~~(Archived by WebCite® at: "http://www.webcitation.org/6o4utJUUU")~~

National Child Identification Program. Why should we fingerprint our children? National Child Identification Program. About us. Available at: "http://www.childid program.com/about-us". Accessed ~~June 10, 2017.~~ August 5, 2021. ~~(Archived by WebCite® at: "http://www.webcitation.org/6o4u8Dfm2")~~

Reddy G, Reddy VP, Sharma M, Aggarwal M. Role of orthodontics in forensic odontology – A social responsibility. J Clin Diag Res 2016;10(4):1-3.

Shanbhag VK. Significance of dental records in personal identification in forensic sciences. J Forensic Sci Med 2016;2(1):39-43.

Sperber N. Identification of children and adults through federal and state identification systems: Recognition of human bite marks. Forensic Sci Int 1986;30(2-3):187-93.

Tesini DA, Harte DB. Anatomy of a properly taken tooth print thermoplastic bite impression. J Mass Dent Soc 2005;54(2):22.

Vij N, Kochhar GK, Chachra S, Kaur T. Dentistry to the rescue of missing children. A review. J Forensic Dent Sci 2016: Jan-Apr (1): 7-12.

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Policy on ~~Mandatory~~ School-Entrance Oral Health Examinations

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **ECC**: Early childhood caries.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) encourages policy makers, public health and education officials, and medical and dental communities to recognize that unmet oral health needs can impact a child's ability to learn. An oral health examination prior to matriculation into school may improve school readiness by providing a timely opportunity for prevention, diagnosis, and treatment of oral conditions.

Methods

This policy was developed by the Council on Clinical Affairs~~, and~~ adopted in 2003(AAPD 2003), and last~~. This document is an update of the previous version,~~ revised in 2017~~2~~(AAPD 2017). This revision included electronic database and hand searches of articles in the medical and dental literature using the terms: oral health examination, dental screening, dental examination, dental assessment, school oral health examinations, dental certificates AND school-entrance; fields: all; limits: within the last 10 years, humans, English, birth through age 18. Additionally, the U.S. Surgeon General's report *Oral Health in America*(Surgeon Gen) and websites for the American Academy of Pediatrics and AAPD were referenced.

Background

Professional care is necessary to maintain oral health.(~~US DHHS 2000~~ NIH2021) The AAPD "emphasizes the importance of initiating professional oral health intervention in infancy and continuing through adolescence and beyond. The periodicity of professional oral health intervention and services is based on a patient's individual needs and risk indicators."(AAPD BP_Periodicity) The American Academy of Pediatrics recommends that, beginning at age three, a child's comprehensive health assessment should include attention to problems that might influence school achievement.(AAP 2000

Ruff 2019) General health examinations prior to school entrance are mandated by many states. However, integration of general health and oral health care programs remains deficient.(IOM 2011) In the United States, approximately 23 percent of children aged 2-5 have experienced dental caries in the primary dentition, and 10 percent have untreated disease(Dye et al. 2015, CDC 2019) .~~Only 30 percent of schools conduct oral health screenings once the child has matriculated.(CDC)~~While regulations may not guarantee that every child will be examined by a dentist, they do increase the likelihood of this happening.(CDHP 2019)

Caries is the most common chronic disease of childhood in the U.S.(US DHHS 2000) Early childhood caries (**ECC**) is a severe problem for young children, affecting 23 percent of children two to five years of age nationwide.(Dye et al. 2015; CDC 2019) By six to eight years of age, the prevalence of dental caries increases to 56 percent.(Dye et al. 2015, CDC 2019) Poverty remains one of the most important indicators of early childhood dental caries experience, with about one in three preschoolers living in poverty having some form of ECC.(NIH2021)~~ Low-income children are disproportionally affected, with 33 percent of low-income children experiencing 75 percent of dental caries.(Fisher-Owens et al. 2008)~~ Dental care remains as one of the greatest unmet needs for children. Untreated health conditions such as asthma, dental pain, and vision and hearing deficits are leading causes of chronic absence, and children with oral health problems are three times more likely than their peers to miss school. (CDC 2019 ,NASBE 2019) Safe and effective measures exist to prevent caries and periodontal diseases; however, dissemination and awareness of such measures do not reach the population at large.(~~US DHHS 2000~~ , NIH2021)More than one-~~third~~ fourth of the population of the United States does not benefit from community water fluoridation.(CDC 2018) Because the use of fluoride contributes to the prevention, inhibition, and reversal of caries,(CDC-Community Water Fluoridation 2018) early determination of a child's systemic and topical fluoride exposure is important. A dental home provides the necessary diagnostic, preventive, and therapeutic practices, as well as ongoing risk assessment and education, to improve and maintain the oral health of infants, children, and adolescents.(AAPD Dental Home) To maximize effectiveness, the dental home should be established within six months of eruption of a child's first tooth and no later than his~~/her~~ first birthday.(AAPD P_Dental home~~BP_Periodicity~~)

The public's lack of awareness of the importance of oral health is a major barrier to dental care~~.(US DHHS 2000~~ NIH2021) Oral health is integral to general health.(~~US DHHS 2000~~ NIH2021) Oral conditions can interfere with eating and adequate nutritional intake, speaking, self-esteem, and daily activities.(Moynihan & Petersen 2004) Children with ~~ECC~~ untreated disease may be severely underweight because of associated pain and the disinclination to eat. Nutritional deficiencies during childhood can impact cognitive development.(~~Moynihan & Petersen 2004~~; Nyaradi et al. 2013) Rampant caries is one of the factors causing insufficient development in children who have no other medical problems.(~~Acs et al. 1992~~Colak 2013) Unrecognized disease and postponed care result in exacerbated problems, which lead to more extensive and costly treatment needs. ~~The World Health Organization has suggested that school dental screenings could enable early recognition and timely interventions, leading to savings of health care dollars for individuals, community health care programs, and third-party payors.(Kwan & Petersen 2003)~~

~~In 2000, the National Association of State Boards of Education recognized "health and success in school are interrelated. Schools cannot achieve their primary mission of education if students and staff are not healthy and fit physically, mentally, and socially."(Bogden & Vega-Matos 2000)~~ Health and education are closely related.(CDC Making the connection) Children with dental pain may be irritable, withdrawn, or unable to concentrate. Pain can affect test performance as well as school attendance. (Moynihan & Petersen 2004; Nyaradi et al. 2013) Data from the North Carolina Child Health Assessment and Monitoring Program showed that children with poor oral health status were nearly three times more likely to miss school as a result of dental pain than were their counterparts.(Jackson et al. 2011) In addition, absences caused by pain were associated with poorer school performance.(Jackson et al. 2011) Further analysis demonstrated that oral health status was associated with performance independent of absence related to pain.(~~Jackson et al.~~ CDC healthy schools)

Following a report by the U.S. Surgeon General,(US DHHS 2000) the Centers for Disease Control and Prevention launched the Oral Health Program Strategic Plan for 2011-2014.(CDC-Oral Health Program) This campaign aimed to provide leadership to prevent and control oral diseases at national level. The program helped individual states strengthen their oral health promotion and disease prevention programs. However, requirements for oral health examinations, implementation/enforcement of regulations, and administrative disposition of collected data vary both among and within states.(CDC-Oral Health Program) Since the 2008 report, four states have passed a dental screening law, and at least one state has legislation in process.(CDHP 2019) Although dental screening laws are used to help ensure that children's oral health does not impede their ability to learn, these laws also present an opportunity to connect children in need with a dental home.(CDHP 2019)

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Policy statement

Early detection and management of oral conditions can improve a child's oral health, general health and well-being, and school readiness. Recognizing the relationship between oral health and education, the AAPD:

- ~~supports~~ advocates legislation ~~mandating~~ requiring a comprehensive oral health examination by a qualified dentist for every student prior to matriculation into school. The examination should be performed in sufficient detail to provide meaningful information to a consulting dentist and/or public health officials. This would include documentation of oral health history, soft tissue health/pathologic conditions, oral hygiene level, variations from a normal eruption/exfoliation pattern, dental dysmorphology or discoloration, dental caries (including ~~white-spot~~ noncavitated lesions), and existing restorations. The examination also should provide an educational experience for both the child and the parent. The child/parent dyad should be made aware of age-related caries-risk and caries-protective factors, as well as the benefits of a dental home.
- recognizes that without requiring, tracking, and funding appropriate follow-up care, requiring oral health examinations is insufficient to ensure school readiness and, therefore, advocates ~~supports~~ such legislation to include subsequent comprehensive oral examinations at periodic intervals throughout the educational process because a child's risk for developing dental disease changes and oral diseases are cumulative and progressive.
- encourages local leaders to establish a referral system to help parents obtain needed oral health care and establish a dental home for their children.
- encourages state and local public health and education officials, along with other stakeholders such as health care providers and dental/medical organizations, to document oral health needs, work toward improved oral health and school readiness for all children, and address related issues such as barriers to oral health care.
- ~~recognizes that without requiring, tracking, and funding appropriate follow-up care, requiring oral health examinations is insufficient to ensure school readiness~~.
- ~~encourages local leaders to establish a referral system to help parents obtain needed oral health care for their children.~~
- opposes regulations that would prevent a child from attending school due to noncompliance with ~~mandated~~ required examinations.

- encourages its members and the dental community at large to volunteer in programs for school-entry dental examinations to benefit the oral and general health of the pediatric community.

References

Acs G, Lodolini G, Kaminsky S, Cisneros GJ. Effect of nursing caries on body weight in a pediatric population. Pediatr Dent 1992;14(5):302-5.

American Academy of Pediatric Dentistry. Policy on mandatory school-entrance oral health examinations Pediatr Dent 2017;39(6):188-96.

American Academy of Pediatric Dentistry. Policy on mandatory school-entrance oral health examinations. Pediatr Dent 2003;25(suppl):15-6.

American Academy of Pediatric Dentistry. Periodicity of examination, preventive dental services, anticipatory guidance, and oral treatment for children. ~~Pediatr Dent 2017;39(6):188-96~~. PENDING

American Academy of Pediatric Dentistry. Policy on the dental home. ~~Pediatr Dent 2017;39(special issue):29-30.~~ The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:43-4.

American Academy of Pediatrics. School health assessment. Pediatrics 2000;105(4Pt1):8757. Reaffirmed October, 2011.

~~Bloom B, Jones LI, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2012. National Center for Health Statistics. Vital Health Stat 2013;10(258):1-81.~~

~~Bogden JF, Vega-Matos CA. A school health policy guide, part 1: Physical activity, healthy eating, and tobacco-use prevention. Alexandria, Va.: National Association of State Boards of Education; 2000.~~

~~Centers for Disease Control and Prevention. Community Water Fluoridation. Fluoridation Statistics 2014. Available at: “http://www.cdc.gov/fluoridation/statistics/2014 stats.htm”. February 23, 2017. (Archived by WebCite® at: “http://www.webcitationorg/6oVCcAbUU”)~~

Centers for Disease Control and Prevention. Water Fluoridation Basics. Page last reviewed October 1, 2021. Available at: “https://www.cdc.gov/fluoridation/basics/index.htm”. Accessed March 18, 2022.

~~Centers for Disease Control and Prevention. Oral Health Program. Strategic Plan 2011-2014. Available at: “https: //www.cdc.gov/oralhealth/pdfs/oral_health_strategic_plan.pdf”. Accessed February 23, 2017. (Archived by WebCite® at: “http://www.webcitation.org/6oVCsiIKC”)~~

~~Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States. MMWR Recomm Rep 2001;50(RR14):1-42.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Centers for Disease Control and Prevention. Healthy schools. Making the connection: Other health behaviors 2020. Available at : "https://www.cdc.gov/healthyschools/health_and_academics/pdf/320889-C_FS_Other_Health_Behaviors_508-tag.pdf". Accessed March 18, 2022.

Centers for Disease Control and Prevention. Oral Health Surveillance Report, 2019. Available at : "https://www.cdc.gov/oralhealth/publications/OHSR-2019-index.html" Accessed March 17, 2022.

Centers for Disease Control and Prevention. Results from the School Health Policies and Practices Study 2014. Available at: "http://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf". Accessed March 17, 2022.~~February 23, 2017.~~ ~~(Archived by WebCite® at: "http://www.webcitation.org/6oVC70IDq")~~

Children's Dental Health Project. State Dental Screening Laws for Children: Examining the Trend and Impact. An Update to the 2008 Report. January 2019. Available at: "https://s3.amazonaws.com/cdhp/Matt+Jacob/Dental+Screening+Law+Report+(Jan+2019).pdf". Accessed March 18, 2022.

Colak H, Dülgergil CT, Dalli M, Hamidi MM. Early childhood caries update: A review of causes, diagnoses, and treatments. J nat sci biol med 2013;4(1):29–38. Available at: "https://doi.org/10.4103/0976-9668.107257". Accessed March 18, 2022.

Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental Caries and Sealant Prevalence in Children and Adolescents in the United States, 2011–2012. NCHS data brief, No. 191. Hyattsville, Md.: National Center for Health Statistics. 2015. Available at: "https://www.cdc.gov/nchs/products/databriefs/db191.htm". Accessed March 17, 2022.J~~une 11, 2017.~~ ~~(Archived by WebCite® at: "http://www.webcitation.org/ 6ta8Q47bZ")~~

Fisher-Owens SA, Barker JC, Adams S, et al. Giving policy some teeth: Routes to reducing disparities in oral health. Health Aff (Millwood) 2008;27(2):404-12.

Institute of Medicine, National Research Council. Improving Access to Oral Health Care for Vulnerable and Underserved Populations. Washington, D.C.: The National Academies Press; 2011. Available at: "https://www.hrsa. gov/publichealth/clinical/oralhealth/improvingaccess.pdf". Accessed March 17 20202 ~~June 30, 2017~~. ~~(Archived by WebCite® at: "http://www.webcitation.org/6ta8K4f9D")~~

Jackson SL, Vann WF, Kotch JB, Pahel BT, Lee JY. Impact of poor oral health on children's school attendance and performance. Am J Public Health 2011;101(10):1900-6.

~~Kwan S, Petersen PE. Oral health promotion: An Essential Element of a Health-promoting School. In: World Health Organization Information Series on School Health. Geneva, Switzerland: WHO;~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~2003:Document 11. Available at: "www.who.int/oral_health/publications/doc11/en/". Accessed August 7, 2017. (Archived by WebCite® at: "http://www.webcitation.org/6siiOfHyI")~~

~~Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. Public Health Nutr 2004;7(1A): 201-26.~~

National Association of State Boards of Education. Examining chronic absence through a student health lens. Policy Update 2019;6(1):1-2.Available at: "https://nasbe.nyc3.digitaloceanspaces.com/2019/02/Blanco-et-al_Chronic-Absence-Final.pdf ". Accessed March 18, 2022.

National Institutes of Health. Oral Health in America: Advances and Challenges. Bethesda, MD: US Department of Health and Human Services, Ntional Institutes of Health, National Institute of Dental and Craniofacial Research, 2021. Section 2A 1-97.

Nyaradi A, Li J, Hickling S, Foster J, Oddy WH. The role of nutrition in children's neurocognitive development, from pregnancy through childhood. Front Hum Neurosci 2013;7:97. Available at: "https://doi.org/10.3389/fnhum. 2013.00097". Accessed March 17, 2022. ~~June 7, 2017. (Archived by Web- Cite® at: "http://www.webcitation.org/6siiqwGXO")~~

~~U.S. Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General. Rockville, Md.: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000.~~

Ruff RR, Senthi S, Susser SR, Tsutsui A. Oral health, academic performance, and school absenteeism in children and adolescents: A systematic review and meta-analysis. J Am Dent Assoc 2019;150(2):111-21.

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. Summary Health Statistics: National Health Interview Survey, 2018 Available at : "https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2018_SHS_Table_C-11.pdf". Accessed March 18, 2022.

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Policy on the Role of Dental Prophylaxis in Pediatric Dentistry

Latest Revision

~~2017~~ 2022

Purpose

The American Academy of Pediatric Dentistry ~~presents~~ ~~this policy to assist practitioners in determining the indications and methods for dental prophylaxis~~ recognizes the dental prophylaxis as an integral component of periodic oral health assessment, education, and preventive care.

Methods

This policy was developed by the Clinical Affairs Committee, ~~and~~ adopted in 1986 (AAPD 1986), and last revised in 2017 (AAPD 2017). This ~~document is an update of the previous version, revised in 2012. The~~ revision included a new literature search of ~~databases~~ PubMed®/MEDLINE ~~and Google Scholar~~ using the terms: dental prophylaxis, tooth-brushing, professional tooth cleaning, fluoride uptake, and professional dental prophylaxis, limited to children (birth to 18 years), the last 10 years, and English language, resulting in 1,390 articles. This was further filtered to utilize randomized control studies and systematic reviews only, resulting in 109 papers for review. ~~Ppapers for review were chosen from relevant articles.~~ When necessary, hand searching for articles and Google Scholar searches were also utilized. Expert and/or consensus opinion by experienced researchers and clinicians also was considered.

Background

The aim of oral prophylaxis is to remove supragingival plaque, stain, and calculus from patients' teeth. NEW BP Perio 2021-2022) This may be accomplished utilizing hand instruments, ultrasonic scalers, rubber rotary cup, toothbrush, interdental cleaners (e.g., floss), and air polishing. Persistent gingival inflammation in young patients with reasonable supragingival home plaque control often is related to calculus deposits previously not detected or only partially removed (Clerehugh & Tugnait, 2001). Attachment loss due to chronic subgingival calculus in young children has been reported (Roberts-Harry & Clerehugh, 2000). Thus, a dental prophylaxis is an important component of initial and recall dental appointments. (NEW BP Perio 2022) The instrumentation (e.g. toothbrush prophylaxis, hand-scaling) needed for each patient is determined on an individual basis. In example, in the young or pre-cooperative patient, patients with special health care needs, or patients with no calculus, a toothbrush prophylaxis may be utilized by the dental professional. ~~The term dental prophylaxis encompasses several techniques that are used by dental personnel to professionally remove plaque, stain, and calculus from patients' teeth.~~

Limited evidence suggests that, although prophylaxis may lead to short-term reductions in plaque levels and gingival bleeding, it may not lead to the prevention of gingivitis (Horowitz 2012; Azarpazhooh & Main 2009). Nevertheless, prophylaxis is an important component of pediatric oral health care and, among other benefits detailed below, facilitates the conduct of a high-quality comprehensive oral examination. The coronal polish procedure typically entails the application of a dental polishing paste to tooth surfaces with a rotary rubber cup or bristle brush to remove plaque and stains from teeth. ~~Often, the~~ A toothbrush coronal polish (i.e., toothbrush and toothpaste) is a procedure that is used to remove plaque from tooth surfaces and demonstrate brushing techniques to caregivers for young children and for patients with special needs who cannot tolerate the use of a rotary rubber cup.(Ramos-Gomez et al. 2010) ~~The rubber cup coronal polish is a procedure in which a dental polishing paste is applied to tooth surfaces with a rotary rubber cup or rotary bristle brush to remove plaque and stains from teeth. (Wilkins 2009)~~ Air polishing uses a mix of pressurized air, abrasive powder, and water to remove supragingival stains, plaque, and deposits from teeth. (Graumann 2013) Dental scaling is a procedure in which hand or ultrasonic instruments are used to remove calculus and stain. Full mouth debridement may be necessary as a preliminary treatment for those whose medical, psychological, physical, or periodontal condition result in calculus accumulation beyond the scope of routine prophylaxis.

These procedures facilitate the clinical examination and introduce dental procedures to the patient. Additionally, the accompanying preventive visit demonstrates proper oral hygiene methods to the patient and/or caregiver. Professional oral hygiene instruction and reinforcement can lead to behaviors that reduce both plaque and gingivitis (Chapple et al, 2015), but in the absence of patient oral hygiene instruction, professional supra-gingival and sub-marginal plaque and calculus removal has little value in gingivitis prevention (Tonetti et al, 2015). (BP Perio 2022)

The frequent disruption or removal of bacterial dental plaque, known as biofilm, from various areas of the oral cavity is crucial to oral disease prevention and is achieved through regular personal oral hygiene and professional prophylaxis. (Larsen, 2017) Accurate detection of biofilm is critical to effective removal and special dyes of iodine, gentian violet, erythrosine, basic fuchsin, fast green, food dyes, fluorescein, and two-tone disclosing agents are available in the forms of tablets, solutions, wafers, lozenges, or mouthrinses. (Dipayan, 2017) Biofilm staining allows for effective personalized oral health guidance

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from healthcare providers. Severe dental caries is most strongly associated with biofilm in the upper posterior palatal, lower posterior buccal, and lower posterior lingual spaces, as well as on the tongue. (Fasoulas 2019) Disclosing agents for both professional and personal use can supplement a personal oral hygiene protocol.

Flossing is an important part of the prophylaxis that removes interproximal and subgingival plaque, aids~~ing~~ in educating the patient, and facilitates ~~ing~~ the oral examination. Since interdental plaque biofilm is not completely removed after brushing (Chapple et al, 2015; Perry et al, 2019) interdental cleaning is indicated when interdental spaces are filled with gingiva or contacts are closed (Drummond, 2017; Silva et al, 2019). Different devices are used to remove plaque interdentally (e.g. dental floss, interdental brushes, oral irrigations) (Chapple et al, 2015; Perry et al, 2019). The benefits of various prophylaxis options are shown in the Table below.

Numerous reports have shown plaque and pellicle are not a barrier to fluoride uptake in enamel and, consequently, ~~there is no evidence of a difference in caries rates or fluoride uptake in subjects~~ patients who receive rubber cup dental prophylaxis~~coronal polish~~ or a tooth-brush prophylaxis ~~coronal polish~~ before fluoride treatment exhibit no difference in caries rates. (Azarpazhooh & Main 2009; Weyant et al. 2013, Horowitz 2012) Rubber cup prophylaxis is not required prior to the topical application of fluorides.

A patient's risks for caries and~~/~~ periodontal disease, as determined by the patient's dental provider, can ~~should~~ help determine the interval of the prophylaxis or periodontal maintenance. An individualized preventive plan increases the probability of good oral health ~~by~~ ~~demonstrating~~through proper oral hygiene methods and techniques as demonstrated by oral health professionals. In addition, removing plaque, stain, calculus, and the factors that influence their buildup increases the probability of good oral health. Patients who exhibit higher risk for developing caries ~~and/~~or periodontal disease ~~should~~ ~~have~~can benefit from recall visits at more frequent intervals.(Patel et al. 2010; AAPD BP_Periodicity 2021)

Policy statement

The American Academy of Pediatric Dentistry supports a ~~P~~professional prophylaxis during new patient comprehensive and periodic examinations to: ~~is indicated to:~~

- instruct the caregiver and child or adolescent in proper oral hygiene techniques.
- remove dental plaque, extrinsic stain, and calculus deposits from the teeth.
- facilitate the examination of hard and soft tissues.

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- introduce dental procedures to the young child and apprehensive patient.

~~A patient's risk for caries/ and periodontal disease helps determine the interval for recall.~~ ~~Those who exhibit higher risks should have recall visits more frequently than every six months.~~ Determination of interval for periodic examinations takes into consideration a patient's assessed risk for caries and periodontal disease (APPD BP Caries-risk Assessment 2022; AAPD Risk Assessment 2022)

References

American Academy of Pediatric Dentistry. Periodicity of examination, preventive dental services, anticipatory guidance/counseling, and oral treatment for infants, children, and adolescents. ~~Pediatr Dent 2017;39(6): 188-96.~~ The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry. PENDING.

American Academy of Pediatric Dentistry. Policy on role of dental prophylaxis in pediatric dentistry. Pediatr Dent 2017;39(6):47-8.

American Academy of Pediatric Dentistry. The role of prophylaxis in pediatric dentistry. Colorado Springs, Colo.: American Academy of Pediatric Dentistry; May, 1986.

Azarpazhooh A, Main PA. Efficacy of dental prophylaxis (rubber cup) for the prevention of caries and gingivitis: A systematic review of literature. Br Dent J 2009;207 (7):E14; discussion 328-9.

Chapple IL, Van der Weijden F, Doerfer C, et al. Primary prevention of periodontitis: Managing gingivitis. J Clin Periodontol 2015;42(Suppl 16):S71-6.

Clerehugh V, Tugnait A. Diagnosis and management of periodontal diseases in children and adolescents. Periodontol 2000 2001;26:146-68.

Dipayan D, Kumar SGR, Narayanan MBA, Selvamary AL, Sujatha A, Disclosing solutions used in dentistry, World J. Pharmaceut Res 2017;6(6):1648-56.

Drummond BK, Brosnan MG, Leichter JW. Management of periodontal health in children: Pediatric dentistry and periodontology interface. Periodontol 2000 2017;74(1):158-67.

Fasoulas A, Pavlidou E, Petridis D, Mantzorou M, Seroglou K, Giaginis C. Detection of dental plaque with disclosing agents in the context of preventive oral hygiene training programs. Heliyon 2019; 10;5(7):e02064.

Graumann SJ, SensatML, Stoltenberg JL. Air polishing: A review of current literature. J Dent Hyg 2013;87(4):173-80.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Horowitz AM. Rubber cup dental prophylaxis is not needed prior to the topical application of fluorides and rubber cup dental prophylaxis at recall is not effective in the prevention of gingivitis. J Evid Base Dent Pract 2012;12:77-8.

Larsen T, Fiehn NE, Dental biofilm infections - An update, APMIS 2017;125(4):376-84.

Patel S, Bay RC, Glick M. A systematic review of dental recall intervals and incidence of dental caries. J Am Dent Assoc 2010;141(5):527-39.

Perry DA, Takei HH, Do JH. Plaque biofilm control for the periodontal patient. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier; 2019: 511-20.

Ramos-Gomez F, Crystal YO, Ng MW, Tinanoff N, Featherstone JD. Caries risk assessment, prevention, and management in pediatric dental care. Gen Dent 2010;58 (6):505-17; quiz 518-9.

Roberts-Harry EA, Clerehugh V. Subgingival calculus: Where are we now? A comparative review. J Dent 2000;28(2):93-102.

Silva DR, Law CS, Duperon DF, Carranza FA. Gingival disease in childhood. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's clinical periodontology. 13th ed. Philadelphia, PA: Elsevier; 2019: 277-86.

Tonetti MS, Eickholz P, Loos BG, et al. Principles in prevention of periodontal diseases: Consensus report of group 1 of the 11th European Workshop on Periodontology on effective prevention of periodontal and peri-implant diseases. J Clin Periodontol 2015;42(Suppl 16):S5-11.

~~Weyant RJ, Tracy SL, Anselmo TT, et al. Topical fluoride for caries prevention: Executive summary of the updated clinical recommendations and supporting systematic review. J Am Dent Assoc 2013;144(11):1279-91.~~

~~Wilkins EM. Extrinsic stain removal. Clinical Practice of Dental Hygienist. 10th ed. Baltimore, Md.: Lippincott Williams and Wilkins; 2009:728-35.~~

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Table. BENEFITS OF PROPHYLAXIS OPTIONS

	Plaque removal	**Stain removal**	**Calculus removal**	**Education of patient/~~parent~~ caregiver**	**Facilitate examination**
Toothbrush	Yes	No	No	Yes	Yes
Rubber cup	Yes	Yes	No	Yes	Yes
Hand instruments	Yes	Yes	Yes	Yes	Yes
Ultrasonic scalers	Yes	Yes	Yes	Yes	Yes
Air polishing	Yes	Yes	Yes	Yes	Yes
Flossing/interdental cleaning	Yes	No	No	Yes	Yes

Policy on Interim Therapeutic Restorations (ITR)

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **ART**: Atraumatic/ alternative restorative techniques. **ITR**: Interim therapeutic restorations.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that unique clinical circumstances can result in challenges in restorative care for infants, children, adolescents, and persons with special health care needs. When circumstances do not permit traditional cavity preparation and/or placement of traditional dental restorations or when caries control is necessary prior to placement of definitive restorations, interim therapeutic restorations (**ITR**)(AAPD BP_Restorative) may be beneficial and are best utilized as part of comprehensive care in the dental home.(Nowak & Casamassimo 2002; AAPD P_Dental Home) This policy will differentiate ITR from atraumatic/alternative restorative techniques (**ART**)(Frencken et al. 1997) and describe the circumstances for its use.

Methods

This policy was developed by the Council on Clinical Affairs, ~~and~~ adopted in 2001(AAPD 2001),~~. This document is a revision of the previous version,~~and revised in 2017~~3~~.(AAPD 2017) This update~~d policy~~ is based upon electronic database and hand searchesof medical and dental literature using PubMed®/Medline and the terms: dental caries, cavity, primary teeth, deciduous teeth, atraumatic restorative treatment, interim therapeutic restoration, AND glass ionomer; fields: all; limits: within the last 10 years, humans, English, birth through age 18. Two hundred ninety-one articles met these criteria. Articles were screened by viewing titles and abstracts. Articles were chosen for review from these searches and from the references within selected articles. Additionally, websites for the AAPD and the American Dental Association were reviewed. Expert and/or consensus opinion by experienced researchers and clinicians was also considered.

Background

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ART has been endorsed by the World Health Organization as a means of restoring and preventing caries in populations with little access to traditional dental care.(Frencken et al. 1997; WHO 2017 ~~No date~~; Frencken 2010) In many countries, practitioners provide treatment in non-traditional settings that restrict restorative care to placement of provisional restorations. Because circumstances do not allow for follow-up care, ART mistakenly has been interpreted as a definitive restoration. ITR utilizes similar techniques but has different therapeutic goals. Interim therapeutic restoration more accurately describes the procedure used in contemporary dental practice in the United States.

ITR may be used to restore, arrest or prevent the progression of carious lesions in young patients, uncooperative patients, or patients with special health care needs or when traditional cavity preparation and/or placement of traditional dental restorations are not feasible and need to be postponed.(Deery 2005; Gryst & Mount 1999; Canares et al 2018) Additionally, ITR may serve useful~~be used~~ for step-wise excavation in children with multiple open carious lesions prior to definitive restoration of the teeth, in erupting molars when isolation conditions are not optimal for a definitive restoration, or for caries control in patients with active lesions prior to treatment performed under general anesthesia.(Vij et al. 2004; Antonson 2012; de Amorim et al 2018) ITR may be beneficial for patients that require additional acclimatization or increased cooperation to complete definitive restorative treatment. (Lim et al 2017) The use of ITR has been shown to reduce the levels of cariogenic oral bacteria (e.g., Mutans streptococci, lactobacilli) in the oral cavity immediately following its placement.(Bönecker et al. 2003; Roshan et al. 2010; Wambier et al. 2007) However, this level may return to pretreatment counts over a period of six months after ITR placement if no other treatment is provided.(Roshan et al. 2010) ITR also may help reduce the risk of decay in teeth adjacent to the interim restoration. (Ruff & Niederman 2018) This technique serves as a viable tool when circumstances (e.g., coronavirus disease 2019 [COVID-19] pandemic) call for minimizing the generation of aerosols during restorative care.(Al-Halabi et al. 2020; Yang et al 2021.)

The ITR procedure involves removal of caries using hand or rotary instruments with caution not to expose the pulp. Leakage of the restoration can be minimized with maximum caries removal from the periphery of the lesion. Following preparation, the tooth is restored with an adhesive restorative material such as glass ionomer or resin-modified glass ionomer cement.(Yip et al. 2001) ITR has the greatest success when applied to single surface or small two surface restorations.(Mandari et al. 2003; da Franca et al. 2011; de Amorim et a 2018) Inadequate cavity preparation with subsequent lack of retention and insufficient bulk can lead to failure.(da Franca et al. 2011; van Gemert-Schriks et al. 2007) Follow-up care with topical fluorides and oral hygiene instruction may improve the treatment outcome in high caries-risk dental populations, especially when glass ionomers (which have fluoride releasing and re-charging properties) are used.(Tam et al. 1997; Scherer et al. 1990; Tyas 1991)

Policy statement

The AAPD recognizes ITR as a beneficial provisional technique in contemporary pediatric restorative dentistry. The AAPD supports the use of ITR ~~may be used~~ to restore and prevent the progression of dental caries in young patients, uncooperative patients, patients with special health care needs, and situations in which traditional cavity preparation ~~and~~/or placement of traditional dental restorations is~~are~~ not feasible. Furthermore, ITR may be used for caries control in children with multiple caries~~carious~~ lesions prior to definitive restoration of the teeth.

References

Al-Halabi M, Salami A, Alnuaimi E, Kowash M, Hussein I. Assessment of paediatric dental guidelines and caries management alternatives in the post COVID-19 period. A critical review and clinical recommendations. Eur Arch Paediatr Dent 2020;21(5):543-556.

American Academy of Pediatric Dentistry. Pediatric restorative dentistry. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry. ~~Pediatr Dent 2017;39(6):312-24~~. BEING UPDATED.

American Academy of Pediatric Dentistry. Policy on the dental home. The Reference Manual of Pediatric Dentistry. Chicago, Ill.:American Academy of Pediatric Dentistry; 2021:43-3. ~~Pediatr Dent 2017;39(6):29-30.~~

Antonson SA, Antonson DE, Brener S, et al. Twenty-four month clinical evaluation of fissure sealants on partially erupted permanent first molars: Glass ionomer versus resin-based sealant. J Am Dent Assoc 2012;143(2):115-22.

Bönecker M, Toi C, Cleaton-Jones P. Mutans strepto-cocci and lactobacilli in carious dentine before and after Atraumatic Restorative Treatment. J Dent 2003;31(6): 423-8.

Canares G, Hsu KL, Dhar V, Katechia, B. Evidence-based care pathways for management of early childhood caries. Gen Dent 2018;66(6):24-8.

de Amorim RG, Frencken JE, Raggio DP, Chen X, Hu X, Leal SC. Survival percentages of atraumatic restorative treatment (ART) restorations and sealants in posterior teeth: an updated systematic review and meta-analysis. Clin Oral Investig. 2018;22(8)2703-25.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

da Franca C, Colares V, Van Amerongen E. Two-year evaluation of the atraumatic restorative treatment approach in primary molars class I and II restorations. Int J Paediatr Dent 2011;21(4):249-53.

Deery C. Atraumatic restorative techniques could reduce discomfort in children receiving dental treatment. Evid Based Dent 2005;6:9.

Frencken J, Pilot T, van Amerongen E, Phantumvanit P, Songpaisan Y. Manual for the atraumatic restorative treatment approach to control dental caries. WHO Col-laboration. Centre for Oral Health Services Research. Groningen, The Netherlands; 1997. Available at: http://vida.gt/clinica/doctores/wp-content/uploads/sites/2/2014/07/ART_Manual_English.pdf. Accessed January 1, 2022.~~"https:// www.researchgate.net/profile/Yupin_Songpaisan/ publication/228553340_Manual_for_the_Atraumatic_Restaurative_Treatment_approach_to_control_dental_ caries/links/02e7e51f0ef4f102d1000000.pdf". Accessed November 6, 2016. (Archived by WebCite® at: "http://www.web citation.org/6owJnTvED")~~

Frencken JE. The ART approach using glass-ionomers in relation to global oral health care. Dent Mater 2010;26 (1):1-6.

Gryst ME, Mount GJ. The use of glass ionomer in special needs patients. Aust Dent J 1999;44(4):268-74.

Lim SN, Kiang L, Manohara R, Tong HJ, Nair R, Hong C, Hu S. Interim therapeutic restoration approach versus treatment under general anaesthesia approach. Int J Paediatr Dent 2017;27(6)551-7.

Mandari GJ, Frencken JE, van't Hof MA. Six-year success rates of occlusal amalgam and glass-ionomer restorations placed using three minimal intervention approaches. Caries Res 2003;37(4):246-53.

Nowak AJ, Casamassimo PS. The dental home. J Am Dent Assoc 2002;133(1):93-8.

Roshan NM, Shigli AL, Deshpande SD. Microbiological evaluation of salivary *Streptococcus mutans* from children of age 5-7 years, pre- and post-atraumatic restorative treatment. Contemp Clin Dent 2010;1(2):94-7.

Ruff RR, Niederman R. Comparative effectiveness of school-based caries prevention: a prospective cohort study. BMC Oral Health 2018;18(1)53-9.

Scherer W, Lippman N, Kaim J, LoPresti J. Antimicrobial properties of VLC liners. J Esthet Dent 1990;2(2):31-2.

Tam LE, Chan GP, Yim D. In vitro caries inhibition effects by conventional and resin modified glass ionomer restorations. Oper Dent 1997;22(1):4-14.

Tyas MJ. Cariostatic effect of glass ionomer cements: A five-year clinical study. Aust Dent J 1991;36(3):236-9.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

van Gemert-Schriks MCM, van Amerongen WE, ten Cate JM, Aartman IHA. Three-year survival of single-and two-surface ART restorations in a high-caries child population. Clin Oral Investig 2007;11(4):337-43.

Vij R, Coll JA, Shelton P, Farooq NS. Caries control and other variables associated with success of primary molar vital pulp therapy. Pediatr Dent 2004;26(3):214-20.

Wambier DS, dosSantos FA, Guedes-Pinto AC, Jaeger RG, Simionato MRL. Ultrastructural and microbiological analysis of the dentin layers affected by caries lesions in primary molars treated by minimal intervention. Pediatr Dent 2007;29(3):228-34.

World Health Organization. WHO Expert Consultation on Public Health Intervention against Early Childhood Caries: report of a meeting, Bangkok, Thailand, 26-28 January 2016. Geneva: World Health Organization; 2017. Available at: "https://www.who.int/publications/i/item/who-expert-consultation-on-public-health-intervention-against-early-childhood-caries". Accessed January 1, 2022. ~~Atraumatic Restorative Treatment. Available at: "http://new.paho.org/hq/index.php?option=com_content&view=article&id=7411&Itemid=39633&lang=en". Accessed November 6, 2016. (Archived by WebCite® at: "http://www.webcitation.org/ 6owJ9ZsBN")~~

Yang F, Yu L, Qin D, Hua F, Song G. Online consultation and emergency management in paediatric dentistry during the COVID-19 epidemic in Wuhan: A retrospective study. Int J Paediatr Dent 2021;31(1):5-11.

Yip HK, Smales RJ, Ngo HC, Tay FR, Chu F. Selection of restorative materials for the atraumatic restorative treatment (ART) approach: A review. Spec Care Dent 2001;21(6):216-221.

Policy on Management of the Frenulum in Pediatric ~~Dental~~ Patients

~~Adopted~~ Revised
~~2017~~ 2022

Abbreviations: AAPD: American Academy of Pediatric Dentistry.

Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes that a restrictive oral frenulum may affect a child's health by hindering the ability to breastfeed or speak. The frequency of ~~frenotomy/ frenectomy~~ surgical intervention is increasing exponentially ~~with reports indicating~~ ~~as much as a 90~~ over the last two decades.(CADTH 2016; Walsh et al. 2017; Messner 2021; Tadros 2022). ~~The American Academy of Pediatric Dentistry~~AAPD recognizes an evidence-based policy on frenula would make information ~~and recommendations~~ more accessible to dentists, physicians, ~~and~~ other allied health professionals and parents ~~in an evidence-based format~~ and help reduce the number of unnecessary or incorrectly timed procedures.

Methods

This policy, developed by the Council of Clinical Affairs in 2017(AAPD 2017), is based on a review of current dental and medical literature and sources of recognized professional expertise and stature, including both the academic and practicing health communities, related to frenula/frenotomies. In addition, literature searches of PubMed®/MEDLINE, Web of Science, and Google Scholar databases were conducted using the terms: ankyloglossia, ankyloglossia AND breastfeeding outcomes, breast-feeding with ankyloglossia and/or upper lip tie, gastroesophageal reflux, frenotomy, frenulotomy, frenulectomy, frenectomy, systematic reviews of ankyloglossia other than breastfeeding, lip-tie, superior labial frenulum, maxillary lip-tie, breastfeeding cessation, frenulum, frenum, tongue-tie, speech articulation with lingual frenulum, frenuoplasty, midline diastema, lactation difficulties, nipple pain with breastfeeding, Hazelbaker Assessment Tool for Lingual Frenulum Function (ATLFF), Infant Breast-feeding Assessment Tool (IBFAT), LATCH grading scales, mandibular labial frenulum, periodontal indications for frenectomy, gingival recession associated with midline diastema; fields: all; limits: within the last ~~15~~10 years, English. One thousand six hundred twenty-two ~~seventeen~~ articles matched these criteria. Papers for review were chosen from this list and from references within selected articles. Expert and/or consensus opinion by experienced researchers and clinicians also was considered.

Definitions

Ankyloglossia: a congenital developmental anomaly of the tongue characterized by a short, thick lingual frenulum resulting in limitation of tongue movement (partial ankyloglossia) or by the tongue appearing to be fused to the floor of the mouth (total ankyloglossia).(John et al. 2016; Amir et al. 2005)

Frenectomy/frenulectomy: ~~excision of the frenulum left to heal by secondary intention.~~ the complete removal of the frenum/frenulum including its attachment to underlying bone.

Frenotomy/frenulotomy: simple cutting or incision of the frenulum.

Frenuloplasty: an extensive frenulum excision that usually involves repositioning of aberrant muscle and closed by Z-plasty or a local flap with placement of sutures ~~excisions involving sutures releasing the frenulum and correcting the anatomic situation.~~ (CDT manual 2021)

Frenulum: a mucosal attachment containing muscle and connective tissue fibers which connect intraoral structures such as the lip and cheek to the alveolar mucosa, gingiva, or periosteum. (Devishree 2012)

Background

Typically, seven frenula are present in the oral cavity, most notable the maxillary labial frenulum, the mandibular labial frenulum, the lingual frenulum, and four buccal (cheek) frenula.(Priyanka et al. 2013) Their primary function is to provide stability of the upper lip, lower lip, and tongue.(Mintz et al. 2005) Frenulum attachments and their impact on oral motor function and development ~~have become~~ are topics of ~~emerging~~ interest within the dental community as well as various healthcare specialties ~~of healthcare providers~~. Studies have shown differences in treatment recommendations among pediatricians, otolaryngologists, lactation consultants, speech pathologists, surgeons, and dental specialists.(Delli et al. 2013; Segal et al. 2007; Boutsi & Tatakis 2011; John et al. 2016; Finigan & Long 2013; O'Callahan et al. 2013; Webb et al. 2013; Suter & Bornstein 2009 LeTran et al 2019;) ~~Clear indications and timing of surgical treatment remain controversial due to lack of consensus regarding accepted anatomical and diagnostic criteria for degree of restriction and relative impact on growth, development, feeding, or oral motor function.(Delli et al. 2013; Segal et al. 2007; Boutsi & Tatakis 2011; John et al. 2016; Finigan & Long 2013; O'Callahan et al. 2013; Webb et al. 2013; Suter & Bornstein 2009)~~

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~~Although the etiology of this condition restremains unknown, the predilection of anomalies of frenulum attachments, whether ankyloglossia (tongue-tie) or a hypertrophic/restrictive maxillary labial frenulum, appears to be higher in males.(Webb et al. 2013; Suter & Bornstein 2009; Huang & Creath 1995; Knox 2010; Walsh & Tunkel 2017) Typically, seven frenula are present in the oral cavity, most notable the maxillary labial frenulum, the mandibular labial frenulum, the lingual frenulum, and four buccal (cheek) frenula.(Priyanka et al. 2013) Their primary function is to provide stability of the upper lip, lower lip, and tongue.(Mintz et al. 2005))~~ Regardless of the etiology, a 734 percent increase in diagnosed cases of ankyloglossia and an 869 percent increase in frenulum procedures have been reported from 1997 to 2012 (Walsh 2017a) When the data is examined more closely over this timespan, the average percent of patients diagnosed with ankyloglossia undergoing surgical procedures is 33 percent. More recently, in 2009, 35 percent of patients received surgery and, in 2012, 38 percent did. In 2020, a panel of pediatric otolaryngologists released a consensus statement on the diagnosis, management, and treatment of ankyloglossia in children less than 18 years old. (Messner 2020 consensus)

Maxillary frenulum

A prominent maxillary frenulum in infants, children, and adolescents, although a common finding, ~~is often~~ can be a concern to parents. The maxillary labial frenulum attachment can be classified with respect to its anatomical insertion level: (Priyanka et al. 2013)

1. mucosal (frenal fibers are attached up to the mucogingival junction);
2. gingival (frenal fibers are inserted within the attached gingiva);
3. papillary (frenal fibers are extending into the inter-dental papilla); and
4. papilla penetrating (frenal fibers cross the alveolar process and extend up to the palatine papilla).

The most commonly observed types are mucosal and gingival.(Webb et al. 2013; Boutzi 2011) However, a maxillary frenulum is a dynamic structure that presents changes in position of insertion, architecture ~~structure~~, and shape during growth and development.(Webb et al. 2013) Evidence suggests apical migration of the insertion as the alveolar process grows and descends and the frenulum remains in place. (Boutsi et al 2011; Pizan et al 2006) Infants have the highest prevalence of papillary penetrating phenotype.(Webb et al. 2013) In severe instances, a restrictive maxillary frenulum attachment has been associated with breastfeeding and bottle-feeding difficulties among newborns. ~~in a number of studies.~~(Neville et al. 2016; Coryllos et al. 2004; Pransky et al. 2014; Ghaheri et al. 2017) However, in a prospective study, anatomical classification of the maxillary frenulum alone was not correlated with

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breastfeeding success or difficulty, pain, or maternally-reported poor latch. (Shah et al.2021)~~It has been suggested~~ Studies suggest~~ed that~~ a restrictive maxillary frenulum may inhibit an airtight seal on the maternal breast through "flanging" of both lips.(Knox 2010; Coryllos et al. 2004; Pransky et al. 2015; Ghaheri et al. 2017) For this reason, future studies focusing on assessment of upper lip flexibility and the ability to flange rather than just anatomical point of insertion may provide more information. (Shah et al, 2021) The maxillary frenulum can contribute to reflux in babies due to the intake of air from a poor seal at the breast or bottle leading to colic or irritability.(Ghaheri et al 2017; Seigal 2016) With the lack of understanding of the function of the labial frenulum, the universality of the labial frenulum, and level of attachment in most infants, ~~there lease~~ the release of the maxillary frenulum based on appearance alone cannot be endorsed ~~at this time~~.(Santa Maria et al. 2017) ~~A hyperplastic labial frenulum that inserts into the free or marginal gingiva has been suggested to interfere with proper oral hygiene measures, potentially leading to facial-cervical caries as well as initiation and progression of gingival/periodontal disease,(Minsk 2002) although, to date, no evidence supports this. Further research is required to substantiate this cause-and-effect relationship. When release of the maxillary frenulum is considered due to higher caries risk, anticipatory guidance and other preventive measures need to be emphasized first~~. Although a causal relationship between a hyperplastic maxillary frenum and facial caries has not been substantiated, anticipatory guidance for patients with restrictive tissues may include additional oral hygiene measures (e.g., swabbing the vestibule after feeding).(Naimer 2021).

Surgical removal of the maxillary midline frenulum ~~also is~~ may be related to presence or prevention of midline diastema formation, prevention of post orthodontic relapse, esthetics, and psychological considerations.(Finigan & Long 2013; O'Callahan et al. 2013; Webb et al. 2013; Gkantidis et al. 2008) Treatment options for midline diastema and sequence of care vary with patient age and can include orthodontics, restorative dentistry, frenectomy, or a combination of these.(Gkantidis et al. 2008) Treatment is suggested (1) when the attachment exerts a traumatic force on the gingiva causing the papilla to blanch when the upper lip is pulled, or (2) if the attachment causes a diastema wider than two millimeters, which is known to rarely close spontaneously during further development.(Webb et al. 2013; Gkantidis et al. 2008; Ochi 2014) When a diastema persists into the permanent dentition, the objectives for treatment involve managing both the diastema and its etiology.(Gkantidis et al. 2008) ~~If orthodontic treatment is indicated, the need for surgical management of a frenulum is assessed and coordinated with orthodontic closure of the diastema to achieve stable results.(Gkantidis 2008; Ochi 2014; Mallya & Lurie 2014) There is general agreement between p~~Pediatric dentists and orthodontists generally agree that most diastemas in the primary and mixed dentitions are normal, are multifactorial, and tend to close with maturity; therefore, any surgical manipulation of the frenulum ~~that a frenectomy~~ ~~should not be performed~~ is not recommended before the permanent canines erupt and ~~that the operation~~ ~~should~~ only following orthodontic closure of the space(Gkantidis 2008; Wheeler et al. 2018) or in conjunction with orthodontic treatment (Suter et al, 2014). This was recently affirmed in a systematic review.(Tadros 2022) Certain surgical interventions, when performed too early, may result in orthodontic relapse due to scarring. (Devishree 2012). A recent retrospective cohort study saw a decrease in maxillary midline diastema width when laser labial frenectomy was performed in both the primary and mixed dentitions. (Baxter 2022). Whether or not this early treatment can prevent the need for orthodontic closure of a persistent diastema in adolescence would best be demonstrated by a prospective study utilizing controls with long-term follow up, which was not present in this study (Baxter 2022).

Mandibular labial frenulum

A high frenulum sometimes can present on the labial aspect of the mandibular ridge. This most often is seen in the permanent central incisor area but also can be found by the canine ~~and frequently occurs in individuals having a shallow vestibule~~.(John et al. 2016) The mandibular labial frenulum occasionally inserts into the free or marginal gingival tissue.(John et al. 2016) Movements of the lower lip can cause the frenulum to pull on the fibers inserted into the free marginal tissue, which creates pocket formation that, in turn, can lead to food and plaque accumulation. (John et al. 2016) ~~Early treatment~~ Surgical intervention can be considered to prevent subsequent inflammation, recession, pocket formation, and possible loss of alveolar bone and/or teeth.(John et al. 2016) However, if factors causing gingival/ periodontal inflammation are controlled, the degree of recession and need for treatment decreases.(Segal et al. 2007; John et al. 2016) ~~Again, wWhen treatment of the frenulum is considered due to higher caries, anticipatory guidance and other preventive measures are indicated.~~

Lingual frenulum

The World Health Organization has recommended mothers worldwide exclusively breastfeed infants for the child's first six months to achieve optimum growth, development, and health.(WHO 2016) Thereafter, they ~~should~~ may be given complementary foods and continue breastfeeding up to the age of two years or beyond.(WHO 2016) The American Academy of Pediatrics in 2018 reaffirmed its recommendation of exclusive breastfeeding for about six months, followed by continued breastfeeding as complementary foods are introduced, with continuation of breastfeeding for one year or longer as mutually desired by mother and child.(AAP 2012) Lingual frenula, in addition to the maxillary labial frenula, have been associated by some practitioners with impedance to successful breastfeeding, thereby leading to recommendations for frenotomy. The most common symptoms that babies and mothers experience from tongue- and lip-tie are poor or shallow latch on the breast or bottle, slow or poor weight gain, reflux and irritability from swallowing excessive air, prolonged feeding time, milk leaking from the mouth from a poor seal, clicking or smacking noises when nursing/ feeding, and painful nursing.(Ghaheri et al 2017; Ghaheri et al. 2018).

An anatomical dissection study determined the lingual frenulum in neonates is not formed by a discrete submucosal midline string or band as previously thought; rather, it is a dynamically formed midline fold created in a layer of fascia spanning the floor of the mouth and characterized by morphology that varies with tongue movement similar to that in adults. (Mills 2019). This fascia runs from the inner surface of the mandible to join with the connective tissue on the ventral surface of the tongue. It is the height of the fascial attachment on the ventral surface of the tongue that alters the visual prominence of the frenulum when placed under tension as seen when elevated. (Mills 2019). The lingual frenulum does not have direct connection to the posterior tongue (also known as the tongue base). Therefore, the term “posterior tongue-tie” is misleading and anatomically incorrect. Ankyloglossia can perhaps be considered an imbalance of the fascial roles, where its provision of tongue stability impacts tongue movement. (Mills 2019).

~~**Ankyloglossia (tongue-tie)**~~

~~Ankyloglossia is a congenital developmental anomaly of the tongue characterized by a short, thick lingual frenulum resulting in limitation of tongue movement (partial ankyloglossia) or by the tongue appearing to be fused to the floor of the mouth (total ankyloglossia).(John et al. 2016; Amir et al. 2005)~~ A methodological review of the term ankyloglossia shows the use of multiple diagnostic criteria, leading to variations in the reported prevalence of ankyloglossia between ~~four~~4.2 and 10.7 percent of the population. (Zoon 2017 Segal et al. 2007; Boutsi & Tatakis 2011) Several diagnostic classifications have been proposed based on anatomical and functional criteria, but none has been universally accepted. (Visconti 2021; Segal et al. 2007) No single anatomical variable of the frenulum has been shown in isolation to correlate directly with impaired tongue function. As such, the use of grading systems simply describes appearance rather than serving as an objective tool to diagnose or categorize the frenulum as ankyloglossia.(Mills 2019) The tongue’s ability to elevate rather than protrude is the most important quality for nursing, feeding, speech, and development of the dental arches. (Yoon et al. Orthod Craniofac Res 2017; Yoon et al. Sleep Breath 2017)

Ankyloglossia has been associated with breastfeeding and bottle-feeding difficulties among neonates, limited tongue mobility and speech difficulties, malocclusion, and gingival recession.(Delli et al. 2013; Segal et al. 2007; Boutsi & Tatakis 2011; John et al. 2016; Finigan & Long 2013; O'Callahan et al. 2013; Webb et al. 2013; Suter & Bornstein 2009; Ochi 2014) An ultrasound study has shown that patterns of tongue motions differed both in infants with ankyloglossia (with breastfeeding problems) and those without ankyloglossia (Geddes 2008), but, because no anatomical variables of the lingual frenulum were included in that study, it is not possible to correlate frenum morphology to changes demonstrated on the ultrasound. (Mills 2019). A short frenulum can inhibit tongue movement and create deglutition problems.(Segal et al. 2007; Dollberg et al. 2006; Geddes et al. 2008) ~~During breastfeeding, a restrictive frenulum can cause ineffective latch, inadequate milk transfer and intake, and persistent maternal nipple pain, all of which can affect feeding adversely and lead to early cessation of breastfeeding.(Delli et al. 2013; Segal et al. 2007; Boutsi & Tatakis 2011; John et al. 2016; Finigan & Long 2013; O'Callahan et al. 2013; Webb et al. 2013; Suter & Bornstein 2009; Huang & Creath 1995; Ochi 2014; Amir et al. 2005; Dollberg et al. 2006; Geddes et al. 2008; Ballard et al. 2002; Srinivasan et al. 2006)~~ Systematic literature review articles acknowledge the role of frenotomy/frenectomy for demonstrable frenal constriction in order to reduce maternal nipple pain (O'Shea 2017) and improve successful breastfeeding when the procedure is provided in conjunction with support of other allied healthcare professionals.(Segal et al. 2007; Boutsi & Tatakis 2011; John et al. 2016; Finigan & Long 2013; Suter & Bornstein 2009; ~~O'Shea et al. 2017~~) A Cochrane Review (O'Shea 2017) noted the included randomized control trials were small and had multiple limitations. Due to those limitations, the review was unable to determine whether frenotomy in infants younger than 30 days who had ankyloglossia and feeding difficulties correlated with longer-term breastfeeding success. Similarly, the Canadian Agency for Drugs and Technologies in Health (CADTH) questioned whether frenectomy provides a meaningful incremental benefit over other treatments or procedures to improve breastfeeding, particularly in the longterm due to studies' designs. (CADTH 2016). Because breastfeeding is a complex relationship dyad, ankyloglossia may be only one of multiple possible deficiencies contributing to difficulty breastfeeding (Hazelbaker) Therefore, predicting which infants will have improved breastfeeding following frenectomy may be difficult. (Briddel 2020) Some studies show decrease in surgical intervention in infants with feeding difficulties when a team of allied healthcare professionals is involved using consistent multidisciplinary assessment and incorporating alternative intervention strategies. (Walsh et al 2019, Dixon et al., 2018)

Limitations in tongue mobility and pathologies of speech ~~pathology~~ have been associated with ankyloglossia.(Segal et al. 2007; Messner & Lalakea 2002; Kupietzky & Botzer 2005) However, opinions vary among health care professionals regarding the correlation between ankyloglossia and speech disorders. Speech articulation is largely perceptual in nature;~~, and differences in pronunciation often are evaluated subjectively. Variability~~ variations in the speech assessment outcomes is very high among individuals and specialists from different medical backgrounds. ~~is very high.~~(Suter & Bornstein 2009) The difficulties in articulation for individuals with ankyloglossia are evident for consonants and sounds like / *s* /, / *z* /, / *t* /, / *d* /, / *l* /, / *sh* /, / *ch* /, / *th* /, and / *dg* /, and ~~it is especially difficult to~~ rolling an *R* is especially challenging.(Suter & Bornstein 2009; Messner & Lalakea 2002) Because parents often do not report speech issues accurately, an evaluation by a speech-language pathologist ~~trained in~~ skilled in assessing tongue-ties (although consensus on assessment techniques has not been established) is ~~recommended~~ suggested ~~to assess for speech or language errors~~ prior to recommending a tongue-tie release.(Hazelbaker 2010) Speech therapy in conjunction with frenuloplasty, frenulotomy, or frenulectomy can be a treatment option to improve tongue mobility and speech.(Messner & Lalakea 2002; Kupietzky & Botzer 2005) One pilot study reported children with moderate and moderate-to-severe speech and language impairment attained better speech and language outcomes after frenulectomy when compared with children with mild and mild-to-moderate impairments. (Daggumati 2019) However, other studies hint at the subjective improvement when parents were surveyed (Baxter 2020; Messner & Lalakea 2002). Nevertheless, further evidence is needed to determine the benefit of surgical correction of ankyloglossia and its relation to speech pathology as many children and individuals with ankyloglossia ~~are~~ may be able to compensate and do not appear to suffer from speech difficulty.(Visconti 2021; Melong 2021; Segal et al. 2007; Finigan & Long 2013; Kummer 2005; Salt et al., 2020).

A high-arched palate, reduced palate width, and elongated soft palate have been associated with tongue-tie.(Yoon et al. Orthod Craniofac Res 2017; Yoon et al. Sleep Breath 2017) Evidence ~~to show~~ ~~that~~ relating ankyloglossia and abnormal tongue position ~~may affect~~ to skeletal development ~~and be~~ ~~associated~~ of ~~with~~ Class III malocclusion is limited.(~~Geddes et al. 2008~~; Lalakea & Messner 2003; Jang 2011) ~~A high-arched palate, reduced palate width, and elongated soft palate have been associated with tongue-tie.(Yoon et al. Orthod Craniofac Res 2017; Yoon et al. Sleep Breath 2017)~~ A complete orthodontic evaluation, diagnosis, and treatment plan are necessary prior to any surgical intervention.(Lalakea & Messner 2003)

Localized gingival recession on the lingual aspect of the mandibular incisors has been associated with ankyloglossia in some cases where frenal attachment causes gingival retraction.(Segal et al. 2007; John et al. 2016) As with most periodontal conditions, elimination of plaque-induced gingival inflammation can minimize gingival recession without any surgical intervention.(Segal et al. 2007) When recession continues even after oral hygiene management, surgical intervention may be indicated.(Segal et al. 2007; John et al. 2016)

Treatment considerations

Although evidence in the literature to promote the timing, indication, and type of surgical intervention is limited, frenulotomy/frenulectomy for functional limitations and symptomatic relief ~~should~~ may be considered on an individual basis.(Segal et al. 2007; Suter & Bornstein 2009; Geddes et al. 2008; Srinivasan 2006; Kupietzky & Botzer 2005; Buryk et al. 2011) Evaluation for other potential head and neck sources (e.g., nasal obstruction, airway obstructions, reflux, craniofacial anomalies) for breastfeeding problems before performing a frenulotomy on a patient who has feeding difficulties (Messner 2020) may prevent unnecessary surgeries especially in very young neonates less than two weeks of age. When indicated, frenuloplasty, frenulectomy, and frenulotomy may be ~~a~~ successful approaches in alleviating the problem.(Segal et al. 2007; Webb et al. 2013; Suter & Bornstein 2009; Devishree et al. 2012) Each of these procedures involves surgical incision or excision, establishing hemostasis, and wound management.(Kaban & Troulis 2004) With regards to anatomy, the lingual nerve has been shown to pass immediately beneath the fascia on the ventral surface of the tongue with smaller branches continuing into the lingual frenum. (Mills 2019) As such, sensory input necessary for tongue shape may be compromised if the lingual nerve is damaged. (Mu and Sanders, 2010) Additional complications may occur during or following frenulum surgical procedures and include excessive bleeding, formation of a mucus retention cyst, reattachment, hematoma formation, numbness or paresthesia, infection, scar tissue formation, and restriction in tongue movement. (Varadan 2019) Dressing placement or the use of antibiotics is not necessary. (Kaban & Troulis 2004) In older patients, post-operative care may ~~recommendations~~ include maintaining a soft diet, regular oral hygiene, and analgesics as needed. Post-operative pain has been reported in some studies and found to persist as a moderate level (6.5 on a scale of 10) for three days. (Zaghi 2019). ~~Post-operative exercises for a child/adolescent are necessary to prevent reattachment of the wound and relapse of the previous symptoms associated with the tongue or lip-tie.(Ghaheri et al. 2018; Lalakea & Messner 2003)~~ Although otolaryngologists' expert opinion (Messner 2020 consensus) and the Canadian Agency for Drugs and Technologies in Health (CADTH 2019) do not support a standard post-procedure regimen including stretching, massaging, or other exercises to prevent reattachment of the frenulum, others have concluded that exercises after tongue-tie release have elicited functional improvements in speech, feeding, and sleep. (Baxter 2020; Zaghi 2019) These studies have been limited by patient numbers and lack of control groups. Post-operative pain, especially in the neonate, may further inhibit post-surgical stretching and exercises and can lead to oral aversion. (Gilliland et al., 2020) Oral exercises have been advocated as a safe and potentially effective adjunct to improve tongue movements with or without surgical intervention in school aged patients. (Zaghi 2019)

The use of electrosurgery or laser technology for frenulotomies/frenulectomies has demonstrated a shorter operative working time, ~~a better ability to control bleeding~~ improved hemostasis, reduced intra- and post-operative pain and discomfort, fewer postoperative complications (e.g., swelling, infection), no need for suture placement ~~removal~~, and increased patient acceptance.(Olivi e al. 2010; Sezgin 2019) These procedures require extensive training as well as skillful technique and patient management, especially in the neonate. (Segal et al. 2007; Webb et al. 2013; Suter & Bornstein 2009; Kupietzky & Botzer 2005; Devishree et al. 2012; Hogan et al. 2005; Díaz-Pizán et al. 2006; Gontijo et al. 2005; Kara 2008) As with all surgical procedures, an informed consent ~~should be obtained~~ is essential. Informed consent includes relevant information regarding assessment, diagnosis, nature and purpose of proposed treatment, and potential benefits and risks of the proposed treatment, along with professionally-recognized or evidence-based alternative treatment options – including no treatment – and their risks.(AAPD BP_Informed Consent)

Policy statement

~~Recognizing evidence is limited,~~The ~~American Academy of Pediatric Dentistry~~ AAPD supports additional research on the causative association between ankyloglossia and difficulties in breastfeeding ~~difficulties~~ or speech articulation, ~~problems and~~ between a hyperplastic labial frenulum and increased risk of caries or periodontal disease, and upper lip restriction and difficulties with breastfeeding/latch.~~due to interference with adequate oral hygiene.~~ The AAPD recognizes that causes other than ankyloglossia are more common for breastfeeding difficulties and that, while frenulotomy for an infant with ankyloglossia can lead to an improvement in breastfeeding, not all infants with ankyloglossia require surgical intervention.(Messner 2020). Due to the broad differential diagnosis, a team-based approach including consultation with other specialists can aid in treatment planning. Further randomized controlled trials and other prospective studies of high methodological quality are necessary to determine the indications and long-term effects of frenulotomy/frenulectomy.~~. With all surgical procedures, an informed consent is necessary. Informed consent includes relevant information regarding assessment, diagnosis, nature and purpose of proposed treatment, and potential benefits and risks of the proposed treatment, along with~~

~~professionally recognized or evidence-based alternative treatment options – including no treatment – and their risks.(AAPD BP_Informed Consent)~~

References

American Academy of Pediatric Dentistry. Informed consent. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2019:439-42.

American Academy of Pediatric Dentistry. Policy on management of the frenulum in pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2019:66-70.

American Academy of Pediatrics. Breastfeeding and the use of human milk. Pediatrics 2012;129(3):e827-e841.

American Dental Association. 2021. CDT 2021: Current dental terminology: Chicago, Ill: American Dental Association. X. Oral & Maxillofacial Surgery . P.71

~~Amir L, James J, Beatty J. Review of tongue-tie release at a tertiary maternity hospital. J Paediatr Child Health 2005;41(5-6):243-5.~~

Ballard J, Auer C, Khoury J. Ankyloglossia: Assessment, incidence, and effect of frenuloplasty on the breastfeeding dyad. Pediatrics 2002;110(5):e63.

Baxter RT, Zaghi S, Lasley AP. Safety and efficacy of maxillary labial frenectomy in children: A retrospective comparative cohort study. Internat Orthodon 2022.(In Press). Available at: "https://doi.org/10.1016/j.ortho.2022.100630". Accessed March 14, 2022.

Baxter R, Merkel-Walsh R, Baxter BS, Lashley A, Rendell NR. Functional improvements of speech, feeding and sleep after lingual frenectomy tongue-tie release: A prospective cohort study. Clin Ped 2020;59(9-10):885-92.

Boutsi E~~Z~~A, Tatakis DN. Maxillary labial frenum attachment in children. Int J Paediatr Dent 2011;21(4):284-8.

Briddell JW, Vendjelovic ND, Fromen CA, Peterman EL, Reilly JS. Geometric model to predict improvement after lingual frenulectomy for ankyloglossia. Int J Ped Ororhinolaryng 2020;134: 110063. https://doi.org/10.1016/j.ijporl.2020.110063.

Buryk M, Bloom D, Shope T. Efficacy of neonatal release of ankyloglossia: A randomized trial. Pediatrics 2011;128(2):280-8.

Caloway C, Hersh C, Baars R, Sally S, Diercks G, Hartnick C. Association of feeding evaluation with frenotomy rates in infants with breastfeeding difficulties. JAMA Otolaryngol Head Neck Surg 2019; 145(9):817-22.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Canadian Agency for Drugs ~~for Drugs~~ and Technologies in Health. Frenectomy for the correction of ankyloglossia: A review of clinical effectiveness and guidelines. CADTH Rapid Response Reports; 2016 Jun 15. Available at: "https://www.ncbi.nlm.nih.gov/books/NBK373454/". Accessed March 14,2022. ~~July1,2019.~~

Canadian Agency for Drugs and Technologies in Health. Exercises and Massage Post-Frenectomy for Infants with Tongue and Lip Tie: Clinical Effectiveness. Ottawa: CADTH; 2019 May. Available at: "https://www.cadth.ca/sites/default/files/pdf/htis/2019/RB1341%20Stretching%20tongue%20tie%20Final.pdf." Accessed March 13, 2022.

Coryllos E, Genna CW, Salloum A. Congenital tongue-tie and its impact on breastfeeding. In: Breastfeeding: Best for baby and mother. Am Acad Pedia (newsletter) 2004;Summer:1-7.

Daggumati S, Cohn JE, Brennan MJ, Evarts M, McKinnon BJ, Terk AR. Speech and language outcomes in patients with ankyloglossia undergoing frenulectomy: A retrospective pilot study. OTO Open: The official open access journal of the American Academy of Otolaryngology—Hend and Neck Surgery Foundation. 2019;3(1):2473974X19826943. Available at: "https://journals.sagepub.com/doi/full/10.1177/2473974X19826943". Accessed September 5, 2021.

Delli K, Livas C, Sculean A, Katsaros C, Bornstein M. Facts and myths regarding the maxillary midline frenum and its treatment: A systematic review of the literature. Germany Quintessence Int 2013;44(2):177-87.

Devishree G, Gujjari SK, Shubhashini PV. Frenectomy: A review with the reports of surgical techniques. J Clin Dent Res 2012;6(9):1587-92.

Díaz-Pizán M, Lagravère M, Villena R. Midline diastema and frenum morphology in the primary dentition. J Dent 2006;26(1):11-4.

Dixon B, Gray J, Elliot N, Shand B, Lynn A. A multifaceted programme to reduce the rate of tongue-tie release surgery in newborn infants: Observational study. Int J Ped Otorhinolaryng 2018;113:156-63

Dollberg S, Botzer E, Guins E, Mimouni F. Immediate nipple pain relief after frenotomy in breast-fed infants with ankyloglossia: A randomized, prospective study. J Pediatr Surg 2006;41(9):1598-600.

Finigan V, Long T. The effectiveness of frenulotomy on infant-feeding outcomes: A systemic literature review. Evidence Based Midwifery 2013;11(2):40-5.

Geddes D, Langton D, Gollow I, Jacobs L, Hartmann P, Simmer K. Frenulotomy for breastfeeding infants with ankyloglossia: Effect on milk removal and sucking mechanism as imaged by ultrasound. Pediatrics 2008;122(1): e188-e194.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Ghaheri B, Cole M, Fausel S, Chuop M, Mace J. Breast-feeding improvement following tongue-tie and lip-tie release: A prospective cohort study. Laryngoscope 2017; 127(5):1217-23.

Ghaheri B, Cole M, Mace J. Revision lingual frenotomy improves patient-reported breastfeeding outcomes: A prospective cohort study. J Hum Lact 2018;34(3): 566-74.

Ghaheri BA, Lincoln D, Mai TNT, Mace JC. Objective improvement after frenotomy for posterior tongue-tie: A prospective randomized trial. Otolaryng Head Neck Surg 2021;1-9.

Gilliland AM, Bunik M, O'Connor ME. Pediatrician's concerns about ankyloglossia and breastfeeding. Pediatrics 2020: 146(1_Meeting Abstract): 124-25.

Gkantidis N, Kolokitha OE, Topouzelis N. Management of maxillary midline diastema with emphasis on etiology. J Clin Pediatr Dent 2008;32(4):265-72.

Gontijo I, Navarro R, Haypek P, Ciamponi A, Haddad A. The applications of diode and Er:YAG lasers in labial frenectomy in infant patients. J Dent Child 2005;72(1):10-5.

Hazelbaker AK. Impact: speech and orofacial considerations. In: Tongue-Tie Morphogenesis, Impact, Assessment and Treatment. Columbus, Ohio: Aidan & Eva Press; 2010:107-13.

Hazalbaker AK. Comment on J Am Board Fam Pract. 2005;18(1):1-7. J Am Board Fam Prac 2005; 18(4):326-7.

Hogan M, Wescott C, Griffiths M. Randomized, controlled trial of division of tongue-tie in infants with feeding problems. J Paediatr Child Health 2005;41(5-6):246-50.

~~Huang W, Creath C. The midline diastema: A review of its etiology and treatment. Pediatr Dent 1995;17(3):171-7.~~

Jang SJ, Cha BK, Ngan P, et al. Relationship between the lingual frenulum and craniofacial morphology in adults. Am J Orthod Dentofacial Orthop 2011;139e361-7.

John J, Weddell JA, Shin DE, Jones JJ. Gingivitis and periodontal disease. In: JA Dean, ed. McDonald and Avery's Dentistry for the Child and Adolescent, ~~10~~11th ed. Saint Louis, Mo.: Mosby Elsevier; ~~2016:243-73~~. 2021: 286-323

Kaban L, Troulis M. Intraoral soft tissue abnormalities. In: Pediatric Oral and Maxillofacial Surgery. Philadelphia, Pa.: Saunders; 2004:146-68.

Kara C. Evaluation of patient perceptions of frenectomy: A comparison of Nd:YAG laser and conventional techniques. Photomed Laser Surg 2008;26(2):147-52.

Knox I. Tongue tie and frenotomy in the breastfeeding newborn. Neo Reviews 2010;11(9):e513-9.

Kummer AW. Ankyloglossia: To clip or not to clip? That's the question. ASHA Lead 2005;10(1):6-30.

Kupietzky A, Botzer E. Ankyloglossia in the infant and young child: Clinical suggestions for diagnosis and management. Pediatr Dent 2005;27(1):40-6.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Lalakea M, Messner A. Ankyloglossia: Does it matter? Pediatr Clin North Am 2003;50(2):381-97.

LeTran V, Osterbauer B, Buen F, Yalamanchili R, Gomez G. Ankyloglossia: Last three-years of outpatient care at a tertiary referral center. Int J Ped Otorhinolaryng 2019;126:109599.

Mallya SM, Lurie AG. Panoramic imaging. In: ~~White S, Pharoah M~~ ,Mallya SM, Lam EWN, eds. White and Pharoah's Oral Radiology: Principles and Interpretation. ~~7th~~ 8th ed. St. Louis, Mo.: Mosby Elsevier; 20149: 1~~66-84~~ 32-50.

Melong J, Bezuhly M, Hong P. The effect of tongue-tie release on speech articulation and intelligibility. Ear, Nose Throat J 2021;0(0):1-5. Available at: "https://journals.sagepub.com/doi/pdf/10.1177/01455613211064045". Accessed January 3, 2022.

Messner AH, Lalakea,, ML Ankyloglossia: Controversies in management., Int J Pediatr Otorhinolaryngol 2000;54(2-3):123-31. Available at: "https://doi.org/10.1016/S0165-5876(00)00359-1". Accessed March 14, 2022.

Messner AH, Lalakea ML. The effect of ankyloglossia on speech in children. Otolaryngol Head Neck Surg 2002;127(6):539-45.

Messner AH, Walsh J, Rosenfeld RM, et.al, Clinical Consensus Statement: Ankyloglossia in Children. Otolaryngol Head Neck Surg.2020;162(5):597-611. doi: 10.1177/0194599820915457. Epub 2020 Apr 14. PMID: 32283998.

Mills N, Keough N, Geddes DT, Pransky SM, Mirjalili SA. Defining the anatomy of the neonatal lingual frenum. Clin Anat 2019;32:824-35.

~~Minsk L. The frenectomy as an adjunct to periodontal treatment. Compend Contin Educ Dent 2002;23(5): 424-6, 428.~~

Mintz SM, Siegel MA, Seider PJ. An overview of oral frena and their association with multiple syndromes and nonsyndromic conditions. Oral Surg Oral Med Oral Pathol Oral Radio/Endo 2005;99(3):321-4.

Mu L, Sanders I. Human tongue neuroanatomy: Nerve supply and motor endplates. Clin Anat 2010;23 (7):777-91.

Naimer SA, Irawl A, Gabbay A. Significance of the tethered maxillary frenulum: A questionnaire-based observational cohort study. Clin Exp Pediatr 2021;64(3):130-35.

Neville BW, Damm DD, Allen CM, Chi AC. Developmental defects of the oral and maxillofacial region. In: Oral and Maxillofacial Pathology, 4th ed. St. Louis, Mo: Saunders Elsevier; 2016:9-10.

O'Callahan C, Macary S, Clemente S. The effects of office-based frenotomy for anterior and posterior ankyloglossia on breastfeeding. Int J Pediatr Otorhinolaryngol 2013;77(5):827-32.

O'Shea JE, Foster JP, O'Donnell, et al. Frenectomy for tongue-tie in newborn infants. Cochrane Library-Wiley Online Library. Available at: "http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD011065.pub2/full". Accessed ~~August 10, 2019.~~ January 4, 2022.

Ochi J. Treating tongue-tie: Assessing the relationship between frenotomy and breastfeeding symptoms. Clin Lactation 2014;5(1):20-7.

Olivi G, Chaumanet G, Genovese MD, Beneduce C, Andreana S. Er,Cr:YSGG laser labial frenectomy: A clinical retrospective evaluation of 156 consecutive cases. Gen Dent 2010;58(3):e126-33.

Pizan ME, Lagravere MO, Villena R. Midline diastema and frenum morphology in the primary dentition. J Dent 2006;26:11-4.

Pransky S, Lago D, Hong P. Breastfeeding difficulties and oral cavity anomalies: The influence of posterior ankyloglossia and upper-lip ties. Int J Pediatr Otorhinolaryngol 2015;79(10):1714-7.

Priyanka M, Sruthi R, Ramakrishnan T, Emmadj P, Ambalavanan N. An overview of frenal attachments. J Indian Soc Periodontol 2013;17(1):12-5.

Salt H, Claessen M, Johnston T, Smart S. Speech production in young children with tongue-tie. Int J Ped Otorhinolaryn 2020;134:110035. https://doi.org/10.1016/j.ijporl.2020.110035

Santa Maria C, Abby J, Truong MT, Thakur Y, Rea Sharon, Messner A. The superior labial frenulum in newborns: What is normal? Glob Pediatr Health 2017 Jul 12. Available at: "http://us.sagepub.com/en-us/nam/ open-access-at-sage". Accessed July 1, 2019.~~ (Archived by WebCite® at: "http://webcitation.org/74Ohw9Ggl")~~

Segal L, Stephenson R, Dawes M, Feldman P. Prevalence, diagnosis, and treatment of ankyloglossia. Can Fam Physician 2007;53(6):1027-33.

Seigal S. Aerophagia induced reflux in breastfeeding infants with ankyloglossia and shortened maxillary labial frenula (tongue and lip tie). Int J Pediatr 2016;5(1):6-8.

Sezgin G, Özener HÖ, Meseli SE, Kuru L. Evaluation of patient's perceptions, healing, and reattachment after conventional and diode laser frenectomy: A three-arm randomized clinical trial. Photobiomod Photomed Las Surg 2020;38(9):552-9.

Shah S, Allen P, Walker R, Rosen-Carole C, Benoit MKM. Upper lip tie: Anatomy, effect on breastfeeding and correlation with ankyloglossia. Laryngoscope 2021;131(5): E1701-06.

Srinivasan A, Dobrich C, Mitnick H, Feldman P. Ankyloglossia in breastfeeding infants: The effects of frenotomy on maternal nipple and latch. Breastfeed Med 2006;1(4):216-24.

Suter VG, Bornstein MM. Ankyloglossia: Facts and myths in diagnosis and treatment. J Periodontol 2009;80(8): 1204-19.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Suter VG, Heinzmann AE, Grossen J, Sculean A, Bornstein MM. Does the maxillary midline diastema close after frenectomy? Quintessence Int. 2014 Jan;45(1):57-66.

Tadros S, Ben-Dov T. Cathain ÉÓ, Anglin C, April MM. Association between superior labial frenum and maxillary midline diastema—A systematic review. Int J Ped Otorhino 2022;156:111063. Available at: "https://www.sciencedirect.com/science/article/pii/S0165587622000246?via%3Dihub". Accessed March 17, 2022.

Varadan M, Chopra A, Sanghavi AD, Sivaraman K, Gupta K. Etiology and clinical recommendations to manage the complications following lingual frenectomy: A Critical review. J Stomatol Oral Maxillofac Surg 2019;120(6):549-53.

Visconti A, Hayes E, Ealy K, Scarborough DR. The effects of frenotomy on breastfeeding and speech in children with ankyloglossia. Inter J Speech-Lang Path 2021;23(4):349-58.

Walsh J, Benoit MM. Ankyloglossia and other oral ties. Otolaryngol Clin N Amer 2019;52:795-811.

Walsh J, Links A, Boss E, Tunkel D. Ankyloglossia and lingual frenectomy: National trends in inpatient diagnosis and management in the United States, 1997-2012. Otolaryngal Head Neck Surg 2017;156(4):735-40.

Walsh J, Tunkel D. Diagnosis and treatment of ankyloglossia in newborns and infants: A review. JAMA Otolaryngol Head Neck Surg 2017;143(10):1032-9.

Webb AN, Hao W, Hong P. The effect of tongue-tie division on breastfeeding and speech articulation: A systematic review. Int J Pediatr Otorhinolaryngol 2013; 77(5):635-46.

Wheeler B, Carrico CK, Shroff B, Brickhouse T, Laskin DM. Management of the maxillary diastema by various dental specialties. J Oral Maxillofac Surg 2018;76(4): 709-15.

World Health Organization. Breastfeeding. Geneva: World Health Organization; 2016. [cited 2016 Jun 2]. Available at: "http://www.who.int/topics/breastfeeding/en/". Accessed ~~July 1, 2019~~ March 14, 2022. ~~(Archived by WebCite® at: "http://www.webcitation.org/74oi8YxBV")~~

Yoon AJ, Zaghi S, Ha S, Law C, Guilleminault C, Liu S. Ankyloglossia as a risk factor for maxillary hypoplasia and soft tissue elongation: A functional-morphological study. Orthod Craniofac Res2017;20(4):237-44.

Yoon A, Zaghi S, Weitzman R,et al. Toward a functional definition of ankyloglossia: Validating current grading scales for lingual frenulum length and tongue mobility in 1052 subjects. Sleep Breath 2017;21(3):767-75.

Zaghi S, Valcu-Pinkerton S, Jabar M, et al., Lingual frenuloplasty with myofunctional therapy: Exploring safety and efficacy in 348 cases. Laryngo Investig Otolaryng 2019;4(5):489-96.

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Policy on Dietary Recommendations for Infants, Children, and Adolescents

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAP: American Academy of Pediatrics. **AAPD**: American Academy Pediatric Dentistry. **AND**: Academy of Nutrition and Dietetics. **AHA**: American Heart Association. **BMI**: Body mass index. **LCS**: Low-calorie sweeteners. ~~**OTC**: Over-the-counter.~~ **SCB**~~**s**~~: Sugar-containing beverages. **SSB**~~**s**~~: Sugar-sweetened beverages. **USDA**: U.S. Department of Agriculture.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes its role in promoting well-balanced, low caries-risk, and nutrient-dense diets for infants, children, adolescents, and persons with special health care needs. A healthy diet is essential to optimal growth and development and prevention of chronic diet-related diseases such as caries, obesity, and cardiovascular disease.

Methods

This policy was developed by the Clinical Affairs Committee, ~~and~~ adopted in 1993(AAPD 1993), and~~.~~ ~~This document is an update from the~~ last revised~~ion~~ in 2017~~2~~(AAPD 2017). ~~The current revision includes searches of articles published in English between 1995 and 2017 using PubMed®/MEDLINE, Embase®, and Google Scholar. Key terms included~~ This revision is based upon a review of current dental and medical literature, including a search of the PubMed®/MEDLINE database using the terms: childhood, obesity, dental caries, diet, ~~and~~ nutrition, health education, breast-feeding, food habits, dietary guidelines, sugar, sugar-sweetened beverages, and body mass index; fields: all; limits: within the last 10 years, humans, English, clinical trials, and ages birth through 18. Papers for review were chosen from the resultant lists and from hand searches. Expert and consensus opinions by experienced researchers and clinicians, including recommendations(Lott 2019 Consensus) developed through a collaboration of the Academy of Nutrition and Dietetics (**AND**), the AAPD, the American Academy of Pediatrics (**AAP**), and the American Heart Association (**AHA**) under the leadership of Healthy Eating Research, also were considered. ~~Additional terms included health education, breast-feeding, food habits, dietary guidelines, sugar, sugar-sweetened beverages, and body mass index. After conducting the literature searches, articles were screened by viewing titles and abstracts. Data from 194 articles were abstracted and used to summarize dietary policies and research on diet and nutrition for infants, children, and adolescents.~~

Background

~~**Dietary behaviors and prevalence of dental caries and obesity in children**~~

A healthy diet in early childhood is essential to supporting optimal growth and development and preventing chronic diet-related diseases. Experts across health care disciplines recognize the importance of breast-feeding during infancy.(Lott Consensus, Lott Tech Report) Human milk and breast-feeding of infants provide general health, nutritional, developmental, psychological, social, economic, and environmental advantages while significantly decreasing risk for a large number of acute and chronic diseases.(AAP 2012) A systematic review of cariogenic potential of milk and infant formulas in animal models found that cow's milk and human milk are less cariogenic than sucrose solutions.(Aarthi et al. 2013) Another systematic review concluded that children exposed to long durations of breast-feeding up to age 12 months had reduced risk of caries.(Tham 2015) However, children breastfed more than 12 months had an increased risk of caries, and those children breastfed nocturnally or more frequently had a further increased caries risk.(Tham 2015) The causes of dental caries and obesity are multifactorial, with both having significant dietary components. Beverages contribute significantly to the early diet. A 2019 consensus statement, *Healthy Beverage Consumption in Early Childhood: Recommendations from Key National Health and Nutrition Organizations,* was developed through a collaboration of AND, AAPD, AAP, and AHA under the leadership of Healthy Eating Research, a nutrition research organization.(Lott Consensus, Lott Tech Report) These organizations recommend breast milk, infant formula, water, and plain milk for children under age five.(Lott Consensus) They suggest that plain (i.e., not flavored, sweetened, or carbonated) fluoridated water should be introduced beginning at six months of age for children who have started solid foods to familiarize the child with water as well as with drinking from a cup; the volume of water offered is based on the intake of other recommended beverages.(Lott Consensus, Lott Tech Report) Drinking fluoridated water is a safe and effective method of reducing caries.(CDC Fluoride 2001) Fluoridated water is preferred beverage for children one to five years of age when consumed outside of meals or snacks.(Lott Tech Report) The consensus statement cautioned against beverages that are sources of added sugars, including flavored milks (e.g., chocolate, strawberry), or contain low-calorie sweeteners (**LCS**).(Lott Consensus) Because the long-term health effects of consumption of LCS by children is unknown(Lott Tech Report, AAP Council), the statement

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recommended against consumption of LCS through age five.(Lott Consensus) In addition, it advised against a wide variety of new beverages on the market targeted to children (e.g., toddler formulas) and caffeinated beverages.(Lott Consensus) Plant-based/non-dairy milks (e.g., almond, rice, oat) were noted to provide no unique nutritional value, but unsweetened varieties may be useful when medically indicated (e.g., allergy or intolerance to cow's milk) or to meet specific dietary preferences (e.g., vegan).(Lott Consensus, Lott Tech Report) ~~One of the behaviors associated with dental caries and obesity in children is the consumption of large quantities of sugar-sweetened foods and beverages.~~

Food and flavor preferences may be established during the early years (Lott Tech Report, Saavedra). Establishing health dietary patterns during the first two years of life can have lifelong health benefits. (Saavedra) The AHA recommends that children less than two years of age avoid added sugars in their diets.(Vos) Sugar-sweetened beverages (**SSB~~s~~**) ~~are defined by the Centers for Disease Control and Prevention to~~ include any liquid (e.g., regular ~~soft drinks (~~soda~~ or pop)~~, fruit drinks, sports drinks, tea and coffee drinks, energy drinks~~, sweetened milk or milk alternatives, and any other beverages to which~~ with added sugar~~, generally high~~ (e.g., fructose, corn syrup, ~~or~~ sucrose ~~(~~[table sugar])~~, has been added~~.(CDC Get the facts) A longitudinal study found introduction of SSB before age one was associated with obesity at age six.(Pan) Sugar-containing beverages (**SCB~~s~~**) include SSB~~s~~ as well as beverages in which sugar, generally glucose or fructose, is naturally present, such as 100 percent fruit juice. In 2017, the AAP reaffirmed that 100 percent juice and juice drinks have no essential role in a healthy diet for children and contribute to excessive calorie intake and risk of dental caries in children.(Heyman 2017) AAP recommendations include: juice should not be introduced to infants before one year of age; intake of juice should be limited to four ounces a day for children one through three years of age, 4-6 ounces for children four through six years of age, and eight ounces for children seven through 18 years of age; toddlers should not be given juice in containers that foster easy consumption; and toddlers should not be given juice at bedtime.(Heyman 2017). The mentioned volumes are recommended maximums, not daily requirements, and fresh fruit is preferred to fruit juice.(Heyman 2017)

Unfortunately, many parents do not adhere to evidence-based dietary recommendations for their children. For example, many infants are provided 100 percent juice and cow's milk before age one, which can increase their risk for nutrient (e.g., iron ZIEGLER) deficiencies.(HER) Nearly half of two- to five-year olds consume a SSB daily, with the prevalence increasing throughout childhood.(Lott Tech Report) Children~~'s~~ and adolescent~~'~~s ~~consumption of SSBs~~ in the United States consumed an average of ~~is high, and it increased from 242~~ 143 calories/day from SSB between 2011-2014, and 7.3 percent of their daily energy intake came from SSB.(Rosinger 2017) Significant differences in beverage intake by race/ethnicity and income groups in early childhood have been noted.(Lott Tech Report)~~1988-1994 to 270 calories/day between 1999-2004.(Wang et al. 2008) Additionally, adolescents with low-educated parents have higher total SSBs consumption and higher energy intake from SSBs.(Han & Powell 2013)~~

Dental caries prevalence in children has been variable, but remains high.(Fleming) The prevalence of dental caries (untreated and treated) in primary or permanent teeth among children aged two through 19 years has been estimated at 45.8 percent (Fleming 2018) ~~For instance, prevalence of dental caries in primary teeth for children aged 2-5 increased from 22 percent to 30 percent between 1988-1994 and 1999-2004 and then decreased to 23 percent in 2011-2012.(Dye et al. 2015)~~ The causes of dental caries involve a combination of factors and include diet, bacteria capable of fermenting carbohydrates, fluoride exposure, and a susceptible host.(Slayton et al. 2016) While sugar, especially high frequency consumption, contributes ~~is a factor contributing~~ to dental caries, a systematic study of sugar consumption and caries risk concluded that the relationship between sugar consumption and caries risk is weaker after the introduction of fluoride exposure.(Burt & Pai~~Satishchandra~~ 2001)

The causes of obesity include genetic components, lifestyle, and environmental variables, as well as nutritional factors. (Lee 2019) When consumed in excess, beverages containing sugar or saturated fats can be harmful.(Lott Consensus) Health initiatives in the United States and other countries have specifically targeted ~~reducing consumption of~~ SSBs in an effort to reduce~~lower~~ the number of calories that children and adolescents consume per day.(von Philipsborn 2019) Data from the 2017–2018 National Health and Nutrition Examination Survey (NHANES) indicate that ~~F~~for children and adolescents aged 2-19, the prevalence of obesity is an estimated 19.3 percent, including 6.1 percent with severe obesity and another 16.1 percent overweight.(Fryar 2020) ~~has remained constant at about 17 percent, with obesity affecting about 12.7 million children and adolescents for the past decade.(Ogden et al. 2012)~~ Children and adolescents who are obese are likely to be obese as adults and, in adulthood, at risk for health problems such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis.(US DHHS/Dept. Ag. 2016)

While dental caries and obesity are both significant pediatric health problems, the relationship between caries and anthropometric measurements is complex. Multiple systematic reviews have reported inconsistent and inconclusive evidence on the relationship between caries and body mass index (BMI). .(Alshehri 2020, Paisi 2019, Chen 2018, Hayden 2013) BMI is a simple, non-invasive means to monitor

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growth patterns and help assess the risk of obesity. Forms to record BMI for age and gender can be downloaded from the website of the Centers for Disease Control and Prevention at "https://www.cdc.gov/growthcharts/clinical_charts.htm#Set1":(CDC growth charts) Because of the persistent high prevalence of dental caries and childhood obesity, the need remains for research, policy, advocacy, education, and professional engagement to further advance healthy dietary practices for infants, children, and adolescents.

~~**National and international dietary guidelines**~~

The U.S. Department of Health and Human Services and the U.S. Department of Agriculture **(USDA)** develop dietary guidelines every five years to help Americans aged two and older make healthy food choices to help prevent chronic disease and enjoy a healthy diet. The ~~2015-~~2020-2025 *Dietary Guidelines for Americans*(US DHHS/Dept. Ag. 2021~~2016~~) includes four overarching guidelines:

- "Follow a healthy dietary pattern at every life stage.
- Customize and enjoy nutrient-dense food and beverage choices to reflect personal preferences, cultural traditions, and budgetary considerations.
- Focus on meeting food group needs with nutrient-dense foods and beverages, and stay within calorie limits.
- Limit foods and beverages higher in added sugars, saturated fat, and sodium, and limit alcoholic beverages."

~~emphasize consuming a healthy pattern that includes a variety of vegetables, fruits, grains, fat-free or low-fat dairy products, a variety of protein foods, and oils, with limits on saturated and trans fats, added sugars, and sodium.~~ *The Dietary Guidelines for Americans* also provides~~give~~ specific quantitative recommendations including:

- "Limiting added sugars* to less than 10% of calories per day for ages 2 and older and to avoid added sugars for infants and toddlers;
- Limiting saturated fat to less than 10% of calories per day starting at age 2;
- Limiting sodium intake to less than 2,300 mg per day (or even less if younger than 14)"(USDA 2021)

~~guidelines for consumers, such as consuming less than 10 percent of calories per day from added sugars, consuming less than 10 percent of calories per day from saturated fats, and consuming less than 2,300 milligrams per day of sodium.(US DHHS/Dept. Ag. 2016) In addition~~To prevent unhealthy weight gain, the World Health Organization recommends energy intake and expenditure be balanced, with a goal of

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total fat not exceeding 30 percent of energy intake and a shift from away from saturated fat and trans-fats.(WHO) ~~reducing the intake of sugar to less than 10 percent of total energy intake, and to reduce children's risk of weight gain and dental caries,~~ ~~l~~Limiting ~~the~~ intake of free sugars to less than five percent of total energy intake per day offers additional health benefits~~(less than 16 grams of sugar for children aged 4-8)~~.(WHO ~~2015~~) Additionally, the American Heart Association recommends ~~reducing sugar~~ limiting consumption of added sugars to no more than six percent of calories (AHA website); for~~in~~ children and adolescents, their recommended limit is ~~to~~ less than 25 grams (100 calories or approximately six teaspoons) of added sugar per day.(Vos et al. 2017) One should note that eight ounces (i.e., one measured cup) of regular soft drink contain approximately 26 grams of sugar; a 12 ounce can of regular soda contains approximately 10 teaspoons of sugar and has no nutritional value(AHA website).

Snacking can help a child meet daily nutritional requirements. More than 25 percent of children's daily caloric intake may come from snacks.(USDA smart snacks) The AAP recommends that toddlers be given two to three healthy snacks daily to supply nutrients that the child cannot consume at mealtime; they should be consumed at a planned time while seated with adult supervision.(AAP 2015) The AAP cautions against confusing snack time with treats for fun as well as continuous/all day snacking.(AAP 2015) Frequent (more than three times/day) exposure to between-meal sugar-containing snacks or beverages categorizes a child at high risk for dental caries.(AAPD Caries risk assessment) If a child is given continuous access to a bottle or cup, it should contain only water. The USDA has established guidelines for healthy snacks at school.(USDA smart snacks) Standards for foods to qualify as a school "smart snack" include:

- "Be a grain product that contains 50 percent or more whole grains by weight (have a whole grain as the first ingredient); or
- Have as the first ingredient a fruit, a vegetable, a dairy product, or a protein food; or
- Be a combination food that contains at least ¼ cup of fruit and/or vegetable; and
- The food must meet the nutrient standards for calories, sodium, sugar, and fats".(USDA)

Using 2017-2018 NHANES data, the USDA reported approximately 20 percent of youth aged 12 through 19 years consumed more than three snacks daily, (USDA NHANES)

~~**Dietary recommendations in dental practice**~~

~~Dietary choices affect oral health as well as general health and well-being.~~ Establishment of a dental home by 12 months of age provides time-critical opportunities to assess caries risk and implement ~~allows the institution of~~ individualized caries-preventive strategies, including dietary recommendations and

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appropriate oral hygiene instruction, as the primary teeth begin to erupt.(AAPD P_Dental Home) A diet that avoids frequent consumption of liquids and foods containing sugar is essential to good oral health. The dental home also can influence general health by instituting additional practices related to general health promotion, disease prevention, and screening for non-oral health related concerns. For example, ~~Epidemiological research shows that human milk and breast-feeding of infants provide general health, nutritional, developmental, psychological, social, economic, and environ-mental advantages while significantly decreasing risk for a large number of acute and chronic diseases.(AAP 2012) A systematic review of cariogenic potential of milk and infant formulas in animal models found that cow's milk and human milk are less cariogenic than sucrose solutions.(Aarthi et al. 2013) Another systematic review concluded that children exposed to long durations of breast-feeding up to age 12 months had reduced risk of caries. However, children breastfed more than 12 months has an increased risk of caries; and those children breastfed nocturnally or more frequently had a further increased caries risk.(Tham et al. 2015)~~

~~A June, 2017 recommendation of the Committee on Nutrition of the American Academy of Pediatrics (**AAP**) has reaffirmed that 100 percent juice and juice drinks have no essential role in a healthy diet for children, and contribute to excessive calorie intake and risk of dental caries in children.(Heyman & Abrams 2017) Their recommendations include: juice should not be introduced to infants before one year of age; intake of juice should be limited to four ounces a day for children ages 1-3 years of age; 4-6 ounces for children 4-6 years of age; eight ounces for children 7-18 years of age; toddlers should not be given juice in containers that foster easy consumption; and toddlers should not be given juice at bedtime.(Heyman & Abrams 2017)~~

~~It has been shown that nearly 54 percent of U.S. preschool children were given some form of over-the-counter (**OTC**) medications, most commonly as analgesics, antipyretics, and cough and cold medications.(Kogan et al. 1994) Numerous OTC and prescribed oral liquid medications have been found to have a high sugar content to increase palatability and acceptance by children.(Kenny et al. 1989; Maguire et al. 1996; Bigeard 2000) Frequent ingestion of sugar-sweetened medications is associated with dental caries in chronically ill children.(Kenny et al. 1989; Maguire et al. 1996; Foster & Fitzgerald 2005) To motivate children to consume vitamins, numerous companies have made sugar containing jelly, gummy, and candy-like chewable vitamin supplements, and cases of vitamin A toxicity have been reported as a result of excessive consumption of candy-like vitamin supplements.(Lam et al. 2006) The AAP has recommended that the optimal way to obtain adequate amounts of vitamins is to consume a healthy and well-balanced diet.(Gidding et al. 2006)~~

~~With regard to obesity~~, oral health professionals can calculate and monitor BMI to help ~~need to be more engaged in~~ identify~~ing~~ children at risk for obesity and provide appropriate referral to pediatric~~ians~~ or nutritional specialists. A 2016 survey of pediatric dentists reported that 17 percent offer childhood obesity interventions, while 94 percent offer information or other interventions on the consumption of sugar sweetened beverages.(Wright & Casamassimo 2017) Barriers to providing healthy weight interventions including fear of offending the parent, appearing judgmental, creating parent dissatisfaction, and lack of parental acceptance of advice about weight management from a dentist.(Wright & Casamassimo 2017)

Policy statement

The AAPD recognizes a healthy diet in early childhood is essential to optimal growth and development and prevention of chronic diet-related diseases such as caries, obesity, and cardiovascular disease. Through dietary and nutritional counseling, dentists assume an important role in preventing oral disease and promoting overall health among children. The AAPD especially recognizes the importance of and supports:

- ~~the recommendation of national and international organizations to reduce the consumption of sugar to less than 10 percent of total energy intake and, to reduce children's risk of weight gain and dental caries, sugar intake should be less than five percent of total energy intake (less than 16 grams of sugar for children aged 4-8).~~
- breast-feeding of infants prior to 12 months of age to ensure the best possible health and developmental and psychosocial outcomes for infants.
- the introduction of plain, fluoridated water to the infant's diet beginning at age six months for hydration, to familiarize the child with the taste, and for the caries-protective benefits of fluoride.
- fluoridated water as the preferred beverage for children from one to five years of age when not part of a meal or snack.
- avoiding added sugars in the diet of children younger than age two and minimizing exposure to sweet-tasting drinks and foods during early life to reduce taste preferences for sweets.
- recommendations from the USDA for individuals aged two and older to consume a diet of nutrient-dense, lean or low-fat foods from across five food groups (i.e., fruits, vegetables, protein, grains, and dairy) that are prepared without added salt, starches, sugars, or fat,
- limiting consumption of sugar to less than five percent of total energy intake to reduce children's risk of weight gain and dental caries.

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- establishing healthy beverage consumption patterns during the first five years to promote intake of healthy nutrients, limit excess intake of sugars and saturated fats, and initiate beneficial long-term dietary habits.
- non-sweetened nutrient-dense snacks that supplement meals to meet daily nutritional requirements.
- additional health practices such as meal portion control and energy balance to help prevent overweight and obesity.
- ~~the AAP recommendations on fruit juice in infants, children, and adolescents.~~

Furthermore, the AAPD encourages

- education of health professionals and the public~~parents~~ regarding healthy beverage choices and daily sugar-consumption recommendations, as well as the sugar content of foods and~~,~~ beverages ~~and oral liquid medications~~.
- dental professionals to~~becoming more engaged in~~ identify~~ing~~ children whose dietary patterns place them at increased ~~consume frequent or large quantities of sugar-containing foods and beverages, and who are at~~ risk for dental caries and obesity and~~.~~
- ~~dental professionals' engagement in nutrition education and provision~~, when necessary, ~~of appropriate~~ referral for dietary counseling from a pediatric~~ian~~ or nutritional specialist.
- a healthy, active lifestyle so energy consumption and energy expenditure promote general health and well-being.
- additional research on the benefits and effects of long-term use of low-calorie sweeteners by children.

References

Aarthi J, Muthu S, Sujatha S. Cariogenic potential of milk and infant formulas: A systematic review. Eur Arch Paediatr Dent 2013;14(5):289-300.

Alshehri YFA, Park JS, Kruger E, Tennant M. Association between body mass index and dental caries in the Kingdom of Saudi Arabia: Systematic review. Saudi Dent J 2020;32(4):171-80.

American Academy of Pediatric Dentistry. Dietary recommendations. American Academy of Pediatric Dentistry. Chicago, Ill. 1993.

American Academy of Pediatric Dentistry. Policy on dietary recommendations for infants, children and adolescents. Pediatr Dent 2017;39(6):64-6.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Policy on the dental home. ~~Pediatr Dent 2017;39(6):29-30~~. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:43-4.

American Academy of Pediatrics. Policy statement: Breast-feeding and the use of human milk. Pediatrics 2012;129(3):e827-41.

American Academy of Pediatrics Council on School Health, Committee on Nutrition. Snacks, sweetened beverages, added sugars, and schools. Pediatrics 2015;135(3):575-83.

American Heart Association. Added Sugars. Available at: “https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/sugar/added-sugars”. Accessed February 18, 2022.

~~Bigeard L. The role of medication and sugars in pediatric dental patients. Dent Clin North Am 2000;44(3): 443-56.~~

Burt BA, ~~Satishchandra~~ Pai S. Sugar consumption and ~~The relationship between low birthweight and subsequent development of~~ caries risk: A systematic review. J Dent Ed 2001;65(10):1017-23.

Centers for Disease Control and Prevention. The CDC guide to strategies for reducing the consumption of sugar-sweetened beverages. Available at: “https://stacks.cdc.gov/view/cdc/51532”. ~~“http://www.cdph.ca.gov/SiteCollectionDocuments/StratstoReduce_Sugar_Sweetened_Bevs.pdf”~~. Accessed March 9, 2022~~March 21, 2017~~. ~~(Archived by WebCite® at: “http://www.webcitation.org/6p8T5uXrT”)~~

Centers for Disease Control and Prevention. Get the Facts: Sugar-Sweetened Beverages and Consumption. March 11, 2021. Available at: “https://www.cdc.gov/nutrition/data-statistics/sugar-sweetened-beverages-intake.html#:~:text=Sugar%2Dsweetened%20beverages%20(SSBs),sugars%20in%20the%20American%20diet.&text=Limiting%20the%20amount%20of%20SSB,and%20have%20a%20healthy%20diet”. Accessed February 24, 2022.

Centers for Disease Control and Prevention. Clinical charts with 5th and 95th percentiles. Available at: “https://www.cdc.gov/growthcharts/clinical_charts.htm#Set1”. Accessed February 24, 2022.

Chen D, Zhi Q, Zhou Y, Tao Y, Wu L, Lin H. Association between dental caries and BMI in children: A systematic review and meta-analysis. Caries Res 2018;52(3):230-45.

~~Dye BA, Hsu KL, Afful J. Prevalence and measurement of dental caries in young children. Pediatr Dent 2015; 37(3):200-16.~~

Fleming E, Afful J. Prevalence of Total and Untreated Dental Caries Among Youth: United States, 2015–2016. NCHS Data Brief, no 307. Hyattsville, MD: National Center for Health Statistics. 2018.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Fryar CD, Carroll MD, Afful J. Prevalence of overweight, obesity, and severe obesity among children and adolescents aged 2–19 years: United States, 1963–1965 through 2017–2018. NCHS Health E-Stats. 2020.

~~Foster H, Fitzgerald J. Dental disease in children with chronic illness. Arch Dis Child 2005;90(7):703-8.~~

~~Gidding SS, Dennison BA, Birch LL, et al. Dietary recommendations for children and adolescents: A guide for practitioners. Pediatrics 2006;117(2):544-59.~~

~~Han E, Powell LM. Consumption patterns of sugar-sweetened beverages in the United States. J Acad Nutr Diet 2013;113(1):43-53.~~

Hayden C, Bowler JO, Chambers S, et al. Obesity and dental caries in children: A systematic review and meta-analysis. Community Dent Oral Epidemiol 2013;41(4):289-308.

Heyman MB, Abrams SA. Fruit juice in infants, children, and adolescents: Current recommendations. Pediatrics 2017;139(6):1-8.

~~Kenny DJ, Somaya P. Sugar load of oral liquid medications on chronically ill children. J Can Dent Assoc 1989; 55(1):43-6.~~

~~Kogan MD, Pappas G, Yu SM, Kotelchuck M. Over-the-counter medication use among US preschool children. J Am Med Assoc 1994;272(13):1025-30.~~

~~Lam HS, Chow CH, Poon WT, et al. Risk of vitamin A toxicity from candylike chewable vitamin supplements for children. Pediatrics 2006;118(2):820-4.~~

~~Maguire A, Rugg-Gunn AJ, Butler TJ. Dental health of children taking antimicrobial and non-antimicrobial li-quid oral medication long-term. Caries Res 1996;30(1): 16-21.~~

~~Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999–2010. JAMA 2012;307 (5):483-90.~~

Lee A, Cardel M, Donahoo WT. Social and Environmental Factors Influencing Obesity. [Updated 2019 Oct 12]. In: Feingold KR, Anawalt B, Boyce A, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available at: “https://www.ncbi.nlm.nih.gov/books/NBK278977/”. Accessed March 13, 2022.

Lott M, Callahan E, Welker Duffy E, Story M, Daniels S. Healthy Beverage Consumption in Early Childhood: Recommendations from Key National Health and Nutrition Organizations. Consensus Statement. Durham, NC: Healthy Eating Research, 2019. Available at: “https://healthyeatingresearch.org/wp-content/uploads/2019/09/HER-HealthyBeverage-ConsensusStatement.pdf”. Accessed February 24, 2022.

Lott M, Callahan E, Welker Duffy E, Story M, Daniels S. Healthy Beverage Consumption in Early Childhood: Recommendations from Key National Health and Nutrition Organizations. Technical

Scientific Report. Durham, NC: Healthy Eating Research, 2019. Available at: "https://healthyeatingresearch.org/wp-content/uploads/2019/09/HER-HealthyBeverageTechnicalReport.pdf". Accessed February 24, 2022.

Paisi M, Kay E, Bennett C, et al. Body mass index and dental caries in young people: A systematic review. BMC Pediatr 2019;19(1):122.

Pan L, Li R, Park S, Galuska DA, Sherry B, Freedman DS. A longitudinal analysis of sugar-sweetened beverage intake in infancy and obesity at 6 years. Pediatrics 2014;134(suppl 1):S29–S35.

Rosinger A, Herrick K, Gahche J, Park S. Sugar-sweetened beverage consumption among U.S. youth, 2011–2014. NCHS data brief, no 271. Hyattsville, MD: National Center for Health Statistics. 2017.

Saavedra JM, Deming D, Dattilo A, Reidy K. Lessons from the Feeding Infants and Toddlers Study in North America: What children eat, and implications for obesity prevention. Ann Nutr Metab 2013;62(suppl 3):27-36.

Slayton RL, Fontana M, Young D, et al. Dental caries management in children and adults. Institute of Medicine, 2016; National Academy of Medicine, Washington, D.C. Available at: "https://nam.edu/dental-caries-management-in-children-and-adults/". Accessed March ~~21~~13, 2022~~17~~. ~~(Archived by WebCite® at: "http://www.webcitation.org/ 6p8Spd8l9")~~

Tham R, Bowatte G, Dharmage SC, et al. Breastfeeding and the risk of dental caries: A systematic review and meta-analysis. Acta Paediatr 2015;104(467):62-84.

U.S. Department of Agriculture, Agricultural Research Service. 2020. Snacks: Distribution of Snack Occasions, by Gender and Age, What We Eat in America, NHANES 2017-2018. Available at: "https://www.ars.usda.gov/ARSUserFiles/80400530/pdf/1718/Table_29_DSO_GEN_17.pdf". Accessed February 19, 2022.

U.S. Department of Agriculture Food and Nutrition Service. A Guide to Smart Snacks in School. For School Year 2018–2019. July, 2016. Slightly revised August 2018.

U.S. Department of Health and Human Services, U.S. Department of Agriculture. ~~2015–~~2020-2025 Dietary Guidelines for Americans, 8th ed, Washington, D.C.: U.S. Department of Health and Human Services and U.S. Department of Agriculture; 2016. Available at: "https://www.dietaryguidelines.gov/sites/default/files/2021-03/Dietary_Guidelines_for_Americans-2020-2025.pdf ~~https:// health.gov/dietaryguidelines/2015/guidelines/~~". Accessed February 24, 2022~~November 25, 2016. (Archived by WebCite® at: "http: //www.webcitation.org/6siU5uUad")~~

von Philipsborn P, Stratil JM, Burns J, et al. Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. Cochrane Database Syst Rev

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

2019;6(6):CD012292. Available at: "https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6564085/". Accessed February 23, 2022.

Vos MB, Kaar JL, Welsh JA, et al. Added sugars and cardiovascular disease risk in children: A scientific statement from the American Heart Association. Circulation 2017;135(19):e1017-e1034.

~~Wang YC, Bleich SN, Gortmaker SL. Increasing caloric contribution from sugar-sweetened beverage, and 100 percent fruit juices among US children and adolescents, 1988-2004. Pediatr 2008;121(6):e1604-14.~~

~~World Health Organization. Guideline: Sugars intake for adults and children. Geneva, Switzerland: World Health Organization; 2015. Available at: "http://apps.who.int/iris /bitstream/10665/149782/1/9789241549028_eng.pdf? ua=1". Accessed March 21, 2017. (Archived by WebCite® at: "http://www.webcitation.org/6p8TH1hvk")~~

World Health Organization. Healthy Diet. April 29, 2020. Available at: "https://www.who.int/news-room/fact-sheets/detail/healthy-diet". Accessed February 24, 2022.

Wright R, Casamassimo PS. Assessing the attitudes and actions of pediatric dentists toward childhood obesity and sugar-sweetened beverages. J Pub Health Dent 2017;77(Suppl 1):S79-S87.

Ziegler EE. Consumption of cow's milk as a cause of iron deficiency in infants and toddlers. Nutr Rev 2011;69(Suppl 1):S37-42.

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Policy on Snacks and Sugar-Sweetened Beverages Sold in Schools

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAP: American Academy of Pediatrics. **AAPD**: American Academy Pediatric Dentistry. **SSBs**: Sugar-sweetened beverages. **USDA**: U.S. Department of Agriculture.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that targeted marketing and easy access to ~~sweetened~~ foods and beverages with added sugars ~~(acidulated carbonated and noncarbonated)~~ by children and adolescents may increase the amount and frequency of their consumption which, in turn, may contribute to an increase in caries risk and a negative influence on overall nutrition and health.

Methods

This document was developed by the Council on Clinical Affairs~~, and~~ adopted in 2002(AAPD 2002), and last revised in 2017(AAPD 2017).~~ The last revision occurred in 2009 and was reaffirmed in 2012.~~ This revision is based upon a review of current dental and medical literature, including a search of the PubMed®/MEDLINE database using the terms: schools, vending machines, AND caries; fields: all; limits: within the last 10 years, humans, English, clinical trials, and ages birth through 18. The update also included a review of the American Academy of Pediatrics' (**AAP**) policy statement: *Soft Drinks in Schools*,(AAP 2004) the AAP's policy statement: *Snacks, Sweetened Beverages, Added Sugars and Schools*,(AAP 2015) and the U.S. Department of Agriculture (**USDA**) policies on school meals. (USDA Nutrition Standards ~~Standards for School Meals; USDA Standards for Food Sold in Schools-Final Rule~~) Papers for review were chosen from the resultant lists and from hand searches. Expert and/or consensus opinion by experienced researchers and clinicians also was considered.

Background

Contemporary changes in beverage consumption patterns have the potential to increase dental caries rates in children. Vending machines provide ready access to ~~highly-refined carbohydrates~~ excess calories from

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added sugars, especially ~~soft drinks~~* sugar-sweetened beverages (SSBs) . Consumption of ~~regular~~ SSBs in the form of sodas ~~pop~~, ~~powdered beverages~~ or sport, energy, and fruit-flavored drinks, and to a lesser extent 100 percent juice, has been associated with an increased ~~caries~~ risk for developing dental caries.(Marshall et al. 2003, Rosinger 2017, Muth 2019, Laniado 2020) The acids present in carbonated beverages can have a greater deleterious effect (i.e., erosion) on enamel than the acids generated by oral flora from the sugars present in sweetened drinks.(ADA CAPIR/CSA 2001) Analysis of the ~~third~~ National Health and Nutrition Examination Survey (NHANES 2011-2014)~~ III data(CDC 2012)~~ indicated that ~~13 percent~~ two-thirds of children aged ~~two through 10~~ 2-19 years consumed at least one SSB on a given day, ~~had diets high in consumption of carbonated soft drinks~~, and ~~these~~ children who consumed SSBs had ~~a~~ significantly higher dental caries experience and untreated dental caries ~~in the primary dentition~~ than did children ~~with other fluid consumption patterns~~ who consumed other beverage types (~~Sohn et al. 2006~~ Laniado 2020, Rosinger 2017) A significant increase in caries scores has been reported for children who attended schools that had vending machines.(Maliderou et al. 2006)

There is ~~growing~~ significant concern that vending machine items ~~with limited~~ which provide little to no nutritional value are competitive foods~~,~~ and result~~ing~~ in snack options ~~that are considered to be~~ of poor nutritional quality.(US GAO 2005; Kakarala et al. 2010; Pasch et al. 2011) As teenage girls' ~~have increased their~~ consumption of ~~soft drinks~~ SSBs increases, their consumption of milk decreases ~~has decreased by 40 percent~~, which may contribute to a decrease in bone density, subsequent increase in fractures, and future risk of osteoporosis.(~~Wyshak 2000; Ludwig et al. 2001~~ Kalkwarf 2003, Ahn 2021) Increased ingestion of SSBs~~sugar-sweetened drinks~~ also has been linked to the increased incidence of childhood obesity.(Fox et al. 2009, Luger 2017) Of all beverages, increasing soda consumption predicted the greatest increase of body mass index (BMI) and the lowest increase in calcium intake.(Striegel-Moore et al. 2006) Carbonated soda consumption was negatively associated with vitamin A intake in all age strata, calcium intake in children younger than 12 years, and magnesium intake in children aged 6 years and older.(Ballew et al. 2000) Many soft drinks also contain significant amounts of caffeine which, if consumed regularly, may lead to increased, even habitual, usage.(Majewski 2001)

In 2013, the USDA initiated smart snacks standards prompting school districts to offer healthier food and beverages in vending machines, school stores, and à la carte cafeteria lines.(USDA Nutrition Standards

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~~* For the purposes of this statement, the term soft drinks refers to such beverages as sodas, fruit juices, and sports drinks~~.

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~~Standards for Food Sold in Schools-Proposed Rule~~) The final rules released by the USDA in July, 2016 state that schools must continue to meet strong nutritional guidelines for snacks/drinks sold to children, and they prevent marketing of foods and drinks inconsistent with those standards.(USDA Nutrition Standards ~~Standards for Food Sold in Schools-Final Rule~~) The USDA's rules establish a national baseline of these standards with the overall goal of improving health and nutrition of our children.

Policy statement

The AAPD:

- Encourages collaboration with other dental and medical organizations, governmental agencies, education officials, parent and consumer groups, and corporations to increase public awareness of the adverse effects of frequent and/or inappropriate intake of sugar-sweetened beverages and low nutrient dense snack foods on children's oral health and general health.
- Promotes educating and informing the public regarding the importance of good nutritional habits as they pertain to consumption of items available in vending machines.
- Encourages school officials and parent groups to consider the importance of maintaining healthy choices in vending machines in schools and encourages the promotion of food and beverages of high nutritional value; bottled water and other more healthy choices should be available instead of ~~soft drinks~~ sugar-sweetened beverages.
- Opposes any arrangements that may decrease access to healthy nutritional choices for children and adolescents in schools.

References

Ahn H, Park YK. Sugar-sweetened beverage consumption and bone health: A systematic review and meta-analysis. Nutr J 2021;20(1):41.

American Academy of Pediatric Dentistry. Policy on beverage vending machines in schools. Pediatr Dent 2002;24(suppl issue):27.

American Academy of Pediatric Dentistry. Policy on snacks and beverages sold in schools. Pediatr Dent 2017;39(6):67-8.

American Academy of Pediatrics Committee on School Health. Policy statement: Soft drinks in schools. Pediatrics 2004;113(1Pt+1):152-4. Reaffirmed December, 2012.

American Academy of Pediatrics. Policy statement: Snacks, sweetened beverages, added sugars, and schools. Pediatrics 2015;135(3):~~D1-4.~~ 575-83.

Ballew C, Kuester S, Gillespie C. Beverage choices affect adequacy of children's nutrient intakes. Arch Pediatr Adolesc Med 2000;154(11):1148-52.

~~Centers for Disease Control and Prevention, National Center for Health Statistics. National Health and Examination Survey Data. (NHANES III) Hyattsville, Md.: U.S. Department of Health and Human Services, Center for Disease Control; 2012. Available at "https://www.cdc.gov/nchs/nhanes/ nhanes 3.htm". Accessed March 22, 2017. (Archived by WebCite® at: "http://www.web citation.org/6p9cTnaGZ")~~

Fox MK, Dodd AH Wilson A, Gleason PM. Association between school food environment and practices and body mass index of US public school children. J Am Diet Assoc 2009;109(2 Suppl):S108-17.

Joint Report of the American Dental Association Council on Access, Prevention, and Interprofessional Relations and Council on Scientific Affairs to the House of Delegates. Response to Resolution 73H-2000. Chicago, Ill.: American Dental Association; 2001.

Kakarala M, Keast DR, Hoerr S. Schoolchildren's consumption of competitive foods and beverages, excluding à la carte. J Sch Health 2010;80(9):429-35.

Kalkwarf HJ, Khoury JC, Lanphear BP. Milk intake during childhood and adolescence, adult bone density, and osteoporotic fractures in US women. Am J Clin Nutr 2003;77(1):257-65.

~~Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: A prospective, observational analysis. Lancet 2001;357(9255):505-8.~~

Luger M, Lafontan M, Bes-Rastrollo M, Winzer E, Yumuk V, Farpour-Lambert N. Sugar-sweetened beverages and weight gain in children and adults: A systematic review from 2013 to 2015 and a comparison with previous studies. Obes Facts 2017;10(6):674-93.

Muth ND, Dietz WH, Magge SN, Johnson RK. Public policies to reduce sugary drink consumption in children and adolescents. Pediatrics 2019;143(4):e20190282.

Majewski R. Dental caries in adolescents associated with caffeinated carbonated beverages. Pediatr Dent 2001;23(3):198-203.

Maliderou M, Reeves S, Nobel C. The effect of social demographic factors, snack consumption, and vending machine use on oral health of children living in London. British Dent J 2006;201(7):441-4.

Marshall TA, Levy SM, Broffitt B, et al. Dental caries and beverage consumption in young children. Pediatr 2003;112(3 Pt 1):e184-91.

Pasch KE, Lytle LA, Samuelson AC, Farbakhsh K, Kubik MY, Patnode CD. Are school vending machines loaded with calories and fat: An assessment of 106 middle and high schools. J Sch Health 2011;81(4):212-8.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~Sohn W, Burt BA, Sowers MR. Carbonated soft drinks and dental caries in the primary dentition. J Dent Res 2006;85(3):262-6~~.

Striegel-Moore RH, Thompson D, Affenito SG, et al. Correlates of beverage intake in adolescent girls: The national heart, lung, and blood institute growth and health study. J Pediatr 2006;148(2):183-7.

~~U.S. Department of Agriculture Food and Nutrition Service. National school lunch program and school breakfast program: Nutrition standards for all foods sold in school as required by the Healthy, Hunger-free Kids Act of 2010. Final rule and interim final rule. 7 C.F.R. Parts 210 and 220. Available at: “https://www.gpo.gov/fdsys/pkg/FR-2016-0729/pdf/2016-17227.pdf”. Accessed March 22, 2017. (Archived by WebCite® at: “http://www.webcitation.org/6p9bqqE15”)~~

~~U.S. Department of Agriculture Food and Nutrition Service. National School Lunch Program and School Breakfast Program: Nutrition Standards for All Foods Sold in School as Required by the Healthy, Hunger-Free Kids Act of 2010. Proposed~~ Final ~~Rule. 7 C.F.R. Parts 210 and 220. Available at: “http://fns.usda.gov/sites/default/files/fdpir/02.13.13-QTC-Nutrition-Standards.pdf”. Accessed March 22, 2017 (Archived by WebCite® at: “http:// www.webcitation.org/6tbNuFhAL”)~~

U.S. Department of Agriculture Food and Nutrition Service. ~~Nutrition standards for school meals.~~ Nutrition Standards in the National School Lunch and School Breakfast Programs Available at: ~~https://www.fns.usda.gov/school-meals/nutrition-standards-school-meals~~ ~~“~~https://www.govinfo.gov/content/pkg/FR-2012-01-26/pdf/2012-1010.pdf” Accessed ~~June 30, 2017.~~ March 16, 2022.

U.S. Government Accountability Office. Report to Congressional Requests: School Meal Programs Competitive Foods are Widely Available and Generate Substantial Revenues for Schools. 2005. ~~Available at: “http://www.gao.gov/new.items/d05563.pdf”.~~ “https://www.gao.gov/assets/gao-05-563.pdf”. Accessed March 16, 2022.~~22, 2017 (Archived by WebCite® at: “http://www.web citation.org/6p9cOMgQF”)~~

~~Wyshak G. Teenaged girls, carbonated beverage consumption, and bone fractures. Arch Pediatr Adolesc Med 2000;154(6):610-3.~~

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Policy on the Use of Lasers for Pediatric Dental Patients

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **CO_2**: Carbon dioxide. **Er, Cr:YSGG**: Erbium-chromium-yttrium-scandium-garnet. **Er:YAG**: Erbium-yttrium-aluminum-garnet. **Nd:YAG**: Neodymium-yttrium-aluminum-garnet. **PBM**: photobiomodulating.

Purpose

The American Academy of Pediatric Dentistry (**AAPD)** recognizes the judicious use of lasers as a beneficial instrument in providing dental restorative and soft tissue procedures for infants, children, and adolescents, including those with special health care needs. This policy is intended to support safe and evidence-based use of lasers through a review of ~~inform and educate dental professionals on~~ the fundamentals, types, diagnostic and clinical applications, benefits, and limitations of laser use in pediatric dentistry.

Methods

This policy was developed by the Council on Clinical Affairs~~, and~~ adopted in 2013 (AAPD 2013), and last revised in 2017(AAPD 2017). ~~It~~ The revision is based on a review of current dental and medical literature related to the safety and use of lasers. This document included database searches using the term: laser dentistry, dental lasers, laser pediatric dentistry, laser soft tissue treatments, and laser restorative dentistry. Articles were evaluated by title and/or abstract and relevance to pediatric dental care. Expert and/or consensus opinion by experienced researchers and clinicians also was considered.

Background

Medicine began integrating lasers in the mid 1970s for soft tissue procedures. Oral and maxillofacial surgeons incorporated the carbon dioxide (CO_2) laser into practice for removal of oral lesions in the 1980s.(Frame 1985; ~~Coluzzi 2005~~) The first laser specifically for dental use was a neodymium-yttrium-aluminum-garnet (**Nd:YAG**) laser, developed in 1987 and approved by the United~~.~~ States~~.~~ Food and Drug

Administration in 1990.(Myers et al. 1989) Since then, laser technology has advanced significantly. Currently, lasers used in dentistry include Nd:YAG, argon, erbium (Er, Cr:YSGG and Er:YAG), diode, and two CO_2 wavelengths. The use of lasers ~~is contributing~~ contributes to many areas of dentistry including periodontics, (Boj et al. 2011) pediatrics, endodontics, oral surgery, (Boj et al. 2011) restorative dentistry ~~(Parker 2016)~~ and dental hygiene, cosmetic dental whitening, and pain management.(Fornaini 2019, Parker 2016, Suresh 2020, Coluzzi 2016, Olivie 2009) ~~of temporomandibular joint pain to name a few.~~

Laser basics

While a detailed description of how lasers work is beyond the scope of this document, ~~it is important to understand~~ the basics of laser physics are important to understand prior to selecting a laser for dental treatment. The term laser is an acronym for light amplification by stimulated emission of radiation. ~~Lasers are classified by the active medium that is used to create the laser energy~~. Within a laser, an active medium (e.g., erbium crystal, CO_2 gas, a semiconductor) is stimulated to produce photons of energy that are delivered in a beam of unique wavelength ~~that is~~ measured in nanometers.(~~Fasbinder 2008~~ Coluzzi 2016) The wavelength of a dental laser is the determining factor of the level to which the laser energy is absorbed by the intended tissue.(Coluzzi 2016, Parker 2020)Target tissues differ in their affinity for specific wavelengths of laser energy depending on the presence of the chromophore or the laser-absorbing elements of the tissue.(~~Fasbinder 208~~; Coluzzi 2016, Parker 2020 ~~Green et al. 2011~~; Martens 2011) Oral hard and soft tissues have a distinct affinity for absorbing laser energy of a specific wavelength.(Coluzzi 2016, Parker 2020) For this reason, selecting a specific laser unit depends on the target tissue the practitioner wishes to treat.

The primary effect of a laser within target tissues is photo-thermal,(~~White et al. 1992~~) meaning that the laser energy is transformed into heat. (Coluzzi 2016) When the temperature of the target tissue containing water is raised above 100 degrees Celsius, vaporization of the water occurs, resulting in soft tissue ablation. (~~Frame 1985~~ Coluzzi 2016, Parker 2020) Since soft tissue is made up of a high percentage of water, excision of soft tissue initiates at this temperature. ~~Hard tissue composed of hydroxyapatite crystals and minerals are not ablated at this temperature, but the water component is vaporized and the resulting steam expands and then disperses the encompassing material into small particles. (Martens 2011)~~ Dental hard tissue is composed of hydroxyapatite, mineral, and water. Erbium lasers do not ablate hard tissues directly, but vaporization of the water component causes the resulting steam to expand and then disperses

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the encompassing material into small particles, a process known as spallation. (Martens 2011; Parker 2020) The 9300 nm CO_2 wavelength targets absorption within the water component, as well as the phosphate and hydrogen phosphate anions of the hydroxyapatite mineral molecule and is, therefore, capable of ablating enamel and dentin. (Parker 2020, Parker 2016)

Laser operating parameters such as power, frequency, emission mode, thermal relaxation time, and air and water coolant used affect the clinical abilities of a laser. (Coluzzi 2016 ,Parker 2020) Additionally, the delivery system of laser unit as well as the tissue concentration of the chromophore greatly influence the laser-tissue interactions.(Coluzzi 2016 ,Parker 2016)

Clinical applications of the lasers commonly used in pediatric dentistry are listed in the Table.

Laser safety

Adherence to safe laser practices is a duty of every laser practitioner, but identification of a laser safety officer for a clinical facility can maximize safe and effective operation of the laser. This person would provide all necessary information, inspect and maintain the laser and its accessories, and ensure that all safety procedures are implemented. (Coluzzi 2016) Because reflected or scattered laser beams may be hazardous to unprotected skin or eyes, wearing wavelength-specific protective eyewear is required at all times by the dental team, patient, and observers during laser use.(Coluzzi 2016) Laser plume results from the aerosol byproducts of laser-tissue interaction and may contain particulate organic and inorganic matter (e.g., viruses, toxic gases, chemicals) which may be infectious or carcinogenic.(Coluzzi 2016) ~~Laser plume, a mixture of gases as well as debris, is generated during the use of lasers.~~ When using dental lasers adherence to infection control protocol, including wearing a 0.1*u*m filtration mask, and-utilization of high-speed suction are imperative. (Coluzzi 2016) ~~as the vaporized aerosol may contain infective tissue particles.(Coluzzi 2005;Piccone 2004)~~ Sparks from lasers can contribute to patient fire in the presence of an oxidizer enriched atmosphere and combustible agents (e.g., dry gauze, throat pack, paper, cotton products; hair; petroleum-based lubricants; alcohol-based products; rubber dam and nitrous mask). (AAPD safety 2020, Chen 2019, Bosack et al. 2016, Weaver 2012) Safe laser practices reduce the risk of fire.(AAPD safety 2020)
~~The practitioner should exercise good clinical judgment when p~~ Providing soft tissue treatment of viral lesions in immunocompromised patients has the ~~potential~~ risk of disease transmission from laser-generated aerosol ~~exists~~.(Parker 2007; Garden et al. 2002) ~~To prevent viral transmission,~~ Palliative

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pharmacological therapies may be more acceptable and appropriate in this group of patients in order to prevent viral transmission.(Garden et al.) ~~Reflected or scattered laser beams may be hazardous to unprotected skin or eyes. Wavelength-specific protective eyewear should be provided and consistently worn at all times by the dental team, patient, and other observers in attendance during laser use.(Coluzzi 2005)~~ Many states have well-defined laser safety regulations, and information can be obtained from ~~and practitioners should contact their specifi~~ state boards ~~to obtain this information~~.

Benefits of lasers in pediatric dentistry

One of the benefits of laser use in pediatric dentistry is the selective and precise interaction with diseased tissues.(~~Coluzzi 2005~~ Coluzzi 2016) Less thermal necrosis of adjacent tissues is produced with lasers than with electrosurgical instruments.(~~Coluzzi 2008~~Coluzzi 2016)During soft tissue procedures, hemostasis can be obtained without the need for sutures in most cases.(~~Coluzzi 2005~~;Coluzzi 2016 Boj et al. 2011;Parker 2020) ~~With the benefit of hemostasis during soft tissue treatments,~~ This may allow wound healing ~~can~~ to occur more rapidly with less post-operative discomfort and a reduced need for analgesics.(Martens 2011; Coluzzi 2016 ~~Coluzzi 2008~~; Boj et al. 2011; Olivi et al. 2009;Parker 2020) Little to no local anesthesia is required for most soft-tissue treatments.(Martens 2011; Boj et al. 2011; Olivi et al. 2009; ~~Convissar & Goldstein 2003~~) Reduced operator chair time has been observed when soft tissue procedures have been completed using lasers.(Boj et al. 2011; Olivi et al. 2009) Lasers demonstrate decontaminating and bacteriocidal properties on tissues, requiring less prescribing of antibiotics post-operatively.(Martens 2011; Boj et al. 2011; Olivi et al. 2009;Parker 2020) ~~Lasers can provide relief from the pain and inflammation associated with aphthous ulcers and herpetic lesions without pharmacological intervention.(Green et al. 2011; Boj et al. 2011; Olivi et al. 2009)~~

Laser therapeutics can occur without a photothermal event, and these effects are known as photobiomodulating (**PBM**) or low-level laser effects. (Fornaini 2019) PBM therapy has been used in children for prevention and treatment of oral mucositis associated with immunosuppressive therapy (chemotherapy, radiation, and transplants). (AAPD Imunosuppressive therapy 2022, Elad 2020, Miranda-Silva 2021, Zadik 2019) PMB may reduce postsurgical or traumatic oral pain(Formaini, 2019), and pain during cavity preparation.(Tanboga 2011) Laser therapy, (PBM as well as application of erbium and CO_2 laser energy)(Yilmaz et al. 2017, Suter et al. 2017) ,can provide relief from the pain and inflammation associated with aphthous ulcers and herpetic lesions without pharmacological intervention;(Green et al. 2011; Boj et al. 2011; Olivi et al. 2009, Bardellini 2020) however, more studies are needed to establish the laser type and therapeutic parameters (e.g. applied energy, wavelength, power outlet) recommended for children. (Suter et al. 2017)

Nd:YAG, erbium, and 9300 nm CO_2 lasers have been shown to have an analgesic effect on hard tissues, reducing or eliminating the use of local anesthesia during tooth preparations.(Caprioglio 2017;Martens 2011; Olivi & Genovese 2011; van As 2004; Matsumoto et al. 2002; Den Besten, et al. 2001 Parker 2016) The mechanism for laser analgesia is not known; however, proposed explanations include that the photo-acoustic effect of laser energy acts within the gate control pathway blocking pain sensations, direct and indirect influences of laser energy on nerves and nociceptors, and modifications of the sodium/potassium pump systems inhibiting nerve transmission. (Poli 2020,Parker 2016)During restorative procedures. conventional dental handpieces produce noise and vibrations which have been postulated as stimulating discomfort, pain, and anxiety for the pediatric patient.(Martens 2011; Olivi & Genovese 2011; Takamori et al. 2003; Tanboga et al. 2011) The non-contact of lasers with hard tissue eliminates the vibratory effects of the conventional high-speed handpiece and may reduce anxiety related to rotary instruments.(Merigo et al. 2015) Lasers can remove caries effectively with minimal involvement of surrounding tooth structure because caries-affected tissue has a higher water content than healthy tissue.(~~Coluzzi 2008~~ Coluzzi 2016, Parker 2016) ~~The noise and vibration of the conventional high-speed dental handpiece has been postulated as stimulating discomfort, pain, and anxiety for the pediatric patient during restorative procedures.(Martens 2011; Olivi & Genovese 2011; Takamori et al. 2003; Tanboga et al. 2011) The non-contact of erbium lasers with hard tissue eliminates the vibratory effects of the conventional high-speed handpiece allowing tooth preparations to be comfortable and less anxiety provoking for children and adolescents.(Martens 2011; Olivi & Genovese 2011; Tanboga et al. 2011) Nd:YAG ,and erbium have been shown to have an analgesic effect on hard tissues, eliminating injections and the use of local anesthesia during tooth preparations.(Martens 2011; Olivi & Genovese 2011; van As 2004; Matsumoto et al. 2002; Den Besten, et al. 2001)~~

~~Limitations~~ Disadvantages of lasers in pediatric dentistry

~~There are some disadvantages of l~~Laser use in pediatric dentistry has some disadvantages. Since different wavelengths are necessary for various soft and hard tissue procedures, the practitioner may need more than one laser.(~~Coluzzi 2005~~ Coluzzi 2016) Laser use requires additional training and education for the various clinical applications and types of lasers.(~~Coluzzi 2005;~~Coluzzi 2016 Olivi et al. 2009; Olivi & Genovese 2011; van As 2004) High start-up costs are required to purchase the equipment, implement the technology, and invest in the required education and training.(~~Coluzzi 2005~~; Coluzzi 2016 ; Olivi et al. 2009) Laser manufacturers provide training on their own units, but most laser education is obtained through continuing education courses. Few dental schools and graduate programs provide comprehensive laser education at this time. Most dental instruments are both side- and end-cutting; lasers are exclusively end-cutting, and lasers are unable to ablate metallic restorations. (Coluzzi 2016, Parker 2016) Cavity preparations are slower to make with a laser than with a highspeed handpiece, (Parker 2016) and ~~When using lasers,~~ modifications in clinical technique along with additional preparation with ~~high-speed~~ handpieces may be required to finish tooth preparations. (~~Coluzzi 2005~~; Coluzzi 2016;Olivi & Genovese 2011)

Policy statement

The AAPD:

- recognizes the use of lasers as an alternative and complementary method of providing soft and hard tissue dental procedures for infants, children, adolescents, and persons with special health care needs.
- advocates the dental professional receive additional didactic and experiential education and training on the use of lasers before applying this technology on pediatric patients.
- encourages dental professionals to research, implement, and utilize the appropriate laser specific and optimal for the indicated procedure. Understanding the technology and clinical implications is necessary before practitioners utilize lasers in patient care.
- encourages additional research regarding the safety, efficacy and application of lasers for dental care for pediatric patients.
- supports patient, visitor, and staff safety through identification of a laser safety officer, supplementation of infection control practices, and use of wavelength-specific protective eyewear when a dental facility employs laser technology ~~Endorses use of protective eyewear specific for laser wavelengths during treatment for the dental team, patient, and observers~~.

References

American Academy of Pediatric Dentistry. Policy on use of lasers for pediatric dental patients. Pediatr Dent 2013;35(special issue):75-7.

American Academy of Pediatric Dentistry. Policy on use of lasers for pediatric dental patients. Pediatr Dent 2017;39(6):93-5.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Dental management of pediatric patients receiving immunosuppressive therapy and/or radiation therapy. The Reference Manual of Pediatric Dentistry. Chicago, Ill: The American Academy of Pediatric Dentistry; 2022: PENDING.

American Academy of Pediatric Dentistry. Policy on patient safety. The Reference Manual of Pediatric Dentistry. Chicago, Ill: American Academy of Pediatric Dentistry; 2021:164-8.

Bardellini E, Veneri F, Amadori F et al. Photobiomodulation therapy for the management of recurrent aphthous stomatitis in children: Clinical effectiveness and parental satisfaction. Med Oral Patol Oral Circ Bucal 2020;25(4):e549-e53.

Boj JR, Poirer C, Hernandez M, et al. Review: Laser soft tissue treatments for paediatric dental patients. Eur Arch Paediatr Dent 2011;12(2):100-5.

Bosack R, BruleyM, VanCleave A, Weaver J. Patient fire during dental care: A case report and call for safety. J Am Dent Assoc 2016;147(8)661-7.

Caprioglio C, Olivi G, Genovese MD. Pediatric laser dentistry. Part 1: General introduction. Eur J Paediatr Dent 2017;18(1):80-2.

Chen JW. Fire during deep sedation and general anesthesia-urban myth or real nightmare? Pediatr Dent Today 2019;LIV(6):32. Available at: "https://www.pediatricdentistrytoday.org/2019/November/LIV/6/news/article/1304/". Accessed March 11, 2022.

Coluzzi DJ, Convissar RA, Roshkind DM. Laser fundamentals. In: Convissar RA, ed. Principles and Practice of Laser Dentistry. 2nd ed. St Louis, Mo.: Elsevier Mosby;2016:12-26.

~~Coluzzi DJ. Fundamentals of lasers in dentistry: Basic science, tissue interaction and instrumentation. J Laser Dent 2008;16(Spec Issue):4-10.~~

~~Coluzzi DJ. Lasers in dentistry. Compend Contin Educ Dent 2005;26(6A Suppl):429-35.~~

~~Convissar RA, Goldstein EE. An overview of lasers in dentistry. Gen Dent 2003;51(5):436-40.~~

Den Besten PK, White JM, Pelino JEP, et al. The safety and effectiveness of an Er:YAG laser for caries removal and cavity preparation in children. Med Laser Appl 2001;16(3):215-22.

Elad S, Cheng KKF, Lalla RV, et al; Mucositis Guidelines Leadership Group of the Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO). MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer 2020;126(19):4423-31.

~~Fasbinder DJ. Dental laser technology. Compend Contin Educ Dent 2008;29(8):452-9.~~

Frame JW. Carbon dioxide laser surgery for benign oral lesions. Br Dent J 1985;158(4):125-8.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Fornaini C, Arany P, Rocca J, et al. Photobiomodulation in pediatric dentistry: A current state-of-the-art. Photomed Laser Surg 2019;37(12):798-813.

Garden JM, O'Bannon MK, Bakus AD, Olson C. Viral disease transmitted by laser-generated plume (aerosol). Arch Dermatol 2002;138(10):1303-7.

Green J, Weiss A, Stern A. Lasers and radiofrequency devices in dentistry. Dent Clin North Am 2011;55(3):585-97.

Low S. Lasers in Surgical Periodontics. In: Convissar RA, ed. Principles and Practice of Laser Dentistry. 2nd ed. St Louis Mo.: Elsevier Mosby;2016:51-66.

Martens LC. Laser physics and review of laser applications in dentistry for children. Eur Arch Paediatr Dent 2011;12(2):61-7.

Matsumoto K, Hossain M, Hossain MM, et al. Clinical assessment of Er,Cr:YSGG laser applications for caries removal and cavity preparation in children. Med Laser Appl 2002;20(1):17-21.

Merigo E, Fornaini C, Clini,F, Fontana M, Cella L, Oppici A. Er:YAG laser dentistry in special needs patients. Laser therapy 2015;24(3):189-93.

Miranda-Silva W, Gomes-Silva W, Zadik Y, et al. Mucositis Study Group of the Multinational Association of Supportive Care in Cancer / International Society for Oral Oncology (MASCC/ISOO). MASCC/ISOO clinical practice guidelines for the management of mucositis: Sub-analysis of current interventions for the management of oral mucositis in pediatric cancer patients. Support Care Cancer 2021;29(7):3539-62.

Myers TD, Myers ED, Stone RM. First soft tissue study utilizing a pulsed Nd:YAG dental laser. Northwest Dent 1989;68(2):14-7.

Nazemisalman B, Farsadeghi M, Sokhansanj M. Types of lasers and their applications in pediatric dentistry: a review. J Lasers Med Sci 2015;6(3) 96-101.doi:10.15171/jlms.2015.01.

Olivi G, Genovese MD, Caprioglio C. Evidence-based dentistry on laser paediatric dentistry: Review and out-look. Eur J Paediatr Dent 2009;10(1):29-40.

Olivi G, Genovese MD. Laser restorative dentistry in children and adolescents. Eur Arch Paediatr Dent 2011; 12(2):68-78.

Parker S. Laser regulation and safety in general dental practice. Br Dent J 2007;202(9):523-32.

Parker S, Cronshaw M, Anagnostaki E, et al. Current concepts of laser-oral tissue interaction. Dent J 2020;8(3):61.

Parker S. Lasers in restorative dentistry. In: Convisar RA, ed. Principles and Practice of Laser Dentistry. 2nd ed. St Louis, Mo.: Elsevier Mosby;2016:162-77.

~~Piccone PJ. Dental laser safety. Dent Clin North Am 2004;48(4):795-807~~

Poli R, Parker S, Anagnostaki E, et al. Laser analgesia associated with restorative dental care: A systematic review of the rationale, techniques, and energy dose considerations. Dent J 2020;8(4):128.

Suresh S, Navit S, Khan S, et al. Effect of diode laser office bleaching on mineral content and surface topography of enamel surface: An SEM study. Int J Clin Ped Dent 2020;13(5);480-5.

Suter VGA, Sjolund S, Bornstein MM. Effect of laser on pain relief and wound healing of recurrent aphthous stomatitis: a systematic review. Lasers Med Sci 2017;32(4):954-63.

Takamori K, Furukama H, Morikawa Y, et al. Basic study on vibrations during tooth preparations caused by highspeed drilling and Er:YAG laser irradiation. Lasers Surg Med 2003;32(1):25-31.

Tanboga I, Eren F, Altinok B, et al. The effect of low level laser therapy on pain during cavity preparation with laser in children. Eur Arch Paediatr Dent 2011;12(2): 93-5.

van As G. Erbium lasers in dentistry. Dent Clin North Am 2004;48(4):1017-59.

Weaver JM. Prevention of fire in the dental chair. Anesth Prog 2012;59(3):105-6.

~~White JM, Goodis HE, Kudler JJ, Tran KT. Thermal laser effects on intraoral soft tissue, teeth and bone in vitro. Third International Congress on Lasers in Dentistry. Salt Lake City, Utah: University of Utah Printing Services; 1992:189-90.~~

Yilmaz HG, Albaba MR, Caygur A, et al. Treatment of recurrent aphthous stomatitis with Er,CR:YSGG laser irradiation: A randomized controlled split mouth clinical study. J Photochem Photobiol B 2017; 170:1-5.

Zadik Y, Arany P R, Fregnani ER, et al. Systematic review of photobiomodulation for the management of oral mucositis in cancer patients and clinical practice guidelines. Supp Care in Cancer.2019;27:3969-83.

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Table. LASER BASICS IN PEDIATRIC DENTISTRY

Laser type	**Wavelength**	**Applications**
Diode	450 - 655 nm	1. Laser fluorescence – diagnostic applications, detection of occlusal caries, detecting calculus in periodontal pockets, detection of dysplastic cells during oral cancer screening (Coluzzi 2016, Parker 2016)
Diode	810 - 980 nm	1. Soft tissue ~~ablation~~ procedures – gingival contouring for esthetic purposes, frenectomy, gingivectomy, operculectomy, biopsy (Boj 2011, Coluzzi 2016)
		2. Photobiomodulation – proliferation of fibroblasts and enhancing the healing of oral lesions (mucositis, aphthous ulcers, herpetic lesions,), or surgical wounds (Fornaini 2019, Sutter et al., 2017)
		3. Periodontal procedures – laser bacterial reduction, elimination of necrotic epithelial tissue during regenerative periodontal surgeries (Low 2016)
		4. Enamel ~~W~~ whitening (Suresh 2020)
Er, Cr:YSGG*	2,780 nm	1. Hard tissue procedures –enamel etching, caries removal and cavity preparation in enamel and dentin (Boj 2011, Coluzzi 2016, Parker 2016)
		2. Osseous tissue procedures – bone ablation (Boj 2011, Coluzzi 2016)
		3. Soft tissue ~~ablation~~ procedures – incision, excision, vaporization, coagulation and hemostasis; gingival contouring for esthetic purposes, frenectomy, gingivectomy, operculectomy, biopsy (Boj 2011, Coluzzi 2016)
		4. Endodontic therapy – pulp cap, pulpotomy, pulpectomy, root canal preparation (Nazemisalman 2015)
		5. Periodontal procedures – laser bacterial reduction, elimination of necrotic epithelial tissue during regenerative periodontal surgeries (Low,2016)

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		6. Treatment of oral ulcerative lesions (Yilmaz et al. 2017)
Er:YAG**	2,940 nm	1. Hard tissue procedures – caries removal and cavity preparation in enamel and dentin (Boj 2011, Coluzzi 2016, Parker 2016) 2. Endodontic therapy – root canal preparation (Nazemisalman 2015)
CO2†	9,300 nm	1. Hard tissue procedures –enamel etching, caries removal and cavity preparation in enamel and dentin (Parker 2020) 2. Osseous tissue procedures – bone ablation 3. Soft tissue procedures ~~– incision, excision, vaporization, coagulation and hemostasis~~ – gingival contouring for esthetic purposes, frenectomy, gingivectomy, operculectomy, biopsy (Boj 2011, Coluzzi 2016)
CO2	10,600 nm	1. Soft tissue ~~ablation~~ procedures – gingival contouring for esthetic purposes, frenectomy, gingivectomy, biopsy (Boj 2011, Coluzzi 2016, Nazemisalman 2015) 2. Treatment of oral ulcerative lesions (Nazemisalman 2015, Suter et al. 2017) 3. Periodontal procedures – elimination of necrotic epithelial tissue during regenerative periodontal surgeries (Nazemisalman 2015)

* Er, Cr:YSGG – erbium, chromium, yttrium, scandium, gallium, garnet. ** Er:YAG – erbium, yttrium, aluminum, garnet. † CO_2: Carbon dioxide.

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Policy on ~~Acute~~ Pediatric Dental Pain Management

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **FDA**: U.S. Food and Drug Administration. **NSAIDs**: Nonsteroidal anti-inflammatory drugs.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that children vary greatly in their cognitive and emotional development, medical conditions, and responses to pain and interventions. This policy is not intended to provide clinical recommendations, which can be found in AAPD's best practice on pain management; rather, the purpose of this document is to support efforts to prevent or alleviate pediatric pain and complications from pain medications. Infants, children, adolescents, and those with special health care needs can and do experience pain;~~,~~ ~~and the majority of~~ dental-related pain in most patients ~~in the dental setting~~ can be prevented or substantially relieved. The AAPD further recognizes ~~that there are~~ many therapeutics are available to treat pain with varying ~~dosages and/or~~ regimens. Recent concerns have developed about toxicities associated with codeine and the adverse effects of opioid analgesics.

Methods

This policy was developed by the Council on Clinical Affairs,~~ and~~ adopted in 2012(AAPD 2012), and last revised in 2017(AAPD 2017). This document is an update of the previous version and is based on a review of current dental and medical literature pertaining to pediatric pain management including a search with PubMed®/MEDLINE using the terms: pediatric dental pain management, pediatric pain management, pediatric postoperative pain management, pediatric analgesic overdose; fields: all; limits: within the last ten years, humans, all children zero to 18 years, English, clinical trials, and literature reviews. The search returned ~~3,388~~ 8,031 articles. ~~The reviewers agreed upon the inclusion of 12 new~~ 16 ~~documents that met the defined criteria. Nine additional documents were retained from the previous version of the policy for historical purposes.~~ When data did not appear sufficient or were inconclusive, information included in this ~~police~~ policy was based upon expert and/or consensus opinion by experienced researchers and clinicians

Background

Pain assessment is an integral component of the dental history and comprehensive evaluation. ~~When symptoms or signs of orofacial/dental pain are evident, a~~ A detailed pain assessment ~~should be conducted and documented in the patient's record. This assessment~~ helps the dentist to derive a clinical diagnosis, develop a prioritized treatment plan, and better estimate analgesic requirements for the patient (deLeeuw 2018). Assessment of pain indicates the need for intervention and appropriateness of treatment (deLeeuw 2018). Assessment of pediatric pain may significantly improve the patient's comfort and quality of life. (Zielinski, 2020) Research suggests that undertreatment of pediatric pain can amplify future pain experience. (Cramton, 2012). Effective pain management is important in both the short and the long-term (deLeeuw 2018). Children with an established dental home have better access for acute and chronic orofacial pain management. A dental home provides comprehensive care which can assess and manage acute and chronic oral pain and infection. (AAPD Policy on Dental Home 2018)

~~Pain is difficult to measure due to its subjectivity, especially in children,(Barrêtto et al. 2004; Jain 2012) and often relies on the report of parents. There are several pain scale indicators that can be used with children, including the Faces Pain Scale and the Wong-Baker FACES® Pain Rating Scale.(Barrêtto et al. 2004; Jain 2012) The method of assessing pain selected by the practitioner must accurately reflect pain intensity. Pain experienced by children with special health care needs or developmental disabilities is more challenging to assess accurately and may require utilization of scales that rely on observations such as vocalization, facial expressions, and body movements.(IOM 2016; Feldt 2000; Merkel et al. 1997)~~

~~In addition to documenting pain severity, it is important to assess pain onset, pattern, location, and quality; aggravating and relieving factors; previous treatment and its effect; and barriers to assessment.(Chou et al. 2016) When assessing pain in a child, the patient's psychological status should be considered. The dentist also should account for the intensity and duration of pain that may be perceived from a given dental procedure.(AAP/APS 2001; Needleman et al. 2008)~~

Pain management may range from nonpharmacologic modalities to pharmacological treatment. Nonpharmacologic therapy includes maintaining a calm environment, encouraging deep breathing, and employing guided imagery, distraction, play therapy, hypnotherapy, virtual reality, and other (e.g.

acupuncture, transcutaneous nerve stimulation) techniques ~~tell-show-do~~.(Lee et al. 2014, BP-Pain 2022) Pharmacologic therapy may consist of administration of topical and local anesthesia, analgesic medications, and/or mild, moderate, or deep sedation regimens.(Lee et al. 2014; AAPD BP_Use of Local Anesthesia) ~~The extent of treatment affects post-operative pain. It has been reported that 95 percent of children undergoing full mouth dental rehabilitation, regardless of extent of treatment, report pain of moderate intensity.(Needleman et al. 2008) Pain scores usually are highest immediately postoperatively while the patient is in the post-anesthesia recovery unit.(Needleman et al. 2008) Due to analgesics and/or local anesthetics administered intra-operatively during dental rehabilitation, some patients may be delayed in their pain response and report greater intensity of pain at home following the procedures. Patients who had extractions, as well as those who had 12 or more dental procedures, were more likely to experience pain at home.(Needleman et al. 2008)~~ ~~The selection of an appropriate~~ Analgesic selection depends on the individual patient, the extent of treatment, the duration of the procedure, psychological factors, and the patient's medical history (Laskarides 2016). ~~Physiologic factors such as bleeding disorders, liver problems, and kidney problems should be given particular attention since some analgesics may promote bleeding.(Becker 2010)~~ If moderate to severe postoperative pain is considered likely, ~~an analgesic should be~~ administering an analgesic on a regular schedule ~~during the first~~ for 36 to 48 hours helps to maintain a ~~create~~ stable plasma level~~s~~ of the agent and ~~analgesics and~~ decreases risk for ~~the chance of~~ breakthrough pain.(Chou 2016~~Becker 2010;~~ Sutters et al. 2010)

~~Treatment of postoperative pain may include opioid analgesics and non-opioid analgesics.~~Many therapeutics are available for the prevention of pain. Acetaminophen and ~~Since most cases of postoperative pain include an inflammatory component,~~ nonsteroidal anti-inflammatory drugs (**NSAIDs**), such as ibuprofen, are considered first line agents in the treatment of acute mild to moderate postoperative pain.(Laskarides 2016~~Becker 2010~~) ~~Aspirin-containing analgesics are contraindicated for pediatric pain management in most situations because, if administered during a viral illness, the potential exists for a serious condition known as Reye syndrome.(Ruest & Anderson 2016) Acetaminophen lacks anti-inflammatory properties but can be a non-opioid alternative when NSAIDs are contraindicated.(Becker 2010) Acetaminophen is found as a single agent and also in combination with other drugs. Overdose of acetaminophen is a potential pediatric emergency, and the maximum daily dose should be observed, especially when combination medications are used.(Am Assn Poison Control Centers 2006)~~ Alternating administration of ibuprofen and acetaminophen is another strategy for pain management in children and may allow lower doses of each individual medication to be used.(Chou et al. 2016; Liu & Ulualp 2015, Moore, 2013) Many analgesics have multiple modalities of administration, such as oral, rectal or

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intravenous, to accommodate a wide patient population. (Ruest & Anderson 2016) Consideration of these modalities may be pertinent when treating patients in different environments such as an office-based outpatient setting versus in the hospital.

Certain analgesics are contraindicated in the pediatric population due to concerns for toxicity and adverse reactions. NSAIDs may prolong bleeding time and exacerbate kidney or liver impairment, and acetaminophen overuse may be associated with hepatotoxicy. (Laskarides 2016) Aspirin-containing analgesics are contraindicated for pediatric pain management in most situations because, if administered during a viral illness, the potential exists for a serious condition known as Reye syndrome, a condition that causes swelling of the liver and brain.(Ruest & Anderson 2016). ~~Practitioners may be hesitant to prescribe opioid analgesics for pediatric patients for fear of addiction. Because opioid use for dental pain should be of short duration, physical dependence is unlikely and its use should be considered.(Sutters et al. 2010)~~ Although opioid analgesics ~~are~~ can be effective for moderate to severe postoperative pain, ~~but have~~ there are potential ~~for~~ adverse effects (e.g., nausea, emesis, constipation, sedation, respiratory depression) and diversion.(Liu & Ulualp 2015; Yaksh & Wallace 2010; Dionne & Moore 2016) From 2006 to 2018, the opioid dispensing rate for the pediatric population steadily decreased. (Renny 2021) Persistent opioid use among children and adolescents is a major concern and represents an important pathway to opioid misuse. (Harbaugh, 2018) A 2013 systematic review found a combination of acetaminophen and ibuprofen provided effective analgesia without the adverse side effects associated with opioids; the combination of acetaminophen and ibuprofen was shown to be more effective in combination than either medication alone. (Moore, 2013) In April, 2017, the United States Food and Drug Administration (**FDA**) issued a warning to restrict the use of codeine and tramadol in children and breastfeeding mothers.(US FDA Codeine Use Breastfeeding) ~~Parental anxiety about postoperative pain and potential adverse effects of pain medications may influence administration of analgesics at home.(Chou et al. 2016; AAP/APS 2001) Strategies that educate parents about anticipated postoperative discomfort and the benefits of pain medication have been associated with reduced reports of pain in pediatric patients.(AAP/APS 2001) Parental education, expectation management, and effective use of non-opioid analgesics are keys in reducing adverse effects of opioid analgesics. Opioid analgesics such as hydrocodone and oxycodone are often combined with acetaminophen. Concomitant or alternating opioid administration with ibuprofen can reduce opioid consumption. Codeine, a prodrug that is metabolized into morphine in the liver, has been removed from many hospital formularies due to safety concerns.(US FDA Codeine Use; Tobias et al. 2016; Crews et al. 2014)~~ s~~Individual response to codeine ranges from high sensitivity to no effect at all due to genetic variability.(Tobias et al. 2016; Crews et al. 2014) A genetic~~

~~polymorphism of the liver cytochrome enzyme CYP2D6 causes some patients to be ultra-rapid metabolizers of codeine.(US FDA Codeine Use) Ultimately, these patients convert codeine into high levels of morphine very quickly. For this reason, postoperative use of codeine has been associated with undesirable consequences including death in infants and children.(US FDA Codeine Use; Tobias et al. 2016; Crews et al. 2014) Another variant of CYP2D may cause patients to be poor metabolizers of codeine and, consequently, under-respond to the opioid. (Crews et al. 2014) Repeated doses, of codeine-containing analgesics in these patients fail to result in adequate analgesia, since codeine is not effectively broken down into the active metabolite morphine.(Crews et al. 2014) Tests cleared by the U.S. Food and Drug Administration (**FDA**) are available and could be considered to identify both ultra-rapid and poor metabolizers of codeine and other opioid analgesics.(US FDA Codeine) Tramadol and, to a lesser extent, hydrocodone and oxycodone, also are influenced by CYP2D6 activity. (Crews et al. 2014) In April, 2017, the FDA issued a warning to restrict the use of codeine and tramadol medicines in children and breastfeeding mothers.(US FDA Tramadol) Morphine and non-opioid alter-natives are not influenced by CYP2D6 metabolism.(Crews et al. 2014)~~

Policy statement

The AAPD recognizes that pediatric dental patients ~~children~~ may experience pain ~~and exhibit~~ as a direct result of their oral condition or secondary to invasive dental procedures. ~~variability in the expression of pain. and that I~~nadequate pain control ~~management~~ ~~may have~~ has the potential for significant physical and psychological consequences, including altering future pain experiences for these children. Furthermore, pharmacologic agents used in pediatric pain management have potential for toxicity and adverse reactions, with narcotics at risk for diversion to unintended recipients. ~~for the patient.~~ Therefore, the AAPD encourages ~~health care professionals to~~:

- healthcare professionals to emphasize preventive oral health practices and to implement safe and effective pre-, intra-, and post-operative approaches to minimize the patient's risk for pain.
- healthcare practitioners to follow evidence-based recommendations regarding analgesic use by pediatric patients to minimize untoward reactions and potential for substance misuse.
- additional research to determine safe and effective treatment modalities for acute pain.
- ~~recognize, assess, and document symptoms of pain in the patient's record.~~
- ~~consider preoperative, intraoperative, and postoperative pain management options.~~
- ~~use non-pharmacologic and pharmacologic strategies to reduce pain experience.~~
- ~~utilize drug formularies in order to accurately prescribe medications for the management of pain.~~

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- ~~choose agents compatible with the patient's medical history.~~
- ~~comprehend the consequences, morbidities, and toxicities associated with the use of specific therapeutics.~~
- ~~consider non-opioid analgesics as first line agents for pain management.~~.
- ~~consider simultaneous use of analgesics with different mechanisms of action to optimize pain management. Combining opioid analgesics with NSAIDs or acetaminophen for moderate to severe pain may decrease overall opioid consumption.~~
- ~~support additional clinical research to extend the understanding of the risks and benefits of both opioid and nonopioid alternatives for orally-administered, effective agents for acute and chronic pain. (Tobias et al. 2016)~~

~~The AAPD supports the FDA's April, 2017 safety communication (US FDA Tramadol) which states that codeine and tramadol are contraindicated for treatment of pain in children younger than 12 years.~~

References

American Academy of Pediatric Dentistry. Policy on pediatric pain management. Pediatr Dent 2012;34(special issue):74-5.

American Academy of Pediatric Dentistry. Policy on acute pediatric dental pain management. Pediatr Dent 2017;39(6):99-101.

American Academy of Pediatric Dentistry. Policy on the dental home. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2018:43-4.

American Academy of Pediatric Dentistry. Use of local anesthesia for pediatric dental patients. ~~Pediatr Dent 2017;39(6):266-72.~~ The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021; 332-7.

~~American Academy of Pediatrics, American Pain Society. The assessment and management of acute pain in infants, children and adolescents. Pediatrics 2001;108(3):793-7.~~

~~American Association of Poison Control Centers. Practice guideline: Acetaminophen poisoning: An evidence-based consensus guideline for out-of-hospital management. Clin Toxicol 2006;44(1):1-18.~~

~~Barrêtto EPR, Ferreira EF, Pordeus IA. Evaluation of toothache severity in children using a visual analog scale of faces. Pediatr Dent 2004;26(6):485-91.~~

~~Becker DE. Pain management: Part 1: Managing acute and postoperative dental pain. Anesth Prog 2010;57(2): 67-79.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Chou R, Gordon DB, de Leon-Cassola OA, et al. Guide-lines on the management of postoperative pain. Management of postoperative pain: A clinical practice guideline from the American Pain Society, American Society of Regional Anesthesia and Pain Medicine, American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Counsel. J Pain 2016;17(2):131-57.

Cramton R, Gruchala NE. Managing procedural pain in pediatric patients. Curr Opin Pediatr 2012; 24:530-8.

~~Crews KR, Gaedick A, Dunnenberger HM. Clinical Pharmacogenetics Implementation Consortium guidelines for cytochrome p450 2D6 genotype and codeine therapy: 2014 update. Clin Pharmacol Ther 2014;95(4):376-82.~~

De Leeuw R, Klasser G. American Academy of Orofacial Pain: Guidelines for Assessment, Diagnosis and Management. 6th ed. Hanover, Ill.: Quintessence Publishing; 2018:26-49.

Dionne R, Moore P. Opioid prescribing in dentistry: Keys for safe and proper usage. Compend 2016;37(1): 21-34.

~~Feldt KS. The checklist of nonverbal pain indicators (CNPI). Pain Manag Nurs 2000;1(1):13-21.~~

Harbaugh CM, Lee JS, Hu HM, et al. Persistent opioid uses among pediatric patients after surgery. Pediatrics 2018;141(1):e20172349.

~~Institute of Medicine. Relieving Pain in America: A Blue-print for Transforming Prevention, Care, Education, and Research. Washington, D.C.: The National Academies Press. Available at: "http://www.uspainfoundation.org/ wp-content/uploads/2016/01/IOM-Full-Report.pdf" Accessed December 10, 2016. (Archived by WebCite® at: "http://www.webcitation.org/6mefMJ1cd")~~

~~Jain A, Yeluri R, Munshi AK. Measurement and assessment of pain in children. J Clin Pediatr Dent 2012;37 (20):125-36.~~

Laskarides C. Update on analgesic medication for adult and pediatric dental patients. Dent Clin North Am 2016; 60(2):347-66.

Lee GY, Yamada J, Kyololo O, Shorkey A, Stevens B. Pediatric clinical practice guidelines for acute procedural pain: A systematic review. Pediatr 2014;133(3):500-15.

Liu C, Ulualp SO. Outcomes of an alternating ibuprofen and acetaminophen regimen for pain relief after tonsillectomy in children. Ann Otol Rhinol Laryngol 2015; 124(10):777-81.

~~Merkel SI, Voepel-Lewis T, Shayevitz JR, Malviya S. The FLACC: A behavioral scale for scoring postoperative pain in young children. Pediatr Nurs 1997;23(3):293-7.~~

~~Needleman HL, Harpayat S, Wu S, Allred EN, Berde C. Postoperative pain and other sequelae of dental rehabilitations performed on children under general anesthesia. Pediatr Dent 2008;30(2):111-21.~~

Raja SN, Carr DB, Cohen M, et al. The revised International Association for the Study of Pain definition of pain: Concepts, challenges, and compromises. Pain 2020;161(9):1976-82.

Ruest C, Anderson A. Management of acute pediatric pain in the emergency department. Curr Opin Pediatr 2016;28(3):298-304.

Renny MH, Yin SY, Jen V, Hadland SE, Cerda M. Temporal trends in opioid prescribing practices in children, adolesscents, and younger teens in the US from 2006 to 2018. JAMA Pediatrics. 2021:175(10):1043-52.

Sutters KA, Miaskowsk C, Holdridge-Zeuner D, et al. A randomized clinical trial of the efficacy of scheduled dosing of acetaminophen and hydrocodone for the management of postoperative pain in children after tonsillectomy. Clin J Pain 2010;26(2):95-103.

Tobias JD, Green TP, Coté CJ, American Academy of Pediatrics Section on Anesthesiology and Pain Medicine, American Academy of Pediatrics Committee on Drugs. Codeine: Time to say "No". Pediatrics 2016;138(4): e20162396. ~~Available at: "http://pediatrics.aappublica tions.org/content/pediatrics/early/2016/09/15/peds. 2016-2396.full.pdf ". Accessed July 1, 2017. (Archived by WebCite® at: "http://www.webcitation.org/6sjq8xisf ")~~

U.S. Food and Drug Administration. Drug Safety Communication: FDA restricts use of prescription codeine pain and cough medicines and tramadol pain medicines in children; recommends against use in breastfeeding women. Available at: "https://www.fda.gov/Drugs/DrugSafety/ucm549679.htm". Accessed March 15, 2022. ~~May 26, 2017~~. ~~(Archived by WebCite® at: "http://www.webcitation. org/6sjqTDBYs")~~

U.S. Food and Drug Administration. Drug Safety Communication: Prescription acetaminophen products to be limited to 325 mg per dosage unit; boxed warning will highlight potential for severe liver failure. Available at:"https://www.fda.gov/drugs/drug-safety-and-availability/fda-drug-safety-communication-prescription-acetaminophen-products-be-limited-325-mg-dosage-unit". Accessed March 15, 2022.

~~U.S. Food and Drug Administration. Drug Safety Communication: Safety review update of codeine use in children; New boxed warning and contraindication on use after tonsillectomy and/or adenoidectomy. Available at: "http://www.fda.gov/drugs/drugsafety/ucm339112. htm". Accessed December 10, 2016. (Archived by Web- Cite® at: "http://www.webcitation.org/6mee873Qm")~~

Yaksh TL, Wallace MS. Opioids, analgesia and pain management. In: Brunton LL, Chabner BA, Knollmann BS, eds. Goodman and Gilman's the Pharmacological Basis of Therapeutics. 12th ed. New York, N.Y.: McGraw- Hill; 2010:481-526.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Zielinksi J, Morawska-Kochman M, Zatonski T. Pain assessment and management in children in the postoperative period: A review of the most common postoperative pain assessment tools, new diagnostic methods and the latest guidelines for postoperative pain therapy in children. Adv Clin Exp Med 2020;29(3):365-74.

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Policy on Model Dental Benefits for Infants, Children, Adolescents, and Individuals with Special Health Care Needs

Revised

~~2017~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) believes that all infants, children, adolescents, and individuals with special health care needs must have access to comprehensive preventive and therapeutic oral health care benefits that contribute to their optimal health and well-being. This policy is intended to assist policy makers, third-party payors, and consumer groups/benefits purchasers to make informed decisions about the appropriateness of oral health care services for these patient populations.

Methods

This policy was developed by the Council on Dental Benefit Programs and Council on Clinical Affairs, ~~and~~ adopted in 2008 (AAPD 2008),~~.~~ and last revised in 2017(AAPD 2017). This policy is based upon a review of the AAPD's ~~systematically developed~~ oral health policies, best practices, and clinical practice guidelines as well as clinical practice guidelines that have been developed by other professional organizations and endorsed by the AAPD.

Background

The AAPD advocates optimal oral health and health care for all infants, children, adolescents, and individuals with special health care needs, regardless of race, ethnicity, religion, sexual or gender identity, medical status, disability, family structure, or financial circumstances. (AAPD P. Vul Pop 2021) Oral diseases are progressive and cumulative; ignoring oral health problems can lead to needless pain and suffering, infection, loss of function, increased health care costs, and lifelong consequences in educational, social, and occupational environments. A dental benefit plan should be actuarially sound and fiscally capable of delivering plan benefits without suppressing utilization rates or the delivery of

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services. When a benefits plan, whether for a commercial or government program, is not actuarially sound and adequately underwritten, access and appropriate care under the plan are placed at risk. When oral health care is not accessible, the health implications, effects on quality of life, and societal costs are enormous.(~~US DHHS 2000~~, National Institutes of Health. Oral Health in America: Advances and Challenges 2021) The AAPD's oral health policies, best practices, and clinical practice guidelines(AAPD Reference Manual 2022) encourage the highest possible level of care to children and patients with special health care needs. The AAPD also sponsors a national ~~consensus conference or~~ symposium each year on pediatric oral health care ~~and those proceedings are published in a special issue of *Pediatric Dentistry*.~~ Those sources, ~~documents(AAPD Reference Manual; AAPD Restorative Consensus Conference 2015; AAPD Symposium on Behavior Guidance 2014; AAPD Symposium on Prevention 2006; AAPD/AAE Symposium on Pulp Therapy; 2008; AAPD Symposium on Trauma 2009; AAPD/AAE Symposium on Trauma 2013)~~ as well as clinical practice guidelines from other organizations with recognized professional expertise and stature(~~AAPD Symposium on Trauma 2009; AAPD/AAE Symposium on Trauma 2013;~~ AAE Guide to Clinical Endodontics 2013; ~~AAPeriod 2003;~~ Caton et al 2018; ADA 2012; ACP-CA ~~2009~~2018; NFED 2003; Rozier et al. 2010; Clark & Slayton 2014; Carter et al. 2008), serve as the basis for the recommendations below. Such recommendations ideally are evidence based but, in the absence of conclusive evidence, may rely on expert opinion and clinical observations.

Policy statement

The AAPD encourages all policy makers and third-party payors to consult the AAPD in the development of benefit plans that best serve the oral health interests of infants, children, adolescents, and individuals with special health care needs. These model services are predicated on establishment of a dental home, defined as the ongoing relationship between the dentist (i.e., the primary oral health care provider) and the patient, inclusive of all aspects of oral health care, starting no later than 12 months of age.(AAPD D_Dental Home 2021)

Value of services is an important consideration, and the AAPD encourages all stakeholders to recognize that a least expensive treatment is not necessarily the most beneficial or cost effective plan in the long term for the patient's oral health.

The following services are essential components in health benefit plans.

A. Preventive services:

1. initial and periodic orofacial examination, including medical, dental, and social histories, furnished in accordance with the attached periodicity schedule(AAPD Reference Manual 2022) or when oral screenings by other health care providers indicate a risk of caries or other dental or oral disease. (AAPD Best Practices for Caries-Risk Assessment and Management 2022; AAPD Policy on Social Determinants 2022)
2. education for the patient and the patient's family on measures that promote oral health as part of initial and periodic well-child assessment. (AAPD Best Practice for Perinatal and Infant Oral Health Care 2021; AAPD Best Practice for Periodicity, Anticipatory Guidance \ Counseling 2022; AAPD Best Practice for Management of Dental Patients with Special Healthcare Needs 2022)
3. age-appropriate anticipatory guidance and counseling on non-nutritive habits, injury prevention, intraoral \ perioral piercing, human papilloma virus, and tobacco use/substance abuse. (AAPD Best Practice for Periodicity, Anticipatory Guidance \ Counseling 2022; AAPD Policy on Intraoral \ Perioral Piercing and Oral Jewelry \ Accessories 2021; AAPD Policy on Human Papilloma Virus Vaccinations 2021; AAPD Policy on Substance Misuse 2021; AAPD Policy on Electronic Nicotine Delivery Systems 2021; AAPD Policy on Tobacco Use 2021; AAPD Policy on Use of Pacifiers 2022)
4. application of topical fluoride at a frequency based upon caries risk factors. (AAPD Policy on Use of Fluoride 2021; AAPD Best Practices for Fluoride Therapy 2021)
5. prescription of a high-concentration fluoridated toothpaste for patients over six years old who are at moderate to high caries risk. (AAPD Best Practice for Fluoride Therapy 2021)
6. prescription of dietary fluoride supplement (Clark & Slayton 2014) based upon a child's age and caries risk as well as fluoride level of the water supply or supplies and other sources of dietary fluoride.
7. application of pit and fissure sealants on primary and permanent teeth based on caries risk factors, not patient age.(Crall & Donly 2015; AAPD Clinical Practice Guidelines: Use of Pit-and-Fissure Sealants 2016)
8. dental prophylactic services at a frequency based on caries and periodontal risk factors.(AAPD Best Practices Caries-risk, AAPD Policy on Role of Dental Prophylaxis in Pediatric Dentistry 2022; AAPD Best Practices for Risk Assessment and Management of Pediatric Periodontal Conditions 2022)

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B. Diagnostic procedures consistent with guidelines developed by organizations with recognized professional expertise and stature, including radiographs in accordance with recommendations by the American Academy of Oral and Maxillofacial Radiology, U.S. Food and Drug Administration and the American Dental Association.(ADA 2012; Carter et al. 2008; AAPD BP Radiographs 2021) When necessary and appropriate, use of teledentistry for orofacial evaluation. (AAPD Policy on Teledentistry 2021).

C. Medically-necessary care, ~~R~~restorative and endodontic services to relieve pain, resolve infection, restore teeth, and maintain dental function and oral health. This would include interim therapeutic restorations, a beneficial provisional technique in contemporary pediatric restorative dentistry.(AAPD Reference Manual 2022; AAPD Def. Medically-Necessary Care 2021; AAPD Policy on Medically-Necessary Care 2021; AAPD Policy on Interim Therapeutic Restorations 2022)

D. Orthodontic services including space maintenance and services to diagnose, prevent, intercept, and treat malocclusions, including management of children with cleft lip or palate and/or congenital or developmental defects, and obstructive sleep apnea (OSA). These services include, but are not limited to, obturators, initial appliance construction, and replacement of appliances as the child grows. (AAPD Reference Manual 2022; AAPD Policy on Obstructive Sleep Apnea (OSA)2021: Reisberg 2000; AAPD Policy on Use of Pacifiers 2022)

E. Dental and oral surgery including sedation/general anesthesia and related medical services performed in an office, hospital, or ambulatory surgical care setting. (AAPD Policy on Hospitalization and Operating Room Access 2021; AAPD Best Practices for Use of Anesthesia Providers in the Administration of Office-Based Deep Sedation / General Anesthesia 2021)

F. Periodontal services to manage gingivitis, periodontitis, and other periodontal diseases or conditions in children.(AAPD Best Practice for Risk Assessment and Management of Pediatric Periodontal Conditions 2022)

G. Prosthodontic services, including implants with restorations to restore oral function~~.~~ as well as maxillofacial prosthetics \ prosthodontics as recommended \ supported by a craniofacial team. (Reisberg 2000; Wermker et al 2014)

H. Diagnostic and therapeutic services related to the acute and long-term management of orofacial trauma. When the injury involves a primary tooth, benefits should cover complications for the developing succedaneous tooth. When the injury involves a permanent tooth, benefits should cover long-term complications to the involved and adjacent or opposing teeth including cosmetic \ esthetic treatment that could impact social health. (AAPD Best Practice for Pediatric Restorative Dentistry 2022)

I. Drug prescription for preventive services, relief of pain, or treatment of infection or other conditions within the dentist's scope of practice. (AAPD Useful Medications for Oral Conditions 2022; AAPD Best Practice for Pain Management 2022; AAPD Best Practice for Use of Antibiotic Therapy 2022)

J. Medically-necessary services for preventive and therapeutic care in patients with medical, physical, or behavioral conditions. These services include, but are not limited to, the care of hospitalized patients, sedation, and general anesthesia in outpatient or inpatient hospital facilities. (Best Practices for Management of Dental Patients with Special Healthcare Needs 2021;AAPD Policy on Hospitalization and Operating Room Access 2021)

K. Behavior guidance services necessary for the provision of optimal therapeutic and preventive oral care to patients with medical, physical, or behavioral conditions. These services may include both pharmacologic and non-pharmacologic management techniques. (AAPD Best Practices for Behavior Guidance for the Pediatric Dental Patient 2021)

L. Consultative services provided by a pediatric dentist when requested by a general practitioner or another dental specialist or medical care provider. (AAPD Policy on the Role of Pediatric Dentists as both Primary and Specialty Care Providers 2021)

References

~~American Academy of Pediatric Dentistry, American Association of Endodontists. Proceedings of the Joint Symposium on Emerging Science in Pulp Therapy: New Insights into Dilemmas and Controversies. November 2-3, 2007. Chicago, Ill. Pediatr Dent 2008;30(3):190-267.~~

~~American Academy of Pediatric Dentistry, American Association of Endodontists. Proceedings of the Joint Symposium: Contemporary Management of Traumatic Injuries to the Permanent Dentition. November, 2012, Scottsdale, Ariz. Pediatr Dent 2013;35(2):102-90, 198.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Behavior guidance for the pediatric dental patient. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:306-24.

American Academy of Pediatric Dentistry. Caries-risk assessment and management for infants, children, and adolescents. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; (2022).

~~American Academy of Pediatric Dentistry. Definition of dental home. Pediatr Dent 2017;39(6):12.~~

American Academy of Pediatric Dentistry. Definition of dental home. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:15.

American Academy of Pediatric Dentistry. Definition of medically-necessary care. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:18.

American Academy of Pediatric Dentistry. Fluoride therapy. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:302-5.

American Academy of Pediatric Dentistry. Management of dental patients with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:287-94.

American Academy of Pediatric Dentistry. Pain management in infants, children, adolescents, and individuals with special health care Needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; (2022).

~~American Academy of Pediatric Dentistry. Pediatric Dentistry Restorative Consensus Conference. Pediatr Dent 2015;37(2):98-170.~~

American Academy of Pediatric Dentistry. Pediatric restorative dentistry. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; (2022).

American Academy of Pediatric Dentistry. Perinatal and infant oral health care. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:262-6.

American Academy of Pediatric Dentistry. Periodicity of examination, preventive dental services, anticipatory guidance/ counseling, and oral treatment for infants, children, and adolescents. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; (2022).

American Academy of Pediatric Dentistry. Policy on care for vulnerable populations in a dental setting. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:32-8.

American Academy of Pediatric Dentistry. Policy on hospitalization and operating room access for oral care of infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:132-3.

American Academy of Pediatric Dentistry. Policy on human papilloma virus vaccinations. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry. 2021:106-7.

American Academy of Pediatric Dentistry. Policy on interim therapeutic restorations (ITR). The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; (2022).

American Academy of Pediatric Dentistry. Policy on intraoral/perioral piercing and oral jewelry/accessories. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:108-9.

American Academy of Pediatric Dentistry. Policy on electronic nicotine delivery systems (ENDS). The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:97-100.

American Academy of Pediatric Dentistry. Policy on medically-necessary care. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:22-7.

American Academy of Pediatric Dentistry. Policy on model dental benefits for infants, children, adolescents, and individuals with special health care needs. Pediatr Dent 2008;30(suppl):71-3.

American Academy of Pediatric Dentistry. Policy on model dental benefits for infants, children, adolescents, and individuals with special health care needs. Pediatr Dent 2017;39(6):108-11.

American Academy of Pediatric Dentistry. Policy on obstructive sleep apnea (OSA). The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:123-6.

American Academy of Pediatric Dentistry. Policy on the role of pediatric dentists as both primary and specialty care providers. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:158.

American Academy of Pediatric Dentistry. Policy on social determinants of children's oral health and health disparities. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; (2022).

American Academy of Pediatric Dentistry. Policy on substance misuse in adolescent patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:101-5.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Policy on teledentistry. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:51-2

American Academy of Pediatric Dentistry. Policy on tobacco use. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:92-6.

American Academy of Pediatric Dentistry. Policy on use of fluoride. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:66-7.

American Academy of Pediatric Dentistry. Policy on use of pacifiers. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry (2022).

~~American Academy of Pediatric Dentistry. Prescribing dental radiographs for infants, children, adolescents, and individuals with special health care needs. Pediatr Dent 2017;39(6):205-7.~~

American Academy of Pediatric Dentistry. Prescribing dental radiographs for infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:258-61

~~American Academy of Pediatric Dentistry. Reference Manual. Chicago, Ill. Pediatr Dent 2017;39(6):1-504. Available at: “http://www.aapd.org/policies”. Accessed July 5, 2017.~~

American Academy of Pediatric Dentistry. Risk assessment and management of pediatric periodontal conditions. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry (2022).

~~American Academy of Pediatric Dentistry. Symposium on Behavior Guidance. Pediatr Dent 2014;36(2):98-160.~~

~~American Academy of Pediatric Dentistry. Symposium on the Prevention of Oral Disease in Children and Adolescents. Pediatr Dent 2006;28(2):96-198.~~

~~American Academy of Pediatric Dentistry. Symposium on Trauma. November 14-15, 2008, Chicago, Ill. Pediatr Dent 2009;31(2):94-163.~~

American Academy of Pediatric Dentistry. The Reference Manual of Pediatric Dentistry. Chicago, Ill: American Academy of Pediatric Dentistry; 2021:1-624.

American Academy of Pediatric Dentistry. Use of anesthesia providers in the administration of office-based deep sedation/ general anesthesia to the Pediatric Dental Patient. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:372-6.

~~American Academy of Periodontology. Periodontal diseases of children and adolescents. J Periodontol 2003; 74(11):1696-704.~~

American Academy of Pediatric Dentistry. Useful medications for oral conditions. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:612-8.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Association of Endodontists. Guide to Clinical Endodontics. 6th ed. Chicago, Ill.: American Association of Endodontists; 2013, Updated 2019. Available at: ~~“http://www.aae.org/clinical-resources/aae-guide-to-clinical-endodontics. aspx”~~ “https://www.aae.org/specialty/clinical-resources/guide-clinical-endodontics/”. Accessed ~~December 4, 2016~~ March 11,2022. ~~(Archived by WebCite®at: “http://www.webcitation.org/6mW6Mb23m")~~

American Cleft Palate-Craniofacial Association. Parameters for Evaluation and Treatment of Patients with Cleft Lip/Palate or Other Craniofacial Differences~~Anomalies~~. Revised edition January, 2018. Cleft Palate Craniofac J 2018;55(1):137-56. ~~Chapel Hill, N.C.: The Maternal and Child Health Bureau, Title V, Social Security Act, Health Resources and Services Administration, U.S. Public Health Service, DHHS; November 2009. Grant # MCJ-425074~~. Available at: “https://journals.sagepub.com/doi/pdf/10.1177/1055665617739564 ~~http://www.acpa-cpf.org/uploads/site/Parameters_Rev_2009.pdf~~”. Accessed ~~December 4, 2016~~March 13, 2022. ~~(Archived by WebCite® at: “http://www.webcitation.org/6mW6yJcBj”)~~

American Dental Association, U.S. Department of Health and Human Services. Recommendations for Patient Selection and Limiting Radiation Exposure. Revised: 2012. Available at: “http://www.ada.org/~/media/ADA/ Publications/ADA%20News/Files/Dental_Radiographic_Examinations_2012.pdf?la=en”. Accessed ~~December 4, 2016~~March 11, 2022. ~~(Archived by WebCite® at: “http://www.web citation.org/6mW7ppEuF”)~~

Carter L, Geist J, Scarfe WC, et. al. American Academy of Oral and Maxillofacial Radiology executive opinion statement on performing and interpreting diagnostic cone beam computed tomography. Oral Surg Oral Med Oral Pathol Oral Radiol 2008;106(4):561-2.

Caton JG, Armitage G, Berglundh T, Chapple ILC, Jepsen S, Kornman KS, Mealey BL, Papapanou PN, Sanz M, Tonetti MS. A new classification scheme for periodontal and peri-implant diseases and conditions - Introduction and key changes from the 1999 classification. J Clin Periodontol. 2018 Jun;45 Suppl 20:S1-S8. Available at: “https://onlinelibrary.wiley.com/doi/10.1111/jcpe.12935”. Accessed March 13, 2022.

Clark MB, Slayton RL, American Academy of Pediatrics Clinical Report: Fluoride use for caries prevention in the primary care setting. Pediatr 2014;134(3):626-33.

Crall JJ, Donl~~e~~y, KJ. Dental sealants guidelines development 2002-2014. Pediatr Dent 2015;37(2):111-5.

National Foundation for Ectodermal Dysplasias. Parameters of Oral Health Care for Individuals Affected by Ectodermal Dysplasias. National Foundation for Ectodermal Dysplasias. Mascoutah, Ill.; 2nd Revision 2015. Available at: “https://www.nfed.org/learn/library/parameters-dental-health-care/”.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Accessed ~~July 3, 2013. Accessed December 4, 2016~~March 11, 2022. ~~(Archived by WebCite® at: "http://www.webcitation.org/6mW8Wrq4U")~~

National Institutes of Health. Oral Health in America: Advances and Challenges. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, National Institute of Dental and Craniofacial Research, 2021. Available at: "https://www.nidcr.nih.gov/sites/default/files/2021-12/Oral-Health-in-America-Advances-and-Challenges.pdf". Accessed March 11, 2022.

Reisberg DJ. Dental and prosthodontic care for patients with cleft or craniofacial conditions. Cleft Palate Craniofac J. 2000 Nov;37(6):534-7.

Rozier RG, Adair S, Graham F, et al. Evidence-based clinical recommendations on the prescription of dietary fluoride supplements for caries prevention: A report of the American Dental Association Council on Scientific Affairs. J Am Dent Assoc 2010;141(12):1480-9.

~~U.S. Department of Health and Human Services. Oral health in America: A report of the Surgeon General - Executive summary. Rockville, Md.: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000. Available at: "http://nidcr.nih.gov/DataStatistics/SurgeonGeneral/Report/ExecutiveSummary.htm". Accessed December 4, 2016. (Archived by WebCite® at: "http://www.webcitation.org/6mW8vDmtm")~~

Wermker K, Jung S, Joos U, Kleinheinz J. Dental implants in cleft lip, alveolus, and palate patients: a systematic review. Int J Oral Maxillofac Implants. 2014 Mar-Apr;29(2):384-90.

Wright JT, Crall JJ, Fontana M, et al. Evidence-based clinical practice guideline for the use of pit and fissure sealants. American Academy of Pediatric Dentistry, American Dental Association. Pediatric Dent 2016;38(5):E120-E36.

Recommended Dental Periodicity Schedule on the next page.

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Recommended Dental Periodicity Schedule for Pediatric Oral Health Assessment, Preventive Services, and Anticipatory Guidance/Counseling (AAPD Periodicity 2022, AAPD Recommended Periodicity Chart)

Recommended Dental Periodicity Schedule for Pediatric Oral Health Assessment, Preventive Services, and Anticipatory Guidance/Counseling

Since each child is unique, these recommendations are designed for the care of children who have no contributing medical conditions and are developing normally. These recommendations will need to be modified for children with special health care needs or if disease or trauma manifests variations from normal. The American Academy of Pediatric Dentistry emphasizes the importance of very early professional intervention and the continuity of care based on the individualized needs of the child. Refer to the text of this best practice~~guideline~~ for supporting information and references. Refer to the text in the Recommendations on the Periodicity of Examination, Preventive Dental Services, Anticipatory Guidance, and Oral Treatment for Infants, Children, and Adolescents (*www.aapd.org/policies/*) for supporting information and references.

	AGE				
	6 TO 12 MONTHS	12 TO 24 MONTHS	2 TO 6 YEARS	6 TO 12 YEARS	12 YEARS AND OLDER
Clinical oral examination [1]	•	•	•	•	•
Assess oral growth and development [2]	•	•	•	•	•
Caries-risk assessment [3]	•	•	•	•	•
Radiographic assessment [4]	•	•	•	•	•
Prophylaxis and topical fluoride [3,4]	•	•	•	•	•
Fluoride supplementation [5]	•	•	•	•	•
Anticipatory guidance/counseling [6]	•	•	•	•	•
Oral hygiene counseling [3,7]	Parent	Parent	Patient /parent	Patient /parent	Patient
Dietary counseling [3,8]	•	•	•	•	•
Counseling for nonnutritive habits [9]	•	•	•	•	•
Injury prevention and safety counseling [~~9~~10]	•	•	•	•	•
~~Counseling for nonnutritive habits~~ [~~10~~]	~~•~~	~~•~~	~~•~~	~~•~~	~~•~~
Assess ~~Counseling for~~ speech/language development [11]	•	•	•		
Assessment ~~and treatment of~~ developing ~~mal~~occlusion [12]			•	•	•
Assessment for pit and fissure sealants [13]			•	•	•
Periodontal risk assessment [3,14]			•	•	•
Counseling for tobacco, vaping, and substance misuse ~~abuse counseling~~				•	•
Counseling for human papilloma virus/vaccine				•	•
Counseling for intraoral/perioral piercing				•	•
Assessment ~~and/or removal of~~ third molars					•
Transition to adult dental care					•

CCA-2022. P_ModelDentalBenefits-Final

1 First examination at the eruption of the first tooth and no later than 12 months. Repeat every 6 months or as indicated by the child's risk status/susceptibility to disease. Includes assessment of pathology and injuries.

2 By clinical examination.

3 Must be repeated regularly and frequently to maximize effectiveness.

4 Timing, type~~selection~~, and frequency determined by child's history, clinical findings, and susceptibility to oral disease.

5 Consider when systemic fluoride exposure is suboptimal. Up to at least 16 years.

6 Appropriate discussion and counseling should be an integral part of each visit for care.

7 Initially, responsibility of parent; as child matures, jointly with parent; then, when indicated, only child.

8 At every appointment; initially discuss appropriate feeding practices, then the role of refined carbohydrates and frequency of snacking in caries development and childhood obesity. Monitor body mass index beginning at age 2.

9 At first, discuss the need for non-nutritive sucking: digits vs pacifiers; then the need to wean from the habit before malocclusion or deleterious effect on the dentofacial complex.occurs. For school-aged children and adolescent patients, counsel regarding any existing habits such as fingernail biting, clenching, or bruxism.

10 Initially ~~play objects,~~ pacifiers, car seats, play objects, electric cords; secondhand smoke; when learning to walk; ~~then~~ with sports and routine playing, including the importance of mouthguards, then motor vehicles and high-speed activities.

~~10 At first, discuss the need for additional sucking: digits vs pacifiers; then the need to wean from the habit before malocclusion or skeletal dysplasia occurs. For school-aged children and adolescent patients, counsel regarding any existing habits such as fingernail biting, clenching, or bruxism.~~

11 Observation for age-appropriate speech articulation and fluency as well as achieving receptive and expressive language milestones

12 Identify: transverse, vertical, and sagittal growth patterns; asymmetry; occlusal disharmonies; functional status including temporomandibular joint dysfunction; esthetic influences on self-image and emotional development

13 For caries-susceptible primary molars, permanent molars, premolars, and anterior teeth with deep pits and fissures; placed as soon as possible after eruption.

14 Periodontal probing should be added to the risk-assessment process after the eruption of the first permanent molars.

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Policy on Third-Party Reimbursement of Medical Fees Related to Sedation/General Anesthesia for Delivery of Oral Health Care Services

Latest Revision

~~2016~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **ACA: Affordable Care Act.** **ADA**: American Dental Association. **ECC**: Early childhood caries. **QOL**: Quality of life

Purpose

The American Academy of Pediatric Dentistry (**AAPD**)~~,~~ wants to ensure that all children have access to the full range of oral health delivery systems.~~,~~ It advocates that if sedation or general anesthesia and related facility fees are payable benefits of a healthcare plan, these same benefits shall apply for the delivery of oral health services.

Methods

This policy was developed by the Dental Care Committee, adopted in 1989 (AAPD 1989), and last revised in 2016 (AAPD 2016) by the Council of Clinical Affairs. This document is ~~an update of the previous policy, revised in 2011, and is~~ based on a review of the current dental literature related to guidelines for sedation and general anesthesia, as well as issues pertaining to medically-necessary oral health care. The update included a PubMed®/MEDLINE search using the terms: general anesthesia/ sedation costs, general anesthesia/sedation reimbursement, general anesthesia/ sedation insurance coverage, general anesthesia and medically necessary dental care, and general anesthesia/oral health-related quality of life and limit: within the last 10 years, as well as relevant articles from dental and medical literature. The search returned 300 ~~95~~ articles. ~~The reviewers agreed upon the inclusion of 24 articles that met the defined criteria.~~ Relevant policies and best practices~~guidelines~~ of the AAPD and the American Dental Association (**ADA**) are included. Additionally, expert opinions and best current practices were relied upon when clinical evidence was not available.

Background

For some infants, children, adolescents, and persons with special health care needs, treatment under sedation/general anesthesia in a hospital, outpatient facility, or dental office or clinic represents the optimal~~only viable~~ method to deliver necessary oral health care.(AAPD D_Medically Necessary Care 2020; AAP 2013~~2005~~; Glassman et al. 2009) The patient's age, dental treatment needs, limited ~~dis~~abilities, medical conditions, ~~and/~~or acute situational anxiety may preclude the patient from being treated ~~safely~~ in a traditional outpatient setting.(Glassman et al. 2009; White et al. 2008; AAPD 2012; Escanilla-Casal et al. 2014; AAPD Sedation Guideline; AAPD BP_Use of Anesthesia Personnel) These patients may be denied access to oral health care when insurance companies refuse to provide reimbursement for sedation/general anesthesia and related facility services. When oral health care is not accessible, the health implications, effects on quality of life, and societal costs are enormous. (Oral Health in America, 2021)

Dental care is medically necessary to prevent and eliminate orofacial disease, infection, and pain, to restore the form and function of the dentition, and to correct facial disfiguration or dysfunction. Medically necessary care includes all supportive health care services that, in the judgment of the attending dentist, are necessary for the provision of optimal quality therapeutic and preventive oral care.(AAPD MNC) Some medical insurance plans may not view dental care and adjunctive services requiring hospital/anesthesia related fees as ~~Most denials cite the procedure as not~~ medically necessary. ~~This determination appears to be based on inconsistent criteria.(White 1995; Cameron et al. 1995; Crall 2004) For instance,~~ Although medical policies often provide reimbursement for sedation/general anesthesia ~~or~~ and facility fees related to myringotomy for a three-year-old child~~,~~ ~~but deny~~ these benefits may be denied when related to treatment of dental disease ~~and/~~ or infection for the same patient. This determination at times appears to be based on inconsistent and poorly-defined criteria.(White 1995; Cameron et al. 1995; Crall 2004) While states or third-party payors may require prior authorization for such procedures in an effort to control healthcare expenditures, this can be a time-consuming burden for practitioners. By establishing well-defined criteria (e.g., patient's age, treatment requirements, behavior, and medically-compromising condition; failed attempts at in-office treatment) and a streamlined preauthorization process, the dental practitioner is provided an opportunity to justify the need for anesthesia services and all parties can be assured of transparency, access to the full range of services available through a patient's benefits plan, and improved timeliness of treatment and reimbursement.

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Delays in care can result in needless pain and suffering, infection, loss of function, and increased health care costs. Additionally, indiscriminate prescription of antibiotics for infections contributes to antibiotic resistance, and chronic use of acetaminophen for pain control can lead to hepatotoxicity. Less-effective management of these patients may result in a higher disease burden for the patient (i.e., more teeth requiring treatment and more invasive treatment needs) (Okuji 2021) as well as the patient's avoidance of oral health professionals in the future and increased likelihood of seeking care in the emergency department. (AAPD 2012) Furthermore, this could also place an increased demand on practitioners, emergency departments, and hospitals to treat patients with urgent and emergent dental needs. In the event the insurer denies the preauthorization or claim citing lack of medical necessity, an appeals process to allow the practitioner to advocate on the patient's behalf through peer-to-peer conferences is essential.

Some patients may have dental developmental disorders such as dentinogenesis imperfecta, osteogenesis imperfecta, or molar-incisor hypoplasia which require extensive dental treatment that may exceed the capability of the patient to be treated in the normal clinic setting. Dental rehabilitation of early childhood caries (**ECC**) has shown a significant improvement in oral health-related quality of life (**QOL**) in children.(White et al. 2008; Jankauskiene et al. 2010; Jankauskiene et al. 2015; Gaynor & Thomson 2012; Yawary et al. 2016; Baghdadi et al. 2015; Malden et al. 208; Cantekin et al. 2014; Klaassen et al. 2009; Antunes et al. 2013; Cunnion et al. 2010; Lanlan 2017) Children undergoing comprehensive dental treatment under general anesthesia exhibited improvement in several areas such as sleeping, eating, and pain.(White et al. 2008; Jankauskiene 2014; Gaynor & Thomson 2012; Yawary et al. 2016; Baghdadi 2015). Parents reported their children to have a better perceived QOL one to four weeks following dental rehabilitation under general anesthesia.(Malden et al. 2008) ~~Dental treatment under general anesthesia is associated with significant improvements in the patient's QOL~~ ~~and~~ Such treatment also has been reported to have a positive impact on the family's quality of life.(Jankauskiene et al. 2010)

ADA Resolution 1989-546 states that insurance companies should not deny benefits that otherwise would be payable "solely on the basis of the professional degree and licensure of the dentist or physician providing treatment, if that treatment is provided by a legally qualified dentist or physician operating within the scope of his or her training and licensure".(ADA 2014) Recently, the ADA adopted Resolution 3-H (2021) which addressed anesthesia coverage under health plans. It "supports the position that all health plans, including those governed by the Employee Retirement Income Security Act, should be required to cover general anesthesia and/or hospital or outpatient surgical facility charges incurred by covered persons who receive dental treatment under anesthesia, due to a documented complexity,

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behavioral, physical, mental or medical reason as determined by the treating dentist(s) and/or physician." (ADA Unofficial 2021)

A majority of states have enacted legislation requiring medical insurers to reimburse for hospital charges associated with provision of dental care for children in the operating room.(AAPD 2012) Such legislation has resulted in increased access to care, with more children receiving services in an operating room setting after enactment of legislation.(White et al. 2008) However, this increased access has recently come in jeopardy due to multiple factors including the implementation of the Essential Health Benefits package under the Affordable Care Act (**ACA**) (AAPD 2012; Grace 2014). While most ACA plans included "oral health" as a benefit, oral health was not defined. States play a major role in determining the content of their ACA plans, and fewer states included dental anesthesia (15) than orthodontic care (32) as a benefit for children.(Grace AM 2014) Lower reimbursement of hospital facility and anesthesia fees also has reduced access to dental care under general anesthesia (Vo 2021).

Per an analysis commissioned by the AAPD, no suitable mechanism for billing rehabilitation services for Medicare or Medicaid beneficiaries having complex dental needs requiring operating room access exists. (AAPD OHPRC 2021) Coding for dental procedures is limited to a miscellaneous code (CPT 41899) which falls in the Ambulatory Payment Class 5161. The mean reimbursement nationally for this class was less than $250, which is grossly insufficient as this rate does not cover the facility's overhead, equipment costs, or anesthesia services. (AAPD OHPRC 2021) Therefore, hospitals may have financial incentive to provide operating room time to surgeons whose cases are associated with higher reimbursement levels. Hospital financial and staffing challenges including those caused by the severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2)/coronavirus disease 2019 (COVID-19) pandemic have limited patient care and severely decreased hospital revenue. (AAPD POHRPC 2021; Berlin 2020; Best 2020.). Due to these obstacles, dental cases reportedly have been delayed as long as six months to a year. (AAPD POHC 2021; Vo, 2021)

Regardless of the insurer and hospital challenges, with dental caries as the most common chronic disease of childhood, access to dental care remains one of the most frequently cited unmet needs.(Benjamin 2010) Less availability of the operating room for pediatric dental patients has far reaching implications. Until this situation is rectified, third party payors may be faced with patients seeking medically-necessary oral health care in more expensive locations such as emergency departments. (Moron 2019; Owens 2018 Cohen 2003)

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Policy statement

The AAPD encourages all policy makers and third party payors to consult the AAPD in the development of benefit plans that best serve the oral health interests of infants, children, adolescents, and individuals with special health care needs.

The AAPD strongly believes that the treating dentist determines the medical necessity for sedation/general anesthesia consistent with accepted guidelines on sedation and general anesthesia.(AAPD D_Medically Necessary Care; AAPD Sedation Guideline)

The AAPD strongly encourages third-party payors to:

1. recognize that sedation or general anesthesia is necessary to deliver compassionate, quality oral health care to some infants, children, adolescents, and persons with special health care needs.
2. include sedation, general anesthesia, and related facility services as benefits of health insurance without discrimination between the medical or dental nature of the procedure.
3. end denial of reimbursement for sedation, general anesthesia, and facility costs related to the delivery of oral health care.
4. regularly consult the AAPD and the ADA with respect to the development of benefit plans that best serve the oral health interests of infants, children, adolescents, and patients with special care needs.(AAPD P_Model Dental Benefits)

The AAPD encourages all states to enact ~~general anesthesia~~ legislation that requires third party payors to reimburse for facility and/~~or~~ <u>sedation/ general</u> anesthesia costs associated with providing oral health care for children.

References

American Academy of Pediatric Dentistry Oral Health Policy and Research Center. Technical Report 2-2012: An Essential Health Benefit: General Anesthesia for Treatment of Early Childhood Caries. Available at: "http: //www.aapd.org/assets/1/7/POHRPCTechBrief2.pdf ". Accessed September <u>2</u>~~7~~, 20<u>2</u>1~~5~~. ~~(Archived by WebCite® at: "http://www.webcitation.org/6fXaZXBRg")~~

<u>American Academy of Pediatric Dentistry. Policy on third-party reimbursement of medical costs related to sedation/general anesthesia. Orlando, Fla.: American Academy of Pediatric Dentistry; May, 1989</u>.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Policy on third-party reimbursement of medical fees related to sedation/general anesthesia for delivery of oral health services. Pediatr Dent 2016:38(special issue):103-5.

American Academy of Pediatric Dentistry. ~~Definition of~~Policy on medically-necessary care. The Reference Manual of Pediatric Dentistry. Chicago, Ill: American Academy of Pediatric Dentistry; 2020: 22-7.~~Pediatr Dent 2016;38(special issue):15.~~

~~American Academy of Pediatric Dentistry. Guideline for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures. Pediatr Dent 2016;38(special issue):216-45.~~

American Academy of Pediatric Dentistry. Guideline on use of anesthesia personnel in administration of office-based deep sedation/general anesthesia to the pediatric dental patient.~~ Pediatr Dent 2016;38(special issue):246-9~~.

American Academy of Pediatric Dentistry. Policy on model dental benefits for infants, children, adolescents, and individuals with special health care needs. ~~Pediatr Dent 2016;38(special issue):100-2~~Pending.

American Academy of Pediatric Dentistry Pediatric Oral Health Research and Policy Center. In: Keels MA, Vo A, Casamassimo PS, Litch CS, Wright R, eds. Denial of Access to Operating Room Time in Hospitals for Pediatric Dental Care. Chicago, Ill.: American Academy of Pediatric Dentistry; April, 2021. Available at: "https://www.aapd.org/globalassets/media/advocacy/ord.pdf ". Accessed [Update during RM publication process], 2022.

American Academy of Pediatrics. ~~Model~~ Essential contractual language for medical necessity for children. Pediatr 2013~~05~~;132(20):398-401.~~ 116(1):261-2~~. ~~Reaffirmed October 2011, Available at: "http://www.pediatrics.org/cgi/doi/10.1542/96 peds. 2011-3210". Accessed September 6, 2015. (Archived by WebCite® at: "http://www.webcitation.org/6fW67njQU")~~

American Dental Association. Benefits for services by qualified practitioners (1989:546). In: ADA Current Policies Adopted 1954-2020~~13~~. Chicago, Ill.: American Dental Association; 2021~~4~~:8~~9~~4.

American Dental Association. 2021 Unofficial Actions of the House of Delegates. Posted 10/28/2021. Available at: "https://www.ada.org/about/governance/board-reports-and-resolutions". Page 2. By membership only. Accessed March 8, 2022.

Antunes LAA, Andrade MRTC, Leão ATT, Maia LC, Luiz R. Change in the quality of life of children and adolescents younger than 14 years old after oral health interventions: A systematic review. Pediatric Dent 2013; 35(1):37-42.

Baghdadi ZD. Children's oral health-related quality of life and associated factors: Midterm changes after dental treatment under general anesthesia. J Clin Experimental Dent 2015;7(1):e106.

Benjamin RM. Oral health: The silent epidemic. Pub Health Rep 2010;125(2):158-9. doi: 10.1177/003335491012500202 Accessed: October 14, 2021.

Berlin G, Bueno D, Gibler K, Schultz J. Cutting through the COVID-19 surgical backlog. New York: McKinsey and Company. October 2020. Available at: "https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/cutting-through-the-covid-19-surgical-backlog". Accessed December 30, 2021.

Best MJ, McFarland EG, Anderson GF, et al. The likely economic impact of fewer elective surgical procedures on U.S. hospitals during the COVID-19 pandemic. Surgery 2020;168(5):962-7. https://doi.org/10.1016/j.surg.2020.07.014

Cameron CA, Litch CS, Liggett M, Heimberg S. National Alliance for Oral Health Consensus Conference on Medically-Necessary Oral Health Care: Legal issues. Spec Care Dentist 1995;15(5):192-200.

Cantekin K, Yildirim MD, Cantekin I. Assessing change in quality of life and dental anxiety in young children following dental rehabilitation under general anesthesia. Pediatr Dent 2014;36(1):12E-17E.

Cohen LA, Magder LS, Manski RJ, Mullins CD. Hospital admissions associate with nontraumatic dental emergencies in a Medicaid population. Am J Emer Med 2003;21(7):540-4.

Cote CJ, Wilson S. American Academy of Pediatric Dentistry, American Academy of Pediatrics. Guidelines for monitoring and management of pediatric patients before, during and after sedation for diagnostic and therapeutic procedures. Pedatr Dent 2019;41(4):E26-E52.

Crall J. Behavior management conference Panel II report –Third party payor issues. Pediatr Dent 2004;26(2):171-4.

Cunnion DT, Spiro A, Jones JA, et al. Pediatric oral health-related quality of life improvement after treatment of early childhood caries: A prospective multisite study. J Dent Child 2010;77(1):4-11.

Escanilla-Casal A, Aznar-Gómez M, Viaño JM, López-Giménez A, Rivera-Baró A. Dental treatment under general anesthesia in a group of patients with cerebral palsy and a group of healthy pediatric patients. Med Oral Patol Oral Cir Bucal 2014;19(5):e490-4.

Gaynor WN, Thomson WM. Changes in young children's OHRQoL after dental treatment under general anaesthesia. Int J Paediatr Dent 2012;22(4):258-64.

Glassman P, Caputo A, Dougherty N, et al. Special Care Dentistry Association consensus statement on sedation, anesthesia, and alternative techniques for people with special needs. Spec Care Dentist 2009;29(1):2-8, quiz 67-8.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Grace AM, Noonan KG, Cheng TL, et al. The ACA's pediatric essential health benefit has resulted in a state-by-state patchwork of coverage and exclusions. Health Affairs 2014;33(12):2136-43.

Jankauskiene B, Narbutaite J. Changes in oral health-related quality of life among children following dental treatment under general anaesthesia. A systematic review. Stomatologija 2010;12(2):60-4.

Jankauskiene B, Virtanen JI, Kubilius R, Narbutaite J. Oral health-related quality of life after dental general anaesthesia treatment among children: A follow-up study. BMC Oral Health 2014;14(1):1-7.

Klaassen MA, Veerkamp JS, Hoogstraten J. Young children's oral health-related quality of life and dental fear after treatment under general anaesthesia: A randomized controlled trial. Eur J Oral Sci 2009;117(3):273-8.

Lanlan L, Wang H, Han X. Oral health-related quality of life in pediatric patient under general anesthesia: A prospective study. Medicine 2017; 96(2): e 5596. Available at: "https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5266155/". Accessed March 10, 2022.

Lee HH, Faundez L, Yarbrough C, Lewis CW, LoSasso AT. Patterns in pediatric dental surgery under general anesthesia across 7 state Medicaid programs. JDR Clin Trans Res. 2020;5(4):358-65.

Malden PE, Thomson WM, Jokovic A, Locker D. Changes in parent-assessed oral health related quality of life among young children following dental treatment under general anaesthetic. Community Dent Oral Epidemiol 2008;36(2):108-17.

Moron EM, Tomar S, Balzer J, Souza R. Hospital inpatient admissions for nontraumatic dental conditions among Florida adults, 2006 through 2016. J Am Dent Assoc 2019;150(6):514-21.

National Institutes of Health. Oral Health in America: Advances and Challenges. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, National Institute of Dental and Craniofacial Research, 2021. Available at: "https://www.nidcr.nih.gov/sites/default/files/2021-12/Oral-Health-in-America-Advances-and-Challenges.pdf". Accessed March 8, 2022.

Okuji DM, Lin J. Predicting negative outcomes while awaiting dental treatment under general anesthesia. J Dent Child 2021:88(1):3-10.

Owens PL, Manski RJ, Weissw AJ. Emergency department visits involving dental conditions, 2018. HCUP Statistical Brief #280. August 2021. Agency for Healthcare Research and Quality, Rockville, MD. Available at: "www.HCUP-us.ahrq.gov/reports/statbriefs/sb280-Dental-ED-Visits-2018.pdf". Accessed October 14, 2021.

Vo AT, Casamassimo PS, Peng J, Amini H, Litch CS, Hammersmith K. Denial of operating room access for pediatric dental treatment: A national survey. Pediatr Dent 2021;43(1):33-41. PMID: 33662248

White BA. The costs and consequences of neglected medically necessary oral care [review]. Spec Care Dentist 1995;15(5):180-6.

White HR, Lee JY, Rozier RG. The effects of general anesthesia legislation on operating room visits by preschool children undergoing dental treatment. Pediatr Dent 2008;30(1):500-5.

Yawary R, Anthonappa RP, Ekambaram M, McGrath C, King NM. Changes in the oral health-related quality of life in children following comprehensive oral rehabilitation under general anaesthesia. Int J Paediatr Dent 2016;26(5):322-9.

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Policy on Third-Party Fees Capping of Non-Covered Services

Latest Revision

~~2017~~ 2022

ABBREVIATIONS

ADA: American Dental Association. **AAPD**: American Academy Pediatric Dentistry.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) supports dental benefit plan provisions designed to meet the oral health needs of patients by facilitating, beginning at birth, the delivery of diagnostic, preventive, and therapeutic services in a comprehensive, continuously accessible, coordinated and family-centered manner.(AAPD P_DentalHome) A well-constructed dental benefit plan respects and meets the needs of the plan purchaser, subscriber/patient, and provider.

Methods

This policy was developed by the Council on Dental Benefits Programs~~, and~~ adopted in 2012 (AAPD 2012), and last revised by the Council on Clinical Affairs in 2017 (AAPD 2017). This revision ~~by the Council of Clinical Affairs~~ included a review and analysis of state laws and pending legislation prohibiting the capping of non-covered services by third-party providers, related federal legislation, and the American Dental Association's Policy on Maximum Fees for Non-Covered Services.(ADA 2015)

Background

The American Dental Association (**ADA**) defines covered service as "any service for which reimbursement is actually provided on a given claim" and noncovered service as "any service for which the third-party provides no reimbursement". Capping of non-covered services occurs when an insurance carrier sets a maximum allowable fee for a service ineligible for third-party reimbursement. While most contractual matters between insurers and providers are those of a private business relationship, this particular business practice is contrary to the public interest for the following reasons.~~:~~

- ~~l~~Larger dental benefit carriers with greater market share and more negotiating power are favored in this arrangement. While dentists may refuse to contract with smaller plans making this requirement, they are unable to make the same decision with larger plans controlling greater numbers of enrollees. Eliminating this practice levels the playing field for all insurers and encourages greater competition among dental plans. If smaller plans and insurers are unable to survive, the group purchaser and subscriber are ultimately left with less market choice and potentially higher insurance cost.

- ~~i~~It is unreasonable to allow plans to set fees for services in which they have no financial liability, and that may not cover the overhead expense of the services being provided. When this provision precludes dentist participation in a reimbursement plan, subscribers realize less choice in their selection of available providers. In many cases, especially in rural or other areas with limited general or specialty practitioners, this adversely affects the care. This is particularly true for vulnerable populations, including individuals with special health care needs.
- ~~f~~For dentists forced to accept this provision, the artificial pricing of uncovered services results in cost-shifting from those covered under a particular plan to uncovered patients. Thus, the uninsured and those covered under traditional indemnity or other plans will shoulder the costs of these provisions. Capping of non-covered services is not cost saving; it is cost-shifting – often to the most vulnerable populations and to those least able to afford healthcare.
- ~~t~~The ability to cap non-covered services allows insurance plans to interfere with the patient-doctor relationship.

The House of Delegates of the ADA in 2020~~2009~~ adopted Resolution ~~59H~~ 19H-2020 Maximum Fees for Non-Covered Services which opposed third party contract provisions that establish fee limits for non-covered services and called for state and federal legislation to prohibit such practices.(ADA ~~2010~~2020,) Legislation to prohibit a dental insurer or dental service plan from limiting fees for services not covered under the plan, is the law in 41~~35~~ states(~~AAPD 2016,~~ ADA 2020) and has been introduced in most other states. Such legislation allows the dentist to utilize the usual and customary fee for services not covered by the plan.

Policy statement

The AAPD believes that dental benefit plan provisions which establish fee limitations for non-covered services are not in the public's interest and should not be imposed through provider contracts.

References

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American Academy of Pediatric Dentistry. Non-covered benefits legislation. Available at: "http://www.pediatric dentistrytoday.org/2016/March/Ll/2/news/article/535/". Accessed January 22, 2017. ~~(Archived by Website® at: "http://www.webcitation.org/6niRwFAVk")~~

American Academy of Pediatric Dentistry. Policy on the dental home. Pediatr Dent 2017;39(6):29-30.

American Academy of Pediatric Dentistry. Policy on third-party fee capping of non-covered services. Pediatr Dent 2012;34(special issue):93-4.

American Academy of Pediatric Dentistry. Policy on third-party fee capping of non-covered services. Pediatr Dent 2017;39(6):122-3.

~~American Dental Association. Health care reform legislation: Side-by-side Comparison. Available at: "http: //www.aapd.org/assets/news/upload/2010/3827.pdf". Accessed January 22, 2017. (Archived by WebCite® at: "http://www.webcitation.org/6niQHlMUM")~~

American Dental Association. Maximum fees for non-covered services. (Trans.2010:616;2020). In: American Dental Association Current Policies Adopted 1954~~-2015~~-2020. Chicago, Ill.: American Dental Association; ~~2015:112.~~ 2021:108.

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Policy on Using Harvested Dental Stem Cells

Latest Revision

~~2017~~ 2022

Abbreviations: **DPSC**: dental pulp stem cells. **MSCs**: Mesenchymal stem cells.

Purpose

The American Academy of Pediatric Dentistry recognizes the emerging field of regenerative medicine and encourages dentists to follow evidence-based literature in order to educate parents about the collection, storage, viability, and use of dental stem cells with respect to autologous regenerative therapies. The American Academy of Pediatric Dentistry also recognizes that harvested dental stem cells is an emerging science which may have application for oral health care but at present there are no treatments available using harvested dental stem cells in humans. This policy is related to the use of harvested dental stem cells from a tooth or follicle.

Methods

This policy was developed by the Council on Clinical Affairs~~, and~~ adopted in 2010 (AAPD 2010), and last~~. This document is an update of the previous version,~~ revised in ~~2013~~2017(AAPD 2017). This revision included a review of current dental and medical literature and sources of recognized professional expertise related to dental stem cells. A literature search of the PubMed®/MEDLINE data-base was conducted using the terms: dental stem cell, harvested tooth cell; fields: all; limits: within the last 10 years, humans, English, birth through age 99~~.~~, resulting in 151 papers that were reviewed by title and abstract. ~~Twenty articles matched these criteria.~~ Papers for review were chosen from this list and from the references within selected articles. Expert and/or consensus opinion by experienced researchers and clinicians was also considered.

Background

Stem cells are pluripotential cells that can divide and multiply for an extended period of time, differentiating into a diverse range of specialized cell types and tissues. ~~Adult mesenchymal stem cells, of which dental stem cells are a subset, are highly proliferative and have the ability to differentiate into many cell lines.(Govindasamy et al. 2011)~~ Dental stem cells are a minor population of mesenchymal stem

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cells existing in specialized dental tissues, such as dental pulp, periodontium, apical papilla, and dental follicle. (Govindasamy et al. 2011; Shuai et al. 2018) Numerous types of stem cells have been isolated from dental tissue, such as dental pulp stem cells (DPSC), stem cells isolated from human pulp of exfoliated deciduous teeth (SHED cells), periodontal ligament stem cells (PDLSC), stem cells from apical papilla (SCAP), and dental follicle cell. All these cells can regenerate the tissue of tooth to provide theoretical basis for clinical treatments. (Zhai et al 2018),(Bansal and Jain 2015) ~~The most familiar application of adult stem cell therapy is bone marrow transplantation to treat hematopoietic cancers, metabolic disorders, and congenital immunodeficiency syndromes. Stem cell therapy is undergoing clinical testing for other conditions such as Parkinson's disease, diabetes, and brain trauma/spinal cord injuries.(Kadar et al. 2009; Nourbakhsh et al. 2011) Suggested applications related to oral health care have included wound healing and regeneration of dental and periodontal tissues as well as craniofacial structures (e.g., repair of cleft lip/palate).(Nishino et al. 2011)~~ DPSC have received special attention because they represent a readily accessible source of stem cells. Their high plasticity and multipotential capacity to differentiate and produce a variety of dental tissues can be explained by its neural crest origin, which supports applications beyond the scope of oral tissues. (Anitua,Troya Zalduendo 2018). Stem cells used for regenerative endodontics and scaffolding have shown successful regeneration in laboratory and animal studies.(Conde et al. 2016; Hynes et al. 2015; Yang et al. 2016) Dental stem cells-based regenerative medicine provides the possibility to repair damaged dental tissues or generate new teeth. (Shuai et al 2018; Morsczek and Reichert 2018) Clinical studies for pulpal regeneration and periodontal tissue generation using dental tissue-derived stem cells have been published, and evidence that these cells could be beneficial in therapies beyond oral tissues is growing. (Campanela 2018).

Due to their differentiation potential, oral-derived mesenchymal stem cells are promising for tissue engineering and regenerative medicine. (Tatullo, Codispoti, Paduano et al.2019), (Morsczek and Reichert 2018). The most familiar application of adult stem cell therapy is bone marrow transplantation to treat hematopoietic cancers, metabolic disorders, and congenital immunodeficiency syndromes. Dental stem cells with high potentials such as ability of self-renewal, mesenchymal stem cell characteristics, multilineage differentiation, and immunomodulation are promising tools for *in vitro* and *in vivo* differentiation studies as well as the therapy of immune-related diseases. (Ayadin, Sahin 2019). Dental mesenchymal stem cells (**MSCs**) are not only easily accessible but are also expandable *in vitro* with relative genomic stability for a long period of time.(Gan et al 2020)Several preclinical studies and clinical trials have been performed using dental MSCs in the treatment of multiple ailments, ranging from dental diseases to nondental diseases, (Gan et al 2020); these are a promising treatment alternative for

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neurological disease including stroke. (Gancheva et al 2019) Some clinical trials with dental MSCs have demonstrated the efficacy and safety of dental MSC-based therapy for oral diseases. (Gan et al 2020). Human exfoliated deciduous teeth stem cells have shown promise in an initial small safety-phase clinical trial for treating a non-dental disease. (Li et al 2021)

Parents may elect to preserve umbilical cord blood of their child for future harvesting of stem cells if autologous regenerative therapies are indicated. Pulpal tissue of exfoliating primary teeth, oral mucosa fibroblasts,(Miyoshi et al. 2010) surgically removed third molars, periodontal ligament,(Wada et al. 2011) and gingival fibroblasts(Wada et al. 2011) may serve as a source of mesenchymal stem cells.(Hynes et al. 2015; Eslaminejad 2010)

The public is increasingly aware of this emerging science, and more parents are expressing interest in harvesting/banking dental stem cells. While sources of dental stem cells are readily accessible, those cells must be secured and stored properly to maintain the potential to proliferate and differentiate.(Perry et al. 2008; Yildirim et al. 2016) Ongoing clinical trials using human dental pulp stem cells may be searched using the web-based resources of the National Library of Medicine at the National Institutes of Health (NIH).

Policy statement

While no treatment using harvested dental stem cells in humans is currently available, the American Academy of Pediatric Dentistry recognizes that this is an emerging science which may have application for oral healthcare. As the technology continues to evolve, the process of procurement of dental stems cells should be accomplished only with deliberate integrity and appropriate informed consent to assure the highest ethical standards and quality of outcomes.

References

Anitua E, Troya M, Zalduendo M. Progress in the use of dental pulp stem cells in regenerative medicine. Cytotherapy 2018;20(4):479-98.

Ayadin S, Sahin F. Stem cells derived from dental tissues. Adv Exp Med Biol 2019;1144:123-32. Available at: “https://doi.org/10.1007/5584_2018_333”. Accessed August 5, 2021~~.~~

Bansal R, Jain A. Current overview on dental stem cells applications in regenerative dentistry. J Nat Sci Biol Med 2015;6(1):29-34.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Campanella V. Dental stem cells: Current research and future applications. Eur J Paediatr Dent 2018; 19(4):257. Available at: "https://doi: 10.23804/ejpd.2018.19.04.1. PMID: 30567439". Accessed August 5, 2021.

Conde MC, Chisini LA, Demarco FF, et al. Stem cell-based pulp tissue engineering: Variables enrolled in translation from the bench to the bedside, a systematic review of literature. Int Endod J 2016;49(6):543-50.

Eslaminejad MB, Vahabi S, Shariati M, Nazarian H. In vitro growth and characterization of stem cells from human dental pulp of deciduous versus permanent teeth. J Dent (Tehran) 2010;7(4):185-95.

Gan L, Liu Y, Cui D, Pan Y, Zheng L, Wan M. Dental tissue-derived human mesenchymal stem cells and their potential in therapeutic application. Stem Cells Int 2020;2020:8864572. Available at: "http://doi: 10.1155/2020/8864572. PMID: 32952572; PMCID: PMC7482010". Accessed August 5, 2021.

Gancheva MR, Kremer KL, Gronthos S, Koblar SA. Using dental pulp stem cells for stroke therapy. Front Neurol 2019;10:422. Available at: "http://doi: 10.3389/fneur.2019.00422. PMID: 31110489; PMCID: PMC6501465". Accessed August 5, 2021.

Govindasamy V, Ronald VS, Abdullah AN, et al. Differentiation of dental pulp stem cells into islet-like aggregates. J Dent Res 2011;90(5):626-52.

Hynes K, Menichanin D, Bright R, et al. Induced pluripotent stem cells: A new frontier for stem cells in dentistry. J Dent Res 2015;94(11):1508-15.

~~Kadar K, Kiraly M, Porcsalmy B, et al. Differentiation potential of stem cells from human dental origin – Promise for tissue engineering. J Physiol Pharmacol 2009; 60(suppl 7):167-75.~~

Li W, Jiao X, Song J, et al, Therapeutic potential of stem cells from human exfoliated deciduous teeth infusion into patients with type 2 diabetes depends on basal lipid levels and islet function. Stem Cells Transl Med 2021;10(7):956-67.

Miyoshi K, Tsuji D, Kudoh K, et al. Generation of human induced pluripotent stem cells from oral mucosa. J Biosci Bioeng 2010;110(3):345-50.

Morsczek C, Reicjert TE. Dental stem cells in tooth regeneration and repair in the future. Expert Opin Biol Ther 2018;18(2);187-96. Available at: "https://doi.org/10.1080/14712598.2018.1402004". Accessed August 5, 2021.

National Institutes of Health National Library of Medicine. Find a Study. Available at: "https://www.clinicaltrials.gov/ct2/home". Accessed March 23, 2022.

~~Nishino Y, Yamada Y, Ebisawa K, et al. Stem cells from human exfoliated deciduous teeth (SHED) enhance wound healing and the possibility of novel cell therapy. Cytotherapy 2011;13(5):598-605.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~Nourbakhsh N, Soleimani M, Taghipour Z, et al. Induced in vitro differentiation of neural-like cells from human exfoliated deciduous teeth-derived stem cells. Int J Dev Biol 2011;55(2):189-95.~~

Perry BC, Zhou D, Wu X, et al. Collection, cryopreservation, and characterization of human dental pulp-derived mesenchymal stem cells for banking and clinical use. Tissue Eng Part C Methods 2008;14(2):149-56.

Shuai Y, Ma Y, Guo T, et al. Dental stem cells and tooth regeneration. Adv Med Biol 2018;1107:41-52. Available at: "https://doi: 10.1007/5584_2018_252. PMID: 30051321". Accessed August 5, 2021.

Tatullo M, Codispoti B, Paduano F, Nuzzolese M, Makeeva I. Strategic tools in regenerative and translational dentistry. Int J Mol Sci 2019;20(8):1879. Available at: "http://doi: 10.3390/ijms20081879. PMID: 30995738; PMCID: PMC6514784". Accessed August 5, 2021.

Wada N, Wang B, Lin NH, Laslett AL, et al. Induced pluripotent stem cell lines derived from human gingival fibroblasts and periodontal ligament fibroblasts. J Periodontal Res 2011;46(4):438-47.

Yang J, Yuan G, Chen Z. Pulp regeneration: Current approaches and future challenges. Front Physiol 2016; 7:58.

Yildirim S, Zibandeh N, Genc D, Ozcan EM, Goker K, Akkoc T. The comparison of the immunologic properties of stem cells isolated from human exfoliated deciduous teeth, dental pulp, and dental follicles. Stem Cells Int 2016;2016:4682875. Available at: "https://www.hindawi.com/journals/sci/2016/4682875/". Accessed ~~June 9, 2017~~August 3, 2021. ~~(Archived by WebCite® at: http://www.web citation.org/6tkJoR5zd)~~

Zhai, Q, Dong Z, Wang W, Li B, Jin Y. Dental stem cell and dental tissue regeneration. Front Med 2019;13(2):152-9. Available at: "https://doi.org/10.1007/s11684-018-0628-x". Accessed August 5, 2021.

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Policy on Pacifiers

Adopted
2022

Abbreviations

AAP: American Academy of Pediatrics; AAPD: American Academy of Pediatric Dentistry; SIDS: Sudden infant death syndrome

Purpose:

The American Academy of Pediatric Dentistry (**AAPD**) encourages health care providers to follow evidence-based literature to educate parents about the safe practices, benefits, and risks of pacifier use by infants and children in order to promote healthy growth and development.

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Methods:

This policy, developed by the Council on Clinical Affairs, is based on review of current dental and medical literature, including a search of the PubMed®/MEDLINE database using the terms: pacifier AND emotional development, safety, benefits, malocclusion, crossbite, open bite, fields: all; limits: within the last 10 years, English. Five hundred forty-nine articles met these criteria. Papers for review were chosen from this list and from references within selected articles.

Background:

Sucking behaviors in infants can be a natural reflex to satisfy a physiological (i.e., nutritive) or psychological (i.e., non-nutritive) need. The non-nutritive drive may be satisfied by sucking a finger or thumb or an available object such as a pacifier. Pacifier use is common among infants in the United States (Sexton 2009). Cultural background may play a role in pacifier introduction. (Feştilă 2014) Considerations when counseling parents on introducing pacifiers include-safety and potential risks and benefits of pacifier use. Although the American Academy of Pediatrics (**AAP**) has recommended delaying pacifier use in breastfed infants until breastfeeding is established to prevent breastfeeding disruption (AAP 2012), a recent Cochrane systematic review found pacifier use, whether started from birth or after lactation, did not affect the prevalence or duration of breastfeeding in healthy, term infants up to four months of age (Jaafar 2016).

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The controlled action of sucking promotes feelings of security (Staufert Gutierrez) and allows infants to self-soothe (Staufert Gutierrez; Augustyn 2009) and to initiate the process of self-regulation.(Augustyn 2009) Pacifiers continue to provide comfort in the toddler years. Cessation may be carried out either through self-implementation or caregiver mediation.(Borrie 2015) A recent review found evidence that psychological interventions such as positive and negative reinforcement effectively improve non-nutritive sucking habits in children.(Borrie) Positive reward for pacifier cessation (e.g., recognition or incentive for each day of non-use) is preferable to negative reinforcement (e.g., criticism, restraint) which can inadvertently cause power struggles and extend the duration of non-nutritive sucking habits.(Augustyn 2009)

Pacifier risks

Practitioners can provide counseling and anticipatory guidance regarding pacifier selection and safe usage to parents of infants and children who utilize a pacifier. Pacifiers of single piece construction are less likely to break apart and become a choking hazard.(AAP 2018) For safety, AAP recommends a pacifier shield be firm, have ventholes, and measure at least 1.5 inches across (i.e., large enough not to pass completely into the mouth).(AAP 2018) Additionally, the U.S. Consumer Product Safety Commission prohibits straps, cords, or attachments that could pose a danger to infants or children.(US CPSC) Regular inspection of the pacifier by caregivers is recommended to evaluate for any structural wear that poses a safety risk.(AAP 2018)

Pacifier use is a risk factor for otitis media in infants and children.(Stone 2000, Warren et al 2001, Gederi 2013, Salah 2013, Nowak 2021) The AAP suggests the incidence of acute otitis media may be reduced by decreasing or eliminating use of a pacifier in the second six months of life.(Lieberthal 2013) Evidence linking pacifier use to issues with speech development or speech delay is limited.(Nelson 2012, Burr 2021) Recent research suggested that while prolonged day-to-day pacifier use lasting several hours may have significance with atypical speech errors, a strong speech-related justification against pacifier use is not evident.(Strutt 2020) The U.S. Food and Drug Administration recommends that infants and young children not be given pacifiers containing or dipped in honey.(FDA) Honey contains spores of a particular bacterium, *Clostridium botulinum*, that produces a neurotoxin capable of causing respiratory difficulty, paralysis, and even death.(FDA) Recent cases of infant botulism in Texas were attributed to commercially-available honey-filled pacifiers.(FDA)

Pacifiers can serve as a reservoir for microbes, and their use is linked to oral yeast infections.(Comina 2006, Nowak 2021) Sterilization/disinfection, either by boiling in water for 15 minutes or preferably spraying an antimicrobial agent (e.g., 0.12 percent chlorhexidine), can minimize and eliminate microbes such as Staphylococcus, *Candida albicans*, and *Streptococcus mutans.*(Nelson 2012, Lopes et al 2019, Nelson-Fihlo 2015)

Children using a pacifier 36 months or longer had a significantly higher incidence of anterior open bite compared to those not using a pacifier. (Warren 2002, Gederi 2013, Duncan 2008, Larsson 1994, Adair 1995, Zardetto 2002, Germa 2016,Bueno 2013,Schmid 2018,Lima 2017, Ling 2018) Pacifier usage beyond one year (Adair 1995) lead to a significantly higher incidence of anterior open bite. An anterior open bite will improve after elimination of the pacifier before age three. (Warren 2002, Duncan 2008, Bishara 2006).

Increased pacifier use also leads to posterior crossbite (Warren 2002, Gederi 2013, Duncan 2008, Adair 1995, Schmid 2018, Zardetto 2002, Montaldo 2011, Lima 2017, Lima Vasquez 2013), including crossbite with midline deviation.(Melink 2010, Lopes Freire 2016, Larsson 2001, Cenci 2015) Increased overjet and a class II malocclusion are more strongly associated with a finger habit versus a pacifier habit.(Bishara 2006, Cenci 2015) A prospective study examining pacifier use beyond age four concluded the transverse occlusal relationship should be evaluated before three years of age (Bishara 2006). To limit the development of a posterior crossbite, discontinuing or limiting pacifier use when canines emerge (approximately 18 months of age) (Melink 2010) has been recommended (Larsson 2001, Bishara 2006) The malocclusion was affected by duration more than frequency, (Cenci 2015, Lima 2017) and the percentage of open bite was significantly greater as the duration of non-nutritive sucking continued beyond three years of age. (Montaldo 2011)

A systematic review noted orthodontic pacifiers induce less open bite compared to conventional pacifiers (Schmid 2018). While one study showed conventional pacifiers use exhibited higher odds of posterior crossbite and anterior open bite compared to orthodontic pacifiers(Lima 2017), another found pacifier usage had a significantly higher incidence of posterior crossbite versus non-habit children although the difference between pacifier types with regards to posterior crossbite was not significant.(Zardetto 2002) A prospective study introduced a pacifier with a thin neck to children (average age 20 months) who had a diagnosed anterior open bite and already used a conventional pacifier; the study group was compared to not only the original pacifier group but also to children not using any pacifier for at least three

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months.(Wagner 2016) A significant difference regarding overbite and overjet changes between pacifier groups was reported, p less than 0.001 (i.e. the thin neck pacifier resulted in less increase in the overbite and open bite compared to the conventional pacifier); however, no improvement in either pacifier group compared to cessation of pacifier use was found.(Wagner 2016) Two reviews comparing orthodontic versus conventional pacifiers stated evidence was insufficient to support a preference for orthodontic pacifiers preventing malocclusions.(Correa 2016, Medeiros 2018)

The pacifier design (orthodontic, conventional, or physiologic) and shield design (conventional or flare) have implications for the use and function of different brand pacifiers. Pacifiers interact with the palate differently based on their fit (i.e., design and size) regardless whether they are labeled conventional or orthodontic.(Tesini et al 2022) Pacifier sizing has been brought into focus for the role it plays in providing palatal support to prevent loss of transverse palatal dimensions and causing palatal collapse. (Lindner 1991, Warren 2002, Levrini 2006, Lima 2016, Tesini 2022) Palatal collapse contributes to the early development of posterior crossbites.(Levrini 2007,Dogrammaci 2016, Schmid 2018) The use of biometrics to aid pacifier selection has shown promise in recent research. (Lee 2022, Tesini et al 2022)

Benefits of pacifiers use:

Based on “good-quality patient-oriented evidence”, the AAP recommends offering a pacifier when an infant is placed to sleep due to its protective effect on the incidence of sudden infant death syndrome (SIDS), but a pacifier should not be forced on resistant infants.(AAP SIDS 2016). This recommendation is supported by other organizations such as the International Society for the Study and Prevention of Perinatal and Infant Death (ISPID) and the Safe to Sleep® campaign of the U.S. Department of Health and Human Services (USDHHS 2017).

Pacifier use may be beneficial when mothers cannot breastfeed due to medication or severe illness, if infants need early oral stimulation to develop or maintain the sucking reflex, or in neonatal intensive care environments when infants need calming, pain relief, or decreased stress. (Lubbe 2017) The benefits of pacifier use also include adjunctive pain relief in newborns and infants undergoing common, minor procedures in the emergency department and reducing the likelihood of a digit-sucking habit.(Gederi 2013, Campos 1994, Marter 2007, Nelson 2009, Sexton 2009, Vu-Ngoc et al 2020). Children who started using an orthodontic pacifier before four months old had a lower risk of developing a finger/thumb sucking habit compared to children who began after four months. (Caruso 2019) Because early forced cessation of pacifier usage has been associated with prolonged finger sucking, allowing the habit to continue beyond 14 months of age may help prevent a persistent finger habit. (Fukumoto 2013)

Policy Statement.

The AAPD supports parents in the decision to introduce a pacifier based on their infant's needs and parental preference. During the first few months of life, pacifiers may be beneficial in helping premature infants develop the sucking reflex, offering comfort and soothing, providing an analgesic effect during minor invasive procedures, decreasing the incidence of SIDS, and preventing a persistent finger-sucking habit. However, a prolonged pacifier habit after 12 months of age can increase the risk of acute otitis media. Pacifier use beyond 18 months can influence the developing orofacial complex, leading to anterior open bite, posterior crossbite, and class II malocclusion. Understanding the safety, benefits, and risks is critical to counseling parents on the use of pacifiers.

The AAPD encourages additional research regarding the biometrics for pacifier selection to minimize disturbances of the developing orofacial complex.

References:

Adair SM, Milano M, Lorenzo I et al. Effects of current and former pacifier use on the dentition of 24- to 59-month-old children Pediatr Dent 1995;17(7):437-44.

American Academy of Pediatrics. Pacifier Safety. Caring for your Baby and Young Child: Birth to Age 5. Updated November 19, 2018. Available at: "https://www.healthychildren.org/English/safety-prevention/at-home/Pages/Pacifier-Safety.aspx". Accessed February 26, 2022.

American Academy of Pediatrics Section on Breastfeeding, Eidelman AI, Schanler RJ, et al. Breastfeeding and the use of human milk. Pediatrics 2012;129(3):e827–e841.

American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. SIDS and other sleep-related infant deaths: Updated 2016 recommendations for a safe infant sleeping environment. Pediatrics 2016;138(5):e20162938.

Augustyn M, Frank DA, Zuckerman BS. Infancy and Toddler years in Carey WB, Crocker AC, Elais ER, Feldman HM, Coleman WL eds. in Developmental- Behavioral Pediatrics. 4th edition. Elsevier, Philadelphia, Pa. 2009:24-38

Burr S, Harding S, Wren Y, Deave T. The relationship between feeding and non-nutritive sucking behaviours and speech sound development: A systematic review. Folia Phoniatr Logop 2021;73(2):75-88.

Bishara SE, Watten JJ, Broffitt B, et al. Changes in the prevalence of nonnutritive sucking patterns in the first 8 years of life. Am J Orthod Dentofacial Orthop 2006;130(1):31-6.

Borrie, FR, Bearn, DR, Innes NP, Iheozor-Ejiofor Z. Interventions for the cessation of non-nutritive sucking habits in children. Cochrane Database Syst Rev 2015 Mar 31(3): CD008694.

Bueno SB, Bittar TO, Vazquez FL et al. Assocaition of breastfeeding, pacifier use, breathing pattern and Malocclusion in pe school children. Dental Press J Orthod 2013;18(1):30.e1-6

Campos RG. Rocking and pacifiers: two comforting interventions for heelstick pain. Res Nurs Health 1994;17(5):321-31.

Caruso, S. Nora A. Darvizeh A. et al. Poor oral habits and malocclusion after usage of Orthodontic Pacifiers: an observational study on 3-5 year old children. BMC Pediatr 2019;19(1):294

Cenci VS, Marciel SM, Jarrus ME, et al. Pacifier-sucking habit duration and frequency on occlusal and myofunctional alterations in preschool children. Braz Oral Res 2015;29(1):1-7.

Comina E, Marion K, Renaud FN, Dore J, Bergeron E, Freney J. Pacifiers: A microbial reservoir. Nurs Health Sci 2006;8(4):216-23.

Corrêa CC, Sallas Bueno MR, Pereira Lauris JB, et al. Interference of conventional and orthodontic nipples in system stomatognatic: Systematic review 2016. Codas 2016;28(2):182-9.

Doğramacı EJ, Rossi-Fedele G. Establishing the association between nonnutritive sucking behavior and malocclusions: A systematic review and meta-analysis. J Am Dent Assoc 2016;147(12):926-34.

Duncan K, McNamara C, Ireland AJ. Sucking habits in childhood and effects on the primary dentition: Findings of the Avon Longitudinal Study of Pregnancy and Childhood. Int J Paediatr Dent 2008;18(3):178-88.

Feştilă D, Ghergie M, Muntean A, Matiz D, Şerb Nescu A. Suckling and non-nutritive sucking habit: What should we know? Clujul Med 2014;87(1):11-4.

Fukumoto E, Fukumoto S, kawasaki K, et al. Cessation age of breast -feeding and pacifier use is associated with persistent finger-sucking. Pediatr Dent 2013;35(7):506-9.

Gederi A, Coomarawamy K, Turner JP. Pacifiers: A review of risks vs benefits. Dent Update 2013;40(2):92-101.

Germa A, Clement C, Weissenbach M, et al. Early risk factors for posterior crossbite and anterior open bite in the primary dentition. Angle Orthod 2016;86(5):832-8.

International Society for the Study and Prevention of Perinatal and Infant Death. How to keep your baby healthy and reduce the risk of sudden infant death (SIDS). July 5, 2020. Available at: “https://www.ispid.org/infantdeath/id-prevention”. Accessed February 5, 2022.

Jaafar SH, Ho JJ, Jahanfar S, Angolkar M. Effect of restricted pacifier use in breastfeeding term infants for increasing duration of breastfeeding. Cochrane Database Syst Rev 2016 Aug 30;(8):CD007202.

Larsson E. Artificial sucking habits: Etiology, prevalence and effect on occlusion. Int J Orofacial Myology 1994;20(1):10-21.

Larsson E. Sucking, chewing, and feeding habits and the development of crossbite: A longitudinal study of girls from birth to 3 years of age Angle Orthod 2001;71(2):116-9.

Lee CL, Costello M, Tesini DA. Computational stimulation of pacifier deformation and interaction with the palate. Clinical and Experimental Dental Research 2021;7(5):884-887

Levrini L, Merlo P, Paracchini L.Different geometric patterns of pacifiers compared on the basis of finite element analysis.. Eur J Paediatr Dent 2007;8(4):173-8.

Lieberthal AS, Carroll AE, Chonmaitree T, et al. Clinical practice guideline: The diagnosis and management of acute otitis media. Pediatrics 2013;131(3):e964–e999. Errata: Pediatrics 2014;133(2):346–7.

Lima AADSJ, Alves CMC, Ribeiro CCC, et al. Effects of conventional and orthodontic pacifiers on the dental occlusion of children aged 24-36 months old. Int J Paediatr Dent 2017:27(2):108-19.

Lima Vasquez F, Castro Meneghim M. Association of breastfeeding, pacifier use, breathing pattern and malocclusions in preschoolers. Dental Press J Orthod 2013;18(1):1-6.

Lindner A, Hellsing E. Cheek and lip pressure against the maxillary dental arch during dummy sucking. Eur J Ortho; 1991;13(5):362-6.

Ling HTB, Sum, FHK, Zhang, L et al. The association between nutritive, non-nutritive sucking habits and primary dental occlusion. BMC Oral Health 2018;18(1):145 open bite

Lopes Freire GM, Suarez de Deza JEE, Rodrigues IC, et al. Non-nutritive sucking habits and their effects on the occlusion in the deciduous dentition in children 2016 Eur J Paediatr Dent 2016;17(4):301-6.

Lubbe W, Ten Ham-Baloyi W. When is the use of pacifiers justifiable in the baby-friendly hospital initiative context? A clinician's guide. BMC Pregnancy Childbirth 2017;17(1):130.

Marter A, Agruss JC. Pacifiers: An update on use and misuse. J Spec Pediatr Nurs 2007;12(4):278-85.

Medeiros R, Ximenes M, Massgnam C, et al. Malocclusion prevention through the usage of an orthodontic pacifier compared to a conventional pacifier: A systematic review. Eur Arch Paediatr Dent 2018;19(5):287-95.

Melink S, Vagner MV, Hocevar-Boltezar I. Posterior crossbite in the deciduous dentition period, its relation with sucking habits, irregular orofacial functions, and otolaryngological findings. Am J Orthod Dentofacial Orthop 2010;138(1):32-40.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Montaldo L, Montaldo P, Pasquale P, et al. Effects of feeding on non-nutritive sucking habits and implications on occlusion in mixed dentition. Int J Paediatr Dent 2011;21(1): 68–73.

Nelson AM. A comprehensive review of evidence and current recommendations related to pacifier usage. J Pediatr Nurs 2012;27(6):690-9.

Nelson-Filho P, Louvain MC, Macari S, et al. Microbial contamination and disinfection methods of pacifiers. J Appl Oral Sci 2015;23(5):523-8.

Nowak AJ, Warren JJ. Oral habits and orofacial development in children. In: UpToDate, . Griffen A, Torchia MM, eds.Available at: "https://www.uptodate.com/contents/oral-habits-and-orofacial-development-in-children?search=pacifier&sorce=search_result&selectedTitle=1~41&usage_type=default&display_rank=1". Accessed February 26, 2022.

United States Consumer Product Safety Commission. Pacifiers Business Guidance. Available at: "https://www.cpsc.gov/Business--Manufacturing/Business-Education/Business-Guidance/Pacifiers-Business-Guidance". Accessed February 26, 2022.

Salah M, Abdel-Aziz M, Al-Farok A, Jebrini A. Recurrent acute otitis media in infants: Analysis of risk factors. Int J Pediatr Otorhinolaryngol 2013;77(10):1665-9.

Schmid KM, Kugler R, Nalabothu P, et al. The effect of pacifier sucking on orofacial structures: A systematic literature review. Prog Orthod 2018;19(1):8.

Sexton S, Natale R. Risks and benefits of pacifiers. Am Fam Physician 2009;79(8):681-5.

Staufert Gutierrez D, Carugno P. Thumb Sucking. [Updated 2021 May 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available at: "https://www.ncbi.nlm.nih.gov/books/NBK556112/". Accessed February 26, 2022.

Stone KN, Fleming P, Golding J. Socio-demographic associations with digit and pacifier sucking at 15 months of age and possible associations with infant infection. The ALSPAC Study Team. Avon Longitudinal Study of Pregnancy and Childhood. Early Hum Dev 2000;60(2):137-48.

Strutt C, Khattab G, Willoughy J. Does the duration and frequency of dummy (pacifier) use affect the development of speech? Int J Lang Commun Disord 2021;56(3):512-27.

Tesini DA. Design, sizing and ergonomics of infant pacifiers: A biometric basis for pacifier fit. Pediatr Nurs 2022;48(1):36-41.

Tesini DA, Hu LC, Usui BH et al. Functional comparison of pacifiers using finite element analysis BMC Oral Health 2022;22:49.

U.S. Department of Health and Human Services Safe to Sleep® campaign. Safe Sleep for Your Baby. Reduce the Risk of Sudden Infant Death Syndrome (SIDS) and Other Sleep-Related Causes of Infant

Death. NIH Pub No 17-HD-7040, June 2017. Available at: “https://www.nichd.nih.gov/sites/default/files/publications/pubs/Documents/NICHD_Safe_to_Sleep_brochure.pdf”. Accessed February 5, 2022.

U.S. Food and Drug Administration. Honey pacifiers suspected in Texas infant botulism cases. FDA reminds parents not to feed honey to children younger than 1 year. November 16, 2018. Available at: “https://www.fda.gov/food/alerts-advisories-safety-information/honey-pacifiers-suspected-texas-infant-botulism-cases#:~:text=The%20FDA%20is%20recommending%20parents,it%20and%20discard%20it%20immediately". Accessed February 5, 2022.

Vu-Ngoc H, Uyen NCM, Thinh OP, et al. Analgesic effect of non-nutritive sucking in term neonates: A randomized controlled trial. Pediatr Neontol 2020;61(1):106-13.

Wagner Y, Heinrich-Weltzien R. Effect of a thin-neck pacifier on primary dentition: A randomized controlled trial. Orthod Craniofac Res 2016;19(3):127-36

Warren JJ, Bishara SE. Duration of nutritive and nonnutritive sucking behaviors and their effects on the dental arches in the primary dentition. Am J Orthod Dentofacial Orthop 2002;121(4):347-56.

Warren JJ, Levy SM, Kirchner HL, et al. Pacifier use and the occurrence of otitis media in the first year of life. Pediatr Dent 2001;23(2):103.

Zardetto CGC, Rodriguez CRMD, Stefani FM. Effects of different pacifiers on the primary dentition and oral myofunctional structures of preschool children. Pediatr Dent 2002;24(6):552-60.

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Policy on Diversity, Equity, and Inclusion

Adopted

2022

Abbreviations: **AAPD**: American Academy of Pediatric Dentistry. **DEI**: Diversity, equity, and inclusion.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) advocates for the health and well-being of all infants, children, and adolescents, regardless of their race, ethnicity, religion, sexual or gender identity, medical status, family structure, or financial circumstances (AAPD P. Vul Pop 2021) and supports efforts to increase health equity among youth. Diversity, equity, and inclusion (**DEI**) are critical to achieve the AAPD'S vision of optimal oral health for all children (AAPD Def & Scope of Ped Dent 2021). The intent of this policy is to review the published literature on how race, ethnicity, and other identifiers are related to children's oral health and health inequities, to identify barriers to DEI within the dental profession, and to encourage clinicians, educators, researchers, and policy makers to advance DEI within the specialty of pediatric dentistry.

Methods

This policy was developed by the Council on Clinical Affairs. A review of current dental and medical literature and sources of recognized professional expertise related to diversity, equity, and inclusion was completed. The literature search of the PubMed®/MEDLINE database was conducted using the terms: diversity, equity, inclusion; fields: all; limits: within the last 10 years, English. Papers for review were chosen from this list and from the references within selected articles. Expert and/or consensus opinion by experienced researchers and clinicians was also considered.

Definitions

Diversity constitutes "a broad range of individual, population, and social characteristics, including but not limited to age; sex; race; ethnicity; sexual orientation; gender identity; family structures; geographic locations; national origin; immigrants and refugees; language; physical, functional, and learning abilities;

religious beliefs; and socioeconomic status" (AACN Position Statement 2017). In addition, other characteristics of diversity include body/size image, veteran status, housing status, and mental health status (Buchanan & O'Connor 2020).

Equity is defined as "the state, quality or ideal of being just, impartial and fair." The concept of equity is synonymous with fairness and justice. To be achieved and sustained, equity needs to be thought of as a structural and systemic concept (Race Equity and Inclusion Action Guide 2015). Moreover, health equity is described as the "attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities" (Healthy People 2020).

Inclusion is "a dynamic state of operating in which diversity is leveraged to create a fair, healthy, and high-performing organization, or community. An inclusive environment ensures equitable access to resources and opportunities for all. It also enables individuals and groups to feel safe, respected, engaged, motivated, and valued, for who they are and for their contributions toward organizational and societal goals" (O'Mara & Richter 2017).

Background

Marked oral health disparities exist by race and ethnicity for children and adolescents in the United States. (Lau 2012; McLaren 2016; Como 2019; CDC 2021). Children of American Indian and/or Alaska Native descent and Native Hawaiian children have the highest documented prevalence of early childhood caries, and a significantly higher percentage of non-Hispanic Black and Mexican American children have dental caries, compared to non-Hispanic white children (Edelstein & Chinn 2009; Deguchi et al. 2013**;** Matsuo et al. 2015; Holve et al. 2021). Reasons such as consumption of more added sugars and less utilization of preventive dental care have been used to explain the higher caries risk assigned to racial and ethnic minorities (Chi et al. 2015; Choi et al. 2022). While behavior modification strategies are important to improve oral health, the overarching role of social determinants of health must be addressed if oral heath disparities are to be reduced in a long-lasting and meaningful way (AAPD SDOH 2021; NIH 2021).

Structural racism (i.e., processes that are embedded in laws, policies, and institutions) (Williams et al. 2019; National Academics of Sciences, Engineering, and Medicine 2021) impacts social determinants of oral health (Jamieson et al 2021; Bastos et al. 2021). Discriminatory policies such as unfair lending

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practices, employment standards, and workplace policies heavily influence factors such as income level, insurance coverage, quality of education, food security, housing, chronic stress, and neighborhood resources that lead to poorer oral health outcomes for marginalized populations (Lee 2014; Braveman 2014; Mclaren 2016; Como 2019; AAPD SDOH 2021). Access to dental services, nutritious food, and safe and fluoridated drinking water (Como 2019; Braveman 2014) are significantly hindered by barriers such as housing instability, food deserts, inflexible work schedules, lack of transportation, and high costs of care that disproportionately affect non-Caucasian families (Cao 2017; da Fonseca & Avenetti 2017; Chi 2018; Vujicic & Fosse 2022). Recognition of the influence of discrimination on the social determinants of oral health is necessary to advocate for greater health equity (Braveman 2014; Evans & Smith 2021).

Available literature has discussed more direct effects of bias on oral health. Racial minorities often receive lower quality health care than their white counterparts even when accounting for factors related to access, socioeconomic status, and education. (Smith 2007; Como 2019) Negative effects on self-perceptions of oral health status (Smith 2007; Schwartz et al. 2019), diminished oral health-related self-efficacy (Gibson 2016), and avoidance of dental appointments due to fear of maltreatment (Schwartz 2017; Como 2019) have been reported. Caregivers of minority children have expressed unmet dental needs and inattentiveness from dental providers (Como 2019).

Heightened awareness of oral health inequities and related social injustices have inspired professional efforts to enhance diversity and inclusion in the pediatric dental workforce and to combat discrimination that leads to oral health inequities. Dental schools and professional organizations have created strategies to increase diversity among their students, members, and leadership (ADEA ADI Strategic Framework 2018; ADEA 2019-22 Strategic Framework; ADA 2020-25 D&I Plan). The increased presence of underrepresented populations among healthcare professionals is important for building trust between providers and marginalized families (Como 2019, NIH 2021). AAPD legislative priorities align with aims to increase professional diversity and health equity through the support of provider training programs, recommended Medicaid reform, and expansion of the dental workforce (AAPD Legislative Priorities 2021; AAPD P. on Workforce Issues 2021).

Both intentional and non-intentional provider biases affect the health care that children receive. The Surgeon General's Report *Oral Health in America: Advances and Challenges* calls for a new framework in dental education that emphasizes the social determinants of health, inequities, and population diversity

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(NIH 2021). Improved cultural competency training in practices, residency programs, dental schools, universities, and other institutions relevant to the practice of dentistry is necessary to address discriminatory assumptions and behaviors among dental providers (ADEA 2019-22 Strategic Framework; Goodman et al. 2020, Forsyth et al. 2020; Nousi et al. 2020; CODA Standards 2021). Relevant training may encourage providers to be mindful of the ways in which personal and professional biases influence practice settings, treatment decisions, office policies, and patient relationships (Jamieson et al. 2021) and motivate them to create an inclusive and respectful environment for all children in their care. Barriers to implementation of DEI principles, including lack of social supports to help manage children's needs, have been reported (HHS Action Plan; Olzmann 2020).

Policy statement

The AAPD acknowledges and celebrates the increasing diversity of children, including their racial and ethnic backgrounds, national origin and citizenship, languages spoken, religious beliefs, abilities, gender and sexual identities, and cultural norms. Additionally, the AAPD welcomes greater diversity within the profession and appreciates the personal experiences, skills, and knowledge possessed by each of its individual members. The AAPD supports broader inclusivity in leadership, membership, education, and practice and deeper engagement with communities to promote necessary collaboration, respect, and dignity for all children and families. Programs, initiatives, and policies that address and overcome social barriers, including racism and other forms of discrimination, are necessary to achieve greater health equity and the AAPD's vision of optimal oral health for children.

Recognizing the importance of DEI to pediatric dentistry, the AAPD:

- supports social and economic policies, research, and initiatives to address social determinants of oral health that result in racial and ethnic oral inequities.
- encourages providers to implement diversity, equity, and inclusion training within the dental office.
- urges dental educators to implement strategies to mitigate bias in applicant and trainee evaluation processes and to enhance institutional DEI curricula.

References

American Academy of Pediatric Dentistry. Overview. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:7-9.

American Academy of Pediatric Dentistry Legislative Priorities. Available at "https://www.aapd.org/globalassets/2022-legislative-priorities-for-website.pdf". Accessed March 12, 2022.

American Academy of Pediatric Dentistry. Policy on care for vulnerable populations in a dental setting. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:32-8.

American Academy of Pediatric Dentistry. Policy on social determinants of children's oral health and health disparities. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; PENDING.

American Academy of Pediatric Dentistry. Policy on workforce issues and delivery of oral health care services in a dental home. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:45-50.

American Dental Education Association. 2019-2020 Key ADEA Access, Diversity and Inclusion Initiatives and Activities. Chicago, IL; 2018 Available at "https://www.adea.org/uploadedFiles/ADEA/Content_Conversion_Final/policy_advocacy/diversity_equity/Documents/2019-20_Key-ADEA-ADI-Intiatives.pdf.". Accessed March 12, 2022.

American Dental Association. 2020-2025 Diversity and Inclusion Plan. Chicago, IL; 2020 Available at "https://www.ada.org/-/media/project/ada-organization/ada/ada-org/files/about/ada_diversity_inclusion_plan.pdf?rev=7c532219f8ad4c308bc15d6011af7c73&hash=CF41B5AACADDDD99122AA15C1054876C". Accessed March 12, 2022.

American Dental Association. Commission on Dental Accreditation. Accreditation Standards for Dental Education Programs. Revised August 5, 2021. Available at "https://coda.ada.org/~/media/CODA/Files/predoc_standards.pdf?la=en". Accessed March 13, 2022.

Annie E. Casey Foundation. Race Equity and Inclusion Action Guide. Baltimore, MD; 2015 Available at: "https://www.aecf.org/resources/race-equity-and-inclusion-action-guide". Accessed March 12, 2022.

Bastos JL, Constante HM, Jamieson LM. Making science and doing justice: The need to reframe research on racial inequities in oral health. Community Dent Health 2021;38(2):132-7.

Braveman P, Gottlieb L. The social determinants of health: It's time to consider the causes of the causes. Public Health Rep 2014;129(Suppl 2):19-31.

Buchanan DT, O'Connor MR. Integrating diversity, equity, and inclusion into a simulation program. Clinical Simulation in Nursing; 2020 49(C), 58-65.Cao S, Gentili M, Griffin PM, Griffin SO, Serban N. Disparities in preventive dental care among children in Georgia. Prev Chronic Dis 2017;14:E104.

Center for Disease Control and Prevention. Disparities in Oral Health. Atlanta, GA. Available at: "https://www.cdc.gov/oralhealth/oral_health_disparities/index.htm". Accessed March 12, 2022.

Chi DL, Hopkins S, O'Brien D, Mancl L, Orr E, Lenaker D. Association between added sugar intake and dental caries in Yup'ik children using a novel hair biomarker. BMC Oral Health 2015;15(1):121.

Chi DL. Oral health for US children with special health care needs. Pediatr Clin North Am. 2018;65(5):981-93.

da Fonseca MA, Avenetti D. Social determinants of pediatric oral health. Dent Clin North Am. 2017;61(3):519-32.

Choi YY, Andreyeva T, Fleming-Milici F, Harris JL. U.S. households' children's drink purchases: 2006-2017 trends and associations with marketing. Am J Prev Med 2022;62(1):9-17.

Como DH, Stein Duker LI, Polido JC, Cermak SA. The persistence of oral health disparities for African American children: A scoping review. Int J Environ Res Public Health 2019;16(5):710.Deguchi M, Valente T, Efird J, Oropeza M, Niederman R, Nigg CR. Hawai'i's silent epidemic: Children's caries (dental decay). Hawaii J Med Public Health 2013;72(6):204-8.

Diversity, Inclusion, and Equity in Academic Nursing: American Association of Colleges of Nursing. Boston, MA; 2017. Available at: "https://www.aacnnursing.org/News-Information/Position-Statements-White-Papers/Diversity". Accessed March 12, 2022.

Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. Acad Pediatr 2009;9(6):415-9.

Evans, CA, Smith, P. Effects of racism on oral health in the United States. Community Dent Health 2021;38(2):138-41.

Forsyth C, Short S, Gilroy J, Tennant M, Irving M. An Indigenous cultural competence model for dentistry education. Br Dent J 2020;228(9):719-25.

Gibson LB, Blake M, Baker S. Inequalities in oral health: The role of sociology. Community Dent Health 2016;33(2):156-60.

Goodman XY, Nugent RL. Teaching cultural competence and cultural humility in dental medicine. Med Ref Serv Q 2020;39(4):309-322.

Holve S, Braun P, Irvine JD, Nadeau K, Schroth RJ. Early childhood caries in Indigenous communities. Paediatr Child Health 2021;26(4):255-58.

Jamieson L, Peres MA, Guarnizo-Herreño CC, Bastos JL. Racism and oral health inequities; An overview. EClinicalMedicine 2021;34:100827.

Lau M, Lin H, Flores G. Racial/ethnic disparities in health and health care among U.S. adolescents. Health Serv Res 2012;47(5):2031-59.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Lee JY, Divaris K. The ethical imperative of addressing oral health disparities: A unifying framework. J Dent Res 2014;93(3):224-30.

Matsuo G, Rozier RG, Kranz AM. Dental caries: Racial and ethnic disparities among North Carolina kindergarten students. Am J Public Health 2015;105(12):2503-9.

McLaren L, McNeil DA, Potestio M, et al. Equity in children's dental caries before and after cessation of community water fluoridation: Differential impact by dental insurance status and geographic material deprivation. Int J Equity Health 2016;15:24.

National Academies of Sciences, Engineering, and Medicine. Addressing Diversity, Equity, Inclusion, and Anti-Racism in 21st Century STEMM Organizations: Proceedings of a Workshop in-Brief. Washington, DC; 2021. The National Academies Press. Available at: “https://doi.org/10.17226/26294”. Accessed March 14, 2022.

National Institutes of Health. Oral Health in America: Advances and Challenges. Bethesda, MD.: USA Department of Health and Human Services, National Institutes of Health, National Institute of Dental and Craniofacial Research; 2021.

Noushi N, Enriquez N, Esfandiari S. A scoping review on social justice education in current undergraduate dental curricula. J Dent Educ 2020;84(5):593-606.

Olzmann JA. Diversity through equity and inclusion: The responsibility belongs to all of us. Mol Biol Cell 2020;31(25):2757-60.

O’Mara J, Richter A. Global Diversity & Inclusion Benchmarks. Standards for organizations around the world. Available at: “https://centreforglobalinclusion.org”. Accessed March 12, 2022.

Schwartz SB. L.G.B.T: Let's go beyond teeth. Pediatr Dent 2017;39(2):90-2.

Schwartz SB, Sanders AE, Lee JY, Divaris K. Sexual orientation-related oral health disparities in the United States. J Public Health Dent 2019;79(1):18-24.

Smith WR, Betancourt JR, Wynia MK, et al. Recommendations for teaching about racial and ethnic disparities in health and health care. Ann Intern Med 2007;147(9):654-65.

US Department of Health and Human Services. HHS Action Plan to Reduce Racial and Ethnic Disparities. A Nation Free of Disparities in Health and Health Care. U.S. Department of Health and Human Services. Office of Minority Health. Rockville, MD; 2013. Available at: “https://www.minorityhealth.hhs.gov/assets/pdf/hhs/HHS_Plan_complete.pdf”. Accessed March 14, 2022.

Vujicic M, Fosse C. Time for dental care to be considered essential in US health care policy. AMA J Ethics 2022;24(1):E57-63.

Williams DR, Lawrence JA, Davis BA. Racism and health: Evidence and needed research. Annu Rev Public Health 2019;40:105-25.

Periodicity of Examination, Preventive Dental Services, Anticipatory Guidance/Counseling, and Oral Treatment for Infants, Children, and Adolescents

Latest Revision

~~2018~~ 2022

Abstract

This best practice presents recommendations about anticipatory guidance and timing of other clinical modalities which promote oral health during infancy, childhood, and adolescence. The guidance, though modifiable to children with special health needs, focuses on healthy, normal-developing children and addresses comprehensive oral examination, assessment of caries risk, professional preventive procedures, fluoride supplementation, radiographic examination , anticipatory guidance, preventive counseling, sealant placement, treatment of dental disease, trauma, treatment of developing malocclusions, evaluation of third molars, and transition to adult care. These preventive recommendations may be applied for the following age groups: six to 12 months, 12 to 24 months, 24 months to six years, six to 12 years, and 12 years and older. The guidance emphasizes the importance of very early professional intervention and continuity of care based upon the individualized needs of the child.

The document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and recommendations regarding preventive oral health services and counseling for pediatric dental patients.

KEYWORDS: ANTICIPATORY GUIDANCE, PERIODICITY OF EXAMINATION, PREVENTIVE DENTISTRY, ADOLESCENT DENTISTRY, CARIES RISK ASSESSMENT, FLUORIDE SUPPLEMENT, ORAL HYGIENE COUNSELING, DENTAL REFERRAL

ABBREVIATIONS

AAP: American Academy of Pediatrics. **BMI**: Body mass index. **CRA**: Caries-risk assessment. **ECC**: Early childhood caries. **HPV**: Human papilloma virus. **PRA**: Periodontal risk assessment. **SHCN**: Special health care needs.

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Purpose

The American Academy of Pediatric Dentistry (**AAPD**) intends these recommendations to help practitioners make clinical decisions concerning preventive oral health interventions, including anticipatory guidance and preventive counseling, for infants, children, and adolescents.

Methods

This document was developed by the Clinical Affairs Committee~~, and~~ adopted in 1991 (AAPD 1991), and~~. This document is a revision of the previous version,~~ last revised by the Council on Clinical Affairs in 2018~~3~~(AAPD 2018). This~~e~~ update used electronic database and hand searches of articles in the medical and dental literature using the terms: periodicity of dental examinations, dental recall intervals, preventive dental services, anticipatory guidance and dentistry, caries risk assessment, early childhood caries, dental caries prediction, dental care cost effectiveness and children, periodontal disease and children and adolescents U.S., pit and fissure sealants, dental sealants, fluoride supplementation and topical fluoride, dental trauma, dental fracture and tooth, non-nutritive oral habits, treatment of developing malocclusion, removal of wisdom teeth, removal of third molars; fields: all; limits: within the last 10 years, humans, English, and clinical trials; birth through age 18. From this search, 2,502~~1,884~~ articles matched these criteria and were evaluated by title and/or abstract~~. Information from 49 articles was chosen for review to update this document.~~ When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/ or consensus opinion by experienced researchers and clinicians.

Background

Professional dental care is necessary to maintain oral health.(US DHHS 2003) The AAPD emphasizes the importance of initiating professional oral health intervention in infancy and continuing through adolescence and beyond.(AAPD BP_Perinatal/Infant) The periodicity of professional oral health intervention and services is based on a patient's individual needs and risk indicators.(Pienihakkinen 2005; Beil & Rozier 2010; Fontana 2016; Fontana González-Cabezas 2015; Patel et al. 2010; Pahel et al. 2011) Each age group, as well as each individual child, has distinct developmental needs to be addressed at specific intervals as part of a comprehensive evaluation.(AAPD BP_Perinatal/Infant; AAPD BP_Adolescent; AAPD P_Prophylaxis; Ramos-Gomez et al. 2010) Continuity of care is based on the assessed needs of the individual patient and assures appropriate management of all oral conditions, dental disease, and injuries.(AAPD BP_Restorative; AAPD BP_Acquired TMD; AAPD BP_Oral Surgery; AAPD P_Orofacial Injuries; Bourguignon et al 2020; Fouad 2020; Day 2020~~Diangelis et al. 2012;~~

~~Andersson et al. 2012; Malmgren et al. 2012~~) The early dental visit to establish a dental home provides a foundation upon which a lifetime of preventive education and oral health care can be built. The early establishment of a dental home has the potential to provide more effective and less costly dental care when compared to dental care provided in emergency care facilities or hospitals.(AAPD P_Dental Home; AAP 2014; AAP 2005; Berg& Stapleton 2012; Kempe et al. 2000) Anticipatory guidance and counseling are essential components of the dental visit.(AAPD BP_Perinatal/Infant; AAPD BP_Adolescent; AAPD P_Prophylaxis; AAPD P_Dental Home; AAP 2014; Berg & Stapleton 2012; AAPD P_ECC-Classifications; AAPD BP_Caries Risk Assessment; AAPD P_Dietary Recommendations; AAPD BP_Developing Dentition) The dental home also can influence general health by instituting additional practices related to general health promotion, disease prevention, and screening for non-oral health related concerns. For example, oral health professionals can calculate and monitor body mass index (**BMI**) to help identify children at risk for obesity and provide appropriate referral to pediatric or nutritional specialists.(AAPD P_Dietary 2022)

Collaborative efforts and effective communication between medical and dental homes are essential to prevent oral disease and promote oral and overall health among children. Medical professionals can play an important role in children's oral health by providing primary prevention and coordinated care. Equally, dentists can improve the overall health of children not only by treating dental disease, but also by proactively recognizing child abuse, preventing traumatic injuries through anticipatory guidance, preventing obesity by longitudinal dietary counseling, and monitoring of weight status.(Tseng et al. 2010) In addition, dentists can have a~~n important~~ significant role in assessing immunization status and developmental milestones for potential delays, as well as making appropriate referral for further neurodevelopmental evaluations and therapeutic services.(Scharf et al. 2016) The unique opportunity that dentists have to help address overall health issues strengthens as children get older since frequency of well child medical visits decreases at the same time the frequency of dental recall visits increases. Research shows that children aged six- to 12-years are, on average, four times more likely to visit a dentist than a pediatrician.(Brown 2006; Selden 2016)

Recommendations

This document addresses periodicity and general principles of examination, preventive dental services, anticipatory guidance/ counseling, and oral treatment for children who have no contributory medical conditions and are developing normally. Accurate, comprehensive, and up-to-date medical, dental, and social histories are necessary for correct diagnosis and effective treatment planning. Recommendations

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may be modified to meet the unique requirements of patients with special health care needs (**SHCN**).(AAPD BP_SHCN)

Clinical oral examination

The first examination is recommended at the time of the eruption of the first tooth and no later than 12 months of age.(AAPD BP_Perinatal/Infant; AAPD P_Dental Home; AAP 2014; Berg & Stapleton 2012) The developing dentition and occlusion should be monitored throughout eruption at regular clinical examinations.(AAPD BP_Developing Dentition) Evidence-based prevention and early detection and management of caries/oral conditions can improve a child's oral and general health, well-being, and school readiness.(Fontana 2016; AAPD P_ECC-Classification; AAPD P_ECC-Challenges; Clarke et al. 2006; Dye et al. 2007~~2004~~; Jackson et al. 2011) ~~It has been reported that t~~The number and cost of dental procedures among high-risk children is less for those seen at an earlier age versus later, confirming the fact that the sooner a child is seen by a dentist, the less treatment needs they are likely to have in the future.(Nowak et al. 2014) On the other hand, delayed diagnosis of dental disease can result in exacerbated problems which lead to more extensive and costly care.(Pahel et al. 2011; AAPD P_ECC-Challenges; Davis et al. 2010; Kobayashi et al. 2005; Lee et al. 2006; AAP 2011) Guidance of eruption and development of the primary, mixed, and permanent dentitions contributes to a stable, esthetic, and functional occlusion. ~~Early diagnosis of developing malocclusions may allow for timely therapeutic intervention.~~(AAPD BP_Adolescent; AAPD BP_Developing Dentition)

Components of a comprehensive clinical~~oral~~ examination include ~~assessment of~~:

- general health/growth assessment (e.g., height, weight, BMI calculation, vital signs);~~.~~
- Pain assessment;~~.~~
- extraoral soft tissue examination;~~s.~~
- temporomandibular joint assessment;~~s.~~
- intraoral soft tissue examination;~~s.~~
- oral hygiene and periodontal risk~~health~~ assessment;~~.~~
- intraoral hard tissue examination;~~s.~~
- assessment of the developing occlusion;~~.~~
- radiographic assessment, if indicated;
- caries risk assessment; and~~.~~
- assessment of cooperative potential/behavior of child~~.~~. (AAPD BP_Recordkeeping)

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Based upon the visual examination, the dentist may employ additional diagnostic aids (e.g., ~~radiographs,~~ photographs, pulp vitality testing, laboratory tests, study casts).(Pahel et al. 2011; AAPD BP_Acquired TMD; AAPD BP_Recordkeeping; Dean 2016; Fontana 2018)

The interval of examination should be based on the child's individual needs or risk status/susceptibility to disease; some patients may require examination and preventive services at more or less frequent intervals, based upon historical, clinical, and radiographic findings.(Beil & Rozier 2010; Patel et al. 2010; Pahel et al. 2011;Bourguignon et al 2020, Day et al.2020 ~~Diangelis et al. 2012; Malmgren et al. 2012~~; AAPD P_ECC-Classifications; AAPD BP_Radiographs; ADA 2012;~~ Califano 2003; Clerehugh 2008~~; AAPD BP Perio Diseases) While the prevalence of caries has decreased in primary teeth, the prevalence of having no caries in the permanent dentition remains unchanged; caries remains a ~~Caries and its sequelae are among the most prevalent~~ health problem~~s~~ facing infants, children, and adolescents in America.(Dye et al. 201~~0~~7) Caries lesions are cumulative and progressive and, in the primary dentition, are highly predictive of caries occurring in the permanent dentition.(Fontana & González-Cabezas 2015; Tagliaferro et al. 2006) Reevaluation and reinforcement of preventive activities contribute to improved instruction for the caregiver of the child or adolescent, continuity of evaluation of the patient's health status, and ~~repetitive exposure to dental procedures,~~ potentially allaying anxiety and fear for the apprehensive child or adolescent.(AAPD BP_Behavior Guidance) Individuals with SHCN may require individualized preventive and treatment strategies that take into consideration the unique needs and disabilities of the patient.(AAPD BP_SHCN)

Caries-risk assessment (CRA)

Risk assessment is a key element of contemporary preventive care ~~for infants, children, adolescents, and persons with SHCN~~. CRA~~It~~ should be performed~~carried out~~ as soon as the first primary tooth~~teeth~~ erupts and be reassessed periodically by dental and medical providers.(Fontana & González-Cabezas 2015; AAPD BP_Caries Risk Assessment) The~~Its~~ goal is to prevent disease by ~~(1)~~ identifying patients~~children~~ at high risk for caries and~~, (2)~~ developing individualized preventive measures and caries management, as well as ~~(3) aiding the practitioner in~~ determining appropriate periodicity of services.(AAPD BP_Caries Risk Assessment; Crall et al. 2016; Fontana & Zero 2006) Given that the etiology of dental caries is multifactorial and complex, current caries-risk assessment models entail a combination of factors including diet, fluoride exposure, host susceptibility, and microflora analysis and consideration of how these factors interact with social, cultural, and behavioral factors. More comprehensive models that include social, political, psychological, and environmental determinants of health also are available.(AAPD P_Social Determinants; Fisher-Owens et al. 2007; Lee & Divaris 2014; Seow 2012) Caries risk assessment forms and caries management protocols ~~are available and~~ aim to simplify and clarify the process.(AAPD BP_Caries Risk Assessment; Domejean et al. 2011; Ramos-Gomez & Ng 2011; Fontana &Gonzalez-Cabezas)

Sufficient evidence demonstrates certain groups of children at greater risk for development of early childhood caries (**ECC**) would benefit from infant oral health care.(~~AAPD P_ECC-Classifications; AAPD P_ECC-Challenges;~~ Harris et al. 2004; Ramos-Gomez 2014; Southward et al. 2008; Nunn et al. 2009; Weber-Gasparoni et al. 2010) Infants and young children have unique caries-risk factors such as ongoing establishment of oral flora and host defense systems, susceptibility of newly erupted teeth, and development of dietary habits. Because the etiology of ECC is multi-factorial and significantly influenced by health behaviors,(Jiang et al 2020~~Albino & Tiwari 2016~~) preventive messages for expectant parents and parents of very young children should target factors known to place children at a higher risk for developing caries (e.g., early Mutans streptococci transmission, poor oral hygiene habits, nighttime feeding, high sugar consumption frequency).(AAPD P_ECC-Classifications; AAPD P_ECC-Challenges; Seow 2012; Plutzer & Keirse 2011) Motivational problems may develop when parents/patients are not interested in changing behaviors or feel that the changes require excessive effort. Parental attitude, self-efficacy, and intention have a strong correlation to oral hygiene practices in preschoolers. (Jiang et al) Therefore, ~~it is important that~~ health care professionals should utilize preventive approaches based on psychological and behavioral strategies. Moreover, they should ~~be sensitive to how they can~~ effectively communicate their recommendations so ~~that~~ parents/patients ~~can~~ perceive them~~their recommendations~~ as behaviors worth pursuing. ~~Two e~~Examples of effective motivational approaches used for caries prevention that share similar psychological philosophies are motivational interviewing and self-determination theory.(Halvari et al. 2012; Harrison et al. 2012; Ismail et al. 2011; Miller & Rollnick 2012; Riedy et al. 2015; Weber-Gasparoni, Reeve et al. 2013; Weber-Gasparoni, Warren et al. 2013)

Studies ~~consistently~~ have reported caries experience in the primary dentition as a predictor of future caries.(Mejàre et al. 2014, Lin, Chou, Lin 2021) Early school-aged children are at a transitional phase from primary to mixed dentition. These children face challenges such as unsupervised toothbrushing and increased consumption of cariogenic foods and beverages while at school, placing them at a higher risk for developing caries.(AAPD P_Snacks; Marshall et al. 2003; Chankanka et al. 2011) Therefore, special attention should be given to school-aged children regarding their oral hygiene and dietary practices. The use of newer technology including cellular telephones (e.g., text messaging, apps) may provide an additional intervention to improve adherence to oral hygiene protocols in children and adolescents.(Sharif et al 2019)

Adolescence can be a time of heightened caries activity due to an increased number of tooth surfaces in the permanent dentition and intake of cariogenic substances, as well as low priority for oral hygiene procedures.(AAPD BP_Adolescent; Fisher-Owens et al. 2007; Lee & Divaris 2014) Risk assessment can assure preventive care (e.g., water fluoridation, professional and home-use fluoride and antimicrobial agents, frequency of dental visits) is tailored to each individual's needs and direct resources to those for whom preventive interventions provide the greatest benefit.(AAPD BP_Adolescent; Featherstone J, Chaffee 2018) Because a child's risk for developing dental disease can change over time due to changes in habits (e.g., diet, home care), oral microflora, or physical condition, risk assessment must be documented and repeated regularly and frequently to maximize effectiveness.(Ramos-Gomez et al. 2010; AAPD BP_Caries Risk Assessment)

Periodontal risk assessment (PRA)

Periodontal risk assessment is an important component of the routine examination of pediatric patients. The gingival and periodontal tissues are subject to change due to normal growth and development. PRA identifies risk factors that place individuals at increased risk of developing gingival and periodontal diseases and pathologies, as well as factors that influence the progression of the disease. Risk factors for periodontal disease may be biological, environmental (social), and behavioral (Elangovan et al, 2019). Probing assessments should be initiated after the eruption of the first permanent molars and incisors as tolerated by the child.(BP_Risk Perio) Probing of primary teeth may be indicated when clinical and radiographic findings indicate the presence of periodontal pathology. Bleeding on probing primary teeth during early childhood, even at a low number of sites, is indicative of high susceptibility to periodontal diseases due to the age-dependent reactivity of the gingival tissues to plaque.(Bimstein, 2013) PRA can improve clinical decision making and allow the implementation of individualized treatment planning and proactive targeted interventions.(Douglass 2006) Maintenance of gingival and periodontal health during childhood and adolescence can help assure healthy periodontal health as an adult. (AAPD BP_Periodon)

Prophylaxis and professional topical fluoride treatment

The interval for frequency of professional preventive services is based upon assessed risk for caries and periodontal disease.(Pienihakkinen et al. 2005; Beil & Rozier 2010; Patel et al. 2010; Pahel et al. 2011; AAPD P_Prophylaxis; Ramos-Gomez et al. 2010; AAPD BP_Caries Risk Assessment; Domejean et al. 2011; Ramos-Gomez & Ng 2011; Harris et al. 2004; BP_Perio Risks) Prophylaxis aids in plaque, stain, and calculus removal, as well as in educating the patient on oral hygiene techniques and facilitating the clinical examination.(AAPD P_Prophylaxis) Gingivitis is common~~, which is nearly universal~~ in children and adolescents and~~,~~ usually responds to the implementation of therapeutic measures and routine maintenance.(AAPD BP Perio). ~~thorough removal of bacterial deposits and improved oral hygiene.(Califano 2003; AAPerio 2001/2003; AAPerio 2011~~) Hormonal fluctuations, including those occurring during the onset of puberty and pregnancy~~,~~ can modify the gingival inflammatory response to dental plaque.(~~Califano 2003; Clerehugh 2008;~~ AAPD BP_Pregnant Adolescent~~) Children can develop any of the several forms of periodontitis, with aggressive periodontitis occurring more commonly in children and adolescents than adults.(Califano 2003; Clerehugh 2008; AAPerio 2011)~~Therefore it is important to recognize modifying factors that may result in the development of periodontal disease. (AAPD BP Perio)

Children who exhibit higher risk of developing caries ~~and/~~ or periodontal disease would benefit from recall appointments at greater frequency than every six months (e.g., every three months). (Pienihakkinen et al. 2005; Beil & Rozier 2010; Pahel et al. 2011; AAPD P_Prophylaxis; Ramos-Gomez et al. 2010; AAPD BP_Caries Risk Assessment; Ramos-Gomez & Ng 2011; AAPD BP_Perio Risk) This allows increased professional fluoride therapy application, professional assessment of oral hygiene, and opportunity to foster improvement of oral health by demonstrating proper oral hygiene techniques, in addition to microbial monitoring, antimicrobial therapy reapplication, and reevaluating behavioral changes for effectiveness.(Pienihakkinen et al. 2005; AAPD P_Prophylaxis; Clerehugh 2008; Ramos-Gomez & Ng 2011; Anderson & Shi 2006; Featherstone 2006; Clerehugh & Tugnait 2001) An individualized preventive plan increases the probability of good oral health by demonstrating proper oral hygiene methods/ techniques and removing plaque, stain, and calculus.(Beil & Rozier 2010; ~~Clerehugh 2008~~; Clerehugh & Tugnait 2001)

Fluoride contributes to the prevention, inhibition, and reversal of caries.(AAPD BP_Fluoride Therapy; Adair 2006; Tinanoff 2016) Professional topical fluoride treatments should be based on caries risk assessment.(AAPD P_Dental Home; AAPD BP_Caries Risk Assessment; Adair 2006; Weyant et al. 2013) Plaque and the enamel pellicle are not a barrier to topical fluoride uptake~~ in enamel~~.(AAPD P_Prophylaxis) Consequently, ~~there is no evidence of a difference in caries rates or fluoride uptake in~~

patients who receive rubber cup dental prophylaxis or a tooth-brush prophylaxis before fluoride treatment exhibit no differences in caries rates.(Azarpazhooh & Main 2009; Weyant et al. 2013) Precautionary measures should be taken to prevent swallowing of any professionally-applied topical fluoride. Children at high caries risk should receive greater frequency of professional topical fluoride applications (e.g., every three months).(AAPD BP_Fluoride Therapy; Weyant et al. 2013; Featherstone et al. 2003; Axelsson et al. 2004; Källestål 2005) Ideally, this would occur as part of a comprehensive preventive program in a dental home.(AAPD P_Dental Home)

Fluoride supplementation

The AAPD encourages optimal fluoride exposure for every child, recognizing ~~fluoride in the~~ community water fluoridation ~~supplies~~ as the most beneficial and cost-effective preventive intervention.(AAPD BP_Fluoride Therapy) Fluoride supplementation should be considered for children at moderate to high caries risk when fluoride exposure is not optimal.(~~AAPD BP_Fluoride Therapy~~, BP_Caries risk assessment) Determination of dietary fluoride sources (e.g., drinking water, toothpaste, foods, beverages) before prescribing supplements is required and can help reduce intake of excess fluoride.(AAPD BP_Fluoride Therapy) In addition, supplementation should be in accordance with the guidelines recommended by the AAPD(AAPD BP_Fluoride Therapy) and the American Dental Association.(ADA 2006; Rozier et al. 2010)

Radiographic assessment

Radiographs are a valuable adjunct in the oral health care of infants, children, and adolescents to diagnose and monitor oral diseases and evaluate dentoalveolar trauma, as well as monitor dentofacial development and the progress of therapy.(AAPD BP_Radiographs, ADA/FDA) Timing of initial radiographic examination should not be based on the patient's age, but upon each child's individual circumstances.(AAPD BP_Radiographs; ADA 2012) The need for dental radiographs can be determined only after consideration of the patient's medical and dental histories, completion of a thorough clinical examination, and assessment of the patient's vulnerability to environmental factors that affect oral health.(AAPD BP_Radiographs) Every effort must be made to minimize the patient's radiation exposure by applying good radiological practices (e.g., use of protective aprons, ~~and~~ thyroid collars, rectangular collimation ~~when appropriate~~) and by following the as low as reasonably achievable (ALARA principle).(AAPD BP_Radiographs; Campbell et al)

Anticipatory guidance/counseling

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Anticipatory guidance is the process of providing practical and developmentally-appropriate information about children's health to prepare parents for significant physical, emotional, and psychological milestones.(AAPD BP_Perinatal/Infant; AAPD BP_Adolescent; AAPD P_Dental Home; AAP 2014; Casamassimo & Nowak 2016; Sigurdsson 2013) Individualized discussion and counseling should be an integral part of each visit. Topics should include oral hygiene practices,~~ to be included are~~ oral/dental development and growth, speech/language development, nonnutritive habits, diet and nutrition, injury prevention, tobacco/nicotine product use, substance misuse~~/abuse~~, and intraoral/perioral piercing and oral jewelry/accessories. (AAPD BP_Perinatal/Infant; AAPD BP_Adolescent; AAPD P_Orofacial Injuries; AAPD P_Dental Home; AAPD BP_Developing Dentition; Casamassimo & Nowak 2016; Sigurdsson 2013; AAPD P_Tobacco; AAPD P_Electronic Cigarettes; AAPD P_Piercing; AAPD P_Substance Misuse; American Speech-Language-Hearing Association (no date); Lewis et al. 2000; AAPD P_Emergency OralCare; American Lung Association (no date))

Anticipatory guidance regarding the characteristics of a normal healthy oral cavity should commence ~~occur~~ during infant oral health visits and continue throughout follow-up dental visits. This allows parents to quantify~~measure against~~ any changes such as, but not limited to, growth delays, traumatic injuries, and poor oral hygiene or presence of caries lesions. Educating parents or guardians regarding ~~T~~tooth development and chronology of eruption can help them~~parents~~ better understand the implications of delayed or accelerated tooth emergence. Parents also need to be informed about the benefits~~ and the role~~ of topical fluorides for~~in~~ newly erupted teeth which~~that~~ may be at greater~~higher~~ risk of developing caries, especially during the post-eruption maturation process.(Casamassimo & Nowak 2016) Assessment of each child's developmental milestones (e.g., fine/gross motor skills, language, social interactions) is crucial for early recognition of potential delays and appropriate referral to therapeutic services.(Scharf et al. 2016) Speech and language are integral components of a child's early development.(American Speech-Language-Hearing Association (no date)) Abnormal delays in speech and language production can be recognized early with referral made to address these concerns. Communication and coordination of appliance therapy with a speech and language professional can assist in the timely treatment of speech disorders.(American Speech-Language-Hearing Association (no date)

Oral habits (e.g., nonnutritive sucking: digital and pacifier habits; bruxism; tongue thrust swallow and abnormal tongue position; self-injurious/self-mutilating behavior) may apply forces to teeth and dentoalveolar structures. Although early use of pacifiers and digit sucking are considered normal, pacifier use beyond 18 months can influence the developing orofacial complex(AAPD P_Pacifier). Increased overjet and class II malocclusion are more strongly associated with a finger habit versus a pacifier habit.(Bishara 2006, Cenci 2015). Children having a non-nutritive sucking habit beyond age three have a higher incidence of malocclusions. ~~habits of sufficient frequency, intensity, and duration can contribute to deleterious changes in occlusion and facial~~ (AAPD BP_Developing Dentition; AAPD Pacifier) ~~It is important to discuss the need for early pacifier and digit sucking, then the need to wean from the habits before malocclusion or skeletal dysplasias occur.(AAPD BP_Developing Dentition)~~ Early dental visits provide an opportunity to counsel ~~encourage~~ parents to help their children stop sucking habits ~~age three years or younger~~ before malocclusion or skeletal dysplasias occur.(AAPD P_Pacifiers, BP_Devel Dentition) For school-aged ~~children~~ and adolescent patients, counseling regarding any existing habits (e.g., fingernail biting, clenching, bruxism), including the potential immediate and long-term effects on the craniofacial complex and dentition, is appropriate.(AAPD BP_Developing Dentition) ~~Parents should be provided with information regarding the potential immediate and long-term effects on the craniofacial complex and dentition from a habit. If treatment is indicated, it~~ Management of an oral habit can include patient/parent counseling, behavior modification techniques, appliance therapy, or referral to other providers including, but not limited to, orthodontists, psychologists, or otolaryngologists.(AAPD BP_Developing Dentition)

Oral hygiene counseling involves the parent and patient. Initially, oral hygiene is the responsibility of the parent. As the child develops, home care can be~~is~~ performed jointly by parent and child. When a child demonstrates the understanding and ability to perform personal hygiene techniques, the health care professional should counsel the child. The effectiveness of home care should be monitored at every visit and includes a discussion on the consistency of daily oral hygiene preventive activities, including adequate fluoride exposure.(Pienihakkinen 2005; Beil & Rozier 2010; AAPD BP_Adolescent; AAPD BP_Caries Risk Assessment; AAPD BP_Fluoride Therapy; AAPD P_Fluoride)

The development of dietary habits and childhood food preferences appears to be established early and may affect the oral health as well as general health and well-being of a child.(Kranz et al. 2006) The establishment of a dental home no later than 12 months of age allows dietary and nutrition counseling to occur early. This helps parents ~~to~~ develop proper oral health habits early in their child's life, rather than trying to change established unhealthy habits later. During infancy, counseling should focus on breastfeeding, bottle or no-spill cup usage, concerns with nighttime feedings, frequency of in-between meal consumption of sugar-sweetened beverages (e.g., sweetened milk, ~~100 percent juice,~~ soft drinks, fruit-flavored drinks, sports drinks) and snacks, as well as special diets.(AAPD P_Dietary

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Recommendations, Lott 2019) Excess consumption of carbohydrates, fats, and sodium contribute to poor systemic health.(Drewnowski 2010; Ervin et al. 2012; Mobley et al. 2009) Dietary analysis and the impact ~~role~~ of dietary choices on oral health, malnutrition, and obesity(Davidson et al, Schroth et al), as well as quality of life, should be addressed through nutritional and preventive oral health ~~counseling at periodic visits~~.(AAPD P_Dietary Recommendations; USDA 2020~~2015~~) The U.S. Departments of Health and Human Services and Agriculture provide dietary guidelines for~~every five years to help~~ Americans two years of age and older every five years to promote a healthy diet and~~make healthy choices to~~ help prevent chronic diseases ~~and guidance for parents and their children and promote a healthy diet~~.(US DHHS 2015~~2016~~)

Traumatic dental injuries in the primary and permanent dentition occur with great frequency with a prevalence of one third of pre-school children and one fourth of school age children.(Glendor 2008, Day 2020)~~Traumatic dental injuries that occur in preschool, school-age children, and young adults comprise five percent of all injuries for which treatment is sought.(Andreasen et al. 2007)~~ Facial trauma that results in fractured, displaced, or lost teeth can have significant negative functional, esthetic, and psychological effects on children.(Lee & Divaris 2009) Practitioners should provide age-appropriate injury prevention counseling for orofacial trauma.(AAPD P_Orofacial Injuries; Sigurdsson 2013) Initial~~ly,~~ discussions ~~w~~should include advice regarding play objects, pacifiers, car seats, and electrical cords. As motor coordination develops and the child grows older, the parent/patient should be counseled on additional safety and preventive measures, including use of protective equipment (e.g., athletic mouthguards helmets with faceshields) for sporting and high-speed activities (e.g., baseball, bicycling, skiing, four-wheeling). Dental injuries could have improved outcomes not only if the public were aware of first-aid measures and the need to seek immediate treatment, but also if the injured child had access to emergency care at all times. Caregivers report that, even though their children had a dental home, they have experienced barriers to care when referred outside of the dental home for emergency services.(Meyer et al. 2017) Barriers faced by caregivers include availability of providers and clinics for delivery of emergency care and the distance one must travel for treatment. Therefore, ~~it is important that all~~ primary care providers should inform parents about ways to access emergency care for dental injuries and provide telephone numbers to access a dentist, including for after-hours emergency care.(AAPD P_Emergency Oral Care) Teledentistry may serve as an adjunct with time-sensitive injuries or when unexpected circumstances result in difficulties accessing care.(AAPD P_Teledentistry)

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Smoking and smokeless tobacco use almost always are initiated and established in adolescence. (American Lung Association (no date); Albert et al. 2006; US DHHS 2012) In 2020, 6.7~~2016, 7.2~~ percent of middle school students and 23.6~~20.2~~ percent of high school students reported current tobacco product use.(CDC 2020~~2017~~) The most common tobacco products used by middle school and high school students were reported to be e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, and bidis (unfiltered cigarettes from India).(CDC 2020~~2017~~) E-cigarette deceased from 27.5 to 19.6 percent among high school students and from 5.3 to 4.7 percent among middle school students from 2019 to 2020.(CDC 2020) The recent decline reversing previous trends may be attributable to multiple factors including increasing the age of sale of tobacco products from 18 to 21 years.(CDC 2020) ~~E-cigarette use rose from 1.5 percent to 16.0 percent among high school students and from 0.6 percent to 5.3 percent among middle school students from 2011 to 2015.(CDC 2017) During this time period,~~ ~~c~~Children may be exposed to opportunities to experiment with other substances that negatively impact their health and well-being. Practitioners should provide education regarding the serious health consequences of tobacco use and exposure to secondhand smoke.(AAPD P_Tobacco; CDC 2020~~2017~~) The practitioner may need to obtain information regarding tobacco use and alcohol/ drug misuse~~abuse~~ confidentially from an adolescent patient(AAPD BP_Adolescent; AAPD P_Substance Misuse) When tobacco or substance abuse has been identified, practitioners should provide brief interventions for encouragement, support, and positive reinforcement for avoiding substance use.(AAPD P_Tobacco; AAPD P_Substance Misuse) If indicated, dental practitioners should provide referral to primary care providers or behavioral-health/addiction specialists for assessment and/or treatment of substance use disorders.(AAPD P_Substance Misuse)

Human papilloma virus (**HPV**) is associated with several types of cancers, including oral and oropharyngeal cancers. (Jiang, National Cancer Institute HPV, 2021) Seventy percent of oropharyngeal cancers in the United States are caused by HPV, and the number of oropharyngeal cancers is increasing annually.(National Cancer Institute HPV, 2021) Evidence supports the HPV vaccine as a means to lessen the risk of oral HPV infection.(Jiang, National Cancer Institute, Oral 2021) The vaccine provides the greatest protection when administered at 9-12 years of age.(National Cancer Institute HPV, 2021) As adolescent patients tend to see the dentist twice yearly and more often than their medical care provider, this is a window of opportunity for the dental professional to counsel patients and parents about HPV’s link to oral cancer and the potential benefits of receiving the HPV vaccine. (AAPD P_HPV).

Complications from intraoral/perioral piercings can range from pain, infection, and tooth fracture to life-threatening conditions of bleeding, edema, and airway obstruction.(AAPD P_Piercing) Education regarding pathologic conditions and sequelae associated with piercings should be initiated for the preteen child/parent and reinforced during subsequent periodic visits. The AAPD strongly opposes the practice of piercing intraoral and perioral tissues and use of jewelry on intraoral and perioral tissues due to the potential for pathological conditions and sequelae associated with these practices.(AAPD P_Piercing)

Treatment of dental disease/injury

Health care providers who diagnose oral disease or trauma should either provide therapy or refer the patient to an appropriately-trained individual for treatment.(AAPD P_Ethical Responsibility) Immediate intervention is necessary to prevent further dental destruction, as well as more widespread health problems. Postponed treatment can result in exacerbated problems that may lead to the need for more extensive care.(Berg & Stapleton 2012; Clarke et al. 2006; Dye et al. 2004; Lee et al. 2006) Early intervention could result in savings of health care dollars for individuals, community health care programs, and third-party payors.(AAP 2005; Scharf et al. 2016; Brown 2006; Clarke et al. 2006)

Treatment of developing malocclusion

Guidance of eruption and development of the primary, mixed, and permanent dentitions is an integral component of comprehensive oral health care for all pediatric dental patients.(AAPD BP_Developing Dentition) Dentists have the responsibility to recognize, diagnose, and manage or refer abnormalities in the developing dentition as dictated by the complexity of the problem and the individual clinician's training, knowledge, and experience.(AAPD P_Ethnical Responsibility) Early diagnosis and successful treatment of developing malocclusions can have both short-term and long-term benefits, while achieving the goals of occlusal harmony and function and dentofacial esthestics.(Dean & Walsh 2020~~Kranz et al. 2006; Drewnowski 2010; Ervin et al. 2012; Mobley et al. 2009; USDA 2015~~) Early treatment is beneficial for many patients, but is not indicated for every patient. When there is a reasonable indication that an oral habit will result in unfavorable sequelae in the developing permanent dentition, any treatment must be appropriate for the child's development, comprehension, and ability to cooperate. Use of an appliance is indicated only when the child wants to stop the habit and would benefit from a reminder. (AAPD BP_Developing Dentition) At each stage of occlusal development, the objectives of intervention/ treatment include: (1) ~~reversing~~ managing adverse growth, (2) ~~preventing~~ correcting dental and skeletal disharmonies, (3) improving esthetics of the smile and the accompanying positive effects on~~, (4) improving~~ self-image, and (~~5~~4) improving the occlusion.(AAPD BP_Developing Dentition)

Sealants

A 2016 systematic review concluded sealants are effective in preventing and arresting pit-and-fissure occlusal caries lesions of primary and permanent molars in children and adolescents and can minimize the progression of noncavitated occlusal caries lesions.(Wright et al. 2016) They are indicated for primary and permanent teeth with pits and fissures ~~that are predisposed to plaque retention.(Beauchamp et al.2008~~ Wright et al. 2016) At-risk pits and fissures should be sealed as soon as possible. Because caries risk may increase at any time during a patient's life due to changes in habits (e.g., dietary, home care), oral microflora, or physical condition, unsealed teeth subsequently might benefit from sealant application. (Sasa & Donly 2010) The need for sealant placement should be reassessed at periodic preventive care appointments. Sealants should be monitored and repaired or replaced as needed.(Beauchamp et al. 2008; Sasa & Donly 2010; AAPD P_Third Party Reimbursement/Dental Sealants)

Third molars

Panoramic or periapical radiographic assessment is indicated during late adolescence to assess the presence, position, and development of third molars.(AAPD BP_Radiographs; ADA 2012) Impacted third molars are potentially pathologic; a 2016 study found the incidence of cysts or tumors associated with impacted mandibular third molars to be 0.41 - 0.71 percent in patients younger than 30 years.(Shin et al) A decision to remove or retain third molars should be made before the middle of the third decade.(Lieblich et al. 2017; AAOMS 2016) ~~Impacted third molars are potentially pathologic. Pathologic conditions generally are more common with an increase in age. Evaluation and treatment may re-quire removal, exposure, and/or repositioning. In selected cases, long-term clinical and radiographic monitoring may be needed. Treatment should be provided before pathologic conditions adversely affect the patient's oral and/or systemic health.(Dean 2016; Lieblich et al. 2017; AAOMS 2016)5~~ Consideration should be given to removal when ~~there is~~ a high probability of disease or pathology exists~~and/~~ or the risks associated with early removal are less than the risks of later removal.(AAPD BP_Developing Dentition; Klene et al 2020 ~~Dean 2016~~; AAOMS 2016) Treatment should be provided before pathologic conditions adversely affect the patient's oral or systemic health.(Lieblich et al. 2017; AAOMS 2016) Postoperative complications for removal of impacted third molars are low when performed at an early age.(Blondeau & Daniel 2007) A Cochrane review in 2012 reported ~~there was~~ no difference in late lower incisor crowding with removal or retention of asymptomatic impacted third molars.(Mettes et al. 2012) When the decision is made to maintain disease free impacted wisdom teeth, clinical and radiographic monitoring is appropriate to prevent undesirable outcomes.(Ghaeminia et al)

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Referral for regular and periodic dental care

As adolescent patients approach the age of majority, ~~it is important to~~ educating~~e~~ the patient and parent on the value of transitioning to a dentist who is experienced~~knowledgeable~~ in adult oral health and can help minimize disruption of high-quality, developmentally-appropriate health care. At the time agreed upon by the patient, parent, and pediatric dentist, the patient should be referred to a specific practitioner in an environment sensitive to the adolescent's individual needs.(AAPD BP_Adolescent; AAPD P_Transitioning) Until the new dental home is established, the patient should maintain a relationship with the current care provider and have access to emergency services. For the patient with SHCN, in cases where it is not possible or desired to transition to another practitioner, the dental home can remain with the pediatric dentist and appropriate referrals for specialized dental care should be recommended when needed.(AAPD P_Transitioning) Proper communication and records transfer allow for consistent and continuous care for the patient.(AAPD BP_Recordkeeping)

Recommendations by age

Six to 12 months

1. Complete the clinical oral examination with adjunctive diagnostic tools (e.g., radiographs as determined by child's history, clinical findings, and susceptibility to oral disease) to assess oral growth and development, pathology, and/or injuries; provide diagnosis.
2. Complete a caries risk assessment.
3. Provide oral hygiene counseling for parents, including the implications of the oral health of the caregiver.
4. Clean teeth and remove supra- and sub-gingival stains or deposits as indicated.
5. Assess the child's exposure to systemic and topical fluorides ~~status~~ (including type of infant formula used)~~, if any,~~ and exposure to fluoridated toothpaste~~)~~ and provide counseling regarding fluoride.
6. Assess appropriateness of feeding practices, including bottle and breast-feeding, and provide counseling as indicated; provide dietary counseling related to oral health.
7. Provide age-appropriate injury prevention counseling for orofacial trauma.
8. Provide counseling for nonnutritive oral habits (e.g., digit, pacifiers).
9. Provide required treatment and/or appropriate referral for any oral diseases or injuries.
10. Provide anticipatory guidance.

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11. Assess overall growth and development~~,~~ and make appropriate referral to therapeutic services if needed.
12. Consult with the child's physician as needed.
13. Determine the interval for periodic reevaluation.

12 to 24 months

1. Repeat the procedures for ages six to 12 months every six months or as indicated by the child's individual needs or risk status/susceptibility to disease.
2. Assess appropriateness of feeding practices (including bottle, breast-feeding, and no-spill training cups) and provide counseling as indicated.
3. Review patient's fluoride status and provide parental counseling.
4. Provide topical fluoride treatments every six months or as indicated by the child's individual needs or risk status/susceptibility to caries~~disease~~.

Two to six years

1. Repeat the procedures for 12 to 24 months every six months or as indicated by the child's individual needs or risk status/susceptibility to disease, including periodontal conditions. Provide age-appropriate oral hygiene instructions.
2. Assess diet and body mass index to identify patterns placing patients at increased risk for dental caries or obesity. Provide counseling or appropriate referral to a pediatric or nutritional specialist as indicated.
3. Scale and clean the teeth every six months or as indicated by individual patient's needs.

4~~3~~. Provide pit and fissure sealants for caries-susceptible anterior and posterior primary and permanent teeth.

5~~4~~. Provide counseling and services (e.g., mouthguards) as needed for orofacial trauma prevention.

6~~5~~. Assess developing dentition and occlusion and ~~P~~provide assessment/treatment or referral of ~~developing~~ malocclusion as indicated by individual patient's needs.

7~~6~~. Provide required treatment and/or appropriate referral for any oral diseases, habits, or injuries as indicated.

8~~7~~. Assess speech and language development and provide appropriate referral as indicated.

Six to 12 years

1. Repeat the procedures for ages two to six years every six months or as indicated by child's individual needs.
2. Complete a periodontal risk assessment that may include radiographs and periodontal probing with eruption of first permanent molars.
3. Provide substance misuse~~abuse~~ counseling (e.g., smoking, smokeless tobacco) and~~/or~~ referral to primary care providers or behavioral health/addiction specialists if indicated.
4. Provide education and counseling regarding HPV and the benefits of the HPV vaccine.
5~~3~~. Provide counseling on intraoral/perioral piercing.

12 years and older

1. Repeat the procedures for ages six to 12 years every six months or as indicated by the child's individual needs or risk status/susceptibility to disease.
2. During late adolescence, assess the presence, position, and development of third molars, giving consideration to removal when there is a high probability of disease or pathology ~~and/~~or the risks associated with early removal are less than the risks of later removal.
3. At an age determined by patient, parent, and pediatric dentist, refer the patient to a general dentist for continuing oral care.

References

Adair SM. Evidence-based use of fluoride in contemporary pediatric dental practice. Pediatr Dent 2006;28 (2):133-42.

Albert DA, Severson HH, Andrews JA. Tobacco use by adolescents: The role of the oral health professional in evidence-based cessation program. Pediatr Dent 2006; 28(2):177-87.

Albino J, Tiwari T. Preventing childhood caries: A review of recent behavioral research. J Dent Res 2016;95(1):35-42.

American Academy of Pediatric Dentistry. Periodicity of examination, preventive dental services, and oral treatment for children. Reference Manual 1991-1992. Chicago, Ill.: American Academy of Pediatric Dentistry; 1991:38-39.

American Academy of Pediatric Dentistry. Best practices for periodicity of examination, preventive dental services, anticipatory guidance/counseling, and oral treatment for infants, children, and adolescents. Pediatr Dent 2018;40(6):194-204.

American Academy of Pediatric Dentistry. Acquired temporomandibular disorders in infants, children, and adolescents. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021 426-31.~~Pediatr Dent 2018;40(6):366-72~~.

American Academy of Pediatric Dentistry. Adolescent oral health care. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:267-76. ~~Pediatr Dent 2018;40(6):221-8.~~

American Academy of Pediatric Dentistry. Behavior guidance for the pediatric dental patient. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:306-24. ~~Pediatr Dent 2018;40(6):254-67~~.

American Academy of Pediatric Dentistry. Caries risk assessment and management for infants, children, and adolescents. ~~Pediatr Dent 2018;40(6):205-12~~. PENDING

American Academy of Pediatric Dentistry. Classification of periodontal diseases in infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 435-49.

American Academy of Pediatric Dentistry. Fluoride therapy. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 302-5. ~~Pediatr Dent 2018;40(6):250-3~~.

American Academy of Pediatric Dentistry. Management considerations for pediatric oral surgery and oral pathology. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 450-60~~Pediatr Dent 2018;40(6):373-82~~.

American Academy of Pediatric Dentistry. Management of dental patients with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 287-94~~Pediatr Dent 2018;40(6):237-42~~.

American Academy of Pediatric Dentistry. Management of the developing dentition and occlusion in pediatric dentistry. The Reference Manual of Pediatric Dentistry. Chicago Ill.: American Academy of Pediatric Dentistry; 2021:408-25~~Pediatr Dent 2018;40(6):352-65~~.

American Academy of Pediatric Dentistry. Oral health care for the pregnant adolescent. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:277-86~~Pediatr Dent 2018;40 (6):229-36~~.

American Academy of Pediatric Dentistry. Pediatric restorative dentistry. ~~Pediatr Dent 2018;40(6):330-42~~. PENDING

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Perinatal and infant oral health care. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:262-6~~Pediatr Dent 2018;40(6):216-20~~.

American Academy of Pediatric Dentistry. Policy on dietary recommendations for infants, children, and adolescents. ~~Pediatr Dent 2018;40(6):65-7~~. PENDING

American Academy of Pediatric Dentistry. Policy on early childhood caries (ECC): ~~Classifications,~~ ~~c~~Consequences~~,~~ and preventive strategies. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:81-4~~Pediatr Dent 2018;40(6):60-2~~.

American Academy of Pediatric Dentistry. Policy on early childhood caries (ECC): Unique challenges and treatment options. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:85-6~~Pediatr Dent 2018;40(6):63-4~~.

American Academy of Pediatric Dentistry. Policy on electronic nicotine delivery systems (ENDS)~~electronic cigarettes~~. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:97-100~~Pediatr Dent 2018;40(6):75-7~~.

American Academy of Pediatric Dentistry. Policy on emergency oral care for infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:63. ~~Pediatr Dent 2018;40(6):46~~.

American Academy of Pediatric Dentistry. Policy on ethical responsibility in the oral health management of infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:172-3 ~~Pediatr Dent 2018;40(6):142-3~~.

American Academy of Pediatric Dentistry. Policy on human papilloma virus vaccinations. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:106-7.

American Academy of Pediatric Dentistry. Policy on intraoral/perioral piercing and oral jewelry/accessories. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:108-9~~Pediatr Dent 2018;40(6):84-5~~.

American Academy of Pediatric Dentistry. Policy on pacifiers. The Reference Manual of Pediatric Dentistry. Chicago,Ill.: American Academy of Pediatric Dentistry, PENDING

American Academy of Pediatric Dentistry. Policy on prevention of sports-related orofacial injuries. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 110-5~~Pediatr Dent 2018;40(6):86-91~~.

American Academy of Pediatric Dentistry. Policy on snacks and beverages sold in schools. ~~Pediatr Dent 2018; 40(6):68-9~~. PENDING

American Academy of Pediatric Dentistry. Policy on social determinants of children's oral health and health disparities. The Reference Manual of Pediatric Dentistry. Chicago Ill.: American Academy of Pediatric Dentistry; 2021: 28-31~~Pediatr Dent 2018;40(6):23-6~~.

American Academy of Pediatric Dentistry. Policy on substance misuse~~abuse~~ in adolescent dental patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 101-5.~~Pediatr Dent 2018;40(6):78-81~~.

American Academy of Pediatric Dentistry. Policy on teledentistry. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 51-2.

American Academy of Pediatric Dentistry. Policy on the dental home. The Reference Manual of Pediatrc Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 43-4~~Pediatr Dent 2018;40(6):29-30~~.

American Academy of Pediatric Dentistry. Policy on the role of dental prophylaxis in pediatric dentistry. ~~Pediatr Dent 2018;40(6):47-8~~. PENDING

American Academy of Pediatric Dentistry. Policy on third-party reimbursement of fees related to dental sealants. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 150-1~~Pediatr Dent 2018;40(6):122-3~~.

American Academy of Pediatric Dentistry. Policy on tobacco use. The Reference Manual of Pediatric Dentistry. Chicago Ill.: American Academy of Pediatric Dentistry; 2021: 91-6~~Pediatr Dent 2018;40(6):70-4~~.

American Academy of Pediatric Dentistry. Policy on transitioning from a pediatric~~-centered~~ to an adult-~~centered~~ dental home for individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 159-63~~Pediatr Dent 2018;40(6):131-4~~.

American Academy of Pediatric Dentistry. Policy on use of fluoride. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 66-7~~Pediatr Dent 2018;40(6):49-50~~.

American Academy of Pediatric Dentistry. Prescribing dental radiographs for infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 258-61~~Pediatr Dent 2018;40(6):213-5~~.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Record-keeping. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021: 484-91~~Pediatr Dent 2018;40(6):401-8. 43~~.

American Academy of Pediatric Dentistry. Risk assessment and management of periodontal diseases and pathologies in pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago,Ill.: American Academy of Pediatric Dentistry, PENDING

American Academy of Pediatrics Council on Children with Disabilities. Care coordination: Integrating health and related systems of care for children with special health care needs. Pediatrics 2005;116(5):1238-44.

American Academy of Pediatrics. Early childhood caries in indigenous communities. Pediatr Dent 2011;127(6): 1190-8.

American Academy of Pediatrics. Maintaining and improving the oral health of young children. Pediatrics 2014;134(6):1224-9.

~~American Academy of Periodontology Research Science and Therapy Committee. Treatment of plaque-induced gingivitis, chronic periodontitis, and other clinical conditions. J Periodontol 2001;72(12):1790-800. Erratum in J Periodontol 2003;74(10):1568.~~

~~American Academy of Periodontology. Comprehensive periodontal therapy: A statement by the American Academy of Periodontology. J Periodontol 2011;82(7):943-9.~~

American Association of Oral and Maxillofacial Surgeons. Advocacy white paper on third molar teeth (2016). Available at: "https://www.aaoms.org/docs/govt_affairs/ advocacy_white_papers/management_third_molar_ white_paper.pdf ". Accessed March 2, 2022.~~June 22, 2018~~. ~~(Archived by WebCite® at: "http:www.webcitation.org/70MmPeb9T")~~

American Dental Association Council on Scientific Affairs. Professionally-applied topical fluoride: Evidence-based clinical recommendations. J Am Dent Assoc 2006; 137(8):1151-9.

American Dental Association. Dental radiographic examinations: Recommendations for patient selection and limiting radiation exposure. Available at: "https://www. ada.org/~/media/ADA/Member%20Center/ Files/Dental_Radiographic_Examinations_2012.pdf ". Accessed March 2, 2022~~June 13, 2018~~. ~~(Archived by WebCite® at: "http:www.web citation.org/70MIED887")~~

American Lung Association. Stop Smoking. Available at: "http://www.lung.org/stop-smoking/". Accessed March 2, 2022~~June 22, 2018. (Archived by WebCite® at: "http://www.web citation.org/71PFNafLe")~~

American Speech-Language-Hearing Association. Available at: “http://www.asha.org/public/speech/ development/chart/”. Accessed March 2, 2022~~June 22, 2018~~. ~~(Archived by WebCite® at: “http:www.webcitation.org/70MIZettj”)~~

Anderson MH, Shi W. A probiotic approach to caries management. Pediatr Dent 2006;28(2):151-3.

~~Andersson L, Andreasen JO, Day P, et al. International Association of Dental Traumatology Guidelines for the Management of Traumatic Dental Injuries: 2. Avulsion of permanent teeth. Dent Traumatol 2012;28(2):88-96.~~

Andreasen JO, Andreasen FM, Andersson L. Textbook and Color Atlas of Traumatic Injuries to the Teeth, 4th ed. Oxford, UK: Wiley-Blackwell; 2007.

Axelsson S, Söder B, Norderam G, et al. Effect of combined caries-preventive methods: A systematic review of controlled clinical trials. Acta Odontol Scand 2004;62 (3):163-9.

Azarpazhooh A, Main PA. Efficacy of dental prophylaxis (rubber-cup) for the prevention of caries and gingivitis: A systematic review of the literature. Brit Dent J 2009; 207(7):E14.

~~Beauchamp J, Caufield PW, Crall JJ, et al. Evidence-based clinical recommendations for the use of pit-and-fissure sealants. J Am Dent Assoc 2008;139(3):257-67.~~

Beil HA, Rozier RG. Primary health care providers’ advice for a dental checkup and dental use in children. Pediatrics 2010;126(2):435-41.

Berg JH, Stapleton FB. Physician and dentist: New initiatives to jointly mitigate early childhood oral disease. Clin Pediatr 2012;51(6):531-7.

~~Bimstein E, Huja Pe, Ebersole JL. The potential lifespan impact of gingivitis and periodontitis in children. J Clini Pediatr Dent 2013;38 (2):95-99.~~.

Bishara SE, Watten JJ, Broffitt B, et al. Changes in the prevalence of nonnutritive sucking patterns in the first 8 years of life. Am J Orthod Dentofacial Orthop 2006;130(1):31-6.

Bourguignon C, Cohenca N, Lauridsen E, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. Dent Traumatol 2020:36(4):324-30.

Brown E Jr. Children’s Dental Visits and Expenses, United States, 2003. Statistical Brief #117. March, 2006. Agency for Healthcare Research and Quality, Rockville, Md. Available at: “http://meps.ahrq.gov/mepsweb/ data_files/publications/st117/stat117.shtml”. Accessed March 2, 2022~~June 22, 2018~~. ~~(Archived by WebCite® at: “http:www.webcitation. org/70MIED887”)~~

Califano JV, Research Science and Therapy Committee American Academy of Periodontology. Periodontal diseases of children and adolescents. J Periodontol 2003; 74(11):1696-704.

Campbell R, Wilson S, Zhand Y, Scarfe W. A survey on radiation exposure reduction including rectangular collimation for intraoral radiography by pediatric dentists in the United States. J Am Dent Assoc 2020;15:1(4):287-96.

Casamassimo PS, Nowak AJ. Anticipatory guidance. In: Berg JH, Slayton RL, eds. Early Childhood Oral Health, 2nd ed. Hoboken, N.J.: John Wiley & Sons, Inc.; 2016: 169-92.

Cenci VS, Marciel SM, Jarrus ME, et al. Pacifier-sucking habit duration and frequency on occlusal and myofunctional alterations in preschool children. Braz Oral Res 2015;29(1):1-7.

Centers for Disease Control and Prevention. Tobacco use among middle and high school students – United States, 2020 ~~2011-2016~~. MMWR Morb Mortal Wkly Rep 2020;69(50:1881-8. ~~2017;66(23):597-736. Erratum in MMWR Morb Mortal Wkly Rep 2017;66(23):765.~~

Chankanka O, Marshall TA, Levy SM, et al. Mixed dentition cavitated caries incidence and dietary intake frequencies. Pediatr Dent 2011;33(3):233-40.

Clarke M, Locker D, Berall G, Pencharz P, Kenny DJ, Judd P. Malnourishment in a population of young children with severe early childhood caries. Pediatr Dent 2006;28(3):254-9.

Clerehugh V. Periodontal diseases in children and adolescents. British Dental J 2008;204(8):469-71.

Clerehugh V, Tugnait A. Periodontal diseases in children and adolescents: 2. Management. Dent Update 2001;28 (6):274-81.

Crall JJ, Quiñonez RB, Zandona AF. Caries risk assessment: Rationale, uses, tools, and state of development. In: Berg JH, Slayton RL, eds. Early Childhood Oral Health, 2nd ed. Hoboken, N.J.: John Wiley & Sons, Inc.; 2016:193-220.

Davidson K, Schroth R, Levi J, Yaffe A, Mittermuller B, Sellers C. Higher body mass index associated with severe early childhood caries. BMC Pediatrics 2016;16(137) 1-8.

Davis EE, Deinard AS, Maiga EW. Doctor, my tooth hurts: The costs of incomplete dental care in the emergency room. J Pub Health Dent 2010;70(3):205-10.

Day PF, Flores MT, O'Connell AC, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries:3. Injuries in the primary dentition. Dent Traumatol. 2020;36(4):343-9.

~~Dean JA. Examination of the mouth and other relevant structures. In: McDonald and Avery's Dentistry for the Child and Adolescent. 11~~~~10th ed. St. Louis, Mo.: Elsevier; 2016:1-16.~~

Dean JA, Walsh JS. Managing the developing occlusion. In: Dean JA, ed. McDonald and Avery's Dentistry for the Child and Adolescent. 11th ed. St. Louis, Mo.: Elsevier Co.; 2020:467-530~~2016:415-78~~.

~~Diangelis AJ, Andreasen JO, Ebeleseder KA, et al. International Association of Dental Traumatology Guidelines for the Management of Traumatic Dental Injuries: 1. Fractures and luxations of permanent teeth. Dent Traumatol 2012;28(1):2-12.~~

Domejean S, White JM, Featherstone JD. Validation of the CDA CAMBRA caries risk assessment: A six year retrospective study. J Calif Dent Assoc 2011;39(10):709-15.

Douglass CW. Risk assessment and management of periodontal disease. J Am Dent Assoc 2006;137 Suppl: 7S-32S.

Drewnowski A. The cost of U.S. foods as related to their nutritive value. Am J Clin Nutr 2010;92(5):1181-8.

Dye BA, Mitnik GL, Iafolia TJ, Vargus CM. Trends in dental caries in children and adolescents according to poverty status in the United States from 1999 through 2004 and from 2011 through 2014. J Am Dent Assoc.2017; \148(8):550-74.

~~Dye BA, Shenkin JD, Ogden CL, Marshall TA, Levy SM, Kanellis MJ. The relationship between healthful eating practices and dental caries in children ages 2-5 years in the United States, 1988-1994. J Am Dent Assoc 2004; 135(1):55-6.~~

~~Dye BA, Tan S, Smith V, et al. Trends in oral health status. United States, 1988-1984 and 1999-2004. Vital Health Stat ll 2007;248:1-92.~~

Ervin RB, Kit BK, Carroll MD, Ogden CL. Consumption of added sugar among U.S. children and adolescents, 2005-2008. NCHS Data Brief 2012;3(87):1-8.

Featherstone JD, Adair SM, Anderson MH, et al. Caries management by risk assessment: Consensus statement, April 2002. J Calif Dent Assoc 2003;331(3):257-69.

Featherstone JDB. Caries prevention and reversal based on the caries balance. Pediatr Dent 2006;28(2):128-32.

Featherstone JDB, Chaffee B. The evidence for caries management by risk assessment (CAMBRA). Adv Dent Res 2018;29(1):9-14.

Fisher-Owens SA, Gansky SA, Platt LJ, et al. Influences on children's oral health: A conceptual model. Pediatrics 2007;120(3):e510-20.

Fontana M, González-Cabezas C. The clinical, environmental, and behavioral factors that foster early childhood caries: Evidence for caries risk assessment. Pediatr Dent 2015;37(3):217-25.

Fontana M. Noninvasive caries risk-based management in private practice settings may lead to reduced caries experience over time. J Evid Based Dent Pract 2016;16 (4):239-42.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Fontana M. Patient evaluation and risk assessment. In: Little JW, Falace DA, Miller CS, Rhodus, NL eds. Dental Management of the Medically Compromised Patient. 9th ed. St. Louis, Mo.: Elsevier; 2016:2-17.

Fontana M, Zero DT. Assessing patients' caries risk. J Am Dent Assoc 2006;137(9):1231-9.

Fouad AF, Abbott PV, Tsilingaridis G. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. Dent Traumatol 2020;36(4):331-42.

Glendor U. Epidemiology of traumatic injuries - A 12 year review of the literature. Dent Traumatol 2008; 24(6):603-611.

Ghaeminia H, Toedtling V, Tummers M, Hoppenreijs T, Van der Sanden W, Mettes T. Surgical removal versus retention for the management of asymptomatic disease-free impacted wisdom teeth. Cochrane Database Syst Rev 2020;5:CD003879. Accessed March 6, 2022.

Halvari AEM, Halvari H, Bjørnebekk G, Deci EL. Self-determined motivational predictors of increases in dental behaviors, decreases in dental plaque, and improvement in oral health: A randomized clinical trial. Health Psychol 2012;31(6):777-88.

Harris R, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: A systematic review of the literature. Community Dent Health 2004;21(suppl):71-85.

Harrison RL, Veronneau J, Leroux B. Effectiveness of maternal counseling in reducing caries in Cree children. J Dent Res 2012;91(11):1032-7.

Ignelzi M. Pit and fissure sealants - An ongoing commitment. Calif Dent Assoc J 2010;38(10):725-8.

Ismail AI, Ondersma S, Jedele JM, Little RJ, Lepkowski JM. Evaluation of a brief tailored motivational intervention to prevent early childhood caries. Community Dent Oral Epidemiol 2011;39(5):433-48.

Jackson SL, Vann WF, Kotch J, Pahel BT, Lee JY. Impact of poor oral health on children's school attendance and performance. Amer J Publ Health 2011;10(10):1900-6.

Jiang S, Dong Y. Human papillomavirus and oral squamous cell carcinoma: A review of HPV-positive oral squamous cell carcinoma and possible strategies for future. Curr Probl Cancer 2017:41(5):323-7.

Jiang S, McGrath C, Lo E,,Ho S, GaoX. Motivational interviewing to prevent early childhood caries: A randomized control trial. J Dent 2020;97(6):1-7.

Källestål C. The effect of five years' implementation of caries-preventive methods in Swedish high-risk adolescents. Caries Res 2005;39(1):20-6.

Kempe A, Beaty B, Englund BP, et al. Quality of care and use of the medical home in a state-funded capitated primary care plan for low-income children. Pediatrics 2000; 105(5):1020-8.

Klene CA, Ferneini EM, Bennett JD. Oral surgery in the pediatric patient. In: Dean JA, ed. McDonald and Avery's Dentistry for the Child and Adolescent. 11th ed. St Louis, Mo: Elsevier Co; 2020: 659-72.

Kobayashi M, Chi D, Coldwell SE, Domoto P, Milgrom P. The effectiveness and estimated costs of the access to baby and child dentistry programs in Washington State. J Am Dent Assoc 2005;136(9):1257-63.

Kranz S, Smiciklas-Wright H, Francis LA. Diet quality, added sugar, and dietary fiber intakes in American pre-schoolers. Pediatr Dent 2006;28(2):164-71.

Lee JY, Bouwens TJ, Savage MF, Vann WF Jr. Examining the cost-effectiveness of early dental visits. Pediatr Dent 2006;28(2):102-5, discussion 192-8.

Lee JY, Divaris K. Hidden consequences of dental trauma: The social and psychological effects. Pediatr Dent 2009;31(2):96-101.

Lee JY, Divaris K. The ethical imperative of addressing oral health disparities: A unifying framework. J Dent Res 2014;93(3):224-30.

Lewis CW, Grossman DC, Domoto PK, Deyo RA. The role of the pediatrician in the oral health of children: A national survey. Pediatrics 2000;106(6):E84.

Lieblich SE, Dym H, Fenton D. Dentoalveolar surgery. J Oral Maxillofac Surg 2017;75(8):250-73.

Lin Y, Chou C, Lin Y. Caries experience between primary teeth at 3-5 years of age and future caries in the permanent first molars. J Dent Sci 2021;16(3):899-904.

Lott M, Callahan E, Walker Duffy E, Story M, Daniels S. Consensus statement. Healthy beverage consumption in early childhood: recommendations from key national health and nutrition organizations. September 2019. Available at: "https// healthyeatingresearch.org/wp-content/2019/09/HER-HealthyBeverage-ConsensusStatement.pdf". Accessed March 16, 2022.

~~Malmgren B, Andreasen JO, Flores MT, et al. International Association of Dental Traumatology Guidelines for the Management of Traumatic Injuries: 3. Injuries in the primary dentition. Dent Traumatol 2012;28(3):174-82.~~

Marshall TA, Levy SM, Broffitt B, et al. Dental caries and beverage consumption in young children. Pediatrics 2003;112(3Pt1):e184-e191.

Mejàre I, Axelsson S, Dahlén D, et al. Caries risk-assessment: A systematic review. Acta Odontol Scand 2014;72(2):81-91.

Mettes TD, Ghaeminia H, Nienhuijs ME, Perry J, van deer Sanden WJ, Plasschaert A. Surgical removal versus retention for the management of asymptomatic impacted wisdom teeth. Cochrane Database Syst Rev 2012;13(6): CD003879.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Meyer BD, Lee JY, Lampiris LN, Mihas P, Vossers S, Divaris K. "They told me to take him somewhere else": Caregivers' experiences seeking emergency dental care for their children. Pediatr Dent 2017;39(3):209-14.

Miller WR, Rollnick S. Meeting in the middle: Motivational interviewing and self-determination theory. Int J Behav Nutr Phys Act 2012;2(9):25.

Mobley C, Marshall TA, Milgrom P, Coldwell SE. The contribution of dietary factors to dental caries and disparities in caries. Acad Pediatr 2009;9(6):410-4.

National Cancer Institute. HPV and Cancer. Reviewed October 25, 2021. Available at: "https://www.cancer.gov/about-cancer/causes-prevention/risk/infectious-agents/hpv-and-cancer". Accessed March 9, 2022.

National Cancer Institute. Oral Cavity, Oropharyngeal, Hypopharyngeal, and Laryngeal Cancers Prevention (PDQ®)–Health Professional Version. Updated October 15, 2021. Available at: "https://www.cancer.gov/types/head-and-neck/hp/oral-prevention-pdq#_223_toc". Accessed March 9, 2022.

Nowak AJ, Casamassimo PS, Scott J, Moulton R. Do early dental visits reduce treatment and treatment costs for children? Pediatr Dent 2014;36(7):489-93.

Nunn ME, Dietrich T, Singh HK, Henshaw MM, Kressin NR. Prevalence of early childhood caries among very young urban Boston children compared with U.S. children. J Public Health Dent 2009;69(3):156-62.

Pahel BT, Rozier RG, Stearns SC, Quiñonez RB. Effec-tiveness of preventive dental treatments by physicians for young Medicaid enrollees. Pediatrics 2011;127(3):682-9.

Patel S, Bay C, Glick M. A systematic review of dental recall intervals and incidence of dental caries. J Am Dent Assoc 2010;141(5):527-39.

Pienihakkinen K, Jokela J, Alanen P. Risk-based early prevention in comparison with routine prevention of dental caries: A 7-year follow-up of a controlled clinical trial; clinical and economic results. BMC Oral Health 2005;5(2):1-5.

Plutzer K, Keirse MJ. Incidence and prevention of early childhood caries in one- and two-parent families. Child Care Health Dev 2011;37(1):5-10.

Ramos-Gomez FJ. A model for community-based pediatric oral health: Implementation of an infant oral care program. Int J Dent 2014;2014:156821.

Ramos-Gomez FJ, Crystal YO, Ng MW, Crall JJ, Featherstone JD. Pediatric dental care: Prevention and management protocols based on caries risk assessment. J Calif Dent Assoc 2010;38(10):746-61.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Ramos-Gomez F, Ng MW. Into the future: Keeping healthy teeth caries free: Pediatric CAMBRA protocols. J Calif Dent Assoc 2011;39(10):723-33.

Riedy C, Weinstein P, Manci L, et al. Dental attendance among low-income women and their children following a brief motivational counseling intervention: A com-munity randomized trial. Soc Sci Med 2015;144:9-18.

Rozier RG, Adair, S, Graham F, et al. Evidence-based clinical recommendations on the prescription of dietary fluoride supplements for caries prevention. J Am Dent Assoc 2010;141(12):1480-9.

Sasa I, Donly KJ. Dental sealants: A review of the materials. Calif Dent Assoc J 2010;38(10):730-4.

Scharf RJ, Scharf GJ, Stroustrup A. Developmental milestones. Pediatr Rev 2016;37(1):25-37.

Schroth R, Levi JA, Sellers EA, Friel J, Kliewer E, Moffatt M. Vitamin D status of children with severe early childhood caries: A case control study. BMC Pediatrics 2013;13(174):1-8.

Selden TM. Compliance with well-child visit recommendations: Evidence from the Medical Expenditure Panel Survey, 2000-2002. Pediatrics 2016;118(6):e1766-78.

Seow KW. Environmental, maternal, and child factors which contribute to early childhood caries: A unifying conceptual model. Int J Paediatr Dent 2012;22(3): 157-68.

Sharif M, Newton T, Cunningham S. A systematic review to assess interventions delivered by mobile phones in improving adherence to oral hygiene advice for children and adolescents. Br Dent J 2019; 227(5):375-82.

Shin S, Choi E, Moon S. Prevalence of pathologies related to impacted mandibular third molars. Springerplus 2016:5(1):915.

Sigurdsson A. Evidence-based review of prevention of dental injuries. Pediatr Dent 2013;35(2):184-90.

Smith S, Kroon J, Schwarzer R, Hamilton K. Parental social cognitive correlates of preechoolers' oral hygiene behavior: A systematic review and meta-analysis. Soc Sci Med 2020;264:113322.

Southward LH, Robertson A, Edelstein BL. Oral health of young children in Mississippi Delta child care centers. A second look at early childhood caries risk assessment. J Public Health Dent 2008;68(4):188-95.

Tagliaferro EP, Pereina AC, Meneghin MDC, Ambrosono GBM. Assessment of dental caries prediction in a seven-year longitudinal study. J Pub Health Dent 2006;66 (3):169-73.

Tinanoff N. Use of fluoride. In: Early Childhood Oral Health. Berg JH, Slayton RL, eds. Hoboken, N.J.: John Wiley & Sons, Inc.; 2016:104-19.

Tseng R, Vann WF Jr, Perrin EM. Addressing childhood overweight and obesity in the dental office: Rationale and practical guidelines. Pediatr Dent 2010;32(5):417-23.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

U.S. Department of Agriculture. Center for Nutrition Policy and Promotion. USDA Food Patterns, 2015. Available at: "http://www.cnpp.usda.gov/usda-food-patterns ~~http://www.cnpp.usda.gov/USDAFoodPatterns~~". Accessed March 2, 2022~~June 22, 2018~~. ~~(Archived by WebCite® at: "http://www.webcitation.org/70MIretpl")~~

U.S. Department of Health and Human Services, U.S. Department of Agriculture. ~~2015–~~2020-2025 Dietary Guidelines for Americans, 9~~8~~th ed. Washington, D.C.: U.S. Department of Health and Human Services and U.S. Department of Agriculture; 2020~~2016~~.

U.S. Department of Health and Human Services. Office of the Surgeon General. A national call to action to promote oral health. Rockville, Md.: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Dental and Craniofacial Research; 2003. Available at: "https://www.ncbi.nlm.nih.gov/books/NBK47472/". Accessed March 2, 2022~~July 25, 2018~~.

U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, Ga.: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Office on Smoking and Health; 2012. Available at: "http://www.cdc.gov/ tobacco/data_statistics/sgr/2012/index.htm". Accessed March 2, 2022~~June 22, 2018~~. ~~(Archived by WebCite® at: "http:www. webcitation.org/70MmL8Mxp")~~

Warren JJ, Van Buren JM, Levy SM, et al. Dental caries clusters among adolescents. Community Dent Oral Epidemiol 2017;45(6):538-44.

Weber-Gasparoni K, Kanellis MJ, Qian F. Iowa's public health-based infant oral health program: A decade of experience. J Dent Educ 2010;74(4):363-71.

Weber-Gasparoni K, Reeve J, Ghosheh N, et al. An effective psychoeducational intervention for early childhood caries prevention: Part I. Pediatr Dent 2013;35(3):241-6.

Weber-Gasparoni K, Warren JJ, Reeve J, et al. An effective psychoeducational intervention for early childhood caries prevention: Part II. Pediatr Dent 2013;35(3):247-51.

Weyant RJ, Tracy SL, Anselmo TT, et al. Topical fluoride for caries prevention: Executive summary of the updated clinical recommendations and supporting systematic review. J Amer Dent Assoc 2013;144(11):1279-91.

Wright JT, Tampi MP, Graham L, et al. Sealants for preventing and arresting pit-and-fissure occlusal caries in primary and permanent molars. Pediatr Dent 2016;38 (4):282-308. Erratum in Pediatr Dent 2017;39(2):100.

Yepes JF, Dean JA. Examination of the mouth and relevant structures. In: Dean JA, ed. McDonald and Avery's Dentistry for the Child and Adolescent. 11th ed. St Louis, Mo: Elsevier Co; 2020; 3-19.

Recommended Dental Periodicity Schedule for Pediatric Oral Health Assessment, Preventive Services, and Anticipatory Guidance/Counseling

Since each child is unique, these recommendations are designed for the care of children who have no contributing medical conditions and are developing normally. These recommendations will need to be modified for children with special health care needs or if disease or trauma manifests variations from normal. The American Academy of Pediatric Dentistry emphasizes the importance of very early professional intervention and the continuity of care based on the individualized needs of the child. Refer to the text of this best practice~~guideline~~ for supporting information and references. Refer to the text in the Recommendations on the Periodicity of Examination, Preventive Dental Services, Anticipatory Guidance, and Oral Treatment for Infants, Children, and Adolescents (*www.aapd.org/policies/*) for supporting information and references.

	AGE				
	6 TO 12 MONTHS	12 TO 24 MONTHS	2 TO 6 YEARS	6 TO 12 YEARS	12 YEARS AND OLDER
Clinical oral examination [1]	•	•	•	•	•
Assess oral growth and development [2]	•	•	•	•	•
Caries-risk assessment [3]	•	•	•	•	•
Radiographic assessment [4]	•	•	•	•	•
Prophylaxis and topical fluoride [3,4]	•	•	•	•	•
Fluoride supplementation [5]	•	•	•	•	•
Anticipatory guidance/counseling [6]	•	•	•	•	•
Oral hygiene counseling [3,7]	Parent	Parent	Patient /parent	Patient /parent	Patient
Dietary counseling [3,8]	•	•	•	•	•
Counseling for nonnutritive habits [9]	•	•	•	•	•
Injury prevention and safety counseling [~~9~~10]	•	•	•	•	•
~~Counseling for nonnutritive habits [10]~~	~~•~~	~~•~~	~~•~~	~~•~~	~~•~~
Assess ~~Counseling for~~ speech/language development [11]	•	•	•		
Assess~~ment and treatment of~~ developing ~~mal~~occlusion [12]			•	•	•
Assessment for pit and fissure sealants [13~~1~~]			•	•	•
Periodontal risk assessment [3,14]			•	•	•
Counseling for tobacco, vaping, and substance misuse ~~abuse counseling~~				•	•
Counseling for human papilloma virus/vaccine				•	•
Counseling for intraoral/perioral piercing				•	•
Assess~~ment and/or removal of~~ third molars					•
Transition to adult dental care					•

1 First examination at the eruption of the first tooth and no later than 12 months. Repeat every 6 months or as indicated by the child's risk status/susceptibility to disease. Includes assessment of pathology and injuries.

2 By clinical examination.

3 Must be repeated regularly and frequently to maximize effectiveness.

4 Timing, type~~selection~~, and frequency determined by child's history, clinical findings, and susceptibility to oral disease.

5 Consider when systemic fluoride exposure is suboptimal. Up to at least 16 years.

6 Appropriate discussion and counseling should be an integral part of each visit for care.

7 Initially, responsibility of parent; as child matures, jointly with parent; then, when indicated, only child.

8 At every appointment; initially discuss appropriate feeding practices, then the role of refined carbohydrates and frequency of snacking in caries development and childhood obesity. Monitor body mass index beginning at age 2.

9 At first, discuss the need for non-nutritive sucking: digits vs pacifiers; then the need to wean from the habit before malocclusion or deleterious effect on the dentofacial complex.occurs. For school-aged children and adolescent patients, counsel regarding any existing habits such as fingernail biting, clenching, or bruxism.

10 Initially ~~play objects,~~ pacifiers, car seats, play objects, electric cords; secondhand smoke; when learning to walk; ~~then~~ with sports and routine playing, including the importance of mouthguards, then motor vehicles and high-speed activities.

~~10 At first, discuss the need for additional sucking: digits vs pacifiers; then the need to wean from the habit before malocclusion or skeletal dysplasia occurs. For school-aged children and adolescent patients, counsel regarding any existing habits such as fingernail biting, clenching, or bruxism.~~

11 Observation for age-appropriate speech articulation and fluency as well as achieving receptive and expressive language milestones

12 Identify: transverse, vertical, and sagittal growth patterns; asymmetry; occlusal disharmonies; functional status including temporomandibular joint dysfunction; esthetic influences on self-image and emotional development

13 For caries-susceptible primary molars, permanent molars, premolars, and anterior teeth with deep pits and fissures; placed as soon as possible after eruption.

14 Periodontal probing should be added to the risk-assessment process after the eruption of the first permanent molars.

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Caries-risk Assessment and Management for Infants, Children, and Adolescents

Latest Revision

~~2019~~ 2022

Abstract

This best practice reviews caries-risk assessment and patient care pathways for pediatric patients. Caries-related topics presented include caries-risk assessment, active surveillance, caries prevention, sealants, fluoride, diet, radiology, and non-restorative treatment. Caries-risk assessment forms are organized by age: 0-5 years and ≥6 years old, incorporating three factor categories~~:~~ (social/ behavioral/medical, clinical, and ~~biological risk indicators,~~ protective factors) and ~~clinical findings~~ disease indicators appropriate for the patient age. Each factor category lists specific conditions to be graded yes if applicable~~or no~~, with the answers tallied to render a caries-risk assessment score of high, moderate, or low. The care management pathway presents clinical care options beyond surgical or restorative choices and promotes individualized treatment regimens dependent on patient age, compliance with preventive strategies, and other appropriate strategies. Caries management forms also are organized by age: 0-5 years and ≥6 years old, addressing risk categories of high, moderate, and low, based on treatment categories of diagnostics, interventions (fluoride, diet counseling, sealants), and restorative care. Caries-risk assessment and clinical management pathways allow for customized periodicity, diagnostic, preventive, and restorative care for infants, children, adolescents, and individuals with special needs.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and recommendations regarding assessment of caries risk and risk-based management protocols.

KEYWORDS: CARIES-RISK ASSESSMENT, CARIES PREVENTION, CLINICAL MANAGEMENT PATHWAYS, DENTAL SEALANTS, FLUORIDE

Purpose

The American Academy of Pediatric Dentistry recognizes that caries-risk assessment and caries management protocols, also called care pathways, can assist clinicians with decisions regarding treatment based upon child's age, caries risk, and patient compliance and are essential elements of contemporary clinical care for infants, children, and adolescents. These recommendations are intended to educate healthcare providers and other interested parties on the assessment of caries risk in contemporary pediatric dentistry and aid in clinical decision-making regarding evidence- and risk-based diagnostic, fluoride, dietary, and restorative protocols.

Methods

This document was developed by the Council on Clinical Affairs and adopted in 2002 (AAPD Use of a CAT, 2002) and last revised in ~~2014~~ 2019(AAPD Caries-risk Assessment ~~2014~~ 2019)~~.~~ To update this best practices document, an electronic search was conducted of publications from 2012 to 2021 that included systematic reviews/meta-analyses or reports from expert panels, clinical guidelines, and other relevant reviews ~~was conducted from 2012 to 2018 2021~~using the terms: caries risk assessment with, diet, sealants, fluoride, radiology, non-restorative treatment, active surveillance, caries prevention. ~~There were four systematic reviews that informed this update on caries risk assessment.(ADA 2018; Fontana 2015; Cagetti et al. 2018; Moyer 2014 ; Schmoeckel 2020)There were 10 systematic reviews and clinical practice guidelines that inform this update on care pathways for caries.(FDA/ADA/DHHS 2012; Rotter et al. 2012; Santos et al. 2013; Weyant et al. 2013; Wright et al. 2014; Scottish Intercollegiate Guidelines Network 2014; Crystal et al. 2017; Slayton et al. 2018; Wright et al. 2016; Vercammen et al. 2018 ,Canares 2018~~) Five hundred ninety-two articles met these criteria. Papers for review were chosen from this list and from references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background

Caries-risk assessment

Risk assessment procedures used in medical practice generally have sufficient data to accurately quantitate a person's disease susceptibility and allow for preventive measures. However, in dentistry there ~~still~~ are limited~~is a lack of~~ sufficiently validated multivariate screening tools to determine which children are at a higher risk for dental caries.(Cagetti et al. 2018; Moyer 2014) Two caries risk assessment tools have been validated in clinical trials and clinical outcomes studies, namely the Cariogram and CAMBRA tools. (Bratthall 2005, Featherstone 2007) Several other published caries- risk assessment tools utilize similar components but have not been clinically validated. (Bratthall 2005, Featherstone 2021)

Nevertheless, caries-risk assessment:

1. fosters the treatment of the disease process instead of treating the outcome of the disease.
2. allows an understanding of the disease factors for a specific patient and aids in individualizing preventive discussions.
3. individualizes, selects, and determines frequency of preventive and restorative treatment for a patient.
4. anticipates caries progression or stabilization.
5. determines different treatment plan options and tailors the specific individualized self-management goals.

Caries-risk assessment is part of a comprehensive treatment plan approach based on age of the child, starting with the age one visit. Caries-risk assessment models currently involve a combination of factors including diet, fluoride exposure, a susceptible host, and microflora that interplay with a variety of social, cultural, and behavioral factors. Caries-risk assessment is the determination of the likelihood of the increased incidence of caries (i.e.,~~ the number of~~ new cavitated or incipient lesions) during a certain time period (~~Santos et al. 2013~~ Fontana 2020) or the likelihood that there will be a change in the size or activity of lesions already present. With the ability to detect caries in its earliest stages (i.e., non-cavitated or white spot lesions), health care providers can help prevent cavitation.(ADA 2018)

Caries risk factors~~indicators~~ are variables that are thought to cause the disease directly (e.g., microflora) or have been shown useful in predicting it (e.g., life-time poverty, low health literacy) and include those variables that may be considered protective factors. The most commonly used caries risk factors~~indicators~~ include~~ presence of caries lesions,~~ low salivary flow, visible plaque on teeth, high frequency sugar consumption, presence of appliance in the mouth, health challenges, socio-demographic factors, access to care, and cariogenic microflora.(ADA 2018). The presence of caries lesions, either non-cavitated or cavitated, also has been shown in numerous studies to be a strong indicator of caries risk. Clinical observation of existing caries lesions or restorations recently placed as a result of such lesions are best thought of as disease indicators rather than risk factors since these lesions do not cause the disease directly or indirectly but, very importantly, indicate the presence of the factors that cause the disease. Protective factors in caries risk include a child's receiving optimally-fluoridated water, having teeth brushed daily with fluoridated toothpaste, receiving topical fluoride from a health professional, and having regular dental care.(ADA 2018, Machiulskiene, 2020)

Some limitations~~issues~~ with the ~~current~~ risk factors ~~indicators~~ include the following:

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- ~~p~~Past caries experience is not particularly useful in young children and activity of lesions may be more important than number of lesions.
- Low salivary flow is difficult to measure and may not be relevant in young children.(Alaluusua and Malmivirta 1994)
- Frequent sugar consumption is hard to quantitate.
- Socio-demographic factors are just a proxy for various exposures/behaviors which may affect caries risk.
- Predictive ability of various risk factors across the life span and how risk changes with age have not been determined.(Divaris~~(ADA~~ 2016~~8~~)
- ~~Furthermore, g~~Genome-level risk factors may account for substantial variations in caries risk.(Divaris~~(ADA~~ 2016~~8~~)

Risk assessment tools can aid in the identification of specific behaviors or risk factors for each individual ~~reliable predictors~~ and allow dentists and other health care professionals ~~dental practitioners, physicians, and other non-dental health care providers~~ to become more actively involved in identifying and referring high-risk children. Tables 1 and 2 incorporate available evidence into practical tools to assist dental practitioners, physicians, and other non-dental health care providers in assessing levels of risk for caries development in infants, children, and adolescents. As new evidence emerges, these tools can be refined to provide greater predictably of caries in children prior to disease initiation. Furthermore, the evolution of caries-risk assessment tools and care pathways can assist in providing evidence for and justifying periodicity of services, modification of third-party involvement in the delivery of dental services, and quality of care with outcomes assessment to address limited resources and work-force issues.

Care pathways for caries management

Care pathways are documents designed to assist in clinical decision-making; they provide criteria regarding diagnosis and treatment and lead to recommended courses of action. (Rotter et al. 2012) The pathways are based on evidence from current peer-reviewed literature and the considered judgment of expert panels, as well as clinical experience of practitioners. Care pathways for caries management in children aged 0-2 and 3-5 years old were first introduced in 2011.(Ramos-Gomez and Ng 2011) Care pathways are updated frequently as new technologies and evidence develop.

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Historically, the management of dental caries was based on the notion that it was a progressive disease that eventually destroyed the tooth unless there was surgical/restorative intervention. Decisions for intervention often were learned from unstandardized dental school instruction and then refined by clinicians over years of practice. It is now known that surgical intervention of dental caries alone does not stop the disease process. Additionally, many lesions do not progress, and tooth restorations have a finite longevity. Therefore, modern management of dental caries should be more conservative and includes early detection of non-cavitated lesions, identification of an individual's risk for caries progression, understanding of the disease process for that individual, and active surveillance to apply preventive measures and monitor carefully for signs of arrest or progression.

Care pathways for children further refine the decisions concerning individualized treatment and treatment thresholds based on a specific patient's risk levels, age, and compliance with preventive strategies (Tables 3 and 4). Such clinical pathways yield greater probability of success, fewer complications, and more efficient use of resources than less standardized treatment.(Rotter et al. 2012)

Content of the present caries management protocol is based on results of systematic reviews and expert panel recommendations that provide better understanding of and recommendations for diagnostic, preventive, and restorative treatments. Recommendations for the use of fluoridated toothpaste are based on the ~~three~~four systematic reviews,(Santos et al. 2013; Wright et al. 2014; Scottish Intercollegiate Guidelines Network 2014,Walsh 2019) and dietary fluoride supplements are based on the Centers for Disease Control and Prevention's fluoride guidelines;(CDC 2001) professionally-applied and prescription strength home-use topical fluoride are based on two systematic reviews;(Weyant et al. 2013; Scottish Intercollegiate Guidelines Network 2014) the use of silver diamine fluoride to arrest caries lesions also is based on two systematic reviews.(Crystal et al. 2017; Slayton et al. 2018) Radiographic diagnostic recommendations are based on the uniform guidelines from ~~the three~~ national organizations.(FDA/ADA/DHHS 2012) Recommendations for pit and fissure sealants, especially regarding primary teeth, are based on the American Dental Association Council on Scientific Affairs' systematic review of the use of pit-and-fissure sealants.(Wright et al. 2016,Ahova-Saloranta 2017) Dietary interventions are based on a systematic review of strategies to reduce sugar-sweetened beverages.(Vercammen et al. 2018) Caries risk is assessed at both the individual level and tooth level. Treatment of caries with interim therapeutic restorations is based on the American Academy of Pediatric Dentistry policy and recommended best practices.(AAPD P_ITR ~~2018~~ 2022; AAPD Pediatric Restorative Dentistry ~~2019~~2022) Active surveillance (prevention therapies and close monitoring) of enamel lesions is based on the concept that treatment of disease may only be necessary if there is disease progression,(Parker 2004) and that caries can arrest without treatment.(Ekstrand et al. 2010)

Other approaches to the assessment and treatment of dental caries will emerge with time and, with evidence of effectiveness, may be included in future guidelines on caries-risk assessment and care pathways.

Recommendations

1. Dental caries-risk assessment, based on a child's age, social/behavioral/medical ~~biological~~ factors, protective factors, and clinical findings, should be a routine component of new and periodic examinations by oral health and medical providers.
2. While there is not enough information at present to have quantitative caries-risk assessment analyses, estimating children at low, moderate, and high caries risk by a preponderance of risk and protective factors and disease indicators will enable a more evidence-based approach ~~to medical provider referrals~~ for referrals by medical providers , as well as establish periodicity and intensity of diagnostic, preventive, and restorative services.
3. Care pathways, based on a child's age and caries risk, provide health providers with criteria and protocols for determining the types and frequency of diagnostic, preventive, and restorative care for patient-specific management of dental caries.

References

Ahovuo- Saloranta A, Forss H, Walsh T, Nordblad A, Mäkelä M, Worthington HV. Pit and fissure sealants for preventing dental decay in permanent teeth. Cochrane Database Sys Rev 2017;7(7):CD001830.

Alaluusua S, Malmivirta R. Early plaque accumulation: A sign for caries risk in young children. Community Dent Oral Epidemiol 1994;22(10):273-6.

American Academy of Pediatric Dentistry. Caries-risk assessment and management for infants, children, and adolescents. ~~Pediatr Dent 2014;36(special issue):127-34~~ The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2019:220-4.

American Academy of Pediatric Dentistry. Pediatric restorative dentistry. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry~~; 2019:341-53.~~ 2022

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

American Academy of Pediatric Dentistry. Policy on interim therapeutic restorations. Pediatr Dent ~~2018;40 (special issue):58-9~~. PENDING

American Academy of Pediatric Dentistry. The use of a caries-risk assessment tool (CAT) for infants, children, and adolescents. Pediatr Dent 2002;24(7):15-7.

American Dental Association. Guidance on caries risk assessment in children, June 2018. Available at: "https:// www.ada.org/~/media/ADA/DQA/CRA_Report.pdf?la=en". Accessed ~~February 12, 2019~~. March 11, 2022 ~~(Archived by WebCite® at: "http://www.webcitation.org/768BDwVDc")~~

Bratthall D, Hansel Petersson G. Cariogram--A multifactorial risk assessment model for a multifactorial disease. Community Dent Oral Epidemiol 2005;33(4):256-64.

Cagetti MG, Bonta G, Cocco F, Lingstrom P, Strohmenger L, Campus G. Are standardized caries risk assessment models effective in assessing actual caries status and future caries increment? A systematic review. BMC Oral Health 2018;18(1):123.

Canares G, Hsu KL, Dhar V, Katechia B. Evidence-based care pathways for management of early childhood caries. Gen Dent 2018;66(6):24-8. PMID: 30444703.

Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States. MMWR Recomm Rep 2001; 50(RR14):1-42.

Crystal YO, Marghalani AA, Ureles SD, et al. Use of silver diamine fluoride for dental caries management in children and adolescents, including those with special health care needs. Pediatr Dent 2017;39(5):135-45.

Divaris K. Predicting dental caries outcomes in childhood: A "risky" concept. J Dent Res 2016;95(3):248-54.

Ekstrand KR, Bakhshandeh A. Martignon S. Treatment of proximal superficial caries lesions on primary molar teeth with resin infiltration and fluoride varnish versus fluoride varnish only: Efficacy after 1 year. Caries Research 2010;44(1):41-6.

~~Featherstone JBD, Domejean-Orliaguet S, Jenson L, et al. Caries risk assessment in practice for age 6 through adult. J Calif Dent Assoc 2007;35(10):703-13.~~

Featherstone JDB, Crystal YO, Alston, P, et al. A comparison of four caries risk assessment methods. Front Oral Health. 28 April 2021. Available at: "https://doi.org/10.3389/froh.2021.656558". Accessed March 17, 2022.

Fontana M, Carrasco-Labra A, Spallek H, Eckert G, Katz B. Improving caries prediction modeling: A call for action. J Dent Res 2020;99(11):1215-0.

Fontana M. The clinical, environmental, and behavioral factors that foster early childhood caries: Evidence for caries risk assessment. Pediatr Dent 2015;37(3):217-25.

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Fontana M, Carrasco-Labra A, Spallek H, Eckert G, Katz B. Improving caries prediction modeling: A call for action. J Dent Res 2020;99(11):1215-0.

Harrison-Barry L, Elsworthy K, Pukallus M, et al. The Queensland Birth Cohort Study for Early Childhood Caries: Results at 7 years. JDR Clin Trans Res 2022;7(1):80-9.

Kirthiga M, Murugan M, Saikia A, Kirubakaran R. Risk factors for early childhood caries: A systematic meta-analysis of case control and cohort studies. Pediatr Dent 2019;41(2):95-112.

Machiulskiene V, Campus G, Carvalho JC, et al. Terminology of dental caries and dental caries management: Consensus report of a workshop organized by ORCA and Cariology Research Group of IADR. Caries Res 2020;54(1):7-14.

Moyer V. Prevention of dental caries in children from birth through age 5 years: U.S. Preventive Services Task Force recommendation statement. Pediatrics 2014;133(6):1102-10.

Parker C. Active surveillance: Toward a new paradigm in the management of early prostate cancer. Lancet Oncol 2004;5(2):101-6.

Ramos-Gomez F, Ng MW. Into the future: Keeping healthy teeth caries free. Pediatric CAMBRA protocols. J Cal Dent Assoc 2011;39(10):723-32.

~~Ramos-Gomez FJ, Crall J, Gansky SA, Slayton RL, Featherstone JDB. Caries risk assessment appropriate for the age 1 visit (infants and toddlers). J Calif Dent Assoc 2007;35(10):687-702.~~

Rotter T, Kinsman L, James E, et al. The effects of clinical pathways on professional practice, patient outcomes, length of stay, and hospital costs: Cochrane systematic review and meta-analysis. Eval Health Prof 2012;35(1): 3-27.

Santos APP, Nadanovsky P, Oliveira BH. A systematic review and meta-analysis of the effects of fluoride toothpaste on the prevention of dental caries in the primary dentition of preschool children. Community Dent Oral Epidemiol 2013;41(1):1-12.

Schmoeckel J, Gorseta K, Splieth CH, Juric H. How to intervene in the caries process: Early childhood caries–A systematic review. Caries Res 2020;54(2):111-21.

Scottish Intercollegiate Guidelines Network: SIGN 138: Dental interventions to prevent caries in children, March 2014. Available at: "https://www.sign.ac.uk/assets/sign138.pdf ". Accessed March 17, 2022. ~~February 12, 2019. (Archived by WebCite® at: "http://www.webcitation.org/768Bl4pgr")~~

Slayton R, Araujo M, Guzman-Armstrong S, et al. Evidence-based clinical practice guideline for non-restorative management of dental caries. J Am Dent Assoc 2018;149(10):837-49.

U. S. Food and Drug Administration, American Dental Association, Department of Health and Human Services. Dental Radiographic Examinations for Patient Selection and Limiting Radiation Exposure, 2012. Available at:

"https://www.ada.org/~/media/ADA/Member%20Center/FIles/Dental_Radiographic_Examinations_2012.pdf ". Accessed March 17, 2022 ~~February 12, 2019~~. ~~(Archived by WebCite® at: "http://www.webcitation.org/768BXNww3")~~

Vercammen KA, Frelier JM, Lawery CM, McGlone ME, Ebbeling CB, Bleich SN. A systematic review of strategies to reduce sugar-sweetened beverage consumption among 0-year to 5 year-olds. Obes Rev 2018;19(11):1504-24.

Walsh T, Worthington HV, Glenny AM, Marinho VCC, Jeroncic A. Fluoride toothpastes of different concentrations for preventing dental caries. Cochrane Database Sys Rev 2019;3(3):CD007868.

Weyant RJ, Tracy SL, Anselmo T, et al. Topical fluoride for caries prevention: Executive summary of the updated clinical recommendations and supporting systematic review. J Am Dent Assoc 2013;144(11):1279-91.

Wright JT, Crall JJ, Fontana M, et al. Evidence-based clinical practice guideline for the use of pit-and-fissure sealants. American Academy of Pediatric Dentistry, American Dental Association. Pediatric Dent 2016;38(5):E120-E36.

Wright JT, Hanson N, Ristic H, et al. Fluoride toothpaste efficacy and safety in children younger than 6 years. J Am Dent Assoc 2014;145(2):182-9.

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Table 1. Caries-risk Assessment Form for 0-5 Years Old ~~(Ramos-Gomez et al. 2007)~~

Use of this tool will help the health care provider assess the child's risk for developing caries lesions. In addition, reviewing specific factors will help the practitioner and parent understand the variable influences that contribute to or protect from dental caries.

	High risk	Moderate risk	Low risk
Risk factors, social/behavioral/medical/~~biological~~			
Mother/primary caregiver has active dental caries	Yes		
Parent/caregiver has lifetime of poverty, low health literacy	Yes		
Child has frequent exposure (>3 times/day) between-meal sugar-containing snacks or beverages per day	Yes		
Child uses bottle or non-spill cup containing natural or added sugar frequently, between meals and/or at bedtime	Yes		
Child is a recent immigrant		Yes	
Child has special health care needs[α]		Yes	
Risk factors, clinical			
Child has visible plaque on teeth	Yes		
Child presents with dental enamel defects	Yes		
Protective factors			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Disease indicators[β] ~~Clinical findings~~			
Child has non-cavitated (incipient/white spot) caries ~~or enamel defects~~	Yes		
Child has visible ~~cavities~~ caries lesions ~~or fillings or missing teeth due to caries~~	Yes		
Child has recent restorations or missing teeth due to caries~~visible plaque on teeth~~	Yes		

α Practitioners may choose a different risk level based on specific medical diagnosis and unique circumstances, especially conditions that affect motor coordination or cooperation.
β While these do not cause caries directly or indirectly, they indicate presence of factors that do.

INSTRUCTIONS

Circle YES that corresponds with those ~~Circling those~~ conditions applying to a specific patient ~~helps the practitioner and parent understand the factors that contribute to or protect from caries. Risk assessment categorization~~ Use the circled responses to visualize the balance among risk factors, protective factors, and disease indicators. Use this balance or imbalance, together with clinical judgment, to assign a caries risk level of low, moderate, or high ~~is~~ based on the preponderance of factors for the individual. ~~However, c~~Clinical judgment may justify the weighting ~~use~~ of one factor (e.g., heavy plaque on the teeth~~frequent exposure to sugar-containing snacks or beverages, more than one decayed missing filled surfaces [dmfs]) in determining overall risk.~~more than others.

Overall assessment of the child's dental caries risk: High ☐ Moderate ☐ Low ☐

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Table 2. Caries-risk Assessment Form for ≥6 Years Old ~~(Featherstone et al. 2007)~~

(For Dental Providers)

Use of this tool will help the health care provider assess the child's risk for developing caries lesions. In addition, reviewing specific factors will help the practitioner and patient/parent understand the variable influences that contribute to or protect from dental caries.

Factors	High risk	Moderate risk	Low risk
Risk factors, social/behavioral/medical/~~biological~~			
Patient has lifetime of poverty, low health literacy	Yes		
Patient has frequent exposure (>3 times/day) between-meal sugar-containing snacks or beverages per day	Yes		
~~Child~~Patient is a recent immigrant		Yes	
Patient uses hyposalivatory medication(s)		Yes	
Patient has special health care needs[α]		Yes	
Risk factors, clinical			
Patient has low salivary flow	Yes		
Patient has visible plaque on teeth	Yes		
Patient presents with dental enamel defects	Yes		
Patient wears an intraoral appliance		Yes	
Patient has defective restorations		Yes	
Protective factors			
Patient receives optimally-fluoridated drinking water			Yes
Patient has teeth brushed daily with fluoridated toothpaste			Yes
Patient receives topical fluoride from health professional			Yes
Patient has dental home/regular dental care			Yes
Disease indicators[β] ~~Clinical findings~~			
Patient has ≥~~1~~ interproximal caries lesion(s)	Yes		
Patient has new non-cavitated (white spot) caries ~~or enamel defects~~	Yes		
Patient has new cavitated caries lesions or lesions into dentin radiographically	Yes		
Patient has restorations that were placed in the last 3 years (new patient) or in the last 12 months (patient of record)	Yes		
~~Patient has low salivary flow~~	~~Yes~~		
~~Patient has defective restorations~~		~~Yes~~	
~~Patient wears an intraoral appliance~~		~~Yes~~	

α Practitioners may choose a different risk level based on specific medical diagnosis and unique circumstances, especially conditions that affect motor coordination or cooperation.
β While these do not cause caries directly or indirectly, they indicate presence of factors that do.

INSTRUCTIONS

Circle YES that corresponds with those ~~Circling those~~ conditions applying to a specific patient ~~helps the practitioner and parent understand the factors that contribute to or protect from caries. Risk assessment categorization~~ Use the circled responses to visualize the balance among risk factors, protective factors, and disease indicators. Use this balance or imbalance, together with clinical judgment, to assign a caries risk level of low, moderate, or high ~~is~~ based on the preponderance of factors for the individual. ~~However, c~~Clinical judgment may justify the weighting ~~use~~ of one factor (e.g., heavy plaque on the teeth~~frequent exposure to sugar-containing snacks or beverages, more than one decayed missing filled surfaces [dmfs]) in determining overall risk.~~more than others.

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Overall assessment of the dental caries risk: High ☐ Moderate ☐ Low ☐

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Table 3. Example of a Caries Management Pathways for 0-5 Years Old

Risk category	Diagnostics	Interventions			Restorative
		Fluoride	Dietary counseling	Sealants	
Low risk	– Recall every six to 12 months – Radiographs every 12 to 24 months	– Drink optimally fluoridated water – Twice daily brushing with fluoridated toothpaste	Yes	Yes	– Surveillance
Moderate risk	– Recall every six months – Radiographs every six to 12 months	– Drink optimally-fluoridated water (alternatively, take fluoride supplements with fluoride-deficient water supplies) – Twice daily brushing with fluoridated toothpaste ~~– Fluoride supplements~~ – Professional topical treatment every six months	Yes	Yes	– Active surveillance of non-cavitated (white spot) caries lesions – Restore ~~of~~ cavitated or enlarging caries lesions
High risk	– Recall every three months – Radiographs every six months	– Drink optimally fluoridated water (alternatively, take fluoride supplements with fluoride-deficient water supplies) – Twice daily brushing with fluoridated toothpaste – Professional topical treatment every three months – Silver diamine fluoride on cavitated lesions	Yes	Yes	– Active surveillance of non-cavitated (white spot) caries lesions – Restore ~~of~~ cavitated or enlarging caries lesions –Interim therapeutic restorations (ITR) may be used until permanent restorations can be placed

~~*Refer to notes below Table 4.*~~

Notes for caries management pathways tables:

Twice daily brushing: Parental supervision of a "smear" amount of fluoridated toothpaste twice daily for children under age 3, pea-size amount for children ages 3-6.

Surveillance: Periodic monitoring for signs of caries progression; Active surveillance: Active measures by parents and oral health professionals to reduce cariogenic environment and monitor possible caries progression.

Silver diamine fluoride: Use of 38 percent silver diamine fluoride to assist in arresting caries lesions; Informed consent particularly highlighting expected staining of treated lesions.

Sealants: The decision to seal primary and permanent molars should account for both the individual-level and tooth-level risks.

Table 4. Example of a Caries Management Pathways for ≥6 Years Old

Risk category	Diagnostics	Interventions			Restorative
		Fluoride	Dietary counseling	Sealants	
Low risk	– Recall every six to 12 months – Radiographs every 12 to 24 months	– Drink optimally fluoridated water – Twice daily brushing with fluoridated toothpaste	Yes	Yes	– Surveillance
Moderate risk	– Recall every six months – Radiographs every six to 12 months	– Drink optimally fluoridated water (alternatively, take fluoride supplements with fluoride-deficient water supplies) – Twice daily brushing with fluoridated toothpaste ~~– Fluoride supplements~~ – Professional topical treatment every six months	Yes	Yes	– Active surveillance of non-cavitated (white spot) caries lesions – Restore of cavitated or enlarging caries lesions
High risk	– Recall every three months – Radiographs every six months	– Drink optimally fluoridated water (alternatively, take fluoride supplements with fluoride-deficient water supplies) – Brushing with 0.5 percent fluoride gel/paste – Professional topical treatment every three months – Silver diamine fluoride on cavitated lesions	Yes	Yes	– Active surveillance of non-cavitated (white spot) caries lesions – Restore of cavitated or enlarging caries lesions –Interim therapeutic restorations (ITR) may be used until permanent restorations can be placed

Notes for caries management pathways tables:

Twice daily brushing: Parental supervision of a "~~smear" amount of fluoridated toothpaste twice daily for children under age 3,~~ pea-size amount for children ~~ages 3-~~6 years of age.

~~Optimize dietary fluoride levels: Ideally by consuming optimally-fluoridated water; alternatively by dietary fluoride supplements, in a non-fluoridated area, for children at high caries risk.~~

Surveillance ~~and active surveillance~~: Periodic monitoring for signs of caries progression; ~~and~~ Active surveillance: aActive measures by parents and oral health professionals to reduce cariogenic environment and monitor possible caries progression.

Silver diamine fluoride: Use of 38 percent silver diamine fluoride to assist in arresting caries lesions. Informed consent particularly highlighting expected staining of treated lesions.

~~Interim therapeutic restorations: also may be called protective restorations.(AAPD P_ITR 2018)~~

Sealants: Although studies report unfavorable cost/benefit ratio for sealant placement in low caries risk children, expert opinion favors sealants in permanent teeth of low-risk children based on possible changes in risk over time and differences in tooth anatomy. The decision to seal primary and permanent molars should account for both the individual-level and tooth-level risks.

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Pain Management in Infants, Children, Adolescents, and Individuals with Special Health Care Needs

Abstract

This statement provides dentists and stakeholders with current best practices for pediatric pain management. Infants, children, adolescents, and individuals with special health care needs may experience pain resulting from dental/orofacial injury, infection, and dental procedures. Dental pain is an inflammatory condition that can be categorized as somatic (i.e., periodontal, alveolar, mucosal) or visceral (i.e., pulpal). Dental professionals should consider pain assessment for all patients. Inadequate pain management may lead to significant physical and psychological consequences for patients. Perioperative pain management approaches include pre-emptive pain management (e.g., anesthetics), use of local anesthesia during general anesthesia for post-operative pain control, non-pharmacological anxiolytic interventions (e.g., providing a calm environment, emotional support), distraction and imagery (e.g., counting, video games), and pharmacological pain control agents including non-opioid analgesics (e.g., nonsteroidal anti-inflammatory drugs, acetaminophen) and opioid analgesics. Acetaminophen and nonsteroidal anti-inflammatory medications are first line pharmacologic therapies for pain management. Use of opioids for pediatric dental patients should be rare, and steps to mitigate opioid misuse are discussed.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance on pain management in infants, children, adolescents, and individuals with special health care needs.

KEYWORDS: FACIAL PAIN; TOOTHACHE; PAIN MANAGEMENT; ACUTE PAIN; CHRONIC PAIN; PAIN, POSTOPERATIVE

~~Adopted~~Revised

~~2018~~ 2022

ABBREVIATIONS

AAP: American Academy of Pediatrics. **AAPD**: American Academy of Pediatric Dentistry. **APAP**: Acetyl-para-aminophenol. **APS**: American Pain Society. **CDC**: Centers for Disease Control and Prevention. **COX**: cyclo-oxygenase. CNS: Central nervous system. **FDA**: U.S. Food and Drug Administration. **IV**:

Intravenous. **NSAIDs**: Nonsteroidal anti-inflammatory drugs. ~~**VAS**: Visual analogue scale.~~ **WHO:** World Health Organization

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that infants, children, adolescents, and individuals with special health care needs can and do experience pain due to dental/orofacial injury, infection, and dental procedures, and that inadequate pain management may have significant physical and psychological consequences for the patient. Appreciation of pediatric pain can help practitioners develop clinical approaches to prevent or substantially relieve dental pain. When pharmacological intervention is necessary to manage pain, the practitioner must understand the consequences, morbidities, and toxicities associated with the use of specific therapeutic agents. These recommendations are intended to provide dental professionals and other stakeholders with current best practices for pain management in pediatric dentistry.

Methods

This document was developed by the Council on Clinical Affairs and adopted in 2018 (AAPD BP_Pain 2018). It is based on a review of current dental and medical literature pertaining to pain management in pediatric dental patients. Review of existing federal and professional pain management guidelines and consensus statements were used to assist with this document. An electronic search was conducted in the PubMed®/MEDLINE database using the terms: dental pain management, pediatric pain assessment, pre-emptive analgesia, paracetamol, pediatric and acetaminophen, adolescent and acetaminophen, pediatric and nonsteroidal anti-inflammatory drugs (**NSAIDs**), adolescent and NSAIDs, pediatric and opioids, adolescent and opioids, opioid risk, adolescent orofacial pain, pediatric and adolescent chronic pain, non-pharmacologic pain management; fields: all; limits: within the last 10 years, humans, English, systematic review, and clinical trials. There were 3,698 ~~1395~~ articles that met these criteria. Papers for review were chosen from this list and from references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

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Background

Pain is defined by the International Association of the Study of Pain as “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage. ~~or described in terms of such damage.~~”(Raja et al. 2020~~IASP 2018~~) Their expanded definition includes six items that provide further context to the complex topic of pain: pain is always a personal experience; pain is different from nociception; pain is learned through life experiences; a person’s report of pain should be respected; pain can have adverse effects on function and well-being; and, verbal description is one of several behaviors used to express pain. (Raja et al. 2020 IASP 2020).

Intraoral pain presenting as a toothache is a common source of orofacial pain in children. (Santos 2022) An estimated 95 percent of orofacial pain results from odontogenic causes (Tecco et al. 2018) and, according to a recent systematic review and meta-analysis, an overall pooled prevalence of toothache in children and adolescents was 36.2 percent. (Santos 2022) Pain experienced during dental procedures can be distressing for the provider, the child, and his parents and can also lead to difficult behavior, dental fear, and avoidance behavior in the child. (Randall et al. 2020) Moreover, p~~P~~ain experience in childhood may shape future pain experiences in adulthood.(Baccei & Fitzgerald 2013).

Pain from dental pulp arises when functional nerves are stimulated by bacteria or trauma (De Leeuw 2018). Periodontal pain occurs when infectious or traumatic insults to the gingiva, periodontal ligament, and alveolar bone stimulate free nerve endings (De Leeuw 2018). Other sources of orofacial pain include temporomandibular disorders (e.g., joint pain, masticatory muscle pain), headaches (e.g., migraine, tension type), or other non-odontogenic causes (e.g., pathologic jaw lesions, oral ulcers, neuralgia). Pain may be divided into diagnostic categories such as somatic, visceral, and neuropathic Zeltzer et al. 2019) Pain encountered in dentistry is typically inflammatory and categorized as somatic (i.e., periodontal, alveolar, mucosal) or visceral (i.e., pulpal) pain.(De Leeuw & Klasser 2018~~3~~)

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Pain management includes pharmacologic and nonpharmacologic strategies to treat both acute and chronic pain. Due to the increased appreciation for pediatric pain and because of the national opioid crisis, recommendations for professional education and approaches for therapeutic management are being reviewed at the national, state, and local levels.(Schaefer et al. 2016; AAP/APS 2001; Assn. Paediatric Anaesthetists. 2012; Pogatzki-Zahn et al. 2007) ~~This document discusses pain processing, pain assessment, pain categories, pre-emptive analgesia, non-pharmacologic pain management, pharmacologic pain management, and best practices for prescribing opioids.~~

~~Pain processing~~ Understanding nociception (i.e., pain processing) is essential for the management of pain. ~~Pain experience in childhood may shape future pain experiences in adulthood.(Baccei & Fitzgerald 2013). Dental pain is an inflammatory condition resulting from tissue damage, infection, or invasive treatment.(Drew 2015) Swelling, hyperthermia, and activation of biochemical cascades are hallmarks of inflammatory pain.(Drew 2015; Brennan 2011)~~ Following tissue injury, infection, or invasive treatment, t~~T~~hermal, mechanical, and chemical stimuli activate receptors on free nerve endings in vital structures in the orofacial region.(Latremolier & Woolf 2009~~.(Dostrovsky 2014;~~ Dawes et al. 2013) In turn, s~~S~~ensory signals travel along afferent trigeminal nerve fibers and relay information to the brainstem and higher structures involved with the perception of pain.(Kaufman et al. 2005) Under normal conditions the perception of pain persists until the stimulus is removed. *~~Peripheral sensitization~~* Sensitization of central and peripheral nervous system circuits occurs following significant tissue damage or prolonged neuronal stimulation (Latremolier & Woolf 2009). Terminal nerve endings at the site of tissue injury exhibit an enhanced neuronal response to noxious stimuli in the peripheral nervous system.(Latremolier & Woolf 2009~~.(Dostrovsky 2014~~) This local increase in nerve membrane excitability is referred to as peripheral sensitization.(Latremolier & Woolf 2009) The exaggerated response to stimuli in the region of tissue damage is called primary hyperalgesia.(Kaufman et al. 2005, Latremolier & Woolf 2009)

~~Central sensitization~~ Central sensitization refers to enhanced functional status of pain circuits and pain processing at the level of the central nervous system (**CNS**).(Brennan 2011; Latremoliere & Woolf 2009; Woolf 2011) Both secondary hyperalgesia, which is an increase in

pain intensity to noxious stimuli outside of the area of tissue damage, and allodynia, which refers to pain perception following innocuous stimuli such as light touch, are characteristics of central sensitization.(Woolf 2011) ~~*Pain modulation*~~ Modulation of pain pathways occurs through CNS excitatory and inhibitory processes. Ascending facilitating and descending inhibitory processes enhance or suppress the pain experience, respectively.(Latremoliere & Woolf 2009) Both pharmacologic and nonpharmacologic methods target these processes to alter pain processing.(Stinson et al. 2016; Buvanendran et al. 2013)

~~**Pain assessment** Ethnic, cultural, and language factors may influence expression and assessment of pain.(Lee et al. 2014)~~ Pain assessment is an integral component of the dental history and comprehensive evaluation. When symptoms or signs of orofacial/dental pain are evident, a detailed pain assessment helps the dentist to derive a clinical diagnosis, develop a prioritized treatment plan, and better estimate analgesic requirements for the patient. Pain is difficult to measure due to its subjectivity, especially in children, (Jain 2012; Randall et al. 2020) and often relies on the report of parents or caregivers. In clinical practice, pain assessment is largely non-standardized and based on signs and symptoms rather than specific tools. (Randall et al. 2020)

Pain ~~is~~ can be assessed using self-report, behavioral (vocalization, facial expression, body movement), and biological (heart rate, transcutaneous oxygen, sweating, stress response) measures.(McGrath & Unruh, 2013) Direct questioning or a structured, comprehensive pain assessment can be clinically beneficial for pediatric and adolescent patients.(McGrath & Unruh 2013; Gouri et al. 2010) Conducting a structured interview begins with asking specific questions regarding pain onset, provoking factors, palliative factors, quality or character, region or location, severity or intensity, timing or duration, and impact on daily activities(Chou 2016). Obtaining information through self-report can be aided by asking the child to make comparisons, using temporal anchors and facilitating communication through objects or gestures.(McGrath & Unruh 2013) Assessing behavioral reactions and physiological reactions to pain are required in non-verbal patients, ~~and~~ young patients, and patients with special health care needs.(McGrath & Unruh 2013) Pain experienced by children with special health care needs or developmental disabilities is more challenging to assess accurately, and assessment may benefit from the utilization of scales that rely on observations such as vocalization, facial expressions, and body movements.(Jain 2012)~~Four- to 12-years-old patients can likely quantify pain based on a series of faces.(McGrath et al. 2008) Patients older than seven should be able to mark pain using a visual analogue scale (VAS) or numeric scale.(McGrath et al. 2008; Hauer & Jones 2020)~~ Validated instruments available for assessing pain in verbal or nonverbal patients include: Wong-Baker FACES®, Faces Pain Scale (Revised), visual analogue scale (VAS), numeric rating scale (NRS), Faces, Legs, Activity, Cry, and Consolability score (FLACC), Revised Faces, Legs, Activity, Cry and Consolability (r-FLACC), and the McGill Pain Questionnaire.(McGrath et al. 2008; Hain et al. 2012; ~~AAPD P_Pain Management;~~ Jain 2012; Hauer & Jones 2020) Additionally, ~~E~~ethnic, cultural, and language factors may influence the expression and assessment of pain.(Lee et al. 2014)

~~**Pain categories** Pain may be divided into diagnostic categories such as somatic, visceral, and neuropathic.(Kent et al. 2017; Fillingim et al. 2014; Betsch et al. 2017; Zeltzer et al. 2016) Pain encountered in dentistry is typically inflammatory and categorized as somatic (i.e., periodontal, alveolar, mucosal) or visceral (i.e., pulpal) pain.(De Leeuw & Klasser 2013)~~

Pain also may be categorized as acute or chronic. Acute pain that fails to respond to treatment may become chronic over time.(Batoz et al. 2016) Chronic pain refers to pain that is dysfunctional and persists beyond the time for typical tissue healing.(IASP 1986, Palmero et al. 2012; ~~Dowell et al. 2016; Grégoire & Finley 2013; Sessel 2014~~) Chronic pain is a costly public health problem that is difficult to treat (Gewandter 2015, WHO Guideline 2021). Temporomandibular disorder (TMD) is an example of a chronic pain condition encountered in dentistry.(AAPD BP_Acquired TMD)

Pain management

Pre-emptive pain management

Pre-emptive pain management refers to the administration of an anesthetic agent, medication, or technique prior to a surgical event with the goal of decreasing pain. Goals of pre-emptive pain management include attenuating central sensitization, decreasing postoperative pain, improving recovery, and reducing postoperative analgesic consumption.(Kaufman et al. 2005; Buvanendran et al. 2013; Raslan and Zouzou 2021; Ashley et al. 2016) Postoperative pain management in pediatric patients has been suboptimal in large part because ~~of the misconception that children do not feel pain as severely as adults do~~ parents frequently do not adequately treat pain that is experienced at home (Rony et al. 2010~~Kankkunen et al. 2003~~) and ~~the~~ fear ~~of~~ adverse events.(Finley et al. 2005) Pain after dental treatment under general anesthesia frequently is related to the total number of teeth treated. (Hu et al. 2018). ~~It has been shown that n~~Nearly 50 percent of patients undergoing dental rehabilitation describe moderate to severe pain(Wong et al. 2015), and data supports pre-emptive measures to optimize pain control for a variety of dental and surgical procedures.(Chou et al. 2016; Raslan and Zouzou 2021; Kaye et al. 2017, Kharouba 2019) ~~However, level of evidence is low due to sparse well-controlled trials.(Shirvani et al. J Oral Rehab 2017; Ashley et al. 2016; Kaye et al. 2017)~~

Achieving profound anesthesia prior to initiating invasive treatment decreases central sensitization.(Chou et al. 2016) Topical anesthetics are used in ~~a~~ dentistry to minimize pain; however, these medicaments alone may not be sufficient for dental procedures.(Boyce et al. 2016; Shavit et al. 2017) Topical anesthetics and over-the-counter products containing benzocaine have been used for minor procedures and to manage oral pain, teething, and ulcers (Malamed 2019). However, benzocaine use in children has been linked to methemoglobinemia, a life-threatening condition. (Gutenberg et al. 2013) In 2018, the U.S. Food and Drug Administration (**FDA**) issued a post-market warning against the use of these products for children younger than two years and that the products must have warning labels regarding methemoglobinemia. (US FDA Risks) Local anesthetic administration techniques, the anesthetic properties, and the needle used during injection ~~Other factors that~~ may contribute to a patient's pain experience ~~are the anesthetic properties and the needle used during the injection~~.(Glass et al. 2015) Distraction techniques made at the time of the injection (e.g. jiggling the patient's cheek, applying pressure to the palate with a mirror handle) take advantage of Aß-fiber signal dominance and can significantly reduce the intensity of pain-related C-fiber signaling.(Glass et al. 2015, Malamed 2019) Buffering or decreasing acidity of local anesthetic using sodium bicarbonate can decrease injection site pain and postoperative discomfort by increasing the pH of the anesthetic. (Tirupathi 2020) . A recent systematic review demonstrated lower pain scores following inferior alveolar block injections in children when buffered versus non -buffered local anesthesia was used; however, there was no difference in observer-reported pain behavior (Tirupathi 2020). ~~This is a well-accepted technique in medicine but has not been commonly used in dentistry.(Glass et al. 2015; Malamed et al. 2013)~~ Finally, decreasing anesthetic delivery rate also has demonstrated pain reduction during injection.(Garret-Bernardin et al. 2017)

~~In one study, the~~ The use of pre-emptive analgesics in conjunction with local anesthetics has been shown to increase ~~increased~~ the ability to achieve pulpal anesthesia in patients with irreversible pulpitis when compared with placebo~~.~~(Shirvani et al. Clin Oral Investig 2017) and to suppress the intensity of injection pain and reduce pain following extractions. (Raslan and Zouzou 2021, Kharouba 2019) The pre-emptive analgesics most commonly used in dentistry are NSAIDs (e.g., ibuprofen) and acetaminophen, either alone or in combination.(~~Baygin 2011~~ Raslan and Zouzou 2021) Analgesics with sedative properties are often administered during the pre-, peri-, or~~and~~ post-operative periods when moderate to severe pain is anticipated.(Pacheco & Ferayorni 2013; AAPD BP_Use of N2O; Laskarides 2016; Conner et al. 2017)

Use of local anesthesia during general anesthesia

Although pain is not experienced during general anesthesia, central sensitization occurs when peripheral nerves are stimulated.(Chou et al. 2016; ~~Needleman et al. 2008~~; Keles & Kocaturk2017) Operating without local anesthesia may result in priming of CNS neurons and increased future pain sensitivity.(Baccei & Fitzgerald 2013) Central sensitization is minimized with pre-emptive analgesia or anesthesia. For this reason, regional block or infiltration anesthesia is commonly performed prior to surgical procedures to decrease postoperative pain.(Kaufman et al. 2005; Townsend et al. 2009; AAPD BP_Local Anesthesia) However, pharmacologic and cardiac considerations along with avoiding the numb sensation and potential for self-inflicted oral trauma are reasons providers may choose not to provide local anesthesia during general anesthesia.(AAPD BP_Local Anesthesia; Parekh et al. 2014)

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Non-pharmacologic approaches to pain management

Studies suggest that nonpharmacologic interventions may be effective alone or as adjuncts to pharmacological interventions in managing procedure-related pain, anxiety, and distress with minimal risk of adverse effects.(Dostrovsky 2014; Landier & Tse 2010; Fein et al. 2012; Lewin & Dahl 1999) Fear and anxiety activate circuits within the CNS that facilitate pain.(Palmero et al. 2012) Creating a safe, friendly environment may help a child feel more comfortable and less stressed.(Fein et al. 2012; Ruest & Anderson 2016) The American Academy of Pediatrics (**AAP**) and the American Pain Society (**APS**) recommend that providers reduce distress-producing stimulation and provide a calm environment for procedures to improve pain management. (AAP/APS 2001) ~~Emotional support is a key component in creating a comfortable environment. (Sinha et al. 2006) Although there is no evidence that the presence of parents decreases pain, there is data to support that it may decrease the child's anxiety and distress.(Ruest & Anderson 2016) Conversely, parental catastrophizing has been associated with poor outcomes for pediatric pain management.(Rabbitts et al. 2017) The AAP and APS jointly advise expectation management for parents along with preparation for comforting their children when pain is anticipated.(AAP/APS 2001)~~ Individual studies have shown the efficacy of psychologic techniques, including preparation and information, parent coaching or training, suggestion, memory alteration or change, and coping self-statements.(Lyons 2009; Birnie et al. 2018 ~~Uman et al. 2007~~; Goettems 2017) ~~However, a 2013 Cochrane review concluded that there is no strong evidence available to support the efficacy of preparation and information, combined cognitive or behavioral strategies, parent coaching plus distraction, or suggestion for reducing needle-related pain and distress.(Uman et al. 2013)~~

Distraction and imagery

Distraction is an effective method of pain management in the pediatric population.(Lee et al. 2014; Davidson et al. 2016) It can be cognitive (e.g., counting, non-procedural talk) or behavioral (e.g., videos, games), both of which aim to shift attention away from pain. Distraction techniques such as bubbles, counting, conversation, music, television, toys, and video games may be used by health care providers or the child's caregiver.(Fein et al. 2012; Ruest Anderson 2016) ~~There is s~~Strong evidence supports~~ing~~ the efficacy of distraction techniques for needle-

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related pain and distress in children and adolescents.(Uman et al. 2013) Distraction ~~has been shown to be~~ is significantly effective when measuring pulse rates, respiratory rates, and self-reported pain.(AAP/APS 2001; Ruest & Anderson 2016) ~~Additionally, distraction intervention has been shown to lower the perception of pain distress in younger children as reported by parents.(Sinha et al. 2006)~~ Distraction techniques may be of great use with patients with special needs ~~that~~ who have shortened attention spans and ~~are unable to~~ cannot understand verbal reasoning or reassurance.(Lyons 2009) Distraction, hypnosis, combined cognitive behavior therapy (CBT), and breathing interventions have been effective in reducing children's needle-related pain or distress, or both. (Birnie et al. 2018)

Imagery guides the child's attention away from the procedure by harnessing imagination and storytelling. Imagery in combination with distraction has~~ve~~ been shown to ~~be~~ help~~ful in~~ decrease~~ing~~ postoperative pain in children.(Davidson et al. 2016; Bukola & Paula 2017) ~~This technique requires the active cooperation of the patient and is most effective when used for children over eight years old.(Landier & Tse 2010)~~

~~Hypnosis~~ Hypnotherapy

Hypnotherapy aims to alter sensory experiences and dissociate from pain experiences, and hypnosis is best for children of school age or older (Birnie et al 2018, Kohen 2014). ~~school-aged or older children.~~(~~Zeltzer et al. 2016~~) There is ~~strong~~ evidence ~~that hypnosis~~ hypnotherapy is effective in reducing needle-related pain and distress in children and adolescents;~~.~~(Birnie et al 2018, Uman et al. 2013; Ramírez-Carrasco et al. 2017) however, t~~T~~here is no evidence ~~that hypnosis~~ hypnotherapy alone is capable of producing an anesthetic effect necessary for invasive dental procedures.~~; therefore, it should always be combined with profound local anesthesia~~.(Ramírez-Carrasco et al. 2017)

Virtual reality and smart phone applications

The use of digital distraction can provide distraction and reduction in pain and distress for children undergoing painful procedures. (Gates et al. 2020; Cunningham et al. 2021) The use of virtual reality, video games, and smartphone applications has shown a reduction in self-reported and observer-reported pain and distress during common procedures such as venipuncture and dental and burn treatments. (Gates et al. 2020). Further studies are needed to assess the benefits of distraction with a tablet compared to audiovisual glasses during dental procedures. (Cunningham et al. 2021)

Other techniques

Studies have shown efficacies for pediatric pain management with other techniques such as relaxation and breathing exercises, transcutaneous electrical nerve stimulation, acupuncture, counterstimulation, ~~virtual reality~~, video modelling, and music therapies.(Goettems et al. 2017; Davidson et al. 2016; Eccleston et al. 2014; Brown et al. 2017; Munshi et al. 2000; Kasat et al. 2014; ~~Aminabadi 2008~~ Monteiro et al. 2020; Klassen et al. 2008) Additional research is need on these interventions to measure their effectiveness. (Monteiro et al. 2020)

Pharmacologic/therapeutic a~~A~~gents

Management of pain in children is changing rapidly as a result of improvements in the appreciation of pediatric pain and pharmacologic knowledge. However, randomized controlled trials are lacking in children so the use of many pain medications ~~are~~ is ~~still~~ considered off label.(Hartling et al. 2016; Walco et al. 2017) ~~Acetaminophen, ibuprofen, and opioids are common medication choices for the treatment of acute pain in children.(Lee et al. 2014; Hartling et al. 2016).~~ Acetaminophen and ibuprofen are recommended as first-line medication choices for the treatment of acute pain in children. (Kelley JAM 2021; Lee et al. 2014; Hartling et al. 2016; Koh et al. 2019). Both have been shown to have good efficacy and safety and are also cost-effective analgesics. (Koh et al 2019; Timmerman and Parashos 2020) The use of opioids in children carries risks. (Kelley JAM 2021,Teoh 2020; Scrivani et al. 2021)

Non-opioid analgesics

Nonsteroidal anti-inflammatory drugs. NSAIDs are among the most commonly used class of drugs and have anti-inflammatory, analgesic, antipyretic, and antiplatelet properties.(Kokki 2003) They inhibit prostaglandin synthesis, with specific action on cyclooxygenase (COX), the enzyme responsible for converting arachidonic acid into pro-inflammatory mediators that drive postoperative pain, swelling, and hyperalgesia.(Laskarides 2016; Teoh 2020) Representatives of

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the major categories of NSAIDs are salicylic acids (aspirin), acetic acids (ketorolac), proprionic acids (ibuprofen, naproxen), and cyclooxygenase-2 selective (celecoxib). Ibuprofen in oral or intravenous (**IV**) form is a safe and commonly used analgesic and antipyretic agent in pediatrics.(Kokki 2003; Koh et al. 2019). Ketorolac, an IV or intranasal NSAID, is useful in treating moderate to severe acute pain in patients unable or unwilling to swallow oral NSAIDs.(Zeltzer et al. 2019~~2016~~; Keles & Kocaturk 2017; Neri et al. 2013) Some ~~of the~~ adverse effects associated with NSAIDs include: rash, inhibition of bone growth and healing, gastritis with pain and bleeding, decreased renal blood flow and kidney dysfunction, reversible inhibition of platelet function, hepatic dysfunction, and increased incidence of cardiovascular events.(Zeltzer et al. 2019~~2016~~; Gosnel and Thikkurissy 2019) A specific concern with NSAIDs is the potential to exacerbate asthma due to a shift in leukotrienes.(Hartling et al. 2016). Due to shared pathways, combined NSAIDs and corticosteroid ~~steroidal anti-inflammatory medications~~ (e.g. prednisone) use may increase the potential for gastrointestinal bleeding ~~should not routinely be co-administered~~.(Moore 2015,~~Becker 2010~~)

Acetaminophen (acetyl-para-aminophenol [APAP], paracetamol). Acetaminophen is an analgesic with efficacy for mild to moderate pain and ~~is~~ also an antipyretic.(Becker 2010) Unlike NSAIDs, acetaminophen is centrally-acting and does not have anti-inflammatory effects or an effect on gastric mucosal lining or platelets.(Becker 2010) Its mechanism of action is the blockade of prostaglandin and substance P production. Allergic reactions are rare, (Gosnell and Thikkurissy 2019) but toxicity from overdose may result in acute liver failure (Drew 2015). Acetaminophen ~~is~~ can be administered in tablets, capsules, and liquid but ~~also~~ is also available as oral disintegrating tablets, oral disintegrating films, and rectal and IV forms.(Laskarides 2016) ~~Studies have shown that r~~Rectal administration has somewhat higher bioavailability and faster onset than the oral route since it partially bypasses hepatic metabolism.(Shah et al. 2014) ~~Pain control can be optimized when acetaminophen and NSAIDs are alternated or staggered, a technique known as multimodal therapy.(Hartling et al. 2016; Becker 2010; Ong et al. 2010)~~

Opioid analgesics

Opioid analgesics historically have been used ~~for many years~~ to produce profound pain relief in all age groups. Opioid analgesics are considered for acute moderate to severe pain refractory to other therapies. However, opioids only interrupt the nociceptive pathway to inhibit pain perception and do not target inflammation (Teoh 2020), which is an integral part of managing dental pain. Common uses in pediatric patients include pain associated with cancer, sickle cell disease, osteogenesis imperfecta, epidermolysis bullosa, and neuromuscular disease.(Schechter & Waldo 2016; Cooper et al. 2017; Fortuna et al. 2010) Limited studies are available regarding postoperative opioid use in pediatric dentistry, ~~but it is also rare~~perhaps because it is rare that pediatric dental patients ~~should~~ require opioid analgesics following dental treatment.(Laskarides 2016) However, opioid/nonopioid combination mediations followed by oxycodone and morphine were the most common analgesics prescribed to children during post-operative emergency room encounters (Stake 2022). Major concerns of opioid analgesics in the pediatric population are efficacy, safety, misuse, and accidental deaths.(Walco et al. 2017; Van Cleve Grigg 2017; Rudd et al. 2016)

Opioids interact differentially with μ, κ, and δ receptors in the central nervous system. Opioid agonists act on receptors located in the brain, spinal cord, and digestive tract. ~~Pathways of opioid receptor signaling are multiple and include G-protein receptor coupling, cyclic adenosine monophosphate inhibition, and calcium channel inhibition.(Laskarides 2016)~~ Activation of opioid receptors can cause respiratory depression, pupil constriction (miosis), euphoria, sedation, physical dependence, endocrine disruption, and suppression of opiate withdrawal.(Zeltzer et al. 2019~~2016~~) Pruritus (itching) may ~~also~~ occur due to histamine release that accompanies some opioid analgesics.(Pacheco & Ferayorni 2013) Naloxone is a μ opioid receptor competitive antagonist usually administered parenterally to counter opioid overdose.(Laskarides 2016) Pain medicine specialists (e.g. pain physicians, anesthesiologists) are experienced in continuing, tapering, or discontinuation of opioids in ~~If~~ patients who are actively prescribed opioids for cancer or ~~non-cancer~~other pain~~, providers should choose another agent for analgesia or consult with a specialty provider (e.g., pain medicine practitioner, anesthesiologist) regarding opioid dosing~~.(Walco et al. 2017, WHO 2020)

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~~**Opioids with active metabolites.**~~ Codeine has more adverse effects and limited efficacy for dental pain when compared to over-the-counter analgesics. (Teoh 2020) Codeine, tramadol, and hydrocodone, and to a lesser extent oxycodone and fentanyl, are ~~opioids that are~~ broken down in the liver to active metabolites by the highly variable cytochrome enzyme, CYP2D6.(~~AAPD P Pain Management; Becker 2010~~; US FDA 2017; Tobias et al. 2016, Crews 2021) Some opioid analgesics~~These drugs~~ are ineffective in certain~~some~~ children due to poor drug metabolism. (Dostrovsky et al. 2014; Tobias et al. 2016) Yet, other patients known as hyper-metabolizers hydrolyze ~~break these~~ prodrugs to their active forms too quickly, potentially resulting in overdose, respiratory depression, and even death.(US FDA 2017; Tobias et al. 2016) The ~~U.S. Food and Drug Administration (~~FDA~~)~~ and AAP ~~and European Medicines Agency have~~ issued warnings and safety communications ~~contraindications statements~~ on codeine and tramadol over the past few years because of this.(US FDA safety communication ~~2017~~; Tobias et al. 2016 ~~European Medicine Agency~~) Hydrocodone and oxycodone also rely~~ies~~ on cytochrome p450 metabolism and have~~s~~ the potential for similar adverse effects.(Crews 2021) Although systematic reviews have demonstrated that these medications ~~might~~ provide appropriate analgesia when compared to placebo, evidence is not convincing they outperform non-opioid analgesics, and safety concerns exist.((Schnabel et al. 2015; Dancel et al. 2017) In 2017, the FDA issued a warning specifically for codeine and tramadol ~~in all patients less than 12 years of age~~, stating they are no longer considered safe to use in all patients less than 12 years of age~~in this age group~~.(US FDA 2017) Deaths have occurred in children using these medicines for post tonsillectomy and/or adenoidectomy pain management, general pain, sore or strep throat pain, and cold and cough.(US FDA 2017; Tobias et al. 2016) The FDA warns that in the 12-17-year age group, these medications should not be used in high-risk patients (e.g., those with obesity, obstructive sleep apnea, lung tissue disease).(US FDA 2017) Furthermore, tramadol and codeine should not be used if breastfeeding since active metabolites are present in breastmilk.(US FDA safety communication ~~2017~~)

~~**Opioids without active metabolites.** Inactive metabolites refer to metabolites that do not have a noticeable effect on the CNS. Naturally-occurring morphine and the synthetics oxycodone and fentanyl do not have CYP2D6 considerations since they do not contain active~~

~~metabolites.(Becker 2010)~~ Although morphine causes respiratory depression and histamine release, it consistently provides rapid relief of severe pain for 2-3 hours (Zeltzer 2019). To that point, the p~~P~~otency of all opioids is compared to morphine using a morphine milligram equivalent dose (Zeltzer 2019, CDC). Considering the variability of drug metabolism, safety concerns, and the experience of pain, the “right dose” for everyone does not exist (Zeltzer 2019). ~~Morphine provides rapid relief of severe pain for 2-3 hours and is associated with histamine release and respiratory.~~ For example, fentanyl is 100 times more potent than morphine, ultra-short acting, and used for invasive procedures and sedations.(Zeltzer et al. 2019~~2016~~) Chest wall rigidity is a well-known adverse reaction to fentanyl.(Zeltzer et al. 2019~~2016~~) Rapidly-acting oxycodone has a longer half-life than morphine and is more potent (Zeltzer 2019). Oxycodone is available as a single agent or is combined with aspirin, ibuprofen, or acetaminophen. It comes in tablets, capsules, oral solution, and oral concentrate, and use is considered off label in children ~~12 years of age and younger~~.(Laskarides 2016,Stake 2022)

Opioid concerns and Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) recommendations. Trends in opioid overdose, opioid misuse, and concerns for opioid addiction prompted the CDC and the World Health Organization (WHO) to issue guidelines for prescribing opioids for chronic pain.(Dowell et al. 2016) The CDC guideline focuses on adults while the WHO guideline relates specifically to children (Dowell 2016, WHO 2020). Although chronic pain is the focus of the guidelines, both~~The guideline~~ aims to improve prescribing practices and ~~to~~ ultimately benefit patient safety, emotional well-being, ~~health~~ and quality of life.(Tompkins et al. 2017, Dowell, WHO) ~~Although the guidance is specific for adults with chronic pain, all prescribers should be mindful of high-risk prescribing practices.(Tompkins et al 2017)~~ The topics covered in the guidelines include~~recommends~~ limiting opioids for moderate to severe pain, restricting opioid prescriptions to three days, ~~and~~ providing concurrent pharmacologic and non-pharmacologic therapy, and following accepted protocols for procurement, storage, and the disposal of unused opioids.(Dowell et al. 2016, WHO 2020) The CDC guideline also advises against overlapping benzodiazepine~~s~~ and opioid~~s~~ prescriptions because of the increased potential for respiratory depression.(Dowell et al. 2016) ~~Dentists can~~

~~have a role in decreasing the overall availability of opioids for nonmedical use and abuse in the home and community.(DePhillips et al. 2017)~~

Deaths due to opioid overdoses ~~are at~~ reached record highs prompting the CDC to declare an opioid epidemic in 2011.(Rudd et al. 2016; DePhillips et al. 2019 ~~2017~~) The pediatric mortality rate for opioid p~~P~~oisoning ~~deaths~~ increased ~~of opioids~~ nearly threefold ~~quadrupled~~ from 1999 to 2016~~11~~, with nearly 9,000 children and adolescents in the United States dying as a result of opioids ~~the most recent data at 5.4 per 100,000 individuals~~.(DePhillips et al. 2019 2017) A trend towards increased pediatric emergency department visits due to opioid ingestion and a greater than ~~5~~fivefold increase in overdose death rates in the 15-24-year age group also have been demonstrated.(DePhillips et al. 2019 ~~2017~~) ~~Since commercial opioids often are combined with acetaminophen, the potential for hepatic failure from toxic levels of acetaminophen also must be considered.(Drew 2015) As previously stated, providers treating pediatric and adolescent populations should avoid prescribing opioid analgesics when patients are using benzodiazepines.(Dowell et al. 2016)~~ Risky use of opioids among children and adolescents is a growing trend, and the concern for opioid use disorder in adolescents is significant.(Allareddy et al. 2017; McCabe et al. 2017) Since commercial opioids often are combined with acetaminophen, the potential for hepatotoxicity~~ic failure from toxic levels of acetaminophen also must be considered~~is an accompanying concern.(Drew 2015) In 2016, the A~~merican~~ A~~cademy of~~ P~~ediatrics~~ released a policy statement that recommended timely intervention to curb opioid use disorder with the goal of eliminating long-term medical, psychiatric, and social consequences of ongoing substance abuse.(~~Citation needed~~ Tobias et al.2016)

Opioid r~~R~~isk mitigation involves ~~begins with understanding how to~~ recogniz~~e~~ing drug-seeking behavior.(Shaefer et al. 2016) To address the potential risk of opioid misuse~~/abuse~~, screening patients prior to prescribing opioids ~~should be~~ has been advocated as standard practice.(Dowell et al. 2016) ~~Screening commonly is performed with adult patients using a variety of screening tools.(Smith et al. 2015) Although screening adolescents for opioid abuse or misuse has been suggested~~However, a standardized assessment for adolescents has not been identified.(Walco et al. 2017; Smith et al. 2015) Therefore, ~~the practitioner should,~~ at a minimum, ~~perform~~ a thorough

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review of medical history including analgesics used in the past is indicated before prescribing. (Walco et al. 2017) Despite the fact that screening of parents is recommended by the AAP, this is not a common practice.(Lane et al. 2007; Spehr et al. 2017) Nonetheless, screening is essential for identifying children at risk of opioid exposure in the home. ~~It also is known that c~~Children of parents who abuse opioids are at an increased risk for neglect and often suffer from parental instability and lack of structure in the home.(Spehr et al. 2017) ~~Therefore, behavioral health support may be required for emotional disturbances such as drug abuse, depression, or post-traumatic stress disorder.(Spehr et al. 2017)~~

For professionals who suspect patients have misuse~~/abuse~~ issues, the FDA, National Institutes of Health, National Institute on Drug Abuse, the American Dental Association, and state prescription drug monitoring programs have resources available to review the history of prescriptions for controlled substances which may decrease their diversion.(NIH 2014) Transparent discussion about the potential for physical and/or psychological dependence is a critical component of safe opioid practices in the adolescent population.~~ of medication use with teens is important.~~(AAPD P_Substance Misuse,Kelley 2020) Furthermore, discussion regarding the proper disposal of unused controlled medications is key to reducing availability/diversion of opioids~~substances with the potential for abuse or for physical and/or psychological dependence~~.(AAPD P Substance Misuse, Kelley JAM 2020). Safeguarding of opioids stored in offices for sedation can be accomplished by following security requirements for dispensers of controlled substances (21CFR 1301-75 Title Drug Enforcement Administration Dept of Justice).

Recommendations

Infants, children, and adolescents can and do experience pain due to dental/orofacial injury, infection, and dental procedures. Inadequate pain management may have significant physical and psychological consequences for the patient. Adherence to the following recommendations can help practitioners prevent or substantially relieve pediatric dental pain and minimize risk of associated morbidities. Practitioners should:

1. assess p~~P~~ain ~~assessment should be considered~~ for all patients as part of the dental history.

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2. avoid sensitization by using ~~Careful~~ techniques ~~should be used~~ to minimize stimulation and tissue damage when providing dental treatment.
3. achieve p~~P~~rofound anesthesia ~~should be achieved~~ prior to invasive treatment.
4. use ~~of~~ pre-emptive analgesia ~~should be considered~~ when moderate to severe postoperative pain is anticipated.
5. manage odontogenic and non-odontogenic pain with combined n~~N~~onpharmacologic ~~techniques~~ (e.g., distraction) and pharmacologic ~~should carefully be considered as potentially valuable interventions for~~ pain management.
6. use APAP/NSAIDs ~~should be used~~ as first-line pharmacologic therapy for pain management.
7. ~~U~~use caution and carefully assess benefits and risks of adverse events when considering prescribing ~~of~~ opioids ~~should be rare~~ for pain management in~~for pediatric~~ children and adolescents~~dental patients~~.
8. ~~To help~~ minimize the risk of opioid misuse~~abuse~~, ~~pediatric patients and their parents should be screened~~ by screening patients and parents regarding previous/current opioid use before prescribing opioid analgesics.
9. ~~To avoid diversion of controlled substances,~~ ~~practitioners should~~ utilize prescription monitoring databases and ~~encourage~~inform parents~~patients~~ to properly discard ~~any~~ unused medications to avoid diversion of controlled substances.
10. inform parents of ~~Providers should be knowledgeable of~~ risks associated with prescribed and over-the-counter analgesic medications and anticipate and manage adverse effects (e.g., asthma and NSAIDs, sedation and opioids.)
11. ~~S~~seek~~ing~~ expert consultation for patients with chronic pain or other complicated pain condition ~~should be considered~~.
12. ~~Providers should~~ be familiar with analgesic properties of agents when used in conjunction with ~~during~~ sedation or general anesthesia.
13. ~~Prescribing opioid analgesics should be avoided~~ strongly advise against opioids in high-risk patients (e.g. obesity, obstructive sleep apnea, lung tissue disease, ~~if the patient is using~~ benzodiazepine~~s~~ use).

14. use an alternating schedule of APAP and NSAIDS for multi-modal pain management if single-agent therapy is ineffective ~~Synergistic effects from multiple medications (multimodal analgesia) may be considered~~.

References:

Allareddy V, Rampa S, Allareddy V. Opioid abuse in children: An emerging public health crisis in the United States! Pediatr Res 2017;82(4):562-3.

American Academy of Pediatric Dentistry. Acquired temporomandibular disorders in infants, children and adolescents. Pediatr Dent 2018;40(6):366-72.

American Academy of Pediatric Dentistry. Best practices for pain management in infants, children, adolescents, and individuals with special health care needs Pediatr Dent 2018;40(6):321-9.

American Academy of Pediatric Dentistry. Policy on acute pediatric dental pain management. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; Pending. ~~Pediatr Dent 2018; 40(6):101-3.~~

American Academy of Pediatric Dentistry. Policy on substance ~~abuse~~ misuse in adolescent patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:101-5.~~Pediatr Dent 2018;40(6):78-81.~~

American Academy of Pediatric Dentistry. Use of local anesthesia for pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:332-7. ~~Pediatr Dent 2018;40(6):274-80.~~

American Academy of Pediatric Dentistry. Use of nitrous oxide for pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:338-43. ~~Pediatr Dent 2018; 40(6):281-6.~~

American Academy of Pediatrics, American Pain Society. The assessment and management of acute pain in infants, children and adolescents. Pediatrics 2001;108(3):793-7.

~~Aminabadi NA, Farahani RMZ, Balayi GE. The efficacy of distraction and counterstimulation in the reduction of pain reaction to intraoral injection by pediatric patients. J Contemp Dent Pract 2008;9(6):33-40.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Ashley PF, Parekh S, Moles DR, Anand P, MacDonald LC. Preoperative analgesics for additional pain relief in children and adolescents having dental treatment. Cochrane Database of Syst Rev 2016;(8):CD008392.

Association of Paediatric Anaesthetists of Great Britain and Ireland. Good practice in postoperative and procedural pain management. 2nd ed. 2012. Paediatr Anaesth 2012;22(Suppl 1):1-79.

Baccei ML, Fitzgerald M. Development of pain pathways and mechanisms. In: McMahon SB, Koltzenburg M, Tracey I, Turk DC, eds. Wall and Melzack's Textbook of Pain. 6th ed. Philadelphia, Pa.: Elsevier Saunders; 2013:143-55.

~~98. Bagley SM, Hadland SE, Carney BL, Saitz R. Addressing stigma in medication treatment of adolescents with opioid use disorder. J Addict Med 2017;11(6):415-6.~~

Batoz H, Semjen F, Bordes-Demolis M, Bénard A, Nouette-Gaulain K. Chronic postsurgical pain in children: Prevalence and risk factors. A prospective observational study. Br J Anaesth 2016;117(4):489–96.

~~Baygin O, Tuzuner T, Isik B. Comparison of pre-emptive ibuprofen, paracetamol, and placebo administration in reducing post-operative pain in primary tooth extraction. Int J Paediatr Dent 2011;21(4):306-13.~~

Becker DE. Pain management: part 1: Managing acute and postoperative dental pain. Anesth Prog 2010;57(2): 67-80. ~~79.~~

Betsch TA, Gorodzinsky AY, Finley GA, Sangster M, Chorney J. What's in a name? Health care providers' perceptions of pediatric pain patients based on diagnostic labels. Clin J Pain 2017;38(8)694-8.

Birnie KA, Noel M, Chambers CT, Uman LS, Parker JA. Psychological interventions for needle- related procedural pain and distress in children and adolescents. Cochrane Database Syst Rev 2018;10:CD005179.

Boyce RA. Kirpalani T, Mohan N. Updates of topical and local anesthesia agents. Dent Clin North Am 2016; 60(2):445-71.

Brown ML, Rojas E, Gouda S. A mind–body approach to pediatric pain management. Children 2017;4(6):~~1~~50.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Bukola IM, Paula D. The effectiveness of distraction as procedural pain management technique in paediatric oncology patients: A meta-analysis and systematic review. J Pain Symptom Manag 2017;54(4):589-600.

Buvanendran A, Lubenow TR, Krooni JS. Postoperative pain and its management. In: McMahon SB, Koltzenburg M, Tracey I, Turk DC, eds. Wall and Melzack's Textbook of Pain. 6th ed. Philadelphia, Pa.: Elsevier Saunders; 2013:629:44.

Code of Federal Regulations (CFR) Title 21.Volume 9, Chapter 2, Part 1303. Registration of Manufacturers, Distributors, and Dispensers of Controlled Substances. 2022: Available at: "https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=1301.75". Accessed on March 13, 2022.

Chou, R, Gordon, DB, de Leon-Cassola OA, et al. ~~Guidelines on the m~~Management of postoperative pain: A clinical practice guideline from the American Pain Society, American Society of Regional Anesthesia and Pain Medicine, American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Counsel. J Pain 2016;17(2):131-57.

Conner ER, Musser D, Colpitts KM , Laochamroonvorapongse DL, Koh JL. Perioperative opioid administration in children with and without developmental delay undergoing outpatient dental surgery. J Clin Anesth 2017;37:92-6.

Cooper TE, Wiffen PJ, Heathcote LC, et al. Antiepileptic drugs for chronic non-cancer pain in children and adolescents. Cochrane Database of Syst Rev 2017;(8): CD012536.

Cunningham A, McPolin O, Fallis R, Coyle C, Best P, McKenna G. A systematic review of the use of virtual reality or dental smartphone applications as interventions for management of paediatric dental anxiety. BMC Oral Health 2021;21(1):244.

Crews KR, Monte AA, Huddart R, et.al. Clinical pharmacogenetics implementation consortium guideline for CYP2D6, OPRM1, and COMT genotypes and select opioid therapy. Clin Pharmacol Ther 2021;110(4):888-96.

Dancel R, Liles EA, Fiore D. Acute pain management in hospitalized children. Rev Recent Clin Trials 2017;12(4):277-83.

Davidson F, Snow S, Haydenc J, Chorney J. Psychological interventions in managing postoperative pain in children: A systematic review. Pain 2016;157(9):1872-86.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Dawes MM, Andersson DA, Bennett DLH, Bevan S, McMahon SB. Inflammatory mediators and modulators of pain. In: McMahon SB, Koltzenburg M, Tracey I, Turk DC, eds. Wall and Melzack's Textbook of Pain. 6th ed. Philadelphia, Pa.: Elsevier Saunders; 2013:48-67.

De Leeuw R, Klasser G. American Academy of Orofacial Pain: Guidelines for Assessment, Diagnosis and Management. 6th ed. Hanover, Ill.: Quintessence Publishing; 2013:121-42.

DePhillips M, Watts J, Lowry J, Dowd~~y~~ MD. Opioid prescribing practices in pediatric acute care settings. Pediatr Emerg Care 2019;35(1):16-21. ~~2017; Epub ahead of print: 1-6.~~

Dostrovsky JO. Inflammatory and cancer-related orofacial pain mechanisms: Insight from animal models. In: Sessel BJ, ed. Orofacial Pain: Recent Advancements in Assessment, Management, and Understanding of Mechanisms. Washington, D.C.: International Association for the Study of Pain Press; 2014:305-30.

Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain – United States, 2016. ~~JAMA 2016;315(15):1624-45.~~ MMWR Recomm Rep 2016;65(No. RR-1):1–49.

Drew S. Best practices for management of pain, swelling, nausea, and vomiting in dentoalveolar surgery. Oral Maxillofac Surg Clin North Am 2015;27(3):393-404. 8. Brennan TJ. Pathophysiology of postoperative pain. Pain 2011;152(3):S33-40.

Eccleston C, Palmero TM, Williams ACDC, et al. Psychological therapies for the management of chronicand recurrent pain in children and adolescents. Cochrane Database of Syst Rev 2014;(5):CD003968.

~~European Medicines Agency. Position on codeine. Available at: "http://www.ema.europa.eu/ema/index.jsp?curl=pages/medicines/human/referrals/Codeine-containing_medicines/human_referral_prac_000008.jsp&mid=WC0b01ac05805c516f". Accessed February 25, 2018.~~

Fein A, Zempsky WT, Cravero JP. Relief of pain and anxiety in pediatric patient in emergency medical systems. Pediatrics 2012;130(5): e1391-405.

Fillingim RB, Bruehl S, Dworkin RH, et al. The ACTTION-American Pain Society Pain Taxonomy (AAPT): An evidence-based and multidimensional approach to classifying chronic pain conditions. J Pain 2014;15(3):241-9.

Finley GA, Franck LS, Grunau RE, von Baeyer CL. Why children's pain matters. Pain: Clin Updates 2005;13(4):1-6.

Fortuna RJ, Robbins BW, Cajola E, et al. Prescribing of controlled medications to adolescents and young adults in the United States. Pediatrics 2010;126(6):1108-16.

Garret-Bernardin A, Cantile T, D'Antò V. Pain experience and behavior management in pediatric dentistry: A comparison between traditional local anesthesia and the wand computerized delivery system. Pain Res Manag 2017;2017:1-6.

Gates M, Hartling L, Shulhan-Kilroy J, et al. Digital technology distraction for acute pain in children: A meta-analysis. Pediatrics 2020;145(2):e20191139.

Gewandter JS, Dworkin RH, Turk DC, et.al. Research design considerations for chronic pain prevention in clinical trials: IMMPACT recommendations. Pain 2015;156(7):1184-97.

Glass JS, Hardy CL, Meeks NM, Carrol BT. Acute pain management in dermatology: Risk assessment and treatment. J Am Acad Dermatol 2015;73(4):543-60.

Goettems ML, Zborowski EJ, Costa FC, et al. Non-pharmacologic intervention on the prevention of pain and anxiety during pediatric dental care: A systematic review. Acad Pediatr 2017;17(2):110-9.

Gosnell ES, Thikkurissy S. Assessment and management of pain in the pediatric patient. In Nowak AJ, Christensen JR, Mabry, TR, Townsend JA, Wells MH, eds. Pediatric Dentistry: Infancy through Adolescence. 6th ed, St. Louis, MO.: Elsevier;2019:97-115.

Gutenberg LL, Chen JW, Trapp L. Methemoglobin levels in generally anesthetized pediatric dental patients receiving prilocaine versus lidocaine. Anesth Prog 2013;60(3):99-108.

Gouri AJ, Jaju RA, Tate A. The practice and perception of pain assessment in US pediatric dentistry residency programs. Pediatr Dent 2010;32(7):546-50.

~~Grégoire MC, Finley GR. Drugs for chronic pain in children: A commentary on clinical practice and the absence of evidence. Pain Res Manag 2013;19(1):47-50.~~

Hartling L, Ali S, Dryden DM, et al. How safe are common analgesics for the treatment of acute pain for children? A systematic review. Pain Res Manag 2016; 2016:5346819.

Hauer J, Jones BL. Evaluation and management of pain in children. In: Poplack DG, Armsby C, eds. UpToDate. Available at: "https://www.uptodate.com/contents/evaluation-and-management-of-pain-in-children?search=.%20Evaluation%20and%20management%20of%20pain%20in%20children&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1”. Accessed ~~June 21 2018~~ October 8, 2021. ~~(Archived by WebCite® at: “http://www.webcitation.org/70Lb4ouuK”)~~

Hu Y-H, Tsai A, Ou-Yang L-W, Chuang L-C, Chang P-C. Postoperative dental morbidity in children following dental treatment under general anesthesia. BMC Oral Health 2018;18(1):84.

~~International Association for the Study of Pain. Terminology. Available at: “https://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1698#Pain”. Accessed November 24, 2017. (Archived by WebCite® at: “http://www.webcitation.org/6vDlQh5Vw”)~~

Jain A, Yeluri R, Munshi AK. Measurement and assessment of pain in children - a review. J Clin Pediatr Dent 2012;37(2~~0~~):125-36.

~~Kankkunen P, Vehviläinen-Julkunen K, Pietilä AM, Kokki H, Halonen P. Parents perception and use of analgesic at home after day surgery. Pediatr Anesth 2003;13(2): 132-40.~~

Kelley-Quon LI, Kirkpatrick MG, Ricca RL, Baird R, Harbaugh CM. Guidelines for opioid prescribing in children and adolescents after surgery: An expert panel opinion. JAMA Surg. 02020:156(1):76-90.

Kharouba J, Ratson T, Somri M, et.al. Preemptive analgesia by paracetamol, ibuprofen, or placebo in pediatric dental care. A randomized controlled study. J Clin Pediatr Dent 2019;43(1):51-5.

Kasat V, Gupta A, Ladd R, Kathariya M, Saluja H, Farooqui AA. Transcutaneous electric nerve stimulation (TENS) in dentistry – A review. J Clin Exp Dent 2014;6(5): e562-8.

Kaufman E, Epstein JB, Gorsky M, Jackson DL, Kadari A. Preemptive analgesia and local anesthesia as a supplement to general anesthesia: A review. Anesth Prog 2005; 52(1):29-38.

Kaye AD, Helander EM, Vadivelu N, et al. Consensus statement for clinical pathway development or perioperative pain management and ~~pain~~ care transitions. Pain Ther 2017;6(2):129-41.

Keles S, Kocaturk O. Immediate postoperative pain and recovery time after pulpotomy performed under general ~~anaesthesia~~ anesthesia in young children. Pain Res Manag 2017; 2017:1:9781501.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~Townsend JA, Ganzberg S, Thikkurissy S. The effect of local anesthetic on quality of recovery characteristics following dental rehabilitation under general anesthesia in children. Anesth Prog 2009;56(4):115-22.~~

Kent ML, Tighe PJ, Belfer I, et al. The ACTTION– APS–AAPM Pain Taxonomy (AAAPT) multidimensional approach to classifying acute pain conditions. Pain Med 2017;18(5):947-58.

Klassen JA, Liang Y, Tjosvold L, et al. Music for pain and anxiety in children undergoing medical procedures: A systematic review of randomized controlled trials. Ambul Pediatr 2008;8(2):117-28.

~~Kokki H. Nonsteroidal anti-inflammatory drugs for postoperative pain: a focus on children. Pediatr Drugs 2003;5(2):102-23.~~

Kohen DP, Kaiser P. Clinical hypnosis with children and adolescents – What? Why? How?: Origins, applications, and efficacy. Children(Basel) 2014;1(2):74-98.

Koh SWC, Li CF, Loh JSP, Wong ML, Loh VWK. Managing tooth pain in general practice. Singapore Med J 2019;60(5):224-8.

Landier WN, Tse A. Use of complementary and alternative medical interventions for the management of procedure-related pain, anxiety, and distress in pediatric oncology: An integrative review. J Pediatr Nurs 2010;25 (6):566-79.

Lane WG, Dubowitz H, Feigelman S, et al. Screening for parental substance abuse in pediatric primary care. Ambul Pediatr 2007;7(6):458-62.

Laskarides C. Update on analgesic medication for adult and pediatric dental patients. Dent Clin North Am 2016; 60(2):347-66.

Latremoliere A, Woolf CJ. Central sensitization: A generator of pain hypersensitivity by central neural plasticity. J Pain 2009;10(9):895-926.

Lee GY, Yamada J, Kyolo O, Shorkey A, Stevens B. Pediatric clinical practice guidelines for acute procedural pain: A systematic review. Pediatrics 2014;133(3):500-15.

Lewin D, Dahl R. Importance of sleep in the management of pediatric pain. J Devel Beh Pediatrics 1999;20 (4):244-52.

Lyons RA. Understanding basic behavioral support techniques as an alternative to sedation and anesthesia. Spec Care Dent 2009;29(1):39-50.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Malamed SF, Tavana S, Falkel M. Faster onset and more comfortable injection with alkalinized 2% lidocaine with epinephrine 1:100,000. Compend Contin Educ Dent 2013;34(1):10-20.

McCabe SE, West BT, Veliz P, et al. Trends in medical and nonmedical use of prescription opioids among U.S. adolescents: 1976–2015. Pediatrics 2017;139(4): e20162387. ~~1-9~~.

McGrath PJ, Unruh AM. Measurement and assessment of pediatric pain. In: McMahon SB, Koltzenburg M, Tracey I, Turk DC, eds. Wall and Melzack's Textbook of Pain. 6th ed. Philadelphia, Pa.: Elsevier Saunders; 2013: 320-7.

McGrath PJ, Walco GA, Turk DC, et al. Core outcome domains and measures ~~from~~ for pediatric acute and chronic/ recurrent pain clinical trials: PedIMMPACT recommendations. J Pain 2008;9(9):771-83.

Monteiro J, Tanday A, Ashley PF, Parekh S, Alamri H. Interventions for increasing acceptance of local anaesthetic in children and adolescents having dental treatment. Cochrane Database Syst Rev 2020;2(2):CD011024.

Munshi AK, Hegde AM, Girdhar D. Clinical evaluation of electronic dental anesthesia for various procedures in pediatric dentistry. J Clin Pediatr Dent 2000;24(3): 199-204.

National Institute of Health, National Institute on Drug Abuse. Principles of adolescent substance use disorder treatment: A research-based guide. NIH Publication Number 14-7953. January, 2014. Available at: "https://nida.nih.gov/publications/principles-adolescent-substance-use-disorder-treatment-research-based-guide/principles-adolescent-substance-use-disorder-treatment". Accessed February 5, 2022. ~~"https:// d14rmgtrwzf5a.cloudfront.net/sites/default/files/podata_1_17_14.pdf". Accessed May 23, 2018. (Archived by WebCite® at: "http://www.webcitation.org/6xV4BfzAb")~~

~~Needleman HL, Harpayat S, Wu S, Allred EN, Berde C. Postoperative pain and other sequelae of dental rehabilitations performed on children under general anesthesia. Pediatr Dent 2008;30(2):111-21.~~

Neri E, Maestro A, Minen F, et al. Sublingual ketorolac versus sublingual tramadol for moderate to severe post-traumatic bone pain in children: A double-blind, randomized, controlled trial. Arch Dis Child 2013;98(9):721-4.

~~102. O'Neil M. The ADA Practical Guide to Substance Use Disorders and Safe Prescribing. Hoboken, N.J.: Wiley Blackwell; 2015:1-240.~~

Ong CK, Seymour RA, Lirk P, et al. Combining paracetamol (acetaminophen) with nonsteroidal anti-inflammatory drugs: A qualitative systematic review of analgesic efficacy for acute postoperative pain. Anesth Analg 2010; 110(4):1170-9.

Pacheco GS, Ferayorni A. Pediatric procedural sedation and analgesia. Emerg Med Clin North Am 2013;31(3):831-52.

Palmero T, Eccleston C, Goldschneider K, et al. Assessment and management of children with chronic pain: Position statement from the American Pain Society. Chicago, Ill.; 2012:1-4.

Parekh S, Gardener C, Ashley PF, Walsh T. Intraoperative local anaesthesia for reduction of postoperative pain following general anaesthesia for dental treatment in children and adolescents. ~~Does local anesthetic injection in children and young people having general anesthesia reduce pain after treatment?~~ Cochrane Database of Syst Rev 2014;(12):CD009742.

Pogatzki-Zahn EM, Zahn PK, Brennan TJ. Postoperative pain-clinical implications of basic research. Best Prac Res Clin Anaesthesiol 2007;21(1):3-13.

Rabbitts J, Fisher E, Rosenbloom BN, Palmero TM. Prevalence and predictors of chronic postsurgical pain in children: A systematic review and meta-analysis. J Pain 2017;18(6):605-14.

Raja SN, Carr DB, Cohen M, et al. The revised International Association for the Study of Pain definition of pain: Concepts, challenges, and compromises. Pain 2020;161(9):1976-82.

Ramírez-Carrasco A, Butrón-Téllez Girón C, Sanchez- Armass O, Pierdant-Pérez M. Effectiveness of hypnosis in combination with conventional techniques of behavior management in anxiety/pain reduction during dental anesthetic infiltration. Pain Res Manag 2017;2017: 1434015.

Randall CL, Zahlis E, Chi DL. Pediatric dental procedure-related pain assessment practices in a rural Alaskan healthcare organization: A qualitative study. Pediatr Dent 2020;42(5):350-3.

Raslan N, Zouzou T. Comparison of preemptive ibuprofen, acetaminophen, and placebo administration in reducing peri- and postoperative pain in primary tooth extraction: A randomized clinical trial. Clin Exp Dent Res 2021;7(6):1045-52.

Rony RYZ, Fortier MA, Chorney JM, Perret D, Kain ZN. Parental postoperative pain management: attitudes, assessment, and management. Pediatrics 2010;125(6):e1372-8.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Rudd RA, Seth P, David F, Scholl L. Increases in drug and opioid-involved overdose deaths – United States, 2010-2015. Morb Mortal Wkly Rep 2016;65(50-51): 1445-52.

Ruest S, Anderson A. Management of acute pediatric pain in the emergency department. Curr Opin Pediatr 2016;28(3):298-304.

Santos PS, Barasuol JC, Moccelini BS, et.at. Prevalence of toothache and associated factors in children and adolescents: a systematic review and meta-analysis. Clin Oral Investig 2022; 26(2):1105-19.

Schechter JL, Waldo GA. The potential impact on children of the CDC guidelines for prescribing opioids for chronic pain: Above all, do no harm. JAMA Pediatr ~~Pediatrics~~ 2016;170(5):425-6.

Schnabel A, Reichl SU, Meyer-Frießem C, Zahn PK, Pogatzki-Zahn E. Tramadol for postoperative pain treatment in children. Cochrane Database Syst Rev 2015; (3):CD009574.

Scrivani SJ, Keith DA, Kulich RJ, et al. Pain management for dental medicine in 2021: Opioids, coronavirus and beyond. J Pain 2021;14:1371-87.

~~Sessel BJ. The societal, political, educational, scientific, and clinical context of orofacial pain. In: Orofacial Pain: Recent Advancements in Assessment, Management, and Understanding of Mechanisms. Washington, D.C.: International Association for the Study of Pain Press; 2014:1-15.~~

Shaefer J, Barreveld AM, Arnstein P, Kulich RJ. Interprofessional education for the dentist in managing acute and chronic pain. Dent Clin North Am 2016;60(4): 825-42.

Shah R, Sawardekar A, Suresh A. Pediatric acute pain management. In: Practical Management of Pain. 5th ed. Philadelphia, Pa.: Elsevier Inc.; 2014:304-11.

Shavit I, Peri-Front Y, Rosen-Walther A, et al. A randomized trial to evaluate the effect of two topical anesthetics on pain response during frenotomy in young infants. Pain Med 2017;18(2):356-62.

Shirvani A, Shamszadeh S, Eghbal MJ Asgary S. The efficacy of non-narcotic analgesics on post-operative endodontic pain: A systematic review and meta-analysis: The efficacy of non-steroidal anti-inflammatory drugs and/ or paracetamol on post-operative endodontic pain. J Oral Rehab 2017;44(9):709-21.

Shirvani A, Shamszadeh S, E~~n~~ghbal MJ, Marvasti LA, Asgary S. Effect of preoperative oral analgesics on pulpal anesthesia in patients with irreversible pulpitis–A systematic review and meta-analysis. Clin Oral Investig 2017;21(1):43-52.

~~94. Shueb SS, Nixdorf DR, John MT, Alonso BF, Durham J. What is the impact of acute and chronic orofacial pain on quality of life? J Dent 2015;43(10):1203-10.~~

~~Sinha M, Christopher NC, Fenn R, Reeves L. Evaluation of nonpharmacologic methods of pain and anxiety management for laceration repair in the pediatric emergency department. Pediatrics 2006;117(4):1162-8.~~

Smith SM, Paillard F, McKeown A, et al. Instruments to identify prescription medication misuse, abuse, and related events in clinical trials: An ACTTION systematic review. J Pain 2015;16(5):389-411.

Spehr MK, Coddington J, ~~Azza H~~ Ahmed A, Jones E. Parental opioid abuse: Barriers to care, policy, and implications for primary care pediatric providers. J Pediatr Healthcare 2017;31(6):695-702.

Stake CE, Manworren RCB, Rizeq YK, et.al. Use of opioids and nonopioid analgesics to treat pediatric postoperative pain in the emergency department, Pediatr Emerg Care 2022;1(38)e234-9.

Stinson J, Connelly M, Kamper SJ, et al. Models of care for addressing chronic musculoskeletal pain and health in children and adolescents. Best Prac Res Clin Rheumatol 2016;30(3):468-82.

Teoh L. Managing acute dental pain without codeine. Aust Prescr 2020;43(2):64.

Tecco S, Ballanti F, Baldini A. New frontiers in orofacial pain and its management. Pain Res Manag 2018;6286717.

Timmerman A, Parashos P. Management of dental pain in primary care. Aust Prescr 2020;43(2):39-44.

Tirupathi SP, Rajasekhar S. Buffered versus unbuffered local anesthesia for inferior alveolar nerve block injections in children: a systematic review. J Dent Anesth Pain Med 2020;20(5):271-9.

Tobias JD, Green TP, Coté CJ; Section on Anesthesiology and Pain Medicine; Committee on Drugs. Codeine: time to say “no”. Pediatrics 2016;138(4):e20162396.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Tompkins DA, Hobelmann JG, Compton P. Providing chronic pain management in the 5th vital sign era: Historical and treatment perspectives in a modern-day medical dilemma. Drug Alcohol Depend 2017;173(Suppl 1):S11-21.

Townsend JA, Ganzberg S, Thikkurissy S. The effect of local anesthetic on quality of recovery characteristics following dental rehabilitation under general anesthesia in children. Anesth Prog 2009;56(4):115-22.

~~92. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Calculating total daily dose of opioids for safer dosage. Available at: "https://www.cdc.gov/drugoverdose/pdf/calculating_ total_daily_dose-a.pdf ". Accessed February 25, 2018. (Archived by WebCite® at: "http://www.webcitation. org/6xV2QBafv")~~

~~103. U.S. Department of Health and Human Services. About the opioid epidemic. Available at: "https://www.hhs.gov/ opioids/about-the-epidemic/". Accessed March 2, 2018. (Archived by WebCite® at: "http://www.webcitation. org/6xc3REvBU")~~

U.S. Food and Drug Administration. Drug Safety Communication: FDA restricts use of prescription codeine pain and cough medicines and tramadol pain medicines in children; recommends against use in breastfeeding women. Available at: "https://www.fda.gov/downloads/Drugs/DrugSafety/UCM553814.pdf". Accessed February ~~25, 2018~~ 4, 2022. ~~(Archived by WebCite® at: "http://www.web-citation.org/6xVGnS3vO")~~

U.S. Food and Drug Administration. Risk of serious and potentially fatal blood disorder prompts FDA action on oral over-the-counter benzocaine products used for teething and mouth pain and prescription local anesthetics. Available at: "https://www.fda.gov/drugs/drug-safety-and-availability/risk-serious-and-potentially-fatal-blood-disorder-prompts-fda-action-oral-over-counter-benzocaine". Accessed January 4, 2022.

~~Uman LS, Birnie KA, Noel M, et al. Psychological interventions for needle-related procedural pain and distress in children and adolescents. Cochrane Database Syst Rev 2013;(10):CD005179.~~

~~Uman LS, Chambers CT, McGrath PJ, et al. Psychological interventions for needle-related procedural pain and distress in children and adolescents. Cochrane Database Syst Rev 2007;(3):CD005179.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Van Cleve WC, Grigg EB. Variability in opioid prescribing for children undergoing ambulatory surgery in the United States. J Clin Anesth 2017;41:16-20.

Vittinghoff M, Lonnqvist P-A, Mossetti V, et al. Postoperative pain management in children: Guidance from the pain committee of the European Society for Paediatric Anaesthesiology (ESPA Pain Management Ladder Initiative). Paediatr Anaesth 2018;28(6):493-506.

Walco GA, Gove N, ~~Jennifer NG,~~ Phillips J, Weisman SJ ~~et al~~. Opioid analgesics administered for pain in the inpatient pediatric setting. J Pain 2017;18(10):1270-6.

Wong M, Copp PE, Haas DA. Postoperative pain in children after dentistry under general anesthesia. Anesth Prog 2015;62(4):140-52.

Woolf CJ. Central sensitization: Implications for the diagnosis and treatment of pain. Pain 2011;152(3 Suppl): S2-15.

World Health Organization. Guidelines on the management of chronic pain in children. Geneva: World Health Organization; 2020. License:CC BY-NCSA3.0 IGO. Available at: “https://www.who.int/publications/i/item/9789240017870”, Accessed: 13 March 2022.

Zeltzer LK, Krane EJ, Palermo TM. Pediatric pain management. In: Kliegman RM, Stanton BF, St. Geme JW, Blum NJ, ~~Schor NF,~~ eds. Nelson’s Textbook of Pediatrics. ~~20th~~ 21st ed. Philadelphia, Pa.: Elsevier Saunders; ~~2016:430-47~~ 2019:469-90.

Pediatric Restorative Dentistry

Latest Revision

~~2019~~ 2022

Abstract

This best practice provides clinicians with guidance to form decisions about restorative dentistry, including when treatment is necessary and which techniques and materials are appropriate for restorative dentistry in pediatric patients. Not every caries lesion requires restoration, and restorative treatment of caries alone does not stop the disease process. Further, restorations have finite lifespans. Restorative approaches and supporting evidence for the excavation and restoration of deep caries lesions, including complete excavation, stepwise (i.e., two-step) excavation, partial (i.e., one-step) excavation, and no removal of caries prior to restoration, are discussed. Further research on long-term effectiveness of resin infiltration for small, non-cavitated interproximal lesions is recommended. The evidence for and against the use of amalgam, composite, glass ionomer and resin-modified glass ionomer cements, compomers, stainless steel crowns, and anterior crowns has been summarized. Practitioners should familiarize themselves with such evidence to inform their clinical decisions regarding pediatric restorative dentistry.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance regarding restorative dental care for children.

KEYWORDS: DENTISTRY, OPERATIVE, DENTAL MATERIALS, DENTAL RESTORATION, PERMANENT, DENTAL RESTORATION, TEMPORARY, EVIDENCE-BASED DENTISTRY

ABBREVIATIONS

AAP: American Academy of Pediatrics. **ART**: Alternative restorative technique. **BPA**: Bisphenol A. **FDA**: Food and Drug Administration. **GIC**: Glass ionomer cement. **HT**: Hall technique. **ITR**: Interim therapeutic restoration. **MIH**: Molar-incisor hypomineralization **MTA**: Mineral trioxide aggregate. **PMC:** Preformed metal crown(s). **RCTs**: Randomized controlled trials. **RMGIC**: Resin modified glass ionomer cements. **SDF**: Silver diamine fluoride. **SSC**: Stainless steel crown(s). **UK**: United Kingdom.

Purpose

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

The American Academy of Pediatric Dentistry (**AAPD**) intends these recommendations to help practitioners make decisions regarding restorative dentistry, including when it is necessary to treat and what the appropriate materials and techniques are for restorative dentistry in children and adolescents.

Methods

These recommendations originally were developed by the Restorative Dentistry Subcommittee of the Clinical Affairs Committee and adopted in 1991.(AAPD 1991) The last ~~comprehensive~~ revision by the Council on~~f~~ Clinical Affairs ~~of this document was~~ occurred in 2019~~2014,(AAPD BP_Restorative) and an addition regarding the Hall technique (**HT**) for preformed metal crowns was added in 2016.~~(AAPD G_Restorative ~~2016~~2019) A thorough review of the scientific literature in the English language pertaining to restorative dentistry in primary and permanent teeth was completed to revise the previous guide-line. Electronic database ~~and hand~~ searches using PubMed®/Medline, for the most part between the years ~~2000-~~2012-2022~~2019~~, were conducted using the terms: dental caries, intra-coronal restorations, restorative treatment decisions, caries diagnosis, caries excavation, dental amalgam, glass ionomers, resin modified glass ionomers, conventional glass ionomers, glass ionomer cements, atraumatic/alternative restorative technique (**ART**), interim therapeutic restoration (**ITR**), resin infiltrations, resin based composite, dental composites, compomers, full coverage dental restorations, stainless steel crowns (**SSC**), Hall technique, primary molars, preformed metal crowns **(PMC)**, strip crowns, pre-veneered crowns, zirconia crowns, esthetic restorations; parameters: humans, English, birth through age 18, clinical trials, randomized controlled clinical trials (**RCTs**). This search yielded 1,671 articles. Articles were screened by viewing titles and abstracts. Articles were chosen for review from these searches and from the references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

~~Full evaluation and abstraction included examination of the clinical efficacy on specific restorative dentistry topics, research methods, and potential for study bias (e.g., patient recruitment, randomization, blinding, subject loss, sample size estimates, conflicts of interest, statistics). Research that was considered deficient or had high bias was eliminated. In those topic areas for which there were rigorous meta-analyses or systematic reviews available, only those clinical trial articles that were not covered by the reviews were subjected to full evaluation and abstraction.~~

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~~The assessment of evidence for each topic was based on a modification of the American Dental Association's grading of recommendations: strong evidence (based on well-executed RCTs, meta-analyses, or systematic reviews); evidence in favor (based on weaker evidence from clinical trials).(ADA 2013)~~

Background

~~**When to restore**~~

Historically, the management of dental caries was based on the belief that caries was a progressive disease that eventually destroyed the tooth unless there was surgical and restorative intervention.(AAPD Caries Risk Assessment 2018~~Tinanoff & Douglass 2001~~) It is now recognized that restorative treatment of dental caries alone does not stop the disease process(~~Sheiham 1997~~) and restorations have a finite lifespan.(AAPD Caries Risk Assessment 2018) Conversely, some caries lesions may not progress and, therefore, may not need restoration.

Contemporary management of dental caries includes identification of an individual's risk for caries progression, understanding of the disease process for that individual, and active surveillance to assess disease progression. ~~and~~ ~~m~~Management with ~~appropriate~~targeted preventive services~~,~~ and therapy such as silver diamine fluoride are supplemented by restorative therapy when indicated.(AAPD BP_Car~~r~~ies Risk Assessment; Urquhart et al. 2019; AAPD P_Silver Diamine Fluoride,)

Molar-incisor hypomineralization **(MIH)** is a developmental defect involving any number of the permanent first molars and possibly the permanent incisors as well. This condition presents esthetic and restorative challenges due to the range of clinical variation, including hypersensitivity, altered resin bond strength, potential for tooth structure loss and a caries presentation that can be unusual. (Giuca et al 2020; Somani et al 2021) Restorative treatment options and overall management of MIH depends on the degree of affected teeth, potential for breakdown of tooth structure, sensitivity, severity and quality of the dental defect in addition to patient preferences and behavior.(Martignon et al 2021; Somani et al 2021)

When to restore

~~With the exception of reports of dental examiners in clinical trials, studies of reliability and reproducibility of detecting dental caries are not conclusive.(NIH 2001) There also is minimal information regarding validity of caries diagnosis in primary teeth,(Tinanoff & Douglass 2001) as~~

~~primary teeth may require different criteria due to thinner enamel and dentin and broader proximal contacts.(Nelson 2010)~~

Among the objectives of restorative treatment are to repair or limit the damage from caries, protect and preserve the tooth structure, and maintain pulp vitality whenever possible. The AAPD's *Use of Vital Pulp Therapies in Primary Teeth with Deep Caries Lesions* (Dhar et al. 2017) and *Pulp Therapy for Primary and Immature Permanent Teeth*(AAPD 2020 state the treatment objective for a tooth affected by caries is to maintain pulpal vitality, especially in immature permanent teeth for continued apexogenesis.

~~Furthermore~~, ~~i~~Indications for restorative therapy only have been examined superficially because such decisions generally have been regarded as a function of clinical judgment.(Bader & Shugars 1992) Decisions for when to restore caries lesions should include at least clinical criteria of visual detection of enamel cavitations, visual identification of shadowing of the enamel, and/or radiographic recognition of enlargement of lesions over time.(AAPD BP_Caries Risk Assessment; Ismail et al. 2007; Beauchamp et al. 2008)

The benefits of restorative therapy include: removing cavitations or defects to eliminate areas that are susceptible to caries; stopping the progression of tooth demineralization; restoring ~~the integrity of~~ tooth structure and function; preventing the spread of infection into the dental pulp; and preventing the shifting of teeth due to loss of tooth structure. The risks of restorative therapy include reducing the longevity of teeth by making them more susceptible to fracture, recurrent lesions, restoration failure, pulp exposure during caries excavation, future pulpal complications~~, and~~ in addition to the risk of iatrogenic damage to adjacent teeth.(Downer et al. 1999; Lenters et al. 2006; Slayton 2015)

Primary teeth may be more susceptible to restoration failures than permanent teeth.(Hickel et al. 2005) Additionally, before restoration of primary teeth, one needs to consider the length of time remaining prior to tooth exfoliation.

Recommendations:

1. Management of dental caries should include~~s~~ identification of an individual's risk for caries progression, understanding of the disease process for that individual, and active surveillance to assess disease progression and manage with appropriate preventive services, supplemented by restorative therapy when indicated.

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2. Decisions for when to restore carious lesions should include at least clinical criteria of visual detection of enamel cavitation, visual identification of shadowing of the enamel, and/or radiographic recognition of progression of lesions.

Deep caries excavation and restoration

~~Among the objectives of restorative treatment are to repair or limit the damage from caries, protect and preserve the tooth structure, and maintain pulp vitality whenever possible. The AAPD's *Use of Vital Pulp Therapies in Primary Teeth with Deep Caries Lesions*(Dhar et al. 2017) and *Pulp Therapy for Primary and Immature Permanent Teeth*(AAPD 20202018) state the treatment objective for a tooth affected by caries is to maintain pulpal vitality, especially in immature permanent teeth for continued apexogenesis.(Bjørndal 2010)~~

With regard to the treatment of deep caries, three methods of caries removal have been compared to complete excavation, where all carious dentin is removed. Stepwise excavation is a two-step caries removal process in which carious dentin is partially removed at the first appointment, leaving caries over the pulp, with placement of a temporary filling. At the second appointment, all remaining carious dentin is removed and a final restoration placed.(Bjørndal 2010) Partial, or one-step, caries excavation removes part of the carious dentin, but leaves caries over the pulp, and subsequently places a base and final restoration.(Maltz et al. 2012; Maltz et al. 2013) No removal of caries before restoration of primary molars in children aged three to 10 years also has been reported.(Innes et al. 2011)

Evidence from ~~RCTs and a systematic review~~ multiple studies show~~s~~ that pulp exposures in primary and permanent teeth are significantly reduced when using incomplete caries excavation compared to complete excavation in teeth with a normal pulp or reversible pulpitis. Two trials and a Cochrane review found that partial excavation resulted in significantly fewer pulp exposures compared to complete excavation.(Lula et al 2009; Orhan et al 2010; Ricketts et al. 2013) One five-year RCT evaluated the pulpal vitality of teeth treated with partial excavation compared to stepwise excavation and found that the success rate was significantly higher in partial excavation (80 percent) versus stepwise excavation (56 percent). (Maltz et al 2018) Two trials of step-wise excavation showed that pulp exposure occurred more frequently from complete excavation compared to stepwise excavation. (Bjørndal 2010; Orhan 2010) There also is evidence of a decrease in pulpal complications and post-operative pain after incomplete caries excavation compared to complete excavation in clinical trials, summarized in a meta-analysis.(Schwendicke 2013)

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Additionally, a meta-analysis found the risk for permanent restoration failure was similar for incompletely and completely excavated teeth.(Schwendicke et al. 2013) With regard to the need to reopen a tooth with partial excavation of caries, one RCT that compared partial (one-step) to stepwise excavation in permanent molars found higher rates of success in maintaining pulp vitality with partial excavation, suggesting there is no need to reopen the cavity and perform a second excavation.(Maltz et al. 2012) Interestingly, two RCTs suggest that restoration without excavation can arrest dental caries so long as a good seal of the final restoration is maintained.(Innes et al 2011; Mertz-Fairhurst et al. 1998)

Recommendations:

1. ~~There is evidence from~~ Multiple RCTs and systematic reviews determined that incomplete caries excavation in primary and permanent teeth with normal pulps or reversible pulpitis, either partial (one-step) or stepwise (two-step) excavation, results in fewer pulp exposures and fewer signs and symptoms of pulpal disease than complete excavation. Incomplete caries removal should be considered in primary and permanent teeth with deep caries and normal pulp status or reversible pulpitis when complete caries removal is likely to result in pulp exposure.
2. ~~There is evidence from~~ ~~t~~Two systematic reviews reported that the rate of restoration failure in permanent teeth is no higher after incomplete rather than complete caries excavation.
3. ~~There is evidence that~~ Numerous studies concluded that partial (one-step) excavation followed by placement of final restoration leads to higher success in maintaining pulp vitality in permanent teeth than stepwise (two-step) excavation.

Resin infiltration

Resin infiltration is used primarily to arrest the progression of non-cavitated interproximal caries lesions.(Paris et al. 2010; Meyer-Lueckel et al. 2012) The aim of the resin infiltration technique is to allow penetration of a low viscosity resin into the porous lesion body of enamel caries.(Paris et al. 2010) Once polymerized, this resin serves as a barrier to acids and theoretically prevents lesion progression. (Dorri et al. 2015; Lee et al 2016)

A systematic review and meta-analysis evaluating~~ed~~ the effectiveness of enamel infiltration in preventing initial caries progression in proximal surfaces of primary and permanent teeth~~. This review identified eight studies for inclusion for quantitative analysis.(Faghihian et al. 2019) Seven of the eight studies~~ found that infiltration was significantly more effective than placebo treatment. (Faghihian et al. 2019) ~~The meta-analysis compared 470 teeth in the resin infiltration group and 473 in the control group. Caries~~

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~~progression was seen in 61 of the infiltration group and 185 of the control group.~~ In three randomized clinical trials, resin infiltration, when used as an adjunct to preventive measures, was found to be more effective in reducing the radiographic progression of early or incipient proximal lesions on primary molars than preventive measures alone over a 24 month period. (Bagher et al 2018; Jorge et al 2019; Sarti et al 2020; Tellez et al 2013) Current American Dental Association (**ADA**) clinical practice guidelines for non-restorative treatment for non-cavitated interproximal caries lesions conditionally recommends enamel infiltration for treatment of these lesions, (low to very low certainty).(Slayton et al. 2018) Few RCTs evaluate the long-term effectiveness of resin infiltration~~, and further research is recommended~~. An additional use of resin infiltration has been suggested to restore white spot lesions ~~formed during orthodontic treatment~~. Based on a RCT, resin infiltration significantly improved the clinical appearance of such white spot lesions and visually reduced their size.(~~Tellez et al. 2013;~~ Senestraro et al. 2013)

Recommendation:

1. ~~There is low to moderate evidence in favor of resin infiltration as a treatment option for small, non-cavitated interproximal caries lesions in primary and permanent teeth.~~ Resin infiltration is indicated as an adjunct to preventive measures for primary and permanent teeth with small, non-cavitated interproximal caries lesions to reduce lesion progression and for white spot lesions to improve their clinical appearance.
2. Further research regarding long-term effectiveness of resin infiltration is needed.

Dental amalgam

Dental amalgam ~~has been the most commonly used restorative material in posterior teeth for over 150 years.(Beazoglou et al. 2007) Amalgam~~ contains a mixture of metals such as silver, copper, and tin, in addition to approximately 50 percent mercury.(US DHHS 2010) Dental amalgam has declined in use ~~over the past decade,(Beazoglou 2007)~~ perhaps due to the controversy surrounding perceived health effects of mercury vapor, environmental concerns from its mercury content, and increased demand for esthetic alternatives. (Beazoglou 2007)

~~With regard to safety of dental amalgam, a comprehensive literature review of dental studies published between 2004 and 2008 found insufficient evidence of associations between mercury release from dental amalgam and the various medical complaints.(ADA 2009~~) Two independent RCTs in children have examined the effects of mercury release from amalgam restorations and found no effect on the central and peripheral nervous systems and kidney function.(Belliger et al. 2006; DeRouen et al. 2006) However, ~~on July 28,~~ in 2009, the U.S. Food and Drug Administration (**FDA**) issued a final rule that reclassified dental amalgam to a Class II device (having some risk) and designated guidance that included warning labels regarding: (1) possible harm of mercury vapors; (2) disclosure of mercury content; and (3) contraindications for persons with known mercury sensitivity. Also in this final rule, the FDA noted ~~that there is limited~~ information regarding dental amalgam and the long-term health outcomes in pregnant women, developing fetuses, and children under the age of six is limited.(US DHHS 2010)

In 2020, the FDA published recommendations on the use of dental amalgam in certain populations considered high-risk, such as pregnant women, women planning to become pregnant, nursing women, children under six years old, and people with pre-existing neurological disease among others. (FDA 2020) The FDA recommended providers avoid the use of dental amalgam in these high-risk populations and consider alternative restorative materials. (FDA 2020) However, the ADA immediately reaffirmed that amalgam is a durable, safe and effective restorative option and that the FDA's recommendations did not cite any new scientific evidence. (ADA 2020) The ADA encourages providers review all options for restorations with their patients and review the risks and benefits of amalgam. (ADA 2020) Both organizations recommend that existing amalgam fillings in good condition should not be removed or replaced unless medically necessary. (US FDA 2020, ADA 2020)

With regard to clinical efficacy of dental amalgam, results comparing longevity of amalgam to other restorative materials are inconsistent. The majority of meta-analyses, evidence-based reviews, and RCTs report comparable durability of dental amalgam to other restorative materials,(Heintze & Rousson 2012; Mickenautsch & Yengopal 2012; Yengopal et al. 2009; Manhart et al. 2004; Soncini et al. 2007; Mandari et al. 2003) while others show greater longevity for amalgam.(Bernardo et al. 2007; Qvist et al. 2004) The comparability appears to be especially true when the restorations are placed in controlled environments such as university settings.(Heintze & Rousson 2012)

Class I amalgam restorations in primary teeth have shown in a systematic review and two RCTs to have a success rate of 85 to 96 percent for up to seven years, with an average annual failure rate of 3.2 percent.(Hickel et al. 2005; Soncini et al. 2007; Qvist et al. 2004) Efficacy of Class I amalgam restorations in permanent teeth of children has been shown in two independent RCTs ~~randomized controlled studies~~ to range from 89.8 to 98.8 percent for up to seven years.(Soncini et al. 2007; Bernardo et al. 2007)

With regard to Class II restorations in primary molars, a 2015~~2007~~ systematic review recommended ~~concluded~~ that amalgam could be utilized in preparations that do not extend beyond proximal line angles.

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(Fuks 2015) ~~should be expected to survive a minimum of 3.5 years and potentially in excess of seven years.(Kilpatrick & Neumann 2007)~~ For Class II restorations in permanent teeth, one meta-analysis and one evidence-based review conclude that the mean annual failure rates of amalgam and composite are equal at 2.3 percent.(Heintze & Rousson 2012; Manhart et al. 2004) The meta-analysis comparing amalgam and composite Class II restorations in permanent teeth suggests that higher replacement rates of composite in general practice settings can be attributed partly to general practitioners' confusion of marginal staining for marginal caries and their subsequent premature replacements. (Heintze & Rousson 2012) Otherwise, this meta-analysis concludes that the median success rate of composite and amalgam are statistically equivalent after ten years, at 92 percent and 94 percent respectively.(Heintze & Rousson)

The limitation of many of the clinical trials that compare dental amalgam to other restorative materials is that the study period often is short (24 to 36 months), at which time interval all materials reportedly perform similarly.(de Amorim et al. 2014; Kavvadia et al. 2004; Fuks et al. 2000; Duggal et al. 2002; Donly et al. 1999) Some of these studies also may be at risk for bias, due to lack of true randomization, inability of blinding of investigators, and, in some cases, financial support by the manufacturers of the dental materials being studied.

Recommendation:

1. ~~There is strong evidence that d~~Dental amalgam ~~is efficacious in the~~ may be used to restore~~ation of~~ Class I and Class II cavity restorations in primary and permanent teeth.
2. Providers should review the risks and benefits of amalgam restorations with patients.

Composites

Resin-based composite restorations were introduced in dentistry about a half century ago as an esthetic restorative material(Leinfelder 1988; Minguez et al. 2003), and composites increasingly are used in place of amalgam for the restoration of ~~carious~~caries lesions.(~~Opdam et al. 2010~~ Heintze & Rousson 2012; Lynch et al 2014) Composites consist of a resin matrix and chemically bonded fillers.(Heintze & Rousson 2012) They are classified according to their filler size, because filler size affects physical properties, polishability/esthetics, polymerization depth~~,~~ and polymerization shrinkage~~, and physical properties~~. (Dhar et al 2015) Hybrid resins combine a mixture of particle sizes for improved strength while retaining esthetics.(Burgess et al. 2002) The smaller filler particle size allows greater polishability and esthetics, while larger size provides strength. Flowable resins have a lower volumetric filler percentage than hybrid resins.(Pallav et al. 1989)

Several factors contribute to the longevity of resin composites, including operator experience, restoration size, and tooth position.(Bernardo et al. 2007) Resins are ~~more~~ technique sensitive ~~than amalgams~~ and require longer placement time than amalgams. (Donly & Garcia-Godoy 2015) In cases where isolation or patient cooperation is in question, resin-based composite may not be the restorative material of choice.(Antony et al 2008; Donly, Garcia-Godoy 2015) Additionally, composite may not be the ideal restorative material for primary posterior teeth requiring large multi-surface restorations or high-risk patients with poor oral hygiene, numerous carious teeth and demineralization.(Donly, Garcia-Godoy 2015)

Bisphenol A (**BPA**) and its derivatives are components of resin-based dental sealants and composites. Trace amounts of BPA derivatives are released from dental resins through salivary enzymatic hydrolysis and increase from baseline at 24 hours post-treatment, but return to baseline by 14 days and remain at baseline six months after treatment.(Marzouk 2019) ~~may be detectable in saliva up to three hours after resin placement.(Fleisch et al.2010)~~ Evidence is accumulating that certain BPA derivatives may pose health risks attributable to their ~~estrogenic~~endocrine-disrupting properties, but no established thresholds for safety and exposure have been determined. (Marzouk 2019) BPA exposure reduction is achieved by cleaning filling surfaces with pumice and cotton roll and rinsing. Additionally, potential exposure can be reduced by using a rubber dam.(Alves dos Santos 2010) Considering the proven benefits of resin based dental materials and minimal exposure to BPA and its derivatives, ~~it is recommended to~~ continued use~~ing~~ of these products, while taking precautions to minimize BPA exposure, has been recommended.(Fleisch)

There is strong evidence from a meta-analysis of 59 RCTs of Class I and II composite and amalgam restorations showing an overall success rate about 90 percent after 10 years for both materials, with rubber dam use significantly increasing restoration longevity.(Heintze & Rousson 2012) ~~Other isolation techniques (e.g., dental isolation suction systems) may be used.~~ Strong evidence from RCTs comparing composite restorations to amalgam restorations showed that the main reason for restoration failure in both materials was recurrent caries.(Soncini et al. 2007; Bernardo et al. 2007; Alves dos Santos et al. 2010)

In primary teeth, there is strong evidence that composite restorations for Class I restorations are successful.(Hickel et al. 2005; Soncini et al. 2007) ~~There is only o~~One RCT showed~~ing~~ success in Class II composite restorations in primary teeth that were expected to exfoliate within two years.(Fuks et al. 2000) Another RCT comparing total caries removal versus selective caries removal with composite restorations showed a statistically significant higher survival rate with total caries removal after 36 months (81 percent to 57 percent). (Liberman et al 2020) In permanent molars, composite replacement after 3.4 years was no

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different than amalgam,(Soncini et al. 2007) but after seven to 10 years the replacement rate was higher for composite.(Antony et al. 2008) Secondary caries rate was reported as 3.5 times greater for composite versus amalgam.(Bernardo et al. 2007) ~~There is evidence from a~~A meta-analysis ~~showing~~concluded that etching and bonding of enamel and dentin significantly decreases marginal staining and detectable margins in composite restorations.(Heintze & Rousson 2012) Regarding different types of composites (packable, hybrid, nanofilled, macrofilled, and microfilled), there is strong evidence showing similar overall clinical performance for these materials.(Dijken & Pallesen 2013; Krämer et al. 2011; Shi et al. 2010; Ernst et al. 2006)

Recommendations:

1. Resin-based composites can be used as Class I and Class II restorations in primary and permanent molars. ~~In primary molars, there is strong evidence from RCTs that composite resins are successful when used in Class I restorations.~~ ~~For Class II lesions in primary teeth, there is one RCT showing success of composite resin restorations for two years.~~
2. ~~In permanent molars, there is strong evidence from meta-analyses that composite resins can be used successfully for Class I and II restorations.~~
~~3.~~ Evidence from a meta-analysis shows enamel and dentin bonding agents decrease marginal staining and detectable margins for the different types of composites.
3. Precautions should be used in conjunction with placement of resin-based composites to help minimize BPA exposure.

Glass-ionomer cements (GIC)

Glass-ionomers cements have been used in dentistry as restorative cements, cavity liner/base, and luting cement since the early 1970s.(Wilson & Kent 1972) Originally, glass ionomer materials had long setting times and~~were difficult to handle,~~ low fracture strength and exhibited poor wear resistance.~~, and were brittle~~. (Berg and Croll 2015) Advancements in conventional glass ionomer formulation led to better properties, including the formation of resin-modified glass ionomers. These products showed improvement in handling characteristics, decreased setting time, increased strength, and improved wear resistance.(Mitra & Kedrowski 1994; Douglas & Lin 1994) All glass ionomers have several properties that make them favorable for use in children including: chemical bonding to both enamel and dentin; thermal expansion similar to that of tooth structure; biocompatibility; uptake and release of fluoride; and decreased moisture sensitivity when compared to resins. (Berg and Croll 2015)

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Fluoride is released from glass ionomer and taken up by the surrounding enamel and dentin, resulting in teeth that are less susceptible to acid challenge.(Tam 1997; Tyas 1991) ~~One study has shown that fluoride release can occur for at least one year.(Swartz et al.)~~ Glass ionomers can act as a reservoir of fluoride, as uptake can occur from dentifrices, mouth rinses, and topical fluoride applications.(Forsten 1998; Donly & Nelson 1997) This fluoride protection, useful in patients at high risk for caries, has led to the use of glass ionomers as luting cement for SSCs, space maintainers, and orthodontic bands.(Donly et al. 1995)

~~Regarding use of conventional glass ionomers in primary teeth, o~~One RCT showed the overall median time from treatment to failure of conventional glass- ionomer restored primary teeth was 1.2 years.(Qvist et al. 2004) Based on findings of a systematic review and meta-analysis, conventional glass ionomers ~~are~~have not been recommended for Class II restorations in primary molars.(Chadwick & Evans 2007; Toh & Messer 2007) Conventional glass ionomer restorations have other drawbacks such as poor anatomical form and marginal integrity.(Dao et al. 2009; Mickenautsch et al. 2009) Composite restorations were more successful than GICs where moisture control was not a problem.(Toh & Messer 2007)

Resin-modified glass-ionomer cements (**RMGIC~~s~~**), with the acid-base polymerization supplemented by a second resin light cure polymerization, have been shown to be efficacious in primary teeth. (Sidhu 2011) Based on a meta-analysis, RMGIC is more successful than conventional glass ionomer as a restorative material.(Toh & Messer 2007) A systematic review supports the use of RMGIC in small to moderate sized Class II cavities.(Chadwick & Evans 2007) Class II RMGIC restorations are able to withstand occlusal forces on primary molars for at least one year.(Toh & Messer 2007) Because of fluoride release, RMGIC may be considered for Class I and Class II restorations of primary molars in a high caries risk population.(Mickenautsch et al. 2009) ~~There is also some evidence that c~~Conditioning dentin improves the success rate of RMGIC.(Chadwick & Evans 2007) According to one RCT, cavosurface beveling leads to high marginal failure in RMGIC restorations and is not recommended.(Alves dos Santos 2010)

With regard to permanent teeth, a meta-analysis review reported significantly fewer ~~carious~~caries lesions on single-surface glass ionomer restorations in permanent teeth after six years as compared to restorations with amalgam.(Mickenautsch et al. 2009) Data from a meta-analysis shows that RMGIC is more caries preventive than composite resin with or without fluoride.(Yengopal & Mickenautsch 2011) Another meta-analysis showed that cervical restorations (Class V) with glass ionomers may have a good retention rate but poor esthetics.(Heintze et al 2010) For Class II restorations in permanent teeth, one RCT showed unacceptable high failure rates of conventional glass ionomers, irrespective of cavity size. (Frankenberger

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2009) However, a high dropout rate ~~was observed~~ in this study limits~~ing its~~ significance.(Frankenberger) ~~In general, there is insufficient evidence to support the use of RMGIC as long-term restorations in permanent teeth.~~

Silver diamine fluoride (**SDF**) application has been used prior to or in conjunction with GIC and RMGIC restorations in primary and permanent teeth. A systematic review and meta-analysis that evaluated the influence of SDF on the dentin bonding of adhesive materials included eleven and ten studies, respectively.(Frohlich et al. 2019) The systematic review found that prior application of SDF does not have a negative effect on the bond strength between glass ionomer cement and dentin. (Frohlich et al. 2019) Another systematic review of thirteen studies that examined the effect of SDF application on the bond strength between dentin and adhesives and dentin and glass ionomer cements was inconclusive due to the inconsistent results from the included studies. (Jiang et al 2020) Further research examining the effect of SDF application to the bond strength of glass ionomers, as well as the advantages of its use prior to the application of glass ionomers, is needed.

Glass ionomers can be utilized for caries control in patients with high caries risk and restoration repair. (Berg, Croll 2015) Other applications of glass ionomers where fluoride release has advantages are for ITR and ART. These procedures have similar techniques but different therapeutic goals. ITR may be used in very young patients,(Wambier et al. 2007) uncooperative patients, or patients with special health care needs(Mandari et al. 2003) for whom traditional cavity preparation ~~and/~~or placement of traditional dental restorations ~~are~~is not feasible or needs to be postponed. Additionally, ITR may be used for caries control in children with multiple open caries~~ous~~ lesions, prior to definitive restoration of the teeth.(Dulgergil 2005) In-vitro, leaving caries-affected dentin does not jeopardize the bonding of glass ionomer cements to the primary tooth dentin.(Alves et al. 2013). ART, endorsed by the World Health Organization and the International Association for Dental Research, is a means of restoring and preventing caries in populations that have little access to traditional dental care and functions as definitive treatment. (Frencken et at 2009)

According to a meta-analysis, single surface ART restorations ~~showed high survival rates in both primary and permanent teeth.(van't Hof et al)~~ had a high survival percentage over the first three years in primary teeth and a high survival percentage over the first five years in permanent teeth. (de Amorim et al 2018) One RCT supported single surface restorations irrespective of the cavity size and also reported higher success in non-occlusal posterior ART compared to occlusal posterior ART.(Frencken et al 2007) With regard to multi-surface ART restorations, there is conflicting evidence. Based on a meta-analysis, ART restorations presented similar survival rates to conventional approaches using composite or amalgam for Class II restorations in primary teeth.(Raggio 2013; Tedesco et al 2017) ~~However, another meta-analysis showed that m~~Multi-surface ART restorations in primary teeth exhibited a medium survival percentage over two years.(de Amorim et al 2018) A recent RCT that compared modified ART to preformed metal crowns on primary teeth reported major failures on 21 percent of modified ART restorations at six months and 34 percent at twelve months.(Ebrahimi et al 2020). More research is needed on the survival percentage of multi-surface ART restorations in permanent teeth.~~high failure rates.(van't Hof et al. 2006)~~

Recommendations:

1. ~~There is evidence in favor of~~ GICs may be used for Class I restorations in primary teeth.
2. ~~From a systematic review, there is strong evidence that~~ RMGICs may be used for Class I restorations ~~are efficacious,~~ and expert opinion supports Class II restorations in primary teeth.
3. ~~There is insufficient e~~Evidence is insufficient to support the use of conventional or RMGICs as long-term restorative material in permanent teeth.
4. ~~From a meta-analysis, there is strong evidence that~~ ITR/ART using high viscosity glass ionomer cements ~~has value~~ may be used as single surface temporary restoration for both primary and permanent teeth. Additionally, ITR may be used for caries control in children with multiple open carious lesions, prior to definitive restoration of the teeth.
5. Further research is needed examining the effect of SDF application on the bond strength of glass ionomers to dentin.

Compomers

Polyacid-modified resin-based composites, or compomers, were introduced into dentistry in the mid-1990s. They contain 72 percent (by weight) strontium fluorosilicate glass and the average particle size is 2.5 micrometers.(Nicholson 2007) Moisture is attracted to both acid functional monomer and basic ionomer-type in the material. This moisture can trigger a reaction that releases fluoride and buffers acidic environments.(Cildir & Sandalli 2005; Peng et al. 2000) Considering ~~the~~its ability to release fluoride, esthetic value, and simple handling properties, ~~of~~ compomer~~, it~~ can be useful in pediatric dentistry. (Nicholson 2007)

Based on a ~~recent~~ 2007 RCT, the longevity of Class I compomer restorations in primary teeth was not statistically different compared to amalgam, but compomers were found to need replacement more frequently due to recurrent caries.(Soncini 2007) In Class II compomer restorations in primary teeth, the

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risk of developing secondary caries and failure did not increase over a two-year period in primary molars.(Duggal et al. 2002; Daou et al. 2009) Compomers also have reported comparable clinical performance to composite with respect to color matching, cavo-surface discoloration, anatomical form, and marginal integrity and secondary caries.(Attin et al. 2000; Attin et al. 2001) Compomers are available in a variety of non-conventional colors which, when polymerized, can cause varying pulp chamber temperatures. (Ertugrul and Ertugrul 2019; Bakkal et al. 2019) Most RCTs showed that compomer tends to have better physical properties compared to ~~glass ionomer~~GIC and ~~resin modified glass ionomer cements~~RMGIC and in primary teeth, but no significant difference was found in cariostatic effects of compomer compared to these materials.(Qvist et al. 2004; Daou et al. 2009; Welbury et al. 2000; Baba et al. 2021; Sagmak et al. 2020, Francois et al. 2020)

Recommendations:

1. Compomers can be an alternative to other restorative materials in the primary dentition in Class I and Class II restorations.
2. There is not enough data comparing compomers to other restorative materials in permanent teeth of children.

Bioactive Materials

A recently recognized category of materials is termed bioactive. Bioactive restorative materials release ions, typically calcium, fluoride or phosphate (Skrtic and Atonucci 2011) yet at times antibacterial monomers, silver particles or strontium particles. (Slowikowski et al 2014) The materials also can absorb ions at their surface. Although they may not meet true ionic equilibrium, the ion exchange still can help prevent adjacent tooth demineralization and enhance remineralization. (May et al 2017; Donly et al 2018)

Bioactive dental restorative materials are available for sealants, adhesive bonding agents, cements, resin-based restorations, GIC and RMGIC restorations, as well as pulp capping agents. Since each bioactive material interacts with hard tissue differently, a modified surface treatment may be required. (Xu 2019)

Recommendations:

1. Bioactive materials can be used for remineralization and pulp capping.
2. Further research examining the basic properties and long-term effect of bioactive materials and comparing bioactive materials to other restorative materials is needed.

Preformed metal crowns

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Preformed metal crowns (PMC), also known as SSC~~s~~, are prefabricated crown forms that are adapted to individual teeth and cemented with a biocompatible luting agent. PMC~~reformed metal crowns~~ have been indicated for the restoration of primary and permanent teeth with extensive caries, cervical decalcification, ~~and/~~or developmental defects (e.g., hypoplasia, hypocalcification), when failure of other available restorative materials is likely (e.g., interproximal caries extending beyond line angles, patients with bruxism), following pulpotomy or pulpectomy, for restoring a primary tooth that is to be used as an abutment for a space maintainer , for the intermediate restoration of fractured teeth, and for definitive restorative treatment for high caries-risk children. (Seale & Randall 2015) They are used more frequently in patients who exhibit high caries risk and whose treatment is performed under sedation or general anesthesia.(Attari & Roberts 2006; Randall 2002; Innes et al. 2007)

~~There are v~~Very few prospective RCTs compare~~ing~~ outcomes for ~~preformed metal crowns~~PMC to intra-coronal restorations.(Atieh 2008; Hutcheson et al. 2012) A Cochrane review and additional studies, including two systematic reviews, concluded that the majority of clinical evidence for the use of PMC ~~preformed metal crowns~~ has come from nonrandomized and retrospective studies. (Hickel et al. 2005; Attari, Roberts 2006; Randall 2002; Innes et al 2007) However, this evidence suggests that ~~preformed metal crowns~~PMC showed greater longevity than amalgam restorations,(Hickel et al. 2005) despite possible study bias of placing SSC~~s~~ on teeth more damaged by caries.(Randall 2002; Innes et al. 2007; Randall et al. 2000) Five studies which retrospectively compared Class II amalgam to PMC~~preformed metal crowns~~ showed an average five year failure rate of 26 percent for amalgam and seven percent for PMC~~preformed metal crowns~~.(Randall 2002) In a recent retrospective study, SSC were shown to have a higher survival rate compared to multi-surface restorations and may be considered when treating multi-surface caries in children younger than four years old in order to avoid possible retreatment.(Wu 2021)

A two-year RCT regarding restoration of primary teeth that had undergone a pulpotomy procedure found a non-significant difference in survival rate for teeth restored with PMC~~preformed metal crowns~~ (95 percent) versus ~~resin modified glass ionomer~~RMGIC/composite restoration (92.5 percent).(Atieh 2008~~) In another prospective study, significantly fewer restoration failures and improved calcium hydroxide pulpotomy success were found with preformed metal crowns (79.7 percent) versus amalgam restorations (60 percent) after one year.(Sonmez & Duruturk 2010) However, a systematic review did not show strong evidence that preformed metal crowns were superior over other restorations for pulpotomized teeth.(Bazargan et al. 2007)~~ A one-year RCT comparing primary molars treated with mineral trioxide aggregate (**MTA**) pulpotomies and restored with either multi-surface composite restorations or PMC showed no difference in radiographic success over a 12-month follow up period. (Hutcheson et al 2012) However, the pulpotomy treated teeth with multi-surface composite restorations had more marginal change and required more maintenance than the pulpotomy treated teeth with PMC and a majority turned gray up to 12 months later even with the use of white MTA. (Hutcheson et al 2012) A systematic review on the use of SSC determined that the outcomes of primary teeth with pulpal therapy are reported as best in teeth treated with SSC. (Seale & Randall 2015).

With regards to gingival health adjacent to PMC~~preformed metal crowns~~, a one year RCT showed no difference in gingival inflammation between PMC~~preformed metal crowns~~ and composite restorations after pulpotomy.(Innes et al. 2007) Yet, a two-year randomized clinical study showed more gingival bleeding for PMC~~preformed metal crowns~~ ~~vs~~.versus composite/glass ionomer restorations.(Atieh 2008) Inadequately contoured crown and residues of set cement remaining in contact with the gingival sulcus ~~are~~have been suggested as reasons for gingivitis associated with preformed metal crowns, and a preventive regime including oral hygiene instruction ~~is~~has been recommended to be incorporated into the treatment plan.(Randall 2002)

The~~re is~~ one RCT on PMC~~preformed metal crowns~~ versus cast crowns placed on permanent teeth, (Zagdwon et al. 2003) ~~and this report~~ found no difference between the two restoration types for quality and longevity after 24 months. A recent retrospective cohort study that focused on the long-term clinical outcomes of SSCs compared to amalgam and composite restorations in permanent teeth on special needs populations concluded that posterior permanent teeth restored with SSCs can be expected to last for 10 years and represent a viable treatment option for severely carious or fractured posterior permanent teeth.(Sigal et al 2020) The remaining evidence is case reports and expert opinion concerning indications for use of PMC~~preformed metal crowns~~ on permanent molars. The indications include teeth with severe genetic/developmental defects, grossly carious teeth, and traumatized teeth, along with tooth developmental stage or financial considerations that require ~~re-quire~~ semi-permanent restoration instead of a permanent cast restoration.(Attari et al. 2006; Randall et al. 2000; Zagdwon et al. 2003) The main reasons for PMC~~preformed metal crowns~~ failure reportedly is~~are~~ crown loss(Hickel et al. 2005; Sonmez & Duruturk 2010; Roberts et al. 2005) and perforation.(Roberts et al. 2005)

~~One~~ A recent method of providing preformed metal crowns is known as the Hall technique (**HT**).(Innes et al. 2006). The Hall technique ~~is method~~ calls for cementation of a SSC over a caries-affected primary molar without local anesthetic, caries removal, or tooth preparation. ~~It is a~~A less invasive ~~caries~~

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management procedure for treating carious primary teeth, ~~and~~**HT** involves ~~the concept of~~ caries control by managing the activity of the biofilm.(Santamaria et al. 2018) In essence, bacteria sealed into the tooth and denied of substrate will die rather than result in caries progression and the best way of producing an effective marginal seal is with a crown. (Welbury 2017) ~~This technique was developed for use when delivery of ideal treatment was not feasible.~~

Using the HT may reduce discomfort from local anesthetic and caries removal at the time of treatment compared to fillings,(Innes et al. 2006) but it may add the discomfort of placement of separator bands prior to the SSC, as well as the pain from biting the crown into place.(Page et al. 2014) In a randomized split mouth clinical trial with general dentists as providers, sealing in caries by using HT significantly outperformed the general dentists' standard restorations to restore caries interproximally and was more effective in the long term. (Innes et al 2011) HT may be considered as a treatment modality for carious primary molars when traditional stainless steel crown technique is not feasible due to limitations such as poor cooperation or barriers to care (Ebrahimi et al 2020) Additional studies that compare this technique to traditionally placed PMC using long term follow-ups, radiographic assessment and caries removal are needed.(Ebrahimi et al 2020; Fontana et al. 2012)

~~The HT has gained some popularity in the United Kingdom (**UK**),(Innes et al. 2006) primarily from use by general dentists (who provide the majority of care for young children).(Roberts et al. 2018) All prospective investigations on the effectiveness of HT have been conducted by general dentists in UK, and comparison groups include restorative treatment as traditionally provided in UK those settings~~.~~, where traditional use of SSCs to restore caries in primary teeth has not been a popular or a frequently used technique.(Roshan et al. 2003; Threlfall et al. 2005; Blinkhorn & Zadeh-Kabir 2003; Maggs-Rapport et al. 2000; This is in spite of the existence of guidelines and policy statements from the British Society of Paediatric Dentistry that SSCs are the restoration of choice for primary molars with multi-surface lesions or extensive caries or when pulp treatment has been performed.(Kindelan et al. 2008; Fayle et al. 2001 Results of a 2003 repeat questionnaire of general dentists in the UK showed that the use of amalgam had declined with an increase in the use of GIC and very little change in the use of SSCs.(Roshan et al. 2003) Placement of GIC restorations or observation without treatment was the management approach of choice, and the use of local anesthesia to provide dental care to children was infrequent.(Threlfall et al. 2005) Given the differences in treatment approaches in health care settings and system between countries, the HT has not been widely adopted in the U.S., and it usually is limited to individual situations where proven methods of caries management cannot be used.(Fontana et al. 2012) Studies that compare this technique~~

~~to traditionally placed preformed metal crowns using radiographic assessment and caries removal are needed.(Fontana et al. 2012)~~
~~Recent retrospective studies (BaniHani et al. Int J Paediatr Dent 2018; BaniHani et al. Caries Res 2018) for cost-effectiveness combined with a cross-sectional evaluation of patient acceptance showed that 95.8 percent of primary teeth restored using the HT remained asymptomatic after a follow-up period of up to 77 months, compared to 95.3 percent in the conventional methods (caries removal with placement of SSC or other restoration); they did not, however, report a breakdown by follow-up time. Although HT and conventional restorative methods had similar successful outcomes, using the HT was associated with reduced treatment costs if general anesthesia or sedation is considered. Both approaches were accepted favorably by the children and care providers.(BaniHani et al. Caries Res 2018)~~

SSC~~s~~ continue to offer the advantage of full coverage to combat recurrent caries and provide strength as well as long-term durability with minimal maintenance, which are desirable outcomes for caries management for high-risk children.(Seale & Randall 2015)

Recommendations:

1. ~~There is evidence from~~ ~~r~~Retrospective studies reported ~~showing~~ greater longevity of PMC~~preformed metal crown~~ restorations compared to amalgam or resin-based restorations for the treatment of caries lesions in primary teeth. Therefore, use of SSC~~s~~ is ~~supported on~~ indicated for high-risk children with large or multi-surface cavitated or non-cavitated lesions on primary molars, especially when children require advanced behavioral guidance techniques(AAPD BP_Behavior Guidance) including general anesthesia for the provision of restorative dental care.
2. ~~There is evidence from case reports and one RCT supporting the use of~~ PMC~~preformed metal crowns~~ may be indicated in permanent teeth as a semi-permanent restoration for the treatment of severe enamel defects or grossly carious teeth.
3. Further research comparing Hall Technique to traditionally-placed PMC is needed.

Posterior Esthetic Crowns in Primary Teeth

The interest by clinicians and patients in esthetic options for full coverage restoration of primary posterior teeth is increasing ~~by clinicians and patients~~.(Holsinger et al. 2016; Davette et al. 2016) Scientific studies that evaluate esthetic options for restoring posterior primary teeth with large caries lesions are not widely reported in the literature. ~~The most popular options are opened-face SSCs, pre-veneered SSCs, and zirconia crowns.(Planells & Fuks 2014)~~ While opened-faced SSC or pre-veneered SSC are not ideal based on minimum evidence, zirconia crowns are an option that has been used by pediatric dentists. ~~There~~

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~~are~~ sSeveral preformed pediatric zirconia crowns are available on the market, and ~~each~~ brands ~~has~~ differ~~ent~~ in material composition, fabrication, surface treatment, retentive feature, and cementation method. (Alrashdi 2022) ~~The amount of tooth reduction and technique for tooth preparation varies significantly.(Clark et al. 2016) There is need for~~ mMore circumferential tooth reduction ~~requirements~~is needed for proper fit and placement of~~for~~ zirconia crowns compared to SSC~~s~~ (Clark et al 2016) and for proper retention, the minimum abutment height is two millimeters. (Jing 2019) The indications for the preformed esthetic crowns are generally the same as those of the preformed SSC~~s~~ but with consideration of esthetics.(Donly et al. 2018) ~~SSCs have comparatively better retention, but recent studies demonstrate that the gingival health and plaque accumulation around~~ Clinical parameters between zirconia crowns ~~are better than~~ and SSC~~s~~ are similar except for retention and gingival health; SSC have comparatively better retention and zirconia crowns have relatively better gingival health.(Donly et al. 2018; Taran, Kaya 2018)

Recommendations:

1. Evidence is limited on the use of zirconia crowns as esthetic crowns for primary posterior teeth. When SSC would otherwise be indicated, zirconia crowns may be considered in lieu of SSC to due to esthetic considerations.

Anterior esthetic restorations in primary teeth

With increasing demand for esthetics in children by their parents, treatment of dental caries of primary anterior teeth remains one of the biggest challenges in pediatric dentistry.(Hamrah 2021) ~~Despite the continuing prevalence of dental caries in primary maxillary anterior teeth in children, the esthetic management of these teeth remains problematic.(Shah et al. 2004)~~ Esthetic restoration of primary anterior teeth can be especially challenging due to: the small size of the teeth; close proximity of the pulp to the tooth surface; relatively thin enamel; lack of surface area for bonding; and issues related to child behavior.(Waggoner ~~2006~~ 2015)

~~There is little scientific support~~Most of the evidence for ~~any of~~ the clinical techniques ~~that clinicians have~~ utilized ~~for many years~~ to restore primary anterior teeth~~, and most of the evidence~~ is regarded as expert opinion. While a lack of strong clinical data does not preclude the use of these techniques, it points out the strong need for well-designed, prospective clinical studies to validate their use ~~of these techniques~~. (~~Waggoner 2002~~ Waggoner 2015) ~~Additionally, there is limited information on the potential psychosocial impact of anterior caries or unaesthetic restorations in primary teeth.(Shah et al. 2004)~~

Class III (interproximal) restorations of primary incisors can be prepared with labial or lingual dovetails to incorporate a large surface area for bonding to enhance retention.(Waggoner ~~2002~~ 2015) Resin-based restorations are appropriate for anterior teeth that can be adequately isolated from saliva and blood. **RMGIC**~~Resin-modified glass ionomer cements~~ have been suggested for this category, especially when adequate isolation is not possible.(Croll et al. 2001; Donly 2013; Berg & Croll 2015) ~~It has been suggested that p~~Patients considered at high-risk for ~~future~~ caries may be better served with placement of full tooth coverage restorations.(Donly 2013; Waggoner 2015)

Class V (cervical) cavity preparations for primary incisors are similar to those in permanent teeth. Due to the young age of children treated and associated cooperation~~behavior guidance~~ difficulty, it is sometimes impossible to isolate teeth for the placement of composite restorations. In these cases, GIC or RMGIC is suggested.(Croll et al. 2001; Donly 2013)

Full coronal restoration of carious primary incisors may be indicated when: (1) caries is present on multiple surfaces, (2) the incisal edge is involved, (3) there is extensive cervical decalcification, (4) pulpal therapy is indicated, (5) caries may be minor, but oral hygiene is very poor, or (6) the child's behavior makes moisture control very difficult.(Waggoner ~~2002~~2015) ~~Successful full-coronal restorations of extensively decayed primary anterior teeth have been reported; however, due to the lack of available clinical studies, it is difficult to determine whether certain techniques of restoring carious primary anterior teeth are effective.(Waggoner 2006 ; Lee 2002 A retrospective study showed that 80 percent of strip crowns were completely retained after three years, and 20 percent were partially retained, with none being completely lost.(Kupietzky et al. 2005) Another retrospective study, with 24-74 months follow-up, reported 80 percent retention of strip crowns.(Ram & Fuks 2006)~~ Currently, full coronal restorations of primary teeth are bonded to existing tooth structure, or cemented in place. (Waggoner 2015) Resin strip crowns are bonded to the tooth, and two retrospective studies show that 80 percent are retained after three years.(Kupietzky 2005; Ram, Fuks 2006) Resin strip crowns are esthetic and parental satisfaction is high. They are technique sensitive and require sufficient tooth structure to provide surface area for bonding. Hemorrhage or saliva can interfere with bonding of the materials and hemorrhage can affect the color of the crown. (Waggoner 2015; Alrashdi 2022)

Preveneered SSCs also are among the options of restoring primary anterior teeth with full coronal coverage. Three retrospective studies report excellent clinical retention of th~~ese~~is type~~s~~ of crowns, yet ~~with~~ a high incidence of partial or complete loss of the resin facings.(Shah et al. 2004; Roberts et al. 2001~~;~~

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~~MacLean et al. 2007~~) The crimping of preveneered SSC on the metal side does not affect the fracture resistance.(Gupta et al 2008) Preveneered SSC~~s~~ have the concerns of color stability and surface roughness changes,(Truong et al. 2017) so long term clinical studies are required to establish their comparative effectiveness. Preformed SSC~~s~~ and opened-face SSC~~stainless steel crowns~~ are still options for treatment on primary anterior teeth, but published studies reporting their effectiveness and use are sparse(Roshan et al. 2003) given the availability of more esthetic and easier-to-use alternatives.

Preformed ~~pediatric~~ zirconia crowns have been available in pediatric dentistry since 2010.(Alrashdi 2022) Zirconia crowns are strong, esthetic, and biocompatable.(Gill 2020; Waggoner 2015) Zirconia crowns placed in a university clinic displayed survival probability at 12, 24 and 36 months of 93, 85, and 76 percent respectively. (Seminario 2019) Parental esthetic satisfaction has been shown to be higher for zirconia crowns than resin strip crowns or preveneered SSC. (Gill 2020) Disadvantages of zirconia crowns include a steep learning curve for dentists and since the crowns cannot be adjusted, the tooth must be reduced in order to fit the crown. The amount of tooth reduction is greater than that required for a SSC and reduction of 1.5 to two millimeters with a feather margin is required to passively seat the zirconia crown. (Clark et al 2016)~~are another option for esthetic full coronal coverage restoration.(Planells & Fuks 2014) As they require a passive fit, the amount of tooth reduction is greater than that required for SSC (minimum of 1.5-2.0 mm), and technique for tooth preparation does vary significantly among different brands.(Clark et al. 2016) Although a RCT with a follow-up of only six months suggests that zirconia crowns gave significantly better results than the others with regard to gingival health and crown fractures(Donly et al. 2018), a systematic review on the topic(Taran & Kaya 2018) concluded that due to the small number of RCTs on this topic and their risk of bias, future RCTs with better study design are required to compare differences between the different types of pediatric preformed zirconia crowns and between other esthetic treatment options~~.

Recommendations:

1. ~~There is expert opinion that suggests the use of r~~Resin-based composites may be used as a treatment option for Class III and Class V restorations in the primary and permanent dentition.
2. ~~There is e~~Expert opinion ~~that suggests~~ finds the use of **RMGIC** as a treatment option for Class III and Class V restorations for primary teeth, particularly in circumstances where adequate isolation of the tooth to be restored is difficult.
3. There is expert opinion that suggests that strip crowns, pre-veneered SSC~~s~~, preformed SSC~~s~~, ~~and~~ opened-face SSC~~s,~~ and zirconia crowns are a treatment option for full coronal coverage restorations in primary anterior teeth.

References

Alves dos Santos MP, Luiz RR, Maia LC. Randomised trial of resin-based restorations in Class I and Class II beveled preparations in primary molars: 48-month results. J Dent 2010;38(6):451-9.

Alrashdi M, Ardoin J, Liu JA. Zirconia crowns for children: A systematic review. Int J Paediatr Dent 2022;32(1):66-81.

Alves FB, Lenzi TL, Guglielmi Cde A, et al. The bonding of glass ionomer cements to caries-affected primary tooth dentin. Pediatr Dent 2013;35(4):320-4.

American Academy of Pediatric Dentistry. Behavior guidance of the pediatric dental patient. Pediatr Dent 2018;40(6):254-67.

American Academy of Pediatric Dentistry. Caries-risk assessment and management for infants, children, and adolescents. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; ~~2019:221-6~~. PENDING

~~American Academy of Pediatric Dentistry. Guideline on restorative dentistry. Pediatr Dent 2014;36(special issue): 230-41.~~

~~American Academy of Pediatric Dentistry. Guideline on restorative dentistry. Pediatr Dent 2016;38(special issue): 250-62.~~

American Academy of Pediatric Dentistry. Guidelines for pediatric restorative dentistry 1991. In: American Academy of Pediatric Dentistry Reference Manual 1991-1992. Chicago, Ill.: American Academy of Pediatric Dentistry; 1991:57-9.

American Academy of Pediatric Dentistry. Policy on the use of silver diamine fluoride for pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:68-71.

American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. The Reference Manual of Pediatric Dentistry. Chicago, Ill.:American Academy of Pediatric Dentistry; 2021:399-407.~~Pediatr Dent 2018;40(6):343-51.~~

~~American Dental Association Center for Evidence-Based Dentistry. ADA Clinical Practice Guidelines Handbook, Update 2013. American Dental Association, Chicago, Ill. November 2013. Available at: “http://ebd.ada.org/~/ media/EBD/Files/ADA_Clinical_Practice_Guidelines_ Handbook-2013.ashx”. Accessed June 18, 2019.~~

American Dental Association. ADA reaffirms that dental amalgam is ‘durable, safe, effective’ restorative material. Available at: “https://www.ada.org/publications/ada-news/2020/september/ada-reaffirms-that-dental-amalgam-is-durable-safe-effective-restorative-material”. Accessed January 30, 2022.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~American Dental Association Council on Scientific Affairs. Statement on Dental Amalgam, Revised 2009. Chicago, Ill.; 2009. Available at: "https://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/ statement-on-dental-amalgam". Accessed July 24, 2019.~~

Antony K, Genser D, Hiebinger C, Windisch F. Longevity of dental amalgam in comparison to composite materials. GMS Health Technol Assess 2008;13(4):Doc12.

Atieh M. Stainless steel crown versus modified open-sandwich restorations for primary molars: A 2-year randomized clinical trial. Int J Paediatr Dent 2008;18 (5):325-32.

Attari N, Roberts JF. Restoration of primary teeth with crowns: A systematic review of the literature. Eur Arch Paediatr Dent 2006;7(2):58-62.

Attin T, Opatowski A, Meyer C, Zingg-Meyer B, Buchalla W, Mönting JS. Three-year follow up assessment of Class II restorations in primary molars with a polyacid-modified composite resin and a hybrid composite. Am J Dent 2001;4(3):148-52.

Attin T, Opatowski A, Meyer C, Zingg-Meyer B, Mönting JS. Class II restorations with a polyacid-modified composite resin in primary molars placed in a dental practice: Results of a two-year clinical evaluation. Oper Dent 2000;25(4):259-64.

Baba MG, Kirzioglu Z, Ceyhan D. One-year clinical evaluation of two high-viscosity glass-ionomer cements in class II restorations of primary molars. Aust Dent J 2021;66(1):32-40.

Bader JD, Shugars DA. Understanding dentists' restorative treatment decisions. J Pub Health Dent 1992;52(2):102-11.

Bagher SM, Hegazi FM, Finkelman M, et al.

Radiographic effectiveness of resin infiltration in arresting incipient proximal enamel lesions in primary molars. Pediatr Dent 2018;40(3):195-200.

Bakkal M, Yılmaz B, Durmus A, Durmus Z, Ozalp S. Polymerization characteristics of colored compomers cured with different LED units. J Appl Biomater Funct Mater 2019;17(1):1-9.

~~BaniHani A, Deery C, Toumba J, Duggal M. Effectiveness, costs, and patient acceptance of a conventional and a biological treatment approach for carious primary teeth in children. Caries Res 2018;53(1):65-75.~~

~~BaniHani A, Duggal M, Toumba J, Deery C. Outcomes of the conventional and biological treatment approaches for the management of caries in the primary dentition. Int J Paediatr Dent 2018;28(1):12-22.~~

~~Bazargan H, Chopra S, Gatonye L, Jones H, Kaur T. Permanent restorations on pulpotomized primary molars: An evidence-based review of the literature. 2007. Available at:~~

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~~"http://www.dentistry.utoronto. ca/system/files/ pulpotomizedprimarymolars.pdf ". Accessed October 17, 2013.~~

Berg JH, Croll TP. Glass ionomer restorative cement systems: An update. Pediatr Dent 2015;37(2):116-24.

Beauchamp J, Caufield PW, Crall JJ, et al. Evidence-based clinical recommendations for the use of pit-and-fissure sealants: A report of the American Dental Association Council on Scientific Affairs. J Am Dent Assoc 2008; 139(3):257-68.

Beazoglou T, Eklund S, Heffley D, Meiers, J, Brown LJ, Bailit H. Economic impact of regulating the use of amalgam restorations. Public Health Rep 2007;122(5): 657-63.

Belliger DC, Trachtenberg F, Barregard L, et al. Neuro-psychological and renal effects of dental amalgam in children: A randomized clinical trial. J Am Med Assoc 2006;295(15):1775-83.

Bernardo M, Luis H, Martin MD, et al. Survival and reasons for failure of amalgam versus composite posterior restorations placed in a randomized clinical trial. J Am Dent Assoc 2007;138(6):775-83.

Bjørndal L, Reit C, Bruun G, et al. Treatment of deep caries lesions in adults: Randomized clinical trials com-paring stepwise vs. direct complete excavation, and direct pulp capping vs. partial pulpotomy. Eur J Oral Sci 2010; 118(3):290-7.

~~Blinkhorn A, Zadeh-Kabir R. Dental care of a child in pain: A comparison of treatment planning options offered by GDPs in California and Northwest of England. Int J Paediatr Dent 2003;13(3):165-71.~~

Burgess JO, Walker R, Davidson JM. Posterior resin-based composite: Review of the literature. Pediatr Dent 2002;24(5):465-79.

Chadwick BL, Evans DJ. Restoration of Class II cavities in primary molar teeth with conventional and resin modified glass ionomer cements: A systematic review of the literature. Eur Arch Paediatr Dent 2007;8(1):14-21.

Cildir SK, Sandalli N. Fluoride release/uptake of glass-ionomer cements and polyacid-modified composite resins. Dent Mater J 2005;24(1):92-7.

Clark L, Wells MH, Harris EF, Lou J. Comparison of amount of primary tooth reduction required for anterior and posterior zirconia and stainless steel crowns. Pediatr Dent 2016;38(1):42-6.

Croll TP, Bar-Zion Y, Segura A, Donly KJ. Clinical performance of resin-modified glass ionomer cement restorations in primary teeth. A retrospective evaluation. J Am Dent Assoc 2001;132(8):1110-6.

Daou MH, Attin T, Göhring TN. Clinical success of compomer and amalgam restorations in primary molars: Follow up in 36 months. Schweiz Monatsschr Zahnmed 2009;119(11):1082-8.

Daou MH, Tavernier B, Meyer JM. Two-year clinical evaluation of three restorative materials in primary molars. J Clin Pediatr Dent 2009;34(1):53-8.

Davette J, Brett C, Catherine F, Gary B, Gary F. Wear of primary tooth enamel by ceramic materials. Pediatr Dent 2016;38(7):519-22.

de Amorim RG, Leal SC, Mulder J, Creugers NH, Frencken JE. Amalgam and ART restorations in children: A controlled clinical trial. Clin Oral Investig 2014;18(1): 117-24.

de Amorim RG, Frencken JE, Raggio DP, Chen X, Hu X, Leal SC. Survival percentages of atraumatic restorative treatment (ART) restorations and sealants in posterior teeth: An updated systematic review and meta-analysis. Clin Oral Investig 2018;22(8):2703-25.

DeRouen TA, Martin MD, Leroux BG, et al. Neuro-behavioral effects of dental amalgam in children: A randomized clinical trial. J Am Med Assoc 2006;295 (15):1784-92.

Dhar V, Hsu KL, Coll JA, et al. Evidence-based update of pediatric dental restorative procedures: Dental materials. J Clin Pediatr Dent 2015;39(4):303-10.

Dhar V, Marghalani AA, Crystal YO, et al. Use of vital pulp therapies in primary teeth with deep caries lesions. Pediatr Dent 2017;39(5):E146-E159.

Dijken JW, Pallesen U. A six-year prospective randomized study of a nano-hybrid and a conventional hybrid resin composite in Class II restorations. Dent Mater 2013;29 (2):191-8.

Donly KJ, García-Godoy F. The use of resin-based composite in children: An update. Pediatr Dent. 2015;37(2):136-43.

Donly KJ, Istre S, Istre T. In vitro enamel remineralization at orthodontic band margins cemented with glass ionomer cement. Am J Orthod Dentofacial Orthop 1995;107(5):461-4.

Donly KJ, Liu JA. Dentin and enamel demineralization inhibition at restoration margins of Vitremer, Z 100 and Cention N. Am J Dent 2018;31(3):166-8.

Donly KJ, Nelson JJ. Fluoride release of restorative materials exposed to a fluoridated dentifrice. ASDC J Dent Child 1997;64(4):249-50.

Donly KJ, Sasa I, Contreras CI, Mendez MJC. Prospective randomized clinical trial of primary molar crowns: 24- month results. Pediatr Dent 2018;40(4):253-8.

Donly KJ, Segura A, Kanellis M, Erickson RL. Clinical performance and caries inhibition of resin-modified glass ionomer cement and amalgam restorations. J Am Dent Assoc 1999;130(10):1459-66.

Donly KJ. Restorative dentistry for children. Dent Clin North Am 2013;57(1):75-82.

Dorri M, Dunne SM, Walsh T, Schwendicke F. Micro-invasive interventions for managing proximal dental decay in primary and permanent teeth. Cochrane Database Syst Rev 2015;(11):CD010431.

Douglas WH, Lin CP. Strength of the new systems. In: Hunt PR, ed. Glass Ionomers: The Next Generation. Philadelphia, Pa.: International Symposia in Dentistry, PC; 1994:209-16.

Downer MC, Azli NA, Bedi R, Moles DR, Setchell DJ. How long do routine dental restorations last? A systematic review. Brit Dent J 1999;187(8):432-9.

Duggal MS, Toumba KJ, Sharma NK. Clinical perfor-mance of a compomer and amalgam for the interproximal restoration of primary molars: A 24 month evaluation. Brit Dent J 2002;193(6):339-42.

Dulgergil DT, Soyman M, Civelek A. Atraumatic restorative treatment with resin-modified glass ionomer material: Short-term results of a pilot study. Med Princ Pract 2005;14(3):277-80.

Ebrahimi M, Sarraf Shirazi A, Afshari E. Success and behavior during atraumatic restorative treatment, the Hall technique, and the stainless steel crown technique for primary molar teeth. Pediatr Dent 2020;42(3):187-92.

Ernst CP, Brandenbusch M, Meyer G, Canbek K, Gottschalk F, Willershausen B. Two-year clinical per-formance of a nanofiller vs a fine-particle hybrid resin composite. Clin Oral Investig 2006;10(2):119-25.

Ertuğrul CÇ, Ertuğrul IF. Temperature change in pulp chamber of primary teeth during curing of coloured compomers: An in vitro study using pulpal blood microcirculation model. Peer J 2019;8(7):1-14.

Faghihian R, Shirani M, Tarrahi M, Zakizade M. Efficacy of the resin infiltration technique in preventing initial caries: A systemic review and meta-analysis. Pediatr Dent 2019;49(2):88-94.

~~Fayle SA, Welbury RR, Roberts JF, British Society of Paediatric Dentistry. British Society of Paediatric Dentistry: A policy document on management of caries in the primary dentition. Int J Paediatr Dent 2001;11(2): 153-7.~~

Fleisch AF, Sheffield PE, Chinn C, Edelstein BL, Landrigan PJ. Bisphenol A and related compounds in dental materials. Pediatrics 2010;126(4):760-8.

~~26. Foley J, Evans D, Blackwell A. Partial caries removal and cariostatic materials in carious primary molar teeth: A randomised controlled clinical trial. Br Dent J 2004;197 (11):697-701.~~

Fontana M, Gooch BF, Junger ML. The Hall technique may be an effective treatment modality for caries in primary molars. J Evid Based Dent Pract 2012;12(2):110-2.

Forsten L. Fluoride release and uptake by glass-ionomers and related materials and its clinical effect. Biomaterials 1998;19(6):503-8.

Francois P, Fouquet V, Attal JP, Dursun E. Commercially available fluoride-releasing restorative materials: A review and a proposal for classification. Materials (Basel) 2020;18;13(10):2313.

Frankenberger R, García-Godoy F, Kramer N. Clinical performance of viscous glass ionomer cement in posterior cavities over two years. Int J Dent 2009;2009:781462.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Frencken JE. Evolution of the ART approach: Highlights and achievements. J Appl Oral Sci 2009;17Suppl(spe):78-83.

Frencken JE, van't Hof MA, Taifour D, Al-Zaher I. Effectiveness of ART and traditional amalgam approach in restoring single surface cavities in posterior teeth of permanent dentitions in school children after 6.3 years. Community Dent Oral Epidemiol 2007;35(3):207-14.

Fröhlich TT, Rocha RO, Botton G. Does previous application of silver diamine fluoride influence the bond strength of glass ionomer cement and adhesive systems to dentin? Systematic review and meta-analysis. Int J Paediatr Dent 2020;30(1):85-95.

Fuks AB. The use of amalgam in pediatric dentistry: New insights and reappraising the tradition. Pediatr Dent 2015;37(2):125-32.

Fuks AB, Araujo FB, Osorio LB, Hadani PE, Pinto AS. Clinical and radiographic assessment of Class II esthetic restorations in primary molars. Pediatr Dent 2000;22(5):479-85.

Gill A, Garcia M, An SW et al. Clinical comparison of three esthetic full-coverage restorations in primary maxillary incisors at 12 months. Pediatr Dent 2020;42(5):367-72.

Giuca MR, Lardani L, Pasini M, Beretta M, Gallusi G, Campanella V. State-of-the-art on MIH. Part. 1 Definition and aepidemiology. Eur J Paediatr Dent 2020;21(1):80-2.

Gupta M, Chen JW, Ontiveros JC. Veneer retention of preveneered primary stainless steel crowns after crimping. J Dent Child 2008;75(1):44-7.

Hamrah MH, Mokhtari S,,Hosseini Z, et al. Evaluation of the clinical, child and parental satisfaction with zirconia crowns in maxillary primary incisors: A systematic review Int J Dent 2021; 5;2021:7877728.

Heintze SD, Rousson V. Clinical effectiveness of direct Class II restorations–A meta-analysis. J Adhes Dent 2012;14(5):407-31.

Heintze SD, Ruffieux C, Rousson V. Clinical performance of cervical restorations–A meta-analysis. Dent Mater 2010;26(10):993-1000.

Hickel R, Kaaden C, Paschos E, Buerkle V, García-Godoy F, Manhart J. Longevity of occlusally-stressed restorations in posterior primary teeth. Am J Dent 2005;18(3):198-211.

Holsinger DM, Wells MH, Scarbecz M, Donaldson M. Clinical evaluation and parental satisfaction with pediatric zirconia anterior crowns. Pediatr Dent 2016;38(3):192-7.

Hutcheson C, Seale NS, McWhorter A, Kerins C, Wright J. Multi-surface composite vs stainless steel crown restorations after mineral trioxide aggregate pulpotomy: A randomized controlled trial. Pediatr Dent 2012;34(7):460-7.

Innes NP, Evans DJ, Stirrups DR. Sealing caries in primary molars: Randomized control trial, 5-year results. J Dent Res 2011;90(12):1405-10.

Innes NP, Ricketts D, Evans DJ. Preformed metal crowns for decayed primary molar teeth. Cochrane Database Syst Rev 2007;(1):CD005512.

Innes NP, Stirrups DR, Evans DJ, Hall N, Leggate M. A novel technique using preformed metal crowns for managing carious primary molars in general practice – A retrospective analysis. Br Dent J 2006;200(8):451-4; discussion 444.

Ismail AI, Sohn W, Tellez M, et al. The international caries detection and assessment system (ICDAS): An integrated system for measuring dental caries. Community Dent Oral Epidemiol 2007;35(3):170-8.

Jiang M, Mei ML, Wong MCM, Chu CH, Lo ECM. Effect of silver diamine fluoride solution application on the bond strength of dentine to adhesives and to glass ionomer cements: A systematic review. BMC Oral Health. 2020;20(1):40.

Jing L, Chen JW, Roggenkamp C, Suprono MS. Effect of crown preparation height on retention of a prefabricated primary posterior zirconia crown. Pediatr Dent. 2019;41(3):229-33.

Jorge RC, Ammari MM, Soviero VM, Souza IPR. Randomized controlled clinical trial of resin infiltration in primary molars: 2 years follow-up. J Dent. 2019;90:103184.

Kavvadia K, Kakaboura A, Vanderas AP, Papagiannoulis L. Clinical evaluation of a compomer and an amalgam primary teeth class II restorations: A 2-year comparative study. Pediatr Dent 2004;26(3):245-50.

~~Kilpatrick NM, Neumann A. Durability of amalgam in the restoration of Class II cavities in primary molars: A systematic review of the literature. Eur Arch Paediatr Dent 2007;8(1):5-13.~~

~~Kindelan SA, Day P, Nichol R., Willmott N, Fayle SA. UK National Clinical Guidelines in Paediatric Dentistry: Stainless steel preformed crowns for primary molars. Int J Paediatr Dent 2008;18(Suppl. 1):20-8.~~

Krämer N, García-Godoy F, Reinelt C, Feilzer AJ, Frankenberger R. Nanohybrid vs. fine hybrid composite in extended Class II cavities after six years. Dent Mater 2011;27(5):455-64.

Kupietzky A, Waggoner WE, Galea J. Long-term photographic and radiographic assessment of bonded resin composite strip crowns for primary incisors: Results after 3 years. Pediatr Dent 2005;27(3):221-5.

Lee J, Chen JW, Omar S, Kwon SR, Meharry M. Evaluation of stain penetration by beverages in demineralized enamel treated with resin infiltration. Oper Dent 2016;41(1):93-102.

~~Lee JK. Restoration of primary anterior teeth: Review of the literature. Pediatr Dent 2002;24(5):506-10.~~

Leinfelder KF. Posterior composite resins. J Am Dent Assoc 1988;117(4):21E-26E.

Lenters M, van Amerongen WE, Mandari GJ. Iatrogenic damage to the adjacent surface of primary molars in three different ways of cavity preparation. Eur Archives Paediat Dent 2006;1(1):6-10.

Liberman J, Franzon R, Guimarles LF, Casagrande L, Haas AN, Araujo FB. Survival of composite restorations after selective or total caries removal in primary teeth and predictors of failures: A 36-months randomized controlled trial. J Dent 2020;93:103268.

Lula EC, Monteiro-Neto V, Alves CM, Ribeiro CC. Microbiological analysis after complete or partial removal of carious dentin in primary teeth: A randomized clinical trial. Caries Res 2009;43(5):354-8.

Lynch CD, Opdam NJ, Hickel R, et al. Guidance on posterior resin composites: Academy of Operative Dentistry - European Section. J Dent 2014;42(4):377-83.

~~Maggs-Rapport FL, Treasure ET, Chadwick BL. Com-munity dental officers' use and knowledge of restorative techniques for primary molars: An audit of two trusts in Wales. Int J Paediatr Dent 2000;10(2):133-9.~~

Maltz M, Garcia R, Jardim JJ, et al. Randomized trial of partial vs. stepwise caries removal: 3-year follow-up. J Dent Res 2012;91(11):1026-31.

Maltz M, Jardim JJ, Mestrinho HD, et al. Partial removal of carious dentine: A multicenter randomized controlled trial and 18-month follow-up results. Caries Res 2013; 47(2):103-9.

Maltz M, Koppe B, Jardim JJ, et al. Partial caries removal in deep caries lesions: a 5-year multicenter randomized controlled trial. Clin Oral Investig 2018;22(3):1337-43.

Mandari GJ, Frencken JE, van't Hof MA. Six-year success rates of occlusal amalgam and glass-ionomer restorations placed using three minimal intervention approaches. Caries Res 2003;37(4):246-53.

Manhart J, Chen H, Hamm G, Hickel R. Buonocore Memorial Lecture. Review of the clinical survival of direct and indirect restorations in posterior teeth of the permanent dentition. Oper Dent 2004;29(5):481-508.

Martignon S, Bartlett D, Manton DJ, Martinez-Mier EA, Splieth C, Avila V. Epidemiology of erosive tooth wear, dental fluorosis and molar incisor hypomineralization in the American continent. Caries Res 2021;55(1):1-11.

Marzouk T, Sathyanarayana S, Kim AS, Seminario AL, McKinney CM. A systematic review of exposure to bisphenol A from dental treatment. JDR Clin Trans Res 2019;4(2):106-15.

May E, Donly KJ. Fluoride release and re-release from bioactive restorative material. Am J Dent 2017;30(6):305-8.

Mertz-Fairhurst EJ, Curtis JW Jr, Ergle JW, Rueggeberg FA, Adair SM. Ultraconservative and cariostatic sealed restorations: Results at year 10. J Am Dent Assoc 1998;129(1):55-66.

Meyer-Lueckel H, Bitter, K, Paris S. Randomized controlled clinical trial on proximal caries infiltration: Three-year follow-up. Caries Res 2012;46(6):544-8.

Mickenautsch S, Yengopal V, Leal SC, Oliveira LB, Bezerra AC, Bonecker M. Absence of carious lesions at margins of glass-ionomer and amalgam restorations: A meta-analysis. Eur J Paediatr Dent 2009;10(1):41-6.

Mickenautsch S, Yengopal V. Failure rate of high-viscosity GIC based ART compared with that of conventional amalgam restorations–Evidence from an update of a systematic review. J South African Dent Assoc 2012;67(7):329-31.

Minguez N, Ellacuria J, Soler JI, Triana R, Ibaseta G. Advances in the history of composite resins. J Hist Dent 2003;51(3):103-5.

Mitra SB, Kedrowski BL. Long-term mechanical properties of glass ionomers. Dent Mater 1994;10(2):78-82.

~~National Institute of Health. Consensus Development Statement: Diagnosis and management of dental caries throughout life. NIH Consensus Statement. J Am Dent Assoc 2001;132(8):1153-61.~~

~~Nelson SJ. Wheeler's Dental Anatomy, Physiology, and Occlusion. 9th ed. Philadelphia, Pa.: WB Saunders; 2010.~~

Nicholson JW. Polyacid-modified composite resins ('compomers') and their use in clinical dentistry. Dent Mater 2007;23(5):615-22.

~~Opdam NJM, Bronkhorst EMB, Loomans BAC, Huysmans MC. 12-year survival of composite vs. amalgam restorations. J Dent Res 2010;89(10):1063-7.~~

Orhan AI, Oz FT, Orhan K. Pulp exposure occurrence and outcomes after 1- or 2-visit indirect pulp therapy vs. complete caries removal in primary and permanent molars. Pediatr Dent 2010;32(4):347-55.

Page LA, Boyd DH, Davidson SE, et al. Acceptability of the Hall Technique to parents and children. N Z Dent J 2014;110(1):12-7.

Pallav P, De Gee AJ, Davidson CL, Erickson RL, Glasspoole EA. The influence of admixing microfiller to small-particle composite resins on wear, tensile strength, hardness and surface roughness. J Dent Res 1989;68(3):489-90.

Paris S, Hopfenmuller W, Meyer-Lueckel H. Resin infiltration of caries lesions: An efficacy randomized trial. J Dent Res 2010;89(8):823-6.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Peng D, Smales RJ, Yip HK, Shu M. In vitro fluoride release from aesthetic restorative materials following recharging with APF gel. Aust Dent J 2000;45(3): 198-203.

~~27. Phonghanyudh A, Phantumvanit P, Songpaisan Y, Petersen PE. Clinical evaluation of three caries removal approaches in primary teeth: A randomised controlled trial. Community Dent Health 2012;29(2):173-8.~~

~~Planells DP, Fuks AB. Zirconia crowns- An esthetic and resistant restorative alternative for ECC affected primary teeth. J Clin Pediatr Dent 2014;38(3):193-5.~~

Qvist V, Laurberg L, Poulsen A, Teglers PT. Eight-year study on conventional glass ionomer and amalgam restorations in primary teeth. Acta Odontol Scand 2004; 62(1):37-45.

Raggio DP, Hesse D, Lenzi TL, Guglielmi CAB, Braga MM. Is atraumatic restorative treatment an option for restoring occluso-proximal caries lesions in primary teeth? A systematic review and meta-analysis. Int J Paediatr Dent 2013;23(6):435-43.

Ram D, Fuks AB. Clinical performance of resin-bonded composite strip crowns in primary incisors: A retrospective study. Int J Paediatr Dent 2006;16(1):49-54.

Randall RC, Vrijhoef MM, Wilson NH. Efficacy of pre-formed metal crowns vs. amalgam restorations in primary molars: A systematic review. J Am Dent Assoc 2000;131 (3):337-43.

Randall RC. Preformed metal crowns for primary and permanent molar teeth: Review of the literature. Pediatr Dent 2002;24(5):489-500.

Ricketts D, Lamont T, Innes NPT, Kidd E, Clarkson JE. Operative caries management in adults and children (Review). Cochrane Database Syst Rev 2013;3:54.

~~Roberts A, McKay A, Albadri S. The use of Hall technique preformed metal crowns by specialist paediatric dentists in the UK. Br Dent J 2018;224(1):48-52.~~

Roberts JF, Attari N, Sherriff M. The survival of resin modified glass ionomer and stainless steel crown restora-tions in primary molars, placed in a specialist paediatric dental practice. Br Dent J 2005;198(7):427-31.

Roberts C, Lee JY, Wright JT. Clinical evaluation of and parental satisfaction with resin-faced stainless steel crowns. Pediatr Dent 2001;23(1):28-31.

Roshan D, Curzon MEJ, Fairpo CG. Changes in dentists' attitudes and practice in paediatric dentistry. Eur J Paediatr Dent 2003;4(1):21-7.

Sagmak S, Bahsi E, Ozcan N, Satici O. Comparative evaluation of antimicrobial efficacy and fluoride release of seven different glass-ionomer-based restorative materials. Oral Health Prev Dent 2020;18(1):521-528.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Santamaria RM, Innes NPT, Machiulskiene V, et al. Alternative caries management options for primary molars: 2.5-year outcomes of a randomised clinical trial. Caries Res 2018;51(6):605-14.

Sarti CS, Vizzotto MB, Filgueiras LV, Bonifácio CC, Rodrigues JA. Two-year split-mouth randomized controlled clinical trial on the progression of proximal carious lesions on primary molars after resin infiltration. Pediatr Dent 2020;42(2):110-5.

Schwendicke F, Dorfer CE, Paris S. Incomplete caries removal: A systematic review and meta-analysis. J Dent Res 2013;92(4):306-14.

Seale NS, Randall R. The use of stainless steel crowns: A systematic literature review. Pediatr Dent 2015;37(2):147-62.

Seminario A, Garcia M, Spiekerman C, et al. Survival of zirconia crowns in primary maxillary incisors at 12-, 24-, and 36-month follow-up. Pediatr Dent 2019;41(5)385-90.

Senestraro SV, Crowe JJ, Wang M, et al. Minimally invasive resin infiltration of arrested white-spot lesions. J Am Dent Assoc 2013;144(9):997-1005.

Shah PV, Lee JY, Wright JT. Clinical success and parental satisfaction with anterior preveneered primary stainless steel crowns. Pediatr Dent 2004;26(5):391-5.

~~Sheiham A. Impact of dental treatment on the incidence of dental caries in children and adults. Community Dent Oral Epidemiol 1997;25(1):104-12.~~

Shi L, Wang X, Zhao Q, et al. Evaluation of packable and conventional hybrid resin composites in Class I restorations: Three-year results of a randomized, double-blind and controlled clinical trial. Oper Dent 2010;35 (1):11-9.

Sidhu SK, Nicholson JW. A review of glass-ionomer cements for clinical dentistry. J Funct Biomater 2016;28;7(3):16.

Sigal AV, Sigal MJ, Titley KC, Andrews PB. Stainless steel crowns as a restoration for permanent posterior teeth in people with special needs: A retrospective study. J Am Dent Assoc 2020;151(2):136-44. Erratum in: J Am Dent Assoc 2020;151(12):890.

Skrtic D, Antonucci JM. Bioactive polymeric composites for tooth mineral regeneration: Physiochemical and cellular aspects. J Functional Biomater 2011;2(3):271-307.

Slayton RL. Clinical decision-making for caries management in children: An update. Pediatr Dent. 2015;37(2):106-10.

Slayton RL, Urquhart O, Araujo M, et al. Evidence-based clinical practice guideline on nonrestorative treatments for carious lesions. J Am Dent Assoc 2018;149(10): 837-49.

Slowikowski L, John S, Finkleman M, et al. Fluoride ion release and recharge over time in three estoratives. J Dent Res 2014;93(Spec Iss A):268.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Somani C, Taylor GD, Garot E, Rouas P, Lygidakis NA, Wong FSL. An update of treatment modalities in children and adolescents with teeth affected by molar incisor hypomineralisation (MIH): A systematic review. Eur Arch Paediatr Dent 2021 Jun 10. doi: 10.1007/s40368-021-00635-0.

Soncini JA, Meserejian NN, Trachtenberg F, Tavares M, Hayes C. The longevity of amalgam versus compomer/ composite restorations in posterior primary and permanent teeth: Findings from the New England Children's Amalgam Trial. J Am Dent Assoc 2007;138(6):763-72.

Sonmez D, Duruturk L. Success rate of calcium hydroxide pulpotomy in primary molars restored with amalgam and stainless steel crowns. Br Dent J 2010;208(9):E18.

~~Swartz ML, Phillips RW, Clark HE. Long-term fluoride release from glass ionomer cements. J Dent Res 1984;63 (2):158-60. 74. Forsten L. Fluoride release and uptake by glass ionomers and related materials and its clinical effect. Biomaterials 1998;19(6):503-8.~~

Tam LE, Chan GP, Yim D. In vitro caries inhibition effects by conventional and resin-modified glass ionomer restorations. Oper Dent 1997;22(1):4-14.

Taran PK, Kaya MS. A comparison of periododontal health in primary molars restored with prefabricated stainless steel and zirconia crowns. Pediatr Dent 2018; 40(5):334-9.

Tedesco TK, Calvo AF, Lenzi TL, et al. ART is an alternative for restoring occlusoproximal cavities in primary teeth - Evidence from an updated systematic review and meta-analysis. Int J Paediatr Dent 2017;27(3):201-9.

Tellez M, Gomez J, Kaur S, Pretty IA, Ellwood R, Ismail AI. Non-surgical management methods of noncavitated carious lesions. Community Dent Oral Epidemiol 2013; 41(1):79-96.

~~Threlfall AG, Pilkington L, Milsom KM, Blinkhorn AS, Tickle M. General dental practitioners' views on the use of stainless steel crowns to restore primary molars. Br Dent J 2005;199(7):435-5.~~

~~Tinanoff N, Douglass JM. Clinical decision-making for caries management of primary teeth. J Dent Ed 2001;65 (10):1133-42.~~

Toh SL, Messer LB. Evidence-based assessment of tooth-colored restorations in proximal lesions of primary molars. Pediatr Dent 2007;29(1):8-15.

Truong K, Chen JW, Lee S, Riter H. Changes of surface properties of composite preveneered stainless steel crowns after prophy polishing to remove stains. Pediatr Dent 2017;39(2):17-24E.

Tyas MJ. Cariostatic effect of glass ionomer cements: A 5-year clinical study. Aust Dent J 1991;36(3):236-9.

U.S. Department of Health and Human Services. Final Rule. Federal Register 75: Issue 112 (Friday, June 11, 2010). Available at: "~~https://www.fda.gov/media/77127/ download~~ https://www.federalregister.gov/documents/2010/06/11/2010-14083/dental-devices-classification-

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

of-dental-amalgam-reclassification-of-dental-mercury-designation-of". Accessed March 12, 2022~~July 24, 2019~~.

U.S. Food and Drug Administration. Recommendations About the Use of Dental Amalgam in Certain High-Risk Populations: FDA Safety Communication. Available at: "https://www.fda.gov/medical-devices/safety-communications/recommendations-about-use-dental-amalgam-certain-high-risk-populations-fda-safety-communication". Accessed January 30, 2022.

Urquhart O, Tampi MP, Pilcher L, et al. Nonrestorative treatments for caries: Systematic review and network meta-analysis. J Dent Res 2019;98(1):14-26.

~~van't Hof MA, Frenecken JE, van Palenstein Helderman WH, Holmgren CJ. The Atraumatic Restorative Treatment (ART) approach for managing dental caries: A meta-analysis. Int Dent J 2006;56(6):345-51.~~

~~Waggoner WF. Anterior crowns for primary anterior teeth: An evidence-based assessment of the literature. Eur Arch Paediatr Dent 2006;7(2):53-7.~~

~~Waggoner WF. Restoring primary anterior teeth. Pediatr Dent 2002;24(5):511-6.~~

Waggoner WF. Restoring primary anterior teeth: Updated for 2014. Pediatr Dent 2015;37(2):163-9.

Wambier DS, dos Santos FA, Guedes-Pinto AC, Jaeger RG, Simionato MR. Ultrastructural and microbiological analysis of the dentin layers affected by caries lesions in primary molars treated by minimal intervention. Pediatr Dent 2007;29(3):228-34.

Welbury RR, Shaw AJ, Murray JJ, Gordon PH, McCabe JF. Clinical evaluation of paired compomer and glass ionomer restorations in primary molars: Final results after 42 months. Br Dent J 2000;189(2):93-7.

Welbury RR. The Hall Technique 10 years on: Its effect and influence. Br Dent J 2017;222(6):421-2.

Wilson AD, Kent BE. A new translucent cement for dentistry. The glass ionomer cement. Br Dent J 1972;132 (4):33-5.

Wu E, Yang YJ, Munz SM, Hsia CC, Boynton, JR. Restorations versus stainless steel crowns in primary molars. A retrospective split-mouth study. Pediatr Dent 2021;43(4):290-5.

Xu S, Wu Zhang MD. Evaluating bonding agent's effect in microleakage of a bioactive restorative material with thermocycling and pH challenge test. Taiwan J Pediatr Dent 2019;19(4):133-42.

Yengopal V, Harnekar SY, Patel N, Siegfried N. Dental fillings for the treatment of caries in the primary dentition (Review). Cochrane Database of Syst Rev 2009;(2):CD004483.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Yengopal V, Mickenautsch S. Caries-preventive effect of resin-modified glass-ionomer cement (RM-GIC) versus composite resin: A quantitative systematic review. Eur Arch Paediatr Dent 2011;12(1):5-14.

Zagdwon AM, Fayle SA, Pollard MA. A prospective clinical trial comparing preformed metal crowns and cast restorations for defective first permanent molars. Eur J Paediatr Dent 2003;4(3):138-42.

Table 1. EVIDENCE OF EFFICACY OF VARIOUS DENTAL MATERIALS/TECHNIQUES IN PRIMARY TEETH WITH REGARD TO CARIES LESION CLASSIFICATIONS

Strong evidence – based on well executed randomized control trials, meta-analyses, or systematic reviews; Evidence in favor – based on weaker evidence from clinical trials; Expert opinion – based on retrospective trials, case reports, in vitro studies and opinions from clinical researchers; Evidence against – based on randomized control trials, meta-analysis, systematic reviews.

	Class I	**Class II**	**Class III**	**Class IV**	**Class V**
Amalgam	Strong evidence	Strong evidence	No data	No data	Expert opinion
Composite	Strong evidence	Strong evidence	Expert opinion	No data	Evidence in favor
Glass ionomer	Strong evidence α	Evidence against β	Evidence in favor γ	No data	Expert opinion γ
RMGIC	Strong evidence	Expert opinion δ	Expert opinion	No data	Expert opinion
Compomers	Evidence in favor	Evidence in favor	No data	No data	Expert opinion
SSC	Evidence in favor ε	Evidence in favor ε	No data	No data	No data
Anterior φ **crowns**	N/A	N/A	Expert opinion	Expert opinion	Expert opinion

RMGIC = resin modified glass ionomer cement. SSC = stainless steel crown.
α Evidence from ART trials.
δ Small restorations; life span 1-2 years.
β Conflicting evidence for multisurface ART restorations.
ε Large lesions.
γ Preference when moisture control is an issue.
φ Strip crowns, stainless steel crowns with/without facings, zirconia crowns.

Table 2. E VIDENCE OF EFFICACY OF VARIOUS DENTAL MATERIALS/TECHNIQUES IN PERMANENT TEETH WITH REGARD TO CARIES LESION CLASSIFICATIONS

	Class I	**Class II**	**Class III**	**Class IV**	**Class V**
Amalgam	Strong evidence	Strong evidence	No data	No data	No data
Composite	Strong evidence	Evidence in favor	Expert opinion	No data	Evidence in favor
Glass ionomer	Strong evidence α	Evidence against	Evidence in favor β	No data	Expert opinion β
RMGIC	Strong evidence	No data	Expert opinion	No data	Evidence in favor
Compomers	Evidence in favor γ	No data	Expert opinion	No data	Expert opinion
SSC	Evidence in favor δ	Evidence in favor δ	No data	No data	No data
Anterior φ **crowns**	N/A	N/A	No data	No data	No data

RMGIC = resin modified glass ionomer cement. SSC = stainless steel crown.
α Evidence from ART trials.
γ Evidence from studies in adults.
β Preference when moisture control is an issue.
δ For children and adolescents with gross caries or severely hypoplastic teeth.
φ Strip crowns, stainless steel crowns with/without facings.

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Use of Antibiotic Therapy for Pediatric Dental Patients

Abstract

This best practice provides clinicians with guidance in the appropriate use of antibiotics to treat oral infections in children. When correctly prescribed and administered, antibiotics can be effective in the treatment of oral bacterial infections. Antibiotic stewardship is important given the rise in antibiotic-resistant microorganisms and potential for adverse drug reactions. This document addresses the following clinical conditions: oral wounds, pulpitis/apical periodontitis/draining sinus tract/localized intraoral swelling, acute facial swelling of dental origin, dental trauma, periodontal diseases, and salivary gland infections and offers guidance on the judicious use of antibiotics in their management. Antibiotics are not indicated in the management of conditions of viral origin. Potential interactions between antibiotics and oral contraceptives are addressed. Health care providers must be prudent in their prescribing practices to maximize effectiveness and minimize bacterial resistance and adverse reactions.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance on the use of antibiotic therapy for pediatric dental patients.

KEYWORDS: ANTIBIOTICS; ANTIMICROBIAL RESISTANCE; DENTAL INFECTION CONTROL; BACTERIAL INFECTIONS

Latest Revision

~~2019~~ 2022

ABBREVIATIONS

AAPD: American Academy of Pediatric Dentistry. **JRP**: Juvenile recurrent parotitis.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes the increasing prevalence of antibiotic-resistant microorganisms and potential for adverse drug reactions and interactions. These recommendations are intended to provide guidance in the proper and judicious use of antibiotic therapy in the treatment of oral conditions. The use of antibiotic prophylaxis for dental patients at risk for infection is addressed in a separate best practices document.(AAPD Antibiotic Prophylaxis 2021

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~~2019~~) Information regarding commonly prescribed antibiotics can be found in the AAPD's *Useful Medications for Oral Conditions*.(AAPD Useful medications ~~2019~~ 2021)

Methods

Recommendations on the use of antibiotic therapy were developed by the Council on Clinical Affairs ~~and~~ adopted in 2001, (AAPD 2001) ~~This document is a revision of the previous version~~,and last revised in ~~2014~~2019.(AAPD Antibiotic therapy ~~2014~~2019) The revision was based upon a new literature search of the PubMed®~~/MEDLINE~~ database using the terms:pediatric dental antibiotic therapy and ~~antibiotic therapy,~~ antibacterial agents, antimicrobial agents, dental trauma, oral wound management, orofacial infections, periodontal disease, viral disease, and oral contraception; fields: all; limits: within the last 10 years, humans, English, clinical trials, birth through age 18. Four hundred seventy-eight ~~Three hundred forty three~~ articles matched these criteria. Papers for review were chosen from this search and from hand searching. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background

Antibiotics are beneficial to patient care when prescribed and administered correctly for bacterial infections. However, the widespread use of antibiotics has permitted common bacteria to develop resistance to drugs that once controlled them.(CDC A/A Resistance ~~2013~~2019; Costelloe et al. 2010) Drug resistance is prevalent throughout the world.(CDC Antibiotic/ Antimicrobial Resistance 2020 ~~2013~~; Costelloe et al. 2010) ~~In the United States,more~~ More than 2.8 million antibiotic-resistant infections occur in the United States each year, and more than 35,000 people die. (CDC A/A Resistance-2019) At least two million people are infected by antibiotic-resistant bacteria per year.(CDC A/A Resistance ~~2013~~2019) Some microorganisms may develop resistance to a single antimicrobial agent, while others develop multidrug-resistant strains.(Costelloe et al. 2010) To diminish the rate at which resistance is increasing, health care providers must be prudent in the use of antibiotics.(CDC A/A Resistance ~~2013~~2019; Aidasani et al. 2019) A study showed 80 percent of prescriptions of antibiotics before dental procedures were unnecessary as risk-factors were not present.(Suda et al. 2019) This highlights a concern on the appropriateness for prescribed antibiotic prophylaxis for dental procedures. (Suda et al. 2019) While use of antibiotic prophylaxis is indicated for certain patients undergoing invasive dental procedures, over-all emphasis should focus on establishment of a dental home, the prevention of disease, establishment and maintenance of good

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oral health care habits, and regular dental care. (Wilson et al 2021; Squire et al 2019) Conservative use of antibiotics is indicated to minimize the risk of developing resistance to current antibiotic regimens.(CDC A/A Resistance ~~2913~~2019; Costelloe et al. 2010; Wilson et al. 2021)

Adverse events such as allergic reactions, development of *Clostridium difficile*, or drug interactions and side effects can occur.(CDC A/A Resistance ~~2013~~2019~~;~~ CDC Antibiotic prescribing 2017, page 39) ~~The Centers for Disease Control and Prevention reports that every year there are 140,000 emergency department visits for reactions to antibiotics, and that antibiotics~~ Antibiotic adverse drug events are ~~the most~~ a common cause of emergency department visits for adverse drug events in children under the age of 18 years, with amoxicillin as the most commonly implicated drug in children less than nine years and sulfamethoxazole-trimethoprim in children aged 10-19.(Lovegrove et al. 2019~~CDC Antibiotic/Antimicrobial Resistance 2013~~)

Amoxicillin, considered the first drug of choice for dental infections in non-allergic children (Ahmadi 2021), is effective against a wide variety of gram-positive bacteria and offers greater gram-negative coverage than penicillin (Akhavan 2021). It has been shown to be effective against oral flora, (Fouad et al. 2020), be well absorbed from the gastrointestinal tract(Wilson 2021), provide high, sustained serum concentrations(Wilson 2021), and have a low incidence of adverse effects(Fouad et al. 2020).

The American Heart Association no longer recommends clindamycin for prophylaxis against infective endocarditis due to frequent and severe reactions. (Wilson et al. 2021) Clindamycin has been associated with significant adverse drug reactions related to community-acquired *C. difficile* infections. (Thornhill et al. 2015) Up to 15 percent of community-acquired *C. difficile* infection has been attributed to antibiotics prescribed for dental procedures. (Wilson et al. 2021) Doxycycline is recommended as an alternative to penicillin, cephalosporin, and macrolide allergy. (Wilson et al. 2021) Short-term use (<21 days) of doxycycline had not been associated with tooth discoloration in children under eight years of age. (Todd et al 2015, AAP 2018, Stultz and Eiland 2019.) Azithromycin is one of the safest antibiotics for patients allergic to penicillins, but there are risks of cardiac complications including cardiotoxicity. (Zeng et al, 2020) The small, heightened risk appears to be related to pre-existing cardiovascular risk factors including prior myocardial infarction, diabetes, age, and gender (Bartold et al, 2013). Cardiac risk in pediatric patients seems to be due to an increased risk of QT prolongation associated with higher dosage levels (Zeng et al, 2020).

Recommendations

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Practitioners should adhere to the following general principles ~~when prescribing antibiotics~~for antibiotic usage for the pediatric dental patient~~population~~. (Wilson et al. 2021, CDC 2019. https://www.cdc.gov/antibiotic-use/community/downloads/dental-fact-sheet-FINAL.pdf)

- Prevention of dental diseases should be stressed in order to reduce the need for antibiotic intervention.
- Antibiotics should be prescribed only when truly needed for a bacterial infection and only as an adjunct to, not an alternative for, other interventions (e.g., pulp therapy, extraction, scaling and root planing) implemented to control the infection source.
- Antibiotics should be selected based on properties of the agent (e.g., spectrum of coverage, safety), previous antibiotic use and patient considerations (e.g medical history, drug allergies, current medication use, ease of use) and then prescribed at an adequate pediatric dose.
- The most effective route of drug administration (intravenous versus intramuscular versus oral) must be considered. If the patient is receiving parenteral antimicrobial therapy for treatment of existing infections, the same antibiotic can be continued. (Wilson et al 2021) Consultation with an infectious disease physician is recommended if there is concern for resistant infections.
- The traditional minimal duration of drug regimen is five days beyond the point of substantial improvement (e.g., improved healing of wound, reduction of erythema or swelling, reduction of signs and symptoms). Usually a five- to seven-day course of treatment is dependent upon the specific drug selected.(Kuriyama et al.(Kuriyama et al.2000; Prieto-Prieto & Calvo 2004)
- However, in light of the growing problem of drug resistance, discontinuation of antibiotics should be considered following determination of either ineffectiveness or cure prior to completion of a full course of therapy.(AAP RedBook Group A Streptococcal Infections 2021,Engleberg, Schaechter's Mechanisms of Microbial Disease. 2022).)
- If an infection is not responsive to the initial drug selection, a culture and sensitivity testing from the infection site or, in some cases, a blood microbiology and culture and sensitivity may be indicated. (CDC A/A Resistance 2019 pages 43-47, Engleberg, Schaechter's Mechanisms of Microbial Disease. 2022).
- Prescriptions should be documented in the patient's dental record.(AAPD Recordkeeping)
- Individuals suspected to have an allergy to antibiotics should receive testing to confirm or refute the presence of a true allergy.

Additional considerations for specific clinical circumstances are discussed below.

Oral wounds

Factors related to host risk (e.g., age, systemic illness, co-morbidities, malnutrition) and type of wound (e.g., laceration, puncture) must be evaluated when determining the risk for infection and subsequent need for antibiotics. Wounds can be classified as clean, potentially contaminated, or contaminated/ dirty. Facial lacerations and puncture wounds may require topical antibiotic agents.(Nakamura and Daya 2007) Intraoral puncture wounds and lacerations that appear to have been contaminated by extrinsic bacteria, debris (e.g., dirt, soil, gravel), foreign body, open fractures, and joint injury have an increased risk of infection and should be managed by systemic antibiotics.(Nakamura and Daya 2007) Tetanus immunization status should be determined. If ~~it is~~ antibiotics ~~would be~~ are deemed beneficial to the healing process, the timing of their administration ~~of antibiotics~~ is critical to supplement the natural host resistance in bacterial killing. The drug should be administered as soon as possible for the best result. (CDC A/A Resistance-2019 pages 36-38) ~~The most effective route of drug administration (intravenous vs. intramuscular vs. oral) must be considered. The clinical effectiveness of the drug must be monitored. The minimal duration of drug therapy should be five days beyond the point of substantial improvement or resolution of signs and symptoms; this is usually a five- to seven-day course of treatment dependent upon the specific drug selected.(Kuriyama et al.(Kuriyama et al.2000; Prieto-Prieto and Calvo 2004) In light of the growing problem of drug resistance, the clinician should consider altering or discontinuing antibiotics following determination of either ineffectiveness or cure prior to completion of a full course of therapy.(Flynn 2011). If the infection is not responsive to the initial drug selection, a culture and sensitivity testing of a swab from the infective site or, in some cases, a blood microbiology and culture and sensitivity may be indicated.~~

Pulpitis/apical periodontitis/draining sinus tract/localized intra-oral swelling

Bacteria can gain access to the pulpal tissue through caries, exposed pulp or dentinal tubules, cracks into the dentin, and defective restorations. If a child presents with acute symptoms of pulpitis, treatment (i.e., pulpotomy, pulpectomy, or extraction) should be rendered. Antibiotic therapy ~~usually~~ is not indicated nor effective if the dental infection is contained within the pulpal tissue or the immediate surrounding tissue. In this case, the child will have no systemic signs of an infection (i.e., no fever, ~~and~~ no facial swelling).(Fluent et al. 2016)

Consideration for use of antibiotics should be given in cases of advanced non-odontogenic bacterial infections such as staphylococcal mucositis, tuberculosis, gonococcal stomatitis, and oral syphilis. If

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suspected, ~~it is best to refer patients~~ referral for microbiology, culture and sensitivity, biopsy, or other laboratory tests for documentation and definitive treatment is indicated.

Acute facial swelling of dental origin

A child presenting with a facial swelling or facial cellulitis secondary to an odontogenic infection should receive prompt dental attention. The clinician should consider age, cooperation, the ability to obtain adequate anesthesia (local versus general), the severity of the infection, the medical status, and any social issues of the child.(Johri and Piecuch 2011; Thikkurissy et al. 2010) ~~In most situations where there is a large~~ For odontogenic infections with non-localized and progressive swelling and systemic manifestations (e.g., fever, difficulty breathing or swallowing), immediate surgical intervention and medical management with intravenous antibiotic therapy ~~is appropriate and~~ contribute to a more rapid cure.(~~Johri and Piecuch 2011~~; Thikkurissy et al. 2010, Adewumi et. al 2019, Baker et al 2010, Solankis 2019) Signs of systemic involvement and septicemia (e.g., fever, malaise, asymmetry, facial swelling, lymphadenopathy, trismus, tachycardia, dysphagia, airway compromise, respiratory distress) warrant emergency treatment.(Adewumi et. al 2019, Baker et al 2010) Additional imaging (e.g. radiographs, ultrasound, ~~and~~ CT scan) and testing ~~such as a~~ (e.g., complete blood examination, c-reactive protein, ~~blood cultures, and~~ bacterial culture and sensitivity can aid in assessment and diagnosis. ~~Intravenous antibiotic therapy medical management is indicated.~~(Johri and Piecuch 2011; Thikkurissy et al. 2010) Penicillin derivatives remain the empirical choice for odontogenic infections; however, consideration of additional adjunctive antimicrobial therapy ~~(i.e.,~~ such as metronidazole~~)~~ can be given ~~where there is~~ for anaerobic bacterial involvement.(~~Flynn 2011~~; AAP RedBook Group A Streptococcal Infections 2021,Zirk et al. 2016) Cephalosporins could be considered as an alternative choice for management of odontogenic infections, especially when a child has had previous course(s) of penicillin/amoxicillin or if the child has a penicillin allergy.(Zirk et al. 2016)

Dental ~~trauma~~ Avulsions

Systemic antibiotics have been recommended as adjunctive therapy for avulsed permanent incisors with an open or closed apex.(Fouad et al. 2020; DiAngelis et al. 2012; Andersson et al. 2012) ~~Tetracycline (doxycycline twice daily for seven days)~~ Amoxicillin or penicillin is the drug of choice due to effectiveness against oral flora and low incidence of adverse effects~~,~~ . (Fouad et al. 2020 – IADT Guidelines ~~Anderrson et al 2012~~) ~~but consideration of the child's age must be exercised in the systemic use of tetracycline due to the risk of discoloration in the developing permanent dentition.18~~

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Doxycycline is recommended as an alternative to penicillin. (Fouad et al. 2020). Doxycycline exhibits antimicrobial, anti-inflammatory, and anti-resorptive properties which makes its use appropriate for dental trauma. (Andreason, Storgaard Jensen, Sae-Lim 2006; Fouad et al. 2020) ~~Penicillin V or amoxicillin can be given as an alternative in patients under 12 years of age.(Andersson et al. 2012; Malmgren et al. 2012)~~ ~~The~~ ~~use of~~ Using topical antibiotics (minocycline or doxycycline) to enhance pulpal revascularization and periodontal healing in immature non-vital traumatized teeth has shown potential in animal studies, (Andersson et al. 2012; Malmgren et al. 2012; McIntyre et al. 2007) ~~has~~ but usage has not been proven effective in human studies, remains controversial, and has not been recommended by the International Association of Dental Traumatology. (Fouad et al 2020) ~~shown some potential~~. ~~(Andersson et al. 2012; Malmgren et al. 2012; McIntyre et al. 2007) However,~~ ~~f~~Further randomized clinical trials are needed.(~~Hargreaves et al 2013; Shabahang 2013~~ Fouad et al 2020) ~~For luxation injuries in the primary dentition, antibiotics are not indicated.(Andersson et al. 2012)~~ Antibiotics can be warranted in cases of concomitant soft tissue injuries (see **Oral wounds**) and when dictated by the patient's medical status.

Pediatric periodontal diseases

~~Gingival inflammation due to the presence of bacterial plaque accumulation is a key factor in the development of periodontal disease and must be controlled.(Murakami et al. 2018) However, a distinction must be made between a site of gingival inflammation versus a gingival case, diagnosed at the patient level, using specific criteria, including bleeding on probing.(Trombelli et al. 2018) Periodontal diseases recently have been classified into three groups: 1) periodontal health, gingival diseases, and conditions; 2) periodontitis and; 3) other conditions affecting the periodontium;(Caton et al. 2018) periodontitis is further classified as necrotizing periodontal disease, periodontitis as manifestation of systemic diseases, and periodontitis.(Caton et al. 2018) Prior terms of chronic or aggressive periodontitis are now included in the single category of periodontitis.(Papapanou et al. 2018~~) Three distinct forms of periodontal disease have been defined as: (1) periodontitis (grouping the two forms formerly recognized as prepubertal, aggressive or chronic); (2) necrotizing periodontitis; and (3) periodontitis as a manifestation of systemic conditions (Caton et al, 2018).~~Dental plaque-induced gingivitis is managed by appropriate local therapeutic interventions (Shabahang 2013) including professional oral hygiene and re-enforcement of brushing twice daily for at least two minutes.(Chapple et al. 2015)~~ Patients diagnosed with what formerly was known as aggressive periodontal disease may require adjunctive antimicrobial therapy in conjunction with localized treatment.(~~American Academy of Periodontology Research 2003~~; AAPD Perio

Classification, Keestra et al. 2015; Rabelo et al. 2015; ~~Merchant et al. 2014~~) In pediatric periodontal diseases associated with systemic ~~disease~~ conditions (e.g., severe congenital neutropenia, Papillon-Lefèvre syndrome, leukocyte adhesion deficiency), the immune system is unable to control the growth of periodontal pathogens and, in some cases, treatment may involve antibiotic therapy or antibiotic prophylaxis.(~~American Academy of Periodontology Research 2003; Schmidt et al. 2013~~ AAPD Classification of Perio, 2021; Squire et al. 2019) ~~In severe and refractory cases, extraction is indicated.(American Academy of Periodontology Research 2003; Schmidt et al. 2013)~~ Culture and susceptibility testing of isolates from the involved sites are helpful in guiding the drug selection. (~~American Academy of Periodontology Research 2003;~~ Schmidt et al. 2013). In severe and refractory cases, extraction is indicated.(~~AAP Research 2003~~; Schmidt et al. 2013)

Viral diseases

Conditions of viral origin such as acute primary herpetic gingivostomatitis should not be treated with antibiotic therapy.(CDC Antibiotic Prescribing 2017)

Salivary gland infections

For acute salivary gland swellings of bacterial nature, antibiotic therapy is indicated.(Patel and Karlis 2009) If the patient does not improve in 24-48 hours on antibiotics alone, incision and drainage may be warranted.(CDC A/A Resistance ~~2013~~ 2019 Amoxicillin/clavulanate is used as empirical therapy to cover both staphylococcal and streptococcal species as most bacterial infections of the salivary glands originate from oral flora.(Patel and Karlis 2009) ~~Clindamycin is appropriate for penicillin-allergic patients.(Rabelo et al. 2015)~~

The most common inflammatory salivary gland disorder in the U.S. is juvenile recurrent parotitis (JRP), with first onset of symptoms between ages 3-6 years old, continuing to puberty.(Garavello 2018~~Patel and Karlis 2009~~)The etiology of JRP remains unknown and treatment varies depending on severity. Although JRP is self-limiting, administration of β-~~lacatam~~lactam antibiotics ~~can~~ may shorten symptom duration.(Garavello 2018)~~Patel and Karlis 2009)~~ For both acute bacterial submandibular sialadenitis and chronic recurrent submandibular sialadenitis, antibiotic therapy is included as part of the treatment.(Carlson 2009)

Oral contraceptive use

Although caution previously was ~~is~~ advised with the concomitant use of antibiotics and oral contraceptives, (DeRossi and Hersh 2002; Becker 2011), a 2018 systematic review of drug interactions between non-rifamycin antibiotics and hormonal contraception found that most women can expect no reduction in hormonal contraceptive effect with the concurrent use of non-rifamycin antibiotics.(Simmons et al. 2018) The World Health Organization also reported in 2015 that most broad-spectrum antibiotics do not affect the contraceptive effectiveness of combined oral contraceptives, combined contraceptive patch, or the combined contraceptive vaginal ring.(WHO 2015) In addition, no differences in ovulation were found when oral contraceptives were combined with ampicillin, doxycycline, temafloxacin, ofloxacin, ciprofloxacin, clarithromycin, roxithromycin, dirithromycin, or metronidazole.(Simmons et al. 2018) Women should be encouraged to take oral contraceptives correctly and consistently at all times, including during ~~periods of~~ illness.(Simmons et al. 2018) Rifamcyin antibiotics, such as rifampin or rifabutin, induce hepatic enzymes that are required for hormonal contraceptive metabolism, which could compromise the contraceptive or antibiotic effect.(Simmons et al. 2018; WHO 2015) Consultation with the medical practitioner regarding use ~~Use~~ of other contraceptives is recommended ~~should be advised~~ with long-term use of these medications.(WHO 2015)

References

Aidasani B, Solankis M, Khetarpal S, Ravi Pratap S. Antibiotics: Their use and misuse in paediatric dentistry. A systematic review. Eur J Paediatr Dent 2019;20(2): 133-8.

Adewumi AO. Oral surgery in children. In: Nowak AJ, Christensen JR, Mabry TR, Townsend JA, Wells MH, eds. Pediatric Dentistry Infancy through Adolescence. 6th ed. St Louis, Mo.: Elsevier; 2019:399-409.

American Academy of Pediatric Dentistry. Antibiotic prophylaxis for dental patients at risk for infection. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; ~~2019: 416-21.~~ PENDING

American Academy of Pediatric Dentistry. Appropriate use of antibiotic therapy~~. Pediatr Dent 2001;23(special issue):71-3~~. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:461-4.

American Academy of Pediatric Dentistry. Classification of periodontal diseases in infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:435-49.

American Academy of Pediatric Dentistry. Record-keeping. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:484-91.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~American Academy of Pediatric Dentistry. Use of antibiotic therapy for pediatric dental patients. Pediatr Dent 2014;36(special issue):284-6.~~

American Academy of Pediatric Dentistry. Use of antibiotic therapy for pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago, IL.: American Academy of Pediatric Dentistry; 2019:443-6.

American Academy of Pediatric Dentistry. Useful medications for oral conditions. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; ~~2019:544-50.~~ 2021:612-18.

~~American Academy of Pediatrics. Tetracyclines. In: Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, eds. Red Book: 2018 Report of the Committee on Infectious Diseases. Elk Grove Village, IL: American Academy of Pediatrics~~

American Academy of Pediatrics. Tetracyclines. In: Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, eds. Red Book: 2021-2024 Report of the Committee on Infectious Diseases. Elk Grove Village, IL: American Academy of Pediatrics; 2021: 905-6.

American Academy of Pediatrics. Group A Streptococcal Infections. In: Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, eds. Red Book: 2021-2024 Report of the Committee on Infectious Diseases. Elk Grove Village, IL: American Academy of Pediatrics; 2021: 694-915.

~~American Academy of Periodontology Research, Science and Therapy Committee. Periodontal diseases of children and adolescents. J Periodontol 2003;74:1696-704.~~

~~Andersson L, Andreasen JO, Day P, et al. International Association of Dental Traumatology Guidelines for the management of traumatic dental injuries: 2 – Avulsion of permanent teeth. Dent Traumatol 2012;28(2):88-96.~~

Andreason JO, Storgaard Jensen S, Sae-Lim V. The role of antibiotics in presenting healing complications after traumatic dental injuries: A literature review. Endod Topics 2006;14:80-92.

Baker S, Parico L. Pathologic paediatric conditions associated with a compromised airway. Int J Paediatr Dent. 2010;20(2):102-11.

Bartold PM, du Bois AH, Gannon S, Haynes DR, Hirsch RS. Antibacterial and immunomodulatory properties of azithromycin treatment implications for periodontitis. Inflammopharmacology. 2013;21(4):321-38.

Becker DE. Adverse drug interactions. Anesth Prog 2011; 58(1):31-41.

Carlson ER. Diagnosis and management of salivary gland infections. Oral Maxillofac Surg Clin North Am 2009; 21(3):293-312.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Caton JC, Armitage G, Berglundh T, et al. A new classification scheme for periodontal and peri-implant diseases and conditions: Introduction and key changes from the 1999 classification. J Periodontol 2018;89(Suppl 1):S1-S8.

Centers for Disease Control and Prevention. Antibiotic Prescribing and Use. Antibiotic Use in Outpatient Settings, 2017. Available at: “https://www.cdc.gov/antibiotic-use/ stewardship-report/outpatient.html”. Accessed ~~October 9, 2019~~ January 24, 2022.

Centers for Disease Control and Prevention. Antibiotic/Antimicrobial Resistance Threats in the United States, 2019 ~~2013~~. Available at: “https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf ““~~https://www.cdc.gov/drugresistance/ threat-report-2013/pdf/ar-threats-2013-508.pdf ”~~. Accessed ~~October 9, 2019~~January 24, 2022.

Centers for Disease Control and Prevention. Checklist for antibiotic prescribing in dentistry. Available at: “https://www.cdc.gov/antibiotic-use/community/downloads/dental-fact-sheet-FINAL.pdf.” 2019. Accessed March 11, 2022

~~Chapple IL, Van der Weijden F, Doerfer C, et al. Primary prevention of periodontitis: Managing gingivitis. J Clin Periodontol 2015;42(Suppl 16):S71-S76.~~

Costelloe C, Metcalfe C, Lovering A, et al. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: Systematic review and meta-analysis. BMJ 2010;340:c2096.

DeRossi SS, Hersh EV. Antibiotics and oral contraceptives. Pediatr Clin North Am 2002;46(4):653-64.

~~DiAngelis AJ, Andreasen JO, Ebelseder KA, et al. International Association of Dental Traumatology Guidelines for the management of traumatic dental injuries: 1 – Fractures and luxations of permanent teeth. Dent Traumatol 2012; 28(2):2-12.~~

Engleberg NC. Strategies to combat bacterial infections. In: Engleberg NC, DiRita VJ, Imperiale MJ, eds. Schaechter’s Mechanisms of Microbial Disease 6th ed Philadelphia, Pa.: Wolters-Kluwer; 2022: 436.

Fouad AF, Abbott PV, Tsilingaridis G, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. Dental Traumatology 2020;36(4):331-342.

Fluent MT, Jacobsen PL, Hicks LA. Considerations for responsible antibiotic use in dentistry. J Am Dent Assoc 2016;147(8):683-6.

Garavello W, Redaelli M, Galluzzi, F. Juvenile recurrent parotitis: A systematic review of treatment studies. Int J Pediatr Otorhinolaryngol. 2018; Sep;112:151-157.

~~Flynn T. What are the antibiotics of choice for odonto-genic infections, and how long should the treatment course last? Oral Maxillofac Surg Clin North Am 2011; 23(4):519-36.~~

~~Hargreaves KM, Diogenes A, Teixeira FB. Treatment options: Biological basis of regenerative endodontic procedures. Pediatr Dent 2013;35(2):129-40.~~

Johri A, Piecuch JF. Should teeth be extracted immediately in the presence of acute infection? Oral Maxillofac Surg Clin North Am 2011;23(4):507-11.

Keestra JAJ, Grosjean I, Coucke W, Quirynen M, Teughels W. Non-surgical periodontal therapy with systemic antibiotics in patients with untreated aggressive periodontitis: A systematic review and meta-analysis. J Periodont Res 2015;50(6):689-706.

Kuriyama T, Karasawa T, Nakagawa K, Saiki Y, Yamamoto E, Nakamura S. Bacteriological features and antimicrobial susceptibility in isolates from orofacial odontogenic infections. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;90(5):600-8.

Lovegrove MC, Geller A, Fleming-Dutra KE, Shehab N, Sapiano MRP, Budnitz DS. US emergency department visits for adverse drug events from antibiotics in children, 2011-2015. J Pediatric Infect Dis Soc 2019;8(5):384-91.

~~Malmgren B, Andreasen JO, Flores MT, et al. International Association of Dental Traumatology Guidelines for the management of traumatic dental injuries: 3. Injuries in the primary dentition. Dent Traumatol 2012;28(3):174-82.~~

~~McIntyre JD, Lee JY, Trope M, Vann WF Jr. Management of avulsed permanent incisors: A comprehensive update. Pediatr Dent 2007;29(1):56-63.~~

~~Merchant H. Vovk A, Kalash D, et al. Localized aggressive periodontitis treatment response in primary and permanent dentitions. J Periodontol 2014;85(12):1722-9.~~

~~Murakami S, Mealey B, Mariotti A, Chapple I. Dental plaque induced gingival conditions. J Periodontol 2018; 89(Suppl 1):S17-S27.~~

Nakamura Y, Daya M. Use of appropriate antimicrobials in wound management. Emerg Med Clin North Am 2007;25(1):159-76.

Papapanou PN, Sanz M, Buduneli N, et al. Periodontitis: Consensus report of Workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol 2018;89 (Suppl 1):S173-S182. Available at: “https://doi.org/10.1002/JPER.17-0721”. Accessed ~~August 10, 2019.~~ January 24, 2022.

~~Patel A, Karlis V. Diagnosis and management of pediatric salivary gland infections. Oral Maxillofacial Surg Clin North Am 2009;21:345-52.~~

Prieto-Prieto J, Calvo A. Microbiological basis of oral infections and sensitivity to antibiotics. Med Oral Patol Oral Cir Bucal 2004;9(suppl S):11-8.

Rabelo CC, Feres M, Gocalves C, et al. Systematic antibiotics in the treatment of aggressive periodontitis. A systematic review and a Bayesian Network meta-analysis. J Clin Periodontol 2015;42(7):647-57.

Schmidt JC, ~~Wlater~~ Walter C, Rischewski JR, Weiger R. Treatment of periodontitis as a manifestation of neutropenia with or without systemic antibiotics: A systematic review. Pediatr Dent 2013;35(2):E54-E63.

~~Shabahang S. Treatment options: Apexogenesis and apexification. Pediatr Dent 2013;35(2):125-8.~~

Simmons K, Haddad L, Nanda K, Curtis, K. Drug interactions between non-rifamycin antibiotics and hormonal contraception: A systematic review. Am J Obstet Gynecol 2018;218(1):88-97.

Solankis M, Khetarpal S, Ravi Pratap S. Antibiotics: Their use and misuse in paediatric dentistry. A systematic review. Eur J Paediatr Dent 2019;20(2): 133-8.

Squire JD, Gardner PJ, Moutsopoulos NM, Leiding JW. Antibiotic prophylaxis for dental treatment in patients with immunodeficiency. J Allergy Clin Immunol Pract 2019;7(3):819-23.

Stultz JS, Eiland LS. Doxycycline and tooth discoloration in children: Changing of recommendations based on evidence of safety. Ann Pharmacother 2019;53(11):1162-6. Available at:"https://doi: 10.1177/1060028019863796". Accessed September 26, 2021.

Suda KJ, Calip GS, Zhou J, et al. Assessment of the appropriateness of antibiotic prescriptions for infection prophylaxis before dental procedures. JAMA Netw Open 2019;2(5):e193909.

Thikkurissy S, Rawlins JT, Kumar A, Evans E, Casamassimo PS. Rapid treatment reduces hospitalization for pediatric patients with odontogenic-based cellulitis. Am J Emerg Med 2010;28(6):668-72.

Todd SR, Dahlgren FS, Traeger MS, et al. No visible dental staining in children treated with doxycycline for suspected Rocky Mountain Spotted Fever. J Pediatr 2015;166(5):1246-51. Available at: "https://doi: 10.1016/j.jpeds.2015.02.015". Accessed January 24, 2022.

~~Trombelli L, Farina R, Silva C, Tatakis D. Plaque induced gingivitis: Case definition and diagnostic considerations. J Periodontol 2018;89(Suppl 1):S46-S73.~~

Wilson WR, Gweitz M, Lockhart PB, et al. Prevention of viridans group streptococcal infective endocarditis: A scientific statement from the American Heart Association. Circulation 2021;143(20):e963-e978. Available at: "https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000969". Accessed March 26, 2022. Erratum in: Circulation 2021;144(9):e192.

World Health Organization. Medical Eligibility Criteria for Contraceptive Use. 5th ed. Geneva, Switzerland: World Health Organization; 2015. Available at: “https:// www.who.int/reproductivehealth/publications/family _planning/MEC-5/en/”. Accessed ~~July 11, 2019.~~ January 24, 2022.

Zeng L, Xu P, Choonara I, et al. Safety of azithromycin in pediatrics: A systematic review and meta-analysis. Eur J Clin Pharmacol 2020;76(12):1709-21.

Zirk M, Buller J, Goeddertz P, et al. Empiric systemic antibiotics for hospitalized patients with severe odontogenic infections. J Craniomaxillofac Surg 2016;44(8):1081-8.

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Antibiotic Prophylaxis for Dental Patients at Risk for Infection

Abstract

This best practice offers recommendations regarding antibiotic prophylaxis to minimize or eliminate transient bacteremia in at-risk dental patients undergoing invasive dental procedures. Evidence supporting the efficacy and use of antibiotic prophylaxis is limited among children. Considering the potential to contribute to antibiotic-resistant microorganisms and possible risk of adverse events, prudence is needed when determining whether prophylaxis is necessary. Antibiotic prophylaxis is warranted for some patients with cardiac conditions and compromised immunity when undergoing dental procedures that involve the manipulation of gingival tissue or the periapical region of teeth or perforation of oral mucosa. While recommendations for certain conditions are discussed within the document, consultation with the patient's physician is recommended for management of other patients potentially at risk due to immune compromise, indwelling vascular catheters or shunts, or implanted devices. Dentists should be familiar with current evidence-based antibiotic prophylaxis recommendations, and specific antibiotic regimens aimed at the microorganisms mainly implicated in infective endocarditis are included.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance on antibiotic prophylaxis for dental patients at risk for infection.

KEYWORDS: PREMEDICATIONS, ANTIBIOTICS; ANTIBIOTIC PROPHYLAXIS; ENDOCARDITIS; ANTIMICROBIAL RESISTANCE

Latest Revision

~~2019~~ 2022

ABBREVIATIONS

AAPD: American Academy of Pediatric Dentistry. **ADA**: American Dental Association. **AHA**: American Heart Association. **CIED**: Cardiovascular implantable electronic device. **GI**: Gastrointestinal. **GU**: Genitourinary. **IE**: Infective endocarditis. **VGS**: Viridans group Streptococcal

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that numerous medical conditions predispose patients to bacteremia-induced infections. ~~Because it is not possible to predict when a~~

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~~susceptible patient will develop an infection, p~~ Prophylactic antibiotics are recommended when ~~these~~ patients with a high risk of adverse outcomes from bacteremia and infection undergo invasive oral/dental procedures. ~~that are at risk for producing bacteremia~~. These recommendations are intended to help practitioners make decisions regarding antibiotic prophylaxis for dental patients at risk.

Methods

Recommendations on antibiotic prophylaxis for dental patients at risk for infection were developed by the Clinical Affairs Committee, ~~and~~ adopted in 1990.(AAPD Boston Mass 1990) ~~This document by the Council of Clinical Affairs is a revision of the previous version,~~ and last revised in 2019.~~2014~~ (AAPD Antibiotic Prophylaxis 2019~~2014~~)~~, and~~ This revision is based on a review of *Prevention of Infective Endocarditis: Guidelines from the American Heart Association* (Wilson et al. 2007), *Infective Endocarditis in Childhood: 2015 Update: A Scientific Statement From the American Heart Association* (Baltimore et al. 2015), the American Dental Association (**ADA**) report *The Use of Prophylactic Antibiotics Prior to Dental Procedures in Patients with Prosthetic Joints*(Sollecito et al. 2015) and the 2021 guideline on *Prevention of Viridans Group Streptococcal Infective Endocarditis: A Scientific Statement From the American Heart Association* (Wilson et al 2021-updated). ~~current dental and medical literature pertaining to post-procedural bacteremia-induced infections. This revision~~ It also included PubMed®/MEDLINE database searches using key terms: infective endocarditis (**IE**), bacteremia, antibiotic prophylaxis, and dental infection. Articles were evaluated by title and/or abstract and relevance to dental care for children, adolescents, and those with special health care needs. Two hundred forty-three articles met these criteria. ~~Thirty-five citations were chosen from this method and from references within selected articles.~~ When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians. ~~In addition, *Prevention of infective endocarditis: Guidelines from the American Heart Association*,(Wilson et al. 2007) *Infective Endocarditis in Childhood: 2015 Update: A Scientific Statement From the American Heart Association*,(Baltimore et al. 2015), and the American Dental Association (**ADA**) report *The Use of Prophylactic Antibiotics Prior to Dental Procedures in Patients with Prosthetic Joints*(Sollecito et al. 2015) were reviewed.~~

Background

Bacteremia (bacteria in the bloodstream) is anticipated following invasive dental procedures and can lead to complications in an immunodeficient patient.(Lockhart at al. 2004; Roberts et al. 2006) High risk cardiac disease, immunosuppression, and immunodeficiencies may compromise one's ability to fight simple infection. The rationale for antibiotic prophylaxis is to reduce or eliminate transient bacteremia caused by invasive dental procedures.(Daly 2017; Lafaurie et al. 2019)

Antibiotic usage may result in the development of resistant organisms.(~~Wilson et al. 2007; Lockhart et al. 2004; Roberts et al. 2006; Fluent et al. 2016 Dajani et al. 1997;~~ CDC Antibiotic/Antimicrobial Resistance) Utilization of antibiotic prophylaxis for patients at risk does not provide absolute prevention of infection. Post-procedural symptoms of acute infection (e.g., fever, malaise, weakness, lethargy) may indicate antibiotic failure and need for further medical evaluation.

The decision to use antibiotic prophylaxis should be made on an individual basis. Some medical conditions that may predispose patients to post-procedural infections (Buonavoglia et al. 2021) are discussed below. This list is not intended to be ~~an~~ exhaustive ~~list~~; rather, the categorization should help practitioners identify children who may be at increased risk. If a patient reports a syndrome or medical condition with which the practitioner is not familiar, it is appropriate to discuss the risk and susceptibility to bacteremia-induced infection with ~~contact~~ the child's physician prior to any invasive dental procedures. ~~to determine susceptibility to bacteremia-induced infections.~~

To date, randomized controlled clinical trials ~~the evidence base~~ supporting the efficacy and use of antibiotic prophylaxis are ~~is~~ limited, especially in the pediatric population. Many recommendations ~~of the indications~~ are based on expert consensus.(Baltimore et al. 2015; Glenny et al. 2013; Cahill et al. BMJ 2017; Cahill et al. Heart 2017, Wilson et al 2021, NICE 2008, Lafaurie et al 2019) A study found 80 percent of pre-procedural antibiotic prescriptions unnecessary as risk-factors were not present, highlighting a concern regarding the appropriateness of prescribed prophylaxis. (Suda et al. 2019) ~~The c~~ Conservative use of antibiotics ~~is indicated to~~ helps minimize the risk of developing resistance to current antibiotic regimens.(Wilson et al. 2007; Fluent et al. 2016; Watters et al. 2013; ~~da Sa et al. 2010~~ Baddour et al. 2021; Buonavoglia et al. 2021) Given the increasing number of organisms that have developed resistance to ~~current~~ antibiotic regimens, as well as the potential for an adverse anaphylactic reaction to the drug administered,(Thornhill et al. 2015) ~~it is best to be~~ antibiotic/antimicrobial stewardship and the judicious ~~in the~~ use of antibiotics for the prevention of IE~~3~~ or other distant-site infections are critical for safe and effective care.(Fluent et al. 2016; CDC Antibiotic/Antimicrobial Resistance; ~~Thornhill et al. 2015;~~ Wilson 2021; Suda 2019) While use of antibiotic prophylaxis is indicated for certain patients undergoing invasive dental procedures, the prevention of oral disease by maintenance of good home care habits and regular dental care is considered more important. (Wilson et al 2021; Squire et al 2019) This may prevent the frequent need for the use of antibiotic therapy and, thus, decrease the risks of resistance and adverse events related to use of antibiotics.(Daly 2017; Habib et al. 2009; National Institute for Health and Care Excellence)

Recommendations

Antibiotic prophylaxis for patients at the highest risk of adverse outcomes from bacteremia-induced infections is recommended with certain dental procedures,(Wilson et al. 2007; Baltimore et al. 2015; Lockhart et al. 2004; Daly 2017; National Heart Foundation of New Zealand; NICE, Wilson 2021) ~~but this~~ and should be directed against the most likely infecting organism. Antibiotic stewardship and judicious use are integral to preventing adverse reactions and resistance. Table 1 shows the recommended antibiotic regimen for at-risk patients undergoing invasive procedures, with amoxicillin as the first choice. (Wilson et al 2021, Lafaurie et al 2019) Recent changes to the AHA Guidelines have removed the use of clindamycin due to frequent and severe reactions. (Wilson et al. 2021). Clindamycin has been associated with significant adverse drug reactions related to community-acquired *C. difficile* infections. (Thornhill et al. 2015) Doxycycline is recommended as an alternative for patients unable to tolerate a penicillin, cephalosporin, or macrolide. (Table 1) (Wilson et al. 2021) Short-term use (less than 21 days) of doxycycline had not been associated with tooth discoloration in children under eight years of age. (Todd et al 2015, AAP 2018, Stultz and Eiland 2019) Antibiotic prophylaxis should be given 30-60 minutes prior to the procedure; however, it can be given up to two hours after a dental procedure. (Wilson et al. 2021) A different class of antibiotics is indicated if the patient is already on oral antibiotic therapy or has an allergy or anaphylactic reaction. (Wilson et al 2021) If unsure of a reported history of an allergic reaction, consultation with an allergy specialist and skin testing can help determine severity of allergic reactions and course of antibiotic regimen. (Wilson et al 2021). If the patient is receiving parenteral antimicrobial therapy for IE or other infections, the same antibiotic can be continued for the dental procedure. (Wilson et al 2021) If possible, elective procedures should be delayed 10 days after completion of short course antibiotic therapy. (Wilson et al 2021). When procedures involve infected tissues or are performed on a patient with a compromised host response, additional doses or a prescribed pre- and post-operative course ~~regimen~~ of antibiotics may be necessary. ~~Emphasis should be placed on the prevention of disease, establishment of good oral health care habits, and routine oral health assessments through a dental home. This may prevent the frequent need for the use of antibiotic therapy and, thus, decrease the risks of resistance and adverse events relation to use of antibiotics.(Daly 2017; Habib et al. 2009; National Institute for Health and Care Excellence)~~

Table 1. ANTIBIOTIC REGIMENS FOR A DENTAL PROCEDURE REGIMEN: SINGLE DOSE 30 TO 60 MINUTES BEFORE PROCEDURE

Situation	Agent	Adults	Children
Oral	Amoxicillin	2g	50 mg/kg
Unable to take oral medication	Ampicillin OR Cefazolin or ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillin or ampicillin —oral	Cephalexin* OR Azithromycin or clarithromycin OR Doxycycline	2 g 500 mg 100 mg	50 mg/kg 15 mg/kg <45 kg, 2.2 mg/kg >45 kg, 100 mg
Allergic to penicillin or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone†	1 g IM or IV	50 mg/kg IM or IV

Clindamycin is no longer recommended for antibiotic prophylaxis for a dental procedure.

IM indicates intramuscular; and IV, intravenous.

* Or other first-or second-generation oral cephalosporin in equivalent adult or pediatric dosing.

† Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillin or ampicillin.

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Patients with cardiac conditions

The American Heart Association (**AHA**) has published guidelines for the prevention of IE and reducing the risk of producing resistant strains of bacteria.(Wilson et al. 2007; Wilson et al. 2021) ~~Infective endocarditis~~ IE is an example of an uncommon but life-threatening complication resulting from bacteremia. The incidence of pediatric admissions due to IE ~~infective endocarditis~~ was between 0.05 and 0.12 cases per 1000 admissions in a multicenter study of U.S. children's hospitals from 2003- 2010.(Baltimore et al. 2015). Although there is no high-quality data showing mortality from or frequency of viridans group streptococcal (**VGS**) infective endocarditis in children, there also has been no convincing evidence of an increase in these cases among high-risk patients since the publication of the 2007 AHA guidelines. (Wilson et al 2021; Dayer et al 2015, Laufarie et al 2019).

Only a limited number of bacterial species have been implicated in resultant postoperative infections; Viridans group streptococci, *Staphylococcus aureus* and *Enterococcus* species are the main microorganisms implicated in IE.(Wilson et al. 2007; Baltimore et al. 2015; Baddour et al. 2021) Enterococcal and other organisms such as *Haemophilus* species, *Aggregatibacter* species, *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella* species are less common.(Baltimore et al. 2015) Routine daily activities such as toothbrushing, flossing, and chewing contribute more to the incidence of bacteremia when compared to dental procedures.(Baltimore et al. 2015) Thus, focus for

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preventing IE has shifted from antibiotic prophylaxis to an emphasis on oral hygiene and the prevention of oral diseases with regular dental care.(Baltimore et al. 2015; Daly 2017; Cahill et al. BMJ 2017; Cahill et al. Heart 2017; National Heart Foundation of New Zealand; National Institute for Health Care and Excellence, Wilson 2021)

~~In 2007, the American Heart Association (**AHA**) revised its guidelines for the prevention of IE and reducing the risk for producing resistant strains of bacteria.(Wilson et al. 2007) The significant reasons for the revision include(Wilson et al. 2007):~~

- ~~"IE is much more likely to result from frequent exposure to random bacteremias associated with daily activities than from bacteremia caused by a dental, [gastrointestinal] **GI** tract, or [genitourinary] **GU** tract procedure."(Wilson et al. 2007) Daily activities would include toothbrushing, flossing, chewing, using toothpicks, using water irrigation devices, and other activities.~~
- ~~"Prophylaxis may prevent an exceedingly small number of cases of IE if any, in individuals who undergo a dental, GI tract, or GU tract procedure.~~
- ~~The risk of antibiotic-associated adverse events exceeds the benefit, if any, from prophylactic antibiotic therapy.~~
- ~~Maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE."(Wilson et al. 2007)~~

A summary of key findings and suggestions by the AHA 2021 scientific statement writing group are outlined in Table 2.

TABLE 2. SUMMARY OF FINDINGS AND SUGGESTIONS
Key findings
VGS IE is much more likely to develop as a result of transient VGS bacteremia attributable to routine daily activities such as chewing food and toothbrushing than from a dental procedure.
An exceedingly small number of cases of VGS IE could be prevented by AP for a dental procedure, even if prophylaxis is 100% effective.
If AP for a dental procedure is effective in preventing a very small number of cases of VGS IE, it should be suggested only for those patients with the highest risk of adverse outcome from VGS IE.
There is no convincing evidence of an increased frequency of or morbidity or mortality from VGS IE in patients at low, moderate, or high risk of adverse outcome since publication of the 2007 document.
AP for a dental procedure is not suggested solely on the basis of an increased lifetime risk of acquisition of VGS IE
Suggestions
AP for a dental procedure that involves manipulation of gingival tissues, periapical region of teeth, or perforation of the oral mucosa is suggested only for patients with the highest risk of adverse outcome from VGS IE.
Maintenance of good oral health and regular access to dental care are considered more important to prevent VGS IE than AP for a dental procedure. We suggest that patients have biannual dental examinations when such care is available.
Shared decision making is important between patients and health care providers. There may be instances when a health care provider and a patient disagree with the suggestions in the 2021 scientific statement. In these cases, the

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health care provider should be familiar with and understand the 2021 suggestions to adequately inform patients of the risks and benefits of AP for a dental procedure so that an informed decision may be made.

The AHA guidelines recommend ~~focus on~~ antibiotic prophylaxis prior to certain dental procedures (see Table 3) for patients with the highest risk of adverse outcomes from VGS IE ~~in the highest risk group~~ (See Table ~~1~~4).(~~Wilson et al. 2007; Baltimore et al. 2015; Lockhart et al. 2004~~; Wilson et al 2021; Baddour et al. 2021) Comorbidities such as obesity, diabetes, cardiopulmonary disease, vascular disease, hemodialysis, lack of access to tertiary hospitals or immunosuppression affect the morbidity and mortality of patients with IE. (Wilson et al 2021; Baddour et al 2021) Global~~ly, there is still a lack of~~ consensus with regards to the benefit of antibiotic prophylaxis for prevention of IE is lacking.~~infective endocarditis~~. (Wilson et al 2021; NICE; National Heart Foundation of New Zealand; Daly 2017; Dayer et al 2015) ~~Since the change in recommendations, the rate and incidence of IE have been low.(Baltimore et al. 2015)~~

TABLE 3. DENTAL PROCEDURES AND AP
AP suggested
All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa
AP not suggested
Anesthetic injections through noninfected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of primary teeth, and bleeding from trauma to the lips or oral mucosa

The antibiotic regimens suggested for prophylaxis for a dental procedure in patients at a high risk of adverse outcome from viridans group streptococcal infective endocarditis are shown in Table 1.
AP indicates antibiotic prophylaxis.

Table 4. AP FOR A DENTAL PROCEDURE: UNDERLYING CONDITIONS FOR WHICH AP IS SUGGESTED*
Prosthetic cardiac valve or material
Presence of cardiac prosthetic valve Transcatheter implantation of prosthetic valves Cardiac valve repair with devices, including annuloplasty, rings, or clips Left ventricular assist devices or implantable heart
Previous, relapse, or recurrent IE
CHD
Unrepaired cyanotic congenital CHD, including palliative shunts and conduits. Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by transcatheter during the first 6 mo after the procedure. Repaired CHD with residual defects at the site of or adjacent to the site of a prosthetic patch or prosthetic device. Surgical or transcatheter pulmonary artery valve or conduit placement such as Melody valve and Contegra conduit.
Cardiac transplant recipients who develop cardiac valvulopathy
AP for a dental procedure not suggested
Implantable electronic devices such as a pacemaker or similar devices Septal defect closure devices when complete closure is achieved Peripheral vascular grafts and patches, including those used for hemodialysis Coronary artery stents or other vascular stents CNS ventriculoatrial shunts Vena cava filters Pledgets

* AP indicates antibiotic prophylaxis; CHD, congenital heart disease; CNS, central nervous system; and IE, infective endocarditis.

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Children with cyanosis with specific periodontal concerns may have an increased risk of IE~~, which makes optimum oral hygiene very important~~.(Wilson et al. 2021; Wilson et al. 2007; Baltimore et al. 2015~~; Gewitz and Taubert 2016~~) At-risk patients with poor oral hygiene and gingival bleeding after routine activities (e.g., toothbrushing) have shown an increased incidence of bacteremia as a measure for risk of IE.(Wilson et al. 2007; ~~Gewitz and Taubert 2016;~~ Baddour et al. 2010) ~~The focus should be on maintaining good oral hygiene, routine dental examinations, infection control to reduce bacteremia, and discouraging tattooing or piercing rather than relying on antibiotic prophylaxis for patients at risk.(Cahill et al. BMJ 2017; Cahill et al. Heart 2017; National Heart Foundation of New Zealand; Habib et al. 2009; National Institute for Health Care and Excellence; Baddour et al. 2010)~~ These patients and their parents need to be educated and motivated to maintain personal oral hygiene ~~through daily plaque removal,~~ including flossing and regular professional preventive dental care and to be discouraged from getting tattoos or piercings.(Wilson et al. 2021; Cahill et al. BMJ 2017; Cahill et al. Heart 2017; National Heart Foundation of New Zealand; Habib et al. 2009; National Institute for Health Care and Excellence; Wilson et al. 2007) ~~There is a shift in the emphasis on improved access to dental care and oral health in patients with underlying cardiac conditions at high risk for IE and less focus on a dental procedure and antibiotic coverage.(Baltimore et al. 2015;)~~ Professional prevention strategies should be based upon the individual's assessed risk for caries and periodontal disease. (AAPD Periodicity)

In addition to those diagnoses listed in the AHA guidelines, patients with a reported history of injection drug use may be considered at risk for developing IE ~~in the absence of cardiac anomalies~~. (Baddour et al. 2021 ~~Gewitz and Taubert 2016~~) ~~Patients also should be discouraged from tattooing and piercing.(Cahill et al. BMJ 2017; Cahill et al. Heart 2017; Lick et al. 2005)~~ Consultation with the patient's physician may be necessary to determine susceptibility to bacteremia-induced infections.

Antibiotics are recommended for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa for cardiac patients with the highest risk for adverse outcomes from IE (Wilson et al. 2007; Wilson et al 2021) (see Tables ~~1~~ 3 and ~~2~~4). Specific antibiotic regimens can be found in Table 3. Practitioners and patients/ parents can review the entire AHA guidelines in the AHA Circulation archives(Wilson et al 2021) (available at " https://www.ahajournals.org/doi/10.1161/CIR.0000000000000969") ~~Wilson et al. 2007) (available at "http://circ.ahajournals.org/ cgi/content/full/116/15/1736")~~ for additional background information as

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well as discussion of special circumstances (e.g., patients already receiving antibiotic therapy, patients on anticoagulant therapy).

Patients with shunts, indwelling vascular catheters, or medical devices

The AHA found no convincing evidence that microorganisms associated with dental procedures cause infection of cardiovascular implantable electronic devices (CIED) and nonvalvular devices at any time after implantation.(Baddour et al. 2010; Lockhart et al. 2007; Wilson et al 2021) The infections occurring after device implantation most often are caused by *Staphylococcus aureus* and coagulase-negative staphylococci or other microorganisms that are non-oral in origin but are associated with surgical implantation or other active infections.(Baddour et al. 2010; Hong et al. 2010) The AHA does not recommend antibiotic prophylaxis for prosthetic cardiovascular devices such as CIED, septal defect closure devices, peripheral vascular grafts and patches, central nervous system ventriculoatrial shunts, vena cava filters and pledgets. (See table 4) Consultation with the child's physician is recommended for management of patients with nonvalvular devices.

Ventriculoatrial (VA), ventriculocardiac (VC), or ventriculovenus (VV) shunts for hydrocephalus were considered at risk of bacteremia-induced infections due to their vascular access~~.~~(Lockhart et al. 2007; Baddour et al. 2003) while ventriculoperitoneal (VP) shunts were not deemed vulnerable.(Lockhart et al. 2007; Baddour et al. 2003) Antibiotic prophylaxis is no longer recommended for patients with VA and VP shunts. (Wilson et al 2021; Baddour et al. 2003). If concerned, consultation with the child's physician is recommended for management of patients with vascular shunts.

Patients with compromised immunity

Non-cardiac patients with a compromised immune system may be at risk for complications of bacteremia and distant site infection following invasive dental procedures. Existing evidence does not support the extensive use of antibiotic prophylaxis; prophylaxis should be limited to immunocompromised patients and those at high risk for adverse outcomes from distant site infection.(Habib et al. 2009) Consultation with the patient's physician is recommended for management of patients with a compromised immune system. ~~Although there is not enough data to support its use, h~~High-risk patients who should be considered for use of prophylaxis includes, but is not limited to, those with(Cahill et al. BMJ 2017; Cahill et al. Heart 2017; Lockhart et al. 2007; Wilson et al. 2021; Squire et al. 2019):

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1. Immunosuppression~~*~~ secondary to: (Squire et al. 2019)
    a. human immunodeficiency virus (HIV);
    b. severe combined immunodeficiency (SCIDS) and other primary immunodeficiency diseases;
    c. neutropenia and other neutrophil related disorders (e.g., severe congenital neutropenia, leukocyte adhesion deficiency, Chediak-Higashi syndrome);
    d. cancer chemotherapy, immunosuppressive therapy and/or radiation therapy; or
    e. hematopoietic stem cell or solid organ transplantation.
2. History of head and neck radiotherapy. (Squire et al. 2019)
3. Autoimmune disease (e.g., juvenile arthritis, systemic lupus erythematosus).
4. Sickle cell anemia.(Tate et al. 2006; Hsu et al. 2020)
5. Asplenism, ~~or~~ status post splenectomy or complement deficiencies. (Squire et al. 2019)
6. Chronic high dose steroid usage.
7. Uncontrolled diabetes mellitus.
8. ~~Bisphosphenate therapy~~ Medication-related osteonecrosis of the jaw (MRONJ) (Montefusco et al. 2008; Yarom et al. 2019 ~~Rogers et al. 2009~~)
9. Hemodialysis.

~~* *Discussion of antibiotic prophylaxis for patients receiving immunosuppressive therapy and/or radiation therapy appears in a separate AAPD document.*(AAPD Immunosuppressive Therapy)~~

~~**Patients with shunts, indwelling vascular catheters, or medical devices**~~

~~The AHA recommends that antibiotic prophylaxis for nonvalvular devices, including indwelling vascular catheters (e.g., central lines) and cardiovascular implantable electronic devices (**CIED**), is indicated only at the time of placement of these devices in order to prevent surgical site infection.(Baddour et al. 2010; Lockhart et al. 2007) The AHA found no convincing evidence that microorganisms associated with dental procedures cause infection of CIED and nonvalvular devices at any time after implantation.(Baddour et al. 2010; Lockhart et al. 2007) The infections occurring after device implantation most often are caused by *Staphylococcus aureus* and coagulase negative staphylococci or other microorganisms that are non-oral in origin but are associated with surgical implantation or other active infections.(Baddour et al. 2010; Rogers et al. 2009; Hong et al. 2010) Consultation with the child's physician is recommended for management of patients with nonvalvular devices.~~

~~Ventriculoatrial (VA), ventriculocardiac (VC), or ventriculovenus (VV) shunts for hydrocephalus are at risk of bacteremia-induced infections due to their vascular access.(Lockhart et al. 2007; Baddour et~~

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~~al. 2003) In contrast, ventriculoperitoneal (VP) shunts do not involve any vascular structures and, consequently, do not require antibiotic prophylaxis.(Lockhart et al. 2007; Baddour et al. 2003) Consultation with the child's physician is recommended for management of patients with vascular shunts.~~

Patients with prosthetic joints

Given the lack of evidence and recognizing the increase in antibiotic resistance and adverse drug reactions, antibiotic prophylaxis prior to dental procedures is no longer recommended for patients with a history of total joint arthroplasty or prosthetic joint infections.(See Table 5) (Sollecito et al. 2015; Suda et al. 2019; Rethman et al. 2013) ~~For patients with a history of total joint arthroplasty, deep hematogenous infections can lead to life threatening complications such as a loss of the prosthetic joint or even increased morbidity and mortality.(Aminoshariae and Kulild 2010; Rethman et al. 2013) Given the increasing risk of developing antibiotic resistance and adverse reactions, antibiotic prophylaxis prior to dental procedures is not recommended in the prevention of prosthetic joint infections.(Sollecito et al. 2015).~~ If unsure of medical history or risk, consultation ~~Consultation~~ with the child's physician is recommended ~~may be necessary~~ for invasive dental management. ~~of at-risk patients as well as patients with other implanted devices (e.g., Harrington rods, external fixation devices).~~(Lockhart et al. 2007; ~~Aminoshariae and Kulild 2010;~~ Rethman et al. 2013; Sollecito et al 2015; Berbari et al. 2010; ~~Little et al. 2010~~)

Table 5. MANAGEMENT OF PATIENTS WITH PROSTHETIC JOINTS UNDERGOING DENTAL PROCEDURES(Sollecito et al. 2015)

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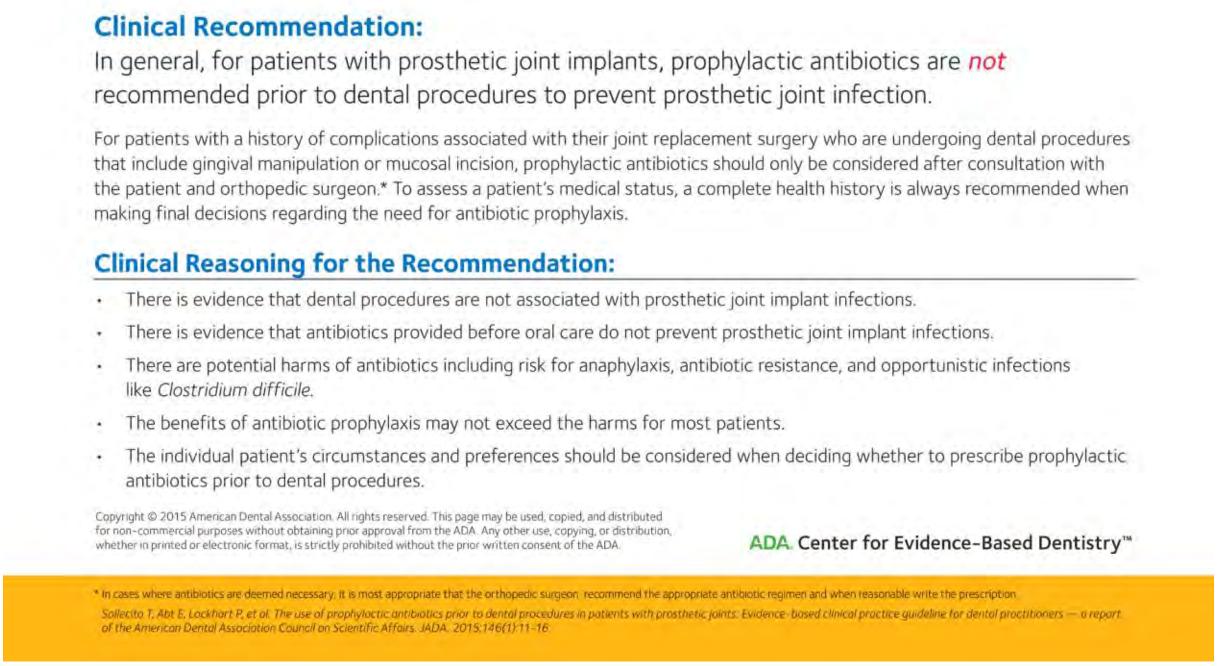

Clinical Recommendation:

In general, for patients with prosthetic joint implants, prophylactic antibiotics are *not* recommended prior to dental procedures to prevent prosthetic joint infection.

For patients with a history of complications associated with their joint replacement surgery who are undergoing dental procedures that include gingival manipulation or mucosal incision, prophylactic antibiotics should only be considered after consultation with the patient and orthopedic surgeon.* To assess a patient's medical status, a complete health history is always recommended when making final decisions regarding the need for antibiotic prophylaxis.

Clinical Reasoning for the Recommendation:

- There is evidence that dental procedures are not associated with prosthetic joint implant infections.
- There is evidence that antibiotics provided before oral care do not prevent prosthetic joint implant infections.
- There are potential harms of antibiotics including risk for anaphylaxis, antibiotic resistance, and opportunistic infections like *Clostridium difficile*.
- The benefits of antibiotic prophylaxis may not exceed the harms for most patients.
- The individual patient's circumstances and preferences should be considered when deciding whether to prescribe prophylactic antibiotics prior to dental procedures.

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* In cases where antibiotics are deemed necessary, it is most appropriate that the orthopedic surgeon recommend the appropriate antibiotic regimen and when reasonable write the prescription.

Sollecito T, Abt E, Lockhart P, et al. The use of prophylactic antibiotics prior to dental procedures in patients with prosthetic joints: Evidence-based clinical practice guideline for dental practitioners — a report of the American Dental Association Council on Scientific Affairs. JADA. 2015;146(1):11-16.

References

American Academy of Pediatric Dentistry. Antibiotic chemoprophylaxis for pediatric dental patients. Boston, Mass.: American Academy of Pediatric Dentistry; 1990.

American Academy of Pediatric Dentistry. Antibiotic prophylaxis for dental patients at risk for infection. The Reference Manual of Pediatric Dentistry. Chicago, Ill: American Academy of Pediatric Dentistry; 2019:416-21.~~Pediatr Dent 2014;36(special issue):287-92~~.

American Academy of Pediatric Dentistry. Dental management of pediatric patients receiving immunosuppressive therapy and/or radiation therapy. The Reference Manual of Pediatric Dentistry. Chicago, Ill.:American Academy of Pediatric Dentistry;PENDING. ~~Pediatr Dent 2018;40 (6):392-400.~~

American Academy of Pediatric Dentistry. Periodicity of examination, preventive dental services, anticipatory guidance/counseling, and oral treatment for infants, children, and adolescents. The Reference Manual of Pediatric Dentistry. Chicago, Ill: American Academy of Pediatric Dentistry;PENDING.

American Academy of Pediatrics. Tetracyclines. In: Kimberlin DW, Brady MT, Jackson MA, Long SS, eds. Red Book: 2021-2024 Report of the Committee on Infectious Diseases, 32nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2021: 978-1-61002-578-2.

~~Aminoshariae A, Kulild J. Premedication of patients undergoing dental procedures causing bacteremia after total joint arthroplasty. J Endod 2010;36(6):974-7.~~

Baddour LM, Bettman MA, Bolger AF, Bolger A, Ferrieri P. Nonvalvular cardiovascular device-related infections. Circulation 2003;108(16):2015-31.

Baddour LM, Epstein AE, Erickson CC, et al. Update on cardiovascular implantable electronic device infections and their management. Circulation 2010;121(3):458-77.

Baddour LM, Shafiyi A, Lahr BD, et al. A contemporary population-based profile of infective endocarditis using the expanded Rochester Epidemiology Project. Mayo Clin Proc 2021;96(6):1438-45.

Baltimore RS, Gweitz M, Baddour LM, et al. Infective endocarditis in childhood: 2015 update: A scientific statement from the American Heart Association. Circulation 2015;132(15):1487-515.

Berbari EF, Osmon DR, Carr A, et al. Dental procedures as risk factors for prosthetic hip or knee infection: A hospital-based prospective case-control study. Clin Infect Dis 2010;50(1):8-16. Erratum in Clin Infect Dis 2010;50(6):944.

Buonavoglia A, Leone P, Solimando AG, et al. Antibiotics or no antibiotics, that is the question: An update on efficient and effective use of antibiotics in dental practice. Antibiotics (Basel) 2021;10(5):550.

Cahill TJ, Dayer M, Prendergast B, Thornhill M. Do patients at risk of infective endocarditis need antibiotics before dental procedures? BMJ 2017;358:j3942.

Cahill TJ, Harrison JL, Jewell P, et al. Antibiotic prophylaxis for infective endocarditis: A systematic review and meta-analysis. Heart 2017;103(12):937-44.

Centers for Disease Control and Prevention. Antibiotic/Antimicrobial resistance. About antimicrobial resistance: A brief overview. Available at: “https://www.cdc.gov/drugresistance/about.html”. Accessed ~~March 26, 2019~~ January 24, 2022.~~ Archived by WebCite® at: “http://www.webcitation.org/ 779R5H5EJ”)~~

~~Dajani AS, Taubert KA, Wilson W, et al. Prevention of bacterial endocarditis: Recommendations by the American Heart Association. JAMA 1997;227(22):1794-801.~~

Daly CG. Antibiotic prophylaxis for dental procedures. Aust Prescr 2017;40(5):184-8.

Dayer MJ, Jones S, Prendergast B, Baddour LM, Lockhart PB, Thornhill MH. Incidence of infective endocarditis in England, 2000-13: A secular trend, interrupted time-series analysis. Lancet. 2015; 385(9974):1219-28.

~~de Sa DD, Tleyieh IM, Anavekar NS, et al. Epidemiological trends of infective endocarditis: A population-based study in Olmsted County, Minnesota. Mayo Clin Proc 2010;85(5):422-6. Erratum in Mayo Clin Proc 2010;85(8):722.~~

~~Fluent MT, Jacobsen PL, Hicks LA. Considerations for responsible antibiotic use in dentistry. J Am Dent Assoc 2016;147(8):683-6.~~

~~Gewitz MH, Taubert KA. Infective endocarditis and prevention. In: Moss AJ, Adams FH, Allen HD, eds. Moss and Adam's Heart Disease in Infants, Children, and Adolescents: Including the Fetus and Young Adult, 8th ed. Philadelphia, Pa.: Lippincott Williams & Wilkins; 2016:1441-53.~~

Glenny AM, Oliver R, Roberts GJ, Hooper L, Worthington HV. Antibiotics for the prophylaxis of bacterial endocarditis in dentistry. Cochrane Database System Rev 2013;4 (10):CD003813. Available at: ~~“https://doi-org.proxy.library.adelaide.edu.au/10.1002/14651858.CD0038 13pub4”.~~ “https://doi.org/10.1002/14651858.CD003813.pub4”. Accessed March 8, 2022.

Habib G, Hoen B, Tornos P, et al. Guidelines on the prevention, diagnosis, and treatment of infective endocarditis (new version 2009): The Task Force on the Prevention, Diagnosis, and Treatment of Infective Endocarditis of the European Society of Cardiology (ESC). Eur Heart J 2009;30(9):2369-413.

Hong CHL, Allred R, Napenas JJ, Brennan MT, Baddour LM, Lockhart PB. Antibiotic prophylaxis for dental procedures to prevent indwelling venous catheter-related infections. Am J Med 2010;123(12):1128-33.

Hsu LL, Fan-Hsu J. Evidence-based dental management in the new era of sickle cell disease: A scoping review. J Am Dent Assoc 2020;151(9):668-77.e9.

Laufaurie GI, Noriega LA, Torres CC, et al. Impact of antibiotic prophylaxis on the incidence, nature, magnitude, and duration of bacteremia associated with dental procedures: A systematic review. JADA 2019;150(11):948-59.

Lick SD, Edozie SN, Woodside KJ, Conti VR. Streptococcus viridans endocarditis from tongue piercing. J Emerg Med 2005;29(1):57-9.

~~Little JW, Jacobson JJ, Lockhart PB, American Academy of Oral Medicine. The dental treatment of patients with joint replacements: A position paper from the American Academy of Oral Medicine. J Am Dent Assoc 2010;141 (6):667-71.~~

Lockhart PB, Brennan MT, Kent ML, Norton JH, Weinrib DA. Impact of amoxicillin prophylaxis on the incidence, nature, and duration of bacteremia in children after intubation and dental procedures. Circulation 2004;109 (23):2878-84.

Lockhart PB, Brennan MT, Sasser HC, Fox PC, Paster BJ, Bahrani-Mougeot FK. Bacteremia associated with tooth-brushing and dental extraction. Circulation 2008;117(24): 3118-25.

Lockhart PB, Loven B, Brennan MT, Fox PC. The evidence base for the efficiency of antibiotic prophylaxis in dental practice. J Am Dent Assoc 2007;138(4):458-74.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Montefusco V, Gay F, Spina F, et al. Antibiotic prophylaxis before dental procedures may reduce the incidence of osteonecrosis of the jaw in patients with multiple myeloma treated with bisphosphonates. Leuk Lymphoma 2008;49(11):2156-62.

National Heart Foundation of New Zealand Advisory Group. Guideline for the prevention of infective endocarditis associated with dental and other medical interventions. Auckland: National Heart Foundation of New Zealand. December, 2008. Available at: "http://www.ttophs.govt.nz/vdb/document/312". Accessed ~~December 15, 2018~~ March 8, 2022. ~~(Archived by WebCite® at: "http://www.webcitation.org/74g YDlg2r")~~

National Institute for Health and Care Excellence. ~~Context In:~~ Prophylaxis against infective endocarditis: Antimicrobial prophylaxis against infective endocarditis in adults and children undergoing interventional procedures. 2008. Updated July 8, 2016. London: NICE. Available at: "https://www.nice. org.uk/guidance/cg64~~/chapter/Recommendations~~". Accessed ~~December 15, 2018~~ January 24, 2022. ~~(Archived by WebCite® at: "http://www.webcitation.org/74gYehSug")~~

Rethman MP, Watters W 3rd, Abt E, et al. The American Academy of Orthopedic Surgeons and the American Dental Association clinical practice guideline on the prevention of orthopaedic implant infection in patients undergoing dental procedures. J Bone Joint Surg 2013; 95(8):745-7.

Roberts GJ, Jaffrey EC, Spract DA, Petrie A, Greville C, Wilson M. Duration, prevalence and intensity of bacteremia after dental extractions in children. Heart 2006;92(9):1274-7.

~~Rogers SN, Hung J, Barber AJ, Lowe D. A survey of consultant members of the British Association of Oral and Maxillofacial Surgeons regarding bisphosphonate-induced osteonecrosis of the jaws. Br J Oral Maxillofac Surg 2009;47(8):598-601.~~

Sollecito TP, Abt E, Lockhart PB, et al. The use of prophylactic antibiotics prior to dental procedures in patients with prosthetic joints: Evidence-based clinical practice guideline for dental practitioners–A report of the American Dental Association Council on Scientific Affairs. J Am Dent Assoc 2015;146(1):11-6.

Squire JD, Gardner PJ, Moutsopoulos NM, Leiding JW. Antibiotic prophylaxis for dental treatment in patients with immunodeficiency. J Allergy Clin Immunol Pract 2019;7(3):819-23.

Stultz JS, Eiland LS. Doxycycline and tooth discoloration in children: Changing of recommendations based on evidence of safety. Ann Pharmacother 2019;53(11):1162-6.

Suda KJ, Calip GS, Zhou J, et al. Assessment of the appropriateness of antibiotic prescriptions for infection prophylaxis before dental procedures. JAMA Netw Open 2019;2(5):e193909.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Tate AR, Norris CK, Minniti CP. Antibiotic prophylaxis for children with sickle cell disease: A survey of pediatric dentistry residency program directors and pediatric hematologists. Pediatr Dent 2006;28(3):332-5.

Thornhill MH, Dayer MJ, Prendergast B, Baddour LM, Jones S, Lockhart PB. Incidence and nature of adverse reactions to antibiotics used as endocarditis prophylaxis. J Antimicrob Chemother 2015;70(8):2382-8.

Todd SR, Dahlgren FS, Traeger MS, et al. No visible dental staining in children treated with doxycycline for suspected Rocky Mountain Spotted Fever. J Pediatr 2015;166(5):1246-51.

Watters W, Rethman MP, Hanson NB, et al. Prevention of orthopaedic implant infection in patients undergoing dental procedures. J Am Acad Orthop Surg 2013;21(3): 180-9.

Wilson WR, Gweitz M, Lockhart PB, et al. Prevention of viridans group streptococcal infective endocarditis: A scientific statement from the American Heart Association. Circulation 2021;143(20)e963-e978. Available at: "https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000969". Accessed March 26, 2022. Erratum in: Circulation 2021;144(9):e192.

Wilson W, Taubert KA, Gevitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association—A Guideline from the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. Circulation 2007;116(15): 1736-54. E-published April 19, 2007. Available at: ~~"http: //circ.ahajournals.org/cgi/content/full/116/15/1736"~~ "https://www.ahajournals.org/doi/full/10.1161/circulationaha.106.183095". Accessed January 16, 2022. Erratum in Circulation 2007;116 (15):e376-e7.

Yarom N, Shapiro CL, Peterson dE, et al. Medication-related osteonecrosis of the jaw: MASCC/ISOO/ASCO Clinical Practice Guideline. J Clin Oncol 2019;37(25):2270-90.

Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Head and Neck Radiation ~~Therapy~~

Abstract

This best practice provides recommendations for oral health care for children undergoing immunosuppressive therapy and/or head and neck radiation. ~~whose medical therapies result in a lowered immune response~~. These children have unique oral health needs and are at risk of developing ~~several~~ multiple associated oral and systemic complications. Dentists play an essential role in diagnosing, preventing, stabilizing, and treating oral health problems that can compromise ~~their~~ a patient's quality of life before, during, and following such ~~immunosuppressive~~ therapies. All children undergoing immunosuppressive therapy and/or head and neck radiation ~~therapy~~ should have an oral examination before such treatments commence~~s~~. Dental interventions must be performed promptly, efficiently, and with attention to the patient's unique circumstances and treatment protocol. Preventing new dental problems and treating existing dental conditions before immunosuppressive therapy and/or head and neck radiation is paramount. Preventive strategies include oral hygiene, diet, fluoride, and patient education. When completing all dental care prior to therapy is not feasible, priorities should be treatment of odontogenic and periodontal infections, extractions, periodontal care, and removal of sources of tissue irritation. Recommendations for ~~managing~~ management of ~~caries~~ caries lesions, pulp therapy, orthodontia, periodontal conditions, and extractions are included. ~~Elective dental care during immunosuppression is not recommended.~~ ~~Management of~~ Strategies to manage oral conditions related to immunosuppressive therapies and head and neck radiation ~~(e.g., mucositis, xerostomia, trismus)~~ ~~is~~ are addressed. For children undergoing hematopoietic cell transplantation, all dental treatment should be completed before the patient becomes immunosuppressed and elective care postponed until immunological recovery has occurred. ~~is completed.~~

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance regarding dental management of pediatric patients receiving immunosuppressive therapy and/or head and neck radiation ~~therapy~~.

KEYWORDS: IMMUNOSUPPRESSION; DENTAL CARE; RADIATION THERAPY; MUCOSITIS; TREATMENT PROTOCOL; PHOTOBIOMODULATION

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Latest Revision

~~2018~~ 2022

ABBREVIATIONS

AAPD: American Academy Pediatric Dentistry. **ANC**: Absolute neutrophil count. ~~**BRONJ**~~: ~~Bisphosphonate-related osteonecrosis of the jaw.~~ **CBC**: Complete blood count. **GVHD**: Graft versus host disease. **HCT**: Hematopoietic stem cell transplantation. ~~**LLLT**: Low-level laser therapy~~. **MASCC/ISOO**: The Multinational Association of Supportive Care in Cancer/ International Society of Oral Oncology. **/mm³**: per cubic millimeter. **MRONJ**: Medication-related osteonecrosis of the jaw. **OM:** Oral mucositis. **PBM**: Photobiomodulation.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that the pediatric dental professional plays an important role in the diagnosis, prevention, stabilization, and treatment of oral and dental problems that can compromise ~~the~~ a child's quality of life before, during, and after immunosuppressive ~~immuno-suppressive~~ therapy and/or head and neck radiation. ~~which lowers the body's normal immune response~~. ~~This can be deliberate as in lowering the immune response~~ Immunosuppression may be the intended goal of therapies to prevent rejection of a donor organ or hematopoietic cell transplantation* (**HCT**), ~~or it can be incidental as in a side effect of~~ or it may be a consequence of anti-neoplastic chemotherapy~~,~~ ~~radiation therapy,~~ or HCT conditioning. Children undergoing such therapies will benefit from ~~D~~dental interventions that are ~~with certain modifications must~~ be ~~done~~ prompt~~ly~~ ~~and~~ efficient~~ly,~~ and modified according ~~with attention~~ to the patient's medical history, cancer treatment protocol~~,~~ and health status.

Immunosuppressive therapy and/or head and neck radiation may cause many acute and long-term side effects in the oral cavity. Furthermore, any existing or potential sources of oral/dental infection~~s~~ and/or soft tissue trauma can compromise ~~the~~ medical treatment, leading to greater morbidity and mortality, ~~and~~ as well as higher hospitalization costs. It is imperative that the pediatric dentist be familiar with the patient's medical history and ~~as well as~~ associated oral manifestations ~~of the underlying conditions.~~, and appropriately address dental concerns in conjunction with the patient's medical team.

Methods

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Developed by the Clinical Affairs Committee as Management of Pediatric Dental Patients Receiving Chemotherapy and/or Radiation and adopted in 1986 (AAPD Immun 1986), this best practice ~~document~~ was last revised in 2018.(AAPD P. Immunosuppressive 2018) ~~2013~~. The revision of the best practice is based upon a review of current dental and medical literature related to immunosuppressive therapy, head and neck radiation and best current practice. The revision by the Council of Clinical Affairs included a new literature search of the PubMed®/ MEDLINE database using the terms: pediatric cancer, pediatric oncology, hematopoietic cell transplantation, bone marrow transplantation, immunosuppressive therapy, mucositis, stomatitis, chemo-therapy, ~~radiotherapy~~radiation therapy, acute effects, long-term effects, dental care, oral health, pediatric dentistry, practice guideline; field: all; limits: within the last 10 years, humans, English, birth through age 18. Two thousand sixty-five articles matched these criteria. Additional strategies such as Google scholar and hand searches were employed. ~~Ninety-five~~ ~~p~~Papers were chosen for review from these searches ~~from this list~~ and from the references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background

A multidisciplinary approach involving physicians, nurses, dentists, social workers, dieticians, and other related health professionals is essential to ~~in caring~~ care for the child before, during and after ~~any~~ immunosuppressive therapy and/or head and neck radiation.(PDQ® NCI ~~National Cancer Institute~~ 2016; NIDCR 2016) Acute and chronic oral~~Oral and associated systemic~~ complications that may occur as ~~a~~ sequelae of such therapies ~~immunosuppressive therapy and/or radiation therapy~~ include ~~pain,~~ oral mucositis and associated pain, ~~oral ulcerations~~, bleeding, taste dysfunction, ~~secondary~~ opportunistic infections (e.g., candidiasis, herpes simplex virus), dental caries, dry mouth, (e.g., salivary gland dysfunction, xerostomia), neurotoxicity, mucosal fibrosis, gingival hypertrophy, ~~post-radiation~~ osteoradionecrosis, ~~bisphosphonate~~ medication-related osteonecrosis, soft tissue necrosis, ~~temporomandibular dysfunction (e.g.,~~ trismus~~),~~ and craniofacial and dental developmental anomalies. and oral graft versus host disease (**GVHD**). PDQ® NCI 2016; Chaveli-Lopez 2014; ~~Hong et al. 2009;~~ Gandi 2017; da Fonseca 2018, Gawade 2014)

All patients undergoing immunosuppressive therapy and/or head and neck radiation should have an oral examination prior to initiation of treatment (PDQ® NCI 2016; NIDCR 2016) to identify ~~Prevention and treatment of~~ any ~~pre-~~existing or potential source of ~~or concomitant~~ oral disease or infection ~~is essential~~ that may complicate ~~to minimize complications~~ the patient's medical treatment ~~in this population~~.(Elad et

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al. 20~~08~~15; Velten 2017) Every patient requires an individualized management approach. Consultations with the patient's physicians and, when appropriate, other dental specialists, should be sought before dental care is instituted (PDQ® NCI 2016). Additionally, t~~T~~he key to success in maintaining a healthy oral cavity during therapy is patient compliance. Educating ~~T~~the child and the parents regarding the possible acute and long-term side effects of cancer therapies is essential, as this may improve patient motivation to adhere to oral care protocols during cancer therapy. ~~should be educated regarding the possible acute side effects and the long-term sequelae of immunosuppressive therapies in the oral cavity~~ (~~Hong et al. 2009~~; Elad et al. 20~~08~~15; ~~Hong et al. Support. Care Cancer 2010;~~ Kwok et al. 2017; ~~Lalla et al. 2011~~; Schubert & Peterson ~~2009~~ 2016; Hong & da Fonseca 2008, Gawade 2014). ~~Every patient should be managed on an individual basis.; Cconsultations with the patient's physicians and, when appropriate, other dental specialists, should be sought before dental care is instituted (Lalla et al. 2011).~~

Recommendations

Dental and oral care before the initiation of immunosuppressive therapy or head and neck radiation

Objectives (Hong & da Fonseca 2008; Ritwik, 2020)

The objectives of a dental/oral examination before therapy starts are three-fold: ~~(Hong & da Fonseca 2008)~~

- to identify and stabilize or eliminate existing and potential sources of infection and local irritants in the oral cavity—without needlessly delaying the treatment or inducing complications.
- to communicate with the medical team regarding the patient's oral health status, plan, and timing of treatment.
- to educate the patient and parents about the importance of optimal oral care in order to minimize oral problems~~/~~and discomfort before, during, and after treatment and to inform them about the possible acute and long-term effects of the therapy in the oral cavity and the craniofacial complex.

Initial evaluation

Medical history review: should include~~, but not be limited to,~~ disease/condition (type, stage, prognosis), treatment protocol (conditioning regimen, surgery, chemotherapy, location and dose of radiation, ~~transplant~~), medications (including bisphosphonates and other bone modifying agents), allergies, surgeries, secondary medical diagnoses, hematological status (e.g. complete blood count [**CBC**]), ~~coagulation status~~, immuno-suppression status, presence of an indwelling venous access line, and contact of medical team/primary care physician(s).(PDQ® NCI 2016) For HCT patients, ~~include~~ the type of transplant, HCT source (i.e., bone marrow, peripheral stem cells, cord blood stem cells), matching status, donor, conditioning protocol, expected date of transplant, and GVHD prophylaxis should be elicited. ~~Patients with a compromised immune systems may not be able to tolerate a transient bacteremia following invasive dental procedures. The decision regarding the need for antibiotic prophylaxis for dental procedures should be made in consultation with the child's physician. Unless advised otherwise by the physician, the American Heart Association's standard regimen to prevent endocarditis is an accepted option. (NIDCR 2016; AAPD Antibiotic prophylaxis 2018)~~

Dental history review: include~~s~~ information such as fluoride exposure, habits, trauma, symptomatic teeth, previous care, preventive practices, oral hygiene, and diet. ~~assessment~~.

Oral/dental assessment: should include a thorough head, neck, and intraoral examination~~s~~, oral hygiene assessment, ~~and training,~~ and radiographic evaluation based on history and clinical findings.

Preventive strategies

Oral hygiene: ~~Oral hygiene includes~~ B~~b~~rush~~ing~~ of the teeth and tongue two to three times daily should be done with a regular soft nylon-bristled ~~brush~~ or electric toothbrush, regardless of ~~the~~ hematological status.(~~Lalla et al. 2011~~; Kwok et al. 2017; Schubert & Peterson ~~2009~~ 2016; Peterson et al. 2015; Wilson et al. 2021 ~~2007~~) Ultrasonic brushes and dental floss should only be allowed ~~only~~ if the patient is properly trained.(Schubert & Peterson ~~2009~~ 2016) If capable, the patient's teeth should be gently flossed daily. If pain or excessive bleeding occurs, the patient should avoid the affected area, but floss the other teeth.(PDQ NCI 2016) Patients with poor oral hygiene and/or periodontal disease may use chlorhexidine rinses ~~daily~~ until the tissue health improves or mucositis develops.(~~Hong et al. Am. J. Med. 2010~~ Elad 2015; Hong et al 2019) The high alcohol content of commercially-available chlorhexidine mouthwash may cause discomfort and dehydrate the tissues in patients with mucositis.~~; thus, an~~ An alcohol-free chlorhexidine solution is indicated in this situation.

Diet: Dental practitioners should discuss the importance of a healthy diet to maintain nutritional status and emphasize ~~with an emphasis on~~ food~~s~~ choices that do not promote caries. Patients and parents should be advised about the high cariogenic potential of carbohydrate-rich dietary supplements ~~in carbohydrates~~ and sucrose-sweetened ~~oral~~ ~~pediatric~~ medications ~~rich in sucrose~~.(~~Hong et al. Support Care Cancer 2010~~; Weng 2021; Nirmala 2015) They should also be instructed that sharp, crunchy, spicy, and highly acidic foods and alcohol should be avoided during chemotherapy, head and neck radiation, and HCT. (PDQ® NCI 2016)

Fluoride: Preventive measures include the use of fluoridated toothpaste, fluoride supplements if indicated, neutral fluoride gels/rinses, or applications of fluoride varnish for patients at risk for caries and/or dry mouth~~xerostomia~~.~~6,8~~ A brush-on technique is convenient and may increase the likelihood of patient compliance with topical fluoride therapy.(Schubert & Peterson~~2009~~ 2016)

Lip care: Lanolin-based creams and ointments are more effective in moisturizing and protecting against damage than petrolatum-based products.(~~Schubert & Peterson 2009~~ Santo et al. 2013)

Trismus prevention/treatment: Patients who receive head and neck radiation ~~therapy to the masticatory muscles~~ may develop trismus. Thus, daily oral stretching exercises/physical therapy should start before radiation is initiated and continue throughout treatment.(~~Lalla et al. 2011;~~ Kowk et al. 2017; Little et al. 2018)

Reduction of head and neck radiation to healthy oral tissues: I~~n cases of radiation to the head and neck, the~~ The use of lead-lined stents, prostheses, and shields, as well as salivary gland sparing techniques (e.g., three-dimensional conformal or intensity modulated radiotherapy, concomitant cytoprotectants, surgical transfer of salivary glands), should be discussed with the radiation oncologist.

Education: Patient and parent education includes the importance of optimal oral care in order to minimize oral problems and discomfort before, during, and after treatment and the possible acute and long-term effects of the therapy in the craniofacial complex. (Hong et al, 2019; PDQ NCI 2016)

Dental care

Hematological considerations:

Dental providers should be aware of the patient's hematologic status and related risks of bacteremia and excessive bleeding. Hematologic management of the patient should be directed by the patient's oncologist, and consultation with the medical team is necessary to determine the need for prophylactic interventions prior to dental treatment.

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In particular, patients who are immunosuppressed may not be able to tolerate ~~a~~ transient bacteremia following invasive dental procedures. A decision regarding the need for antibiotic prophylaxis prior to dental treatment should be made in consultation with the child's physician. Unless advised otherwise, the American Heart Association's standard regimen to prevent endocarditis is an acceptable option for the immunocompromised patient. (NIDCR 2016; Wilson et al. 2021). The following parameters may be used to guide decisions regarding need for antibiotic prophylaxis:

- Absolute neutrophil count (**ANC**):
  - — >2,000 per cubic millimeter (**/mm^3**): no need for antibiotic prophylaxis;(PDQ NCI 2016; Little et al. 2018)
  - — 1000 to 2000/mm^3: Use clinical judgment based on the patient's health status and planned procedures. Some authors(PDQ® NCI 2016; ~~Lalla et al. 2011~~) suggest that antibiotic coverage ~~(dosed per AHA recommendations [Hong et al. Am J Med 2010])~~ may be prescribed when the ANC is in this range ~~between 1,000 and 2,000/mm³~~. If infection is present at the site of the planned procedure, ~~or unclear~~, a more aggressive prophylactic antibiotic therapy regimen may be ~~indicated and should be~~ discussed with the medical team; and
  - — <1,000/mm^3: defer elective dental care.(da Fonseca 2018; Levi et al 2018) In dental emergencies~~y cases~~, discuss management with a course of antibiotic therapy versus one dose of antibiotics for prophylactic coverage. ~~antibiotic coverage (antibiotic prophylaxis versus antibiotic coverage for a period of time)~~ with the medical team before proceeding with treatment. ~~The patient may need hospitalization for dental management.~~

Patients undergoing cancer treatments are at risk for thrombocytopenia. The following parameters may be used to determine need for pre- and post-operative interventions:

- Platelet count:(~~Lalla et al. 2011~~) (~~Little et al. 2018~~)
  - — <60,000/mm^3: Defer elective treatment and avoid invasive procedures when possible. When medically-necessary dental treatment is required, a hospital setting is most appropriate. Discuss supportive measures (e.g., platelet transfusions pre- and post-operatively, bleeding control, hospital admission and care) with the patient's physician before proceeding. Localized hemostatic measures to manage prolonged bleeding may be utilized (e.g., sutures, hemostatic agents, pressure packs, microfibrillar collagen, topical thrombin and/ or gelatin foams). Systemic measures (e.g., aminocaproic acid, tranexamic acid) may be recommended by the hematologist/oncologist. If platelet transfusions are administered, the dentist should consult with the hematologist regarding the need for a post-transfusion platelet count before the commencement of dental treatment.

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Additional transfusions would ideally be available in the event of excessive and persistent intraoperative or postoperative bleeding (Schiffer et al. 2018).

• Other coagulation tests (e.g., prothrombin time, partial thromboplastin time, international normalized ratio, platelet function) may be recommended for certain patients with other coagulopathies.

~~>75,000 /mm^3: no additional support needed~~.~~;~~

~~40,000 to <75,000/mm^3: Platelet transfusions may be considered pre- and 24 hours post-operatively. Z, Localized procedures to manage prolonged bleeding may include (~~e.g.~~ sutures, hemostatic agents, pressure packs, and/ or gelatin foams); and~~.

~~<40,000/mm^3: defer care. In dental emergency cases, contact supportive measures the patient's physician to discuss (e.g., platelet transfusions bleeding control, hospital admission and care) before proceeding. Additional localized procedures (e.g., microfibrillar collagen, topical thrombin) and additional medications as recommended by the hematologist/oncologist (e.g., aminocaproic acid, tranexamic acid) may help control bleeding.(~~PDQ ~~NCI 2016).~~

~~• Other coagulation tests may be in order for individual patients.~~

Dental procedures:

- Ideally, all dental care should be completed before immunosuppressive therapy is initiated. When that is not feasible, temporary restorations may be placed and non-acute dental treatment may be delayed until the patient's hematological status is stable.(PDQ NCI 2016; Hong et al. 2018; ~~Lalla et al. 2011~~) The patient's blood counts typically ~~normally~~ start falling five to seven days after the beginning of treatment cycle~~,~~ and stay~~ing~~ low for approximately 14 to 21 days~~,~~ before rising ~~again~~ to normal levels. ~~for a few days until the next cycle begins~~. Patients who require an organ transplant are best able to tolerate dental care at least three months after transplant when overall health improves (NIDCR 2016).
- Prioritizing procedures: ~~When all dental needs~~ In the event that definitive dental care would result in a delay of oncologic treatment and a resultant poorer medical prognosis, ~~cannot be treated before therapy is initiated, priorities should~~ providers may prioritize treatment of symptomatic or potentially symptomatic caries lesions (risk of irreversible pulpitis), ~~be~~ infections, hopeless teeth (e.g., root tips, non-restorable teeth) and removal of ~~extractions, periodontal care (e.g., scaling, prophylaxis), and~~ sources of tissue irritation before the treatment of asymptomatic carious teeth (e.g., incipient, small asymptomatic caries lesions), root canal therapy for asymptomatic

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permanent teeth, and replacement of faulty restorations.(Hong et al. 2018; da Fonseca 2018; Little et al. 2018) It is important for the practitioner to be aware that the signs and symptoms of periodontal disease and infection may be decreased in immunosuppressed patients.(Kwok et al. 2017, Little et al. 2018)

- ~~Pain and the risk for pulpal infection determine which carious lesions should be treated first.(Schubert & Peterson 2009) Incipient to small carious lesions may be treated with fluoride, silver diamine fluoride, and/or sealants if until definitive care can be accomplished.(Lalla et al. 2011 Some patients requiring an organ transplant will be best able to tolerate dental care at least three months after transplant when overall health improves.(NIDCR 2016) It is important for the practitioner to be aware that the signs and symptoms of periodontal disease may be decreased in immunosuppressed patients.(Lalla et al. 2011)~~
- Pulp therapy in primary teeth: Few studies have evaluated the safety of performing pulp therapy in primary teeth prior to the initiation of chemotherapy and/or head and neck radiation~~otherapy~~. Many clinicians choose to extract pulpally involved carious teeth ~~provide a more definitive treatment in the form of extraction~~ because of the potential for pulpal/periapical/furcal infections ~~during immunosuppression periods~~ to ~~can~~ become life-threatening during periods of immunosuppression.(~~Lalla et al. 2011~~; Schubert and Peterson ~~2009~~ 2016) Asymptomatic ~~T~~teeth that are already ~~have been~~ treated pulpally and are clinically and radiographically sound should be monitored periodically for clinical and radiographic signs of ~~internal resorption or~~ failure. ~~due to pulpal/ periapical/furcal infections.~~
- Endodontic treatment in permanent teeth: Symptomatic non-vital permanent teeth ideally should receive root canal treatment in a single visit at least one week before initiation of immunosuppressive therapy to allow sufficient time to assess treatment success. ~~before the chemotherapy~~.(da Fonseca 2018; ~~Lalla et al. 2011~~; Little et al. 2018) If that is not possible, alternative options include pulpectomy and closure with an antibacterial agent or extraction. ~~is indicated. Extraction is also the treatment of choice for teeth that cannot be treated by definitive endodontic treatment in a single visit.~~ The need for antibiotics is determined by the patient's health status and should be discussed with the patient's physician. ~~In that case~~, ~~the extraction should be followed by antibiotic therapy (penicillin or, for penicillin-allergic patients, clindamycin) for about one week is indicated.(Lalla et al. 2011~~; Li~~ttle et al. 2018)~~ Endodontic treatment of asymptomatic non-vital permanent teeth may be delayed until the ~~hematological~~ immunologic status of the patient is stable.(da Fonseca 2018; Little et al. 2018) ~~It is important that the~~ The etiology of periapical radiolucencies ~~lesions~~ associated with previously

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endodontically treated teeth should be determined because they may represent ~~can be due to a number of factors including~~ pulpal infections, inflammatory reactions, apical scars, cysts, ~~and~~ or malignancies~~y~~.(Schubert & Peterson ~~2009~~ 2016) Periapical lesions that are asymptomatic and most likely depict apical scars do not need retreatment.(Hong et al, 2018) ~~If a periapical lesion is associated with an endodontically treated tooth and no signs or symptoms of infection are present, there is no need for retreatment or extraction since the radiolucency likely is due to an apical scarYamagata et al. 2006)~~

- Orthodontic appliances and space maintainers: Poorly-fitting appliances can ~~abrade oral mucosa~~ result in a breach of oral mucosa and increased the risk of microbial invasion into deeper tissues. (Levi et al. 2018; ~~Lalla et al. 2011~~) Fixed ~~A~~appliances should be removed if the patient has poor oral hygiene and/or if the treatment protocol ~~or~~ (e.g., HCT conditioning regimen, head and neck radiation) carries a risk for the development of moderate to severe mucositis.(da Fonseca 2018) Simple appliances (e.g., band and loops, fixed lower lingual arches) that are not irritating to the soft tissues may be left in place in patients with ~~who present~~ good oral hygiene. (da Fonseca 2018; Schubert & Peterson ~~2009~~ 2016) Removable appliances and retainers that fit well may be worn as long as tolerated by the patient with ~~who maintains~~ good oral care.(~~Lalla et al. 2011~~; Schubert & Peterson ~~2009~~ 2016) Patients should be instructed to clean their appliance daily and routinely clean appliance cases with an antimicrobial solution to prevent contamination and reduce the risk of appliance-associated oral infections.(~~Lalla et al. 2011~~) Consider removing orthodontic bands or adjusting prosthes~~is~~es that approximate gingival tissue if a patient is expected to receive cyclosporine or other drugs known to cause gingival hyperplasia. If band removal is not possible, vinyl mouth guards or orthodontic wax should be used to decrease tissue trauma.(Schubert & Peterson ~~2009~~ 2016)
- Periodontal considerations: Extraction is the treatment of choice for teeth with a poor prognosis (e.g., non-restorable teeth, periodontal pockets greater than five millimeters, significant bone loss, furcation involvement, mobility, infection) that cannot be treated by definitive periodontal therapy. Partially erupted molars can become a source of infection because of pericoronitis. The overlying gingival tissue should be excised if the dentist believes it is a potential risk and if ~~the~~ hematological status permits.(Schubert & Peterson ~~2009~~ 2016; Little et al. 2018) ~~Extraction is the treatment of choice for teeth with a poor prognosis that cannot be treated by definitive periodontal therapy. If the patient has had bisphosphonates and an invasive periodontal procedure is indicated, risks must be discussed with the patient, parents, and physicians prior to the procedure.~~

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- Third molars and other impacted teeth: Some practitioners prefer to extract all third molars that are not fully erupted, particularly prior to HCT. Others favor a more conservative approach and only recommend extraction of third molars at risk for pulpal infection, with significant pathology, infection, periodontal disease, or pericoronitis, or when malposed or non-functional.(Schubert & Peterson 2016; AAPD Oral surgery 2020; AAOMS 2016)
- Primary teeth that are mobile due to natural exfoliation may be left alone.
- Extractions: ~~There are no clear recommendations for the use of antibiotics for extractions. (da Fonseca 2018) Recommendations generally have been empiric or based on anecdotal experience.~~ Surgical procedures must be as atraumatic as possible, with no sharp bony edges remaining and satisfactory closure of the wounds. These extractions are ideally performed three weeks (or at least ten to fourteen days) before cancer therapy is initiated to allow for adequate healing (~~Lalla et al. 2011;~~Schubert & Peterson ~~2009~~2016; Little et al. 2018) If the patient is immunocompromised and at risk of infection from transient bacteremia, antibiotic prophylaxis should be discussed with the patient's physicians. ~~If~~ Regardless of hematologic status, if there is documented infection associated with the extracted tooth, antibiotics (ideally chosen with the benefit of sensitivity testing) should be administered for about one week post-operatively.(~~Lalla et al. 2011;~~ Schubert & Peterson ~~2009~~ 2016; Little et al. 2018)

- ~~To minimize the risk of development of osteonecrosis, osteoradionecrosis, or bisphosphonate-related osteonecrosis of the jaw (**BRONJ**), patients who will receive radiation to the jaws or bisphosphonate treatment as part of the cancer therapy must have all oral surgical procedures completed before those measures are instituted.(Saad et al. 2012; Kuhl et al. 2012; Dodson 2009) If the patient has received bisphosphonates or radiation to the jaws and an oral surgical procedure is necessary, risks must be discussed with the patient, parents, and physician prior to the procedure. In patients undergoing long-term potent, high-dose intravenous bisphosphonates, there is an increased risk of BRONJ after a tooth extraction or with periodontal disease,(Saad et al. 2012; Kuhl et al. 2012; Dodson 2009 although most of the evidence has been described in the adult population.(Kuhl et al. 2012) Patients with a high risk of BRONJ are best managed by a dental specialist in coordination with the medical team in the hospital setting.~~
~~Loose primary teeth should be allowed to exfoliate naturally. Nonrestorable teeth, root tips, teeth with periodontal pockets greater than six millimeters, symptomatic impacted teeth, and teeth exhibiting acute infections, significant bone loss, involvement of the furcation, or mobility should~~

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~~removed ideally two weeks (or at least seven to 10 days) before therapy is initiated to allow adequate healing.(Lalla et al. 2011; Schubert & Peterson 2009; Little et al. 2018) Some practitioners prefer to extract all third molars that are not fully erupted, particularly prior to HCT, while others favor a more conservative approach, recommending extraction of third molars at risk for pulpal infection or those associated with significant pathology, infection, periodontal disease, or pericoronitis or if the tooth is malpositioned or non-functional.(Schubert & Peterson 2009; AAPD Oral surgery 2018; AAOMS 2016)~~

- In pediatric patients who are on bone modifying agents (e.g., bisphosphonates, anti-resorptive, anti-angiogenic agents) as part of their cancer treatment, or in those who have had head and neck radiation are at an increased risk of medication-related osteonecrosis of the jaw (**MRONJ**) or osteoradionecrosis,(Yarom et al. 2019; Migliorati 2019; Ruggerio et al. 2014) although most of the evidence has been described in the adult population (Migliorati 2019). Patients deemed to be at a significant risk of MRONJ or osteoradionecrosis are best managed by a dentist in coordination with the medical team in a hospital setting. To minimize the risk of development of ~~osteonecrosis,~~ osteoradionecrosis~~,~~ or MRONJ, ~~bisphosphonate-related osteonecrosis of the jaw~~ (~~**BRONJ**~~), patients would ideally have ~~who will receive radiation to the jaws or bisphosphonate treatment as part of the cancer therapy must have~~ all oral surgical procedures (e.g., extractions and periodontal treatment) completed before those therapies ~~measures~~ are instituted.(~~Saad et al. 2012; Kuhl et al. 2012~~; ~~Dodson 2009~~ Yarom et al. 2019; Migliorati 2019~~)~~ In patients who have been on anti-resorptive (e.g., bisphosphates, denosumab) or anti-angiogenic agents as part of their cancer treatment or have had ~~If the patient has received bisphosphonates or~~ radiation to the jaws, and an oral surgical procedure or invasive periodontal procedure is necessary, ~~risks must be discussed~~ it is important to discuss risks with the patient~~,~~ and caregivers~~, and physician~~ prior to the procedure. ~~In patients undergoing long-term potent, high-dose intravenous bisphosphonates, there is an increased risk of BRONJ after a tooth extraction or with periodontal disease,(Saad et al. 2012; Kuhl et al. 2012; Dodson 2009) although most of the evidence has been described in the adult population.(Kuhl et al. 2012) Patients with a high risk of BRONJ are best managed by a dental specialist in coordination with the medical team in the hospital setting.~~

Communication:

It is vital that the dentist communicate the comprehensive oral care plan with the medical team. Information to be shared includes the extent of non-elective dental treatment needed, need for supportive care (e.g., hospital admission, blood product replacement, antibiotic coverage) and the amount of time needed for stabilization of oral disease and healing from the dental procedures. ~~the severity of dental caries (number of teeth involved and which teeth need immediate treatment), endodontic needs (pulpal versus periapical infection), periodontal status, number of teeth requiring extraction, soft tissue pathology, and any other urgent care needed.~~ ~~Furthermore~~, ~~it is important for the dentist to discuss~~ Discussions with the medical team can ensure ~~how much~~ ~~time is needed for the stabilization of oral disease and~~ ideal coordination between needed dental services and planned cancer therapy. ~~as this will also affect the timing of the or conditioning protocols~~.(PDQ NCI 2016)

~~Dental and~~ ~~o~~Oral care during immunosuppression periods and radiation therapy

Preventive strategies

Oral hygiene: ~~Intensive~~ Maintenance of good oral care ~~is of paramount importance~~ in patients undergoing immunosuppressive therapy and head and neck radiation is necessary to ~~because it~~ reduce~~s~~ the microbial load in the oral cavity. This may decrease the host inflammatory response and subsequent severity of OM. Furthermore, a clean oral cavity reduces the risk of opportunistic infections. ~~risk of developing moderate/severe mucositis without causing an increase in septicemia and infections in the oral cavity.~~ ~~(~~PDQ NCI 2016; ~~Hong et al. 2009;~~ Elad et al. 2015~~08~~; ~~Hong et al. Support Care Cancer 2010~~; ~~Lalla et al. 2011~~; Kwok et al. 2017; Schubert & Peterson ~~2009~~ 2016; Peterson et al. 2015; Little et al. 2018; ~~Stiff et al. 2006~~ Levi et al. 2018) ~~Thrombocytopenia should not be the sole determinant of oral hygiene as patients are able to brush without bleeding at widely different levels of platelet count.(Schubert & Peterson 2009)~~ Patients should use a soft nylon brush two to three times daily and replace it ~~on a regular~~ ~~(~~every two to three months~~) basis~~.(Schubert & Peterson ~~2009~~ 2016; Peterson et al. 2015)

Thrombocytopenia is not the sole determinant of oral hygiene as patients are able to brush without bleeding at widely different levels of platelet counts.(Schubert & Peterson ~~2009~~ 2016) Fluoridated toothpaste is effective for caries prevention ~~can be used~~, ~~but,~~ and a mildly flavored toothpaste may be better tolerated during periods of OM. ~~if the patient does not tolerate it during periods of mucositis due to oral burning or stinging sensations, it may be discontinued and the patient should switch to mild-flavored non-fluoridated toothpaste.~~ If moderate to severe OM ~~mucositis~~ develops and the patient cannot tolerate a regular soft nylon toothbrush or an end-tufted brush, foam brushes or super soft brushes soaked in chlorhexidine may be used.(Hong and da Fonseca 2008; Ritwik 2020) Otherwise, foam or super soft brushes are ~~should be~~ discouraged because they do not allow for effective cleaning. The use of a regular brush should be resumed as soon as the OM ~~mucositis~~ improves.(Schubert & Peterson ~~2009~~ 2016;

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Peterson et al. 2015) Brushes should be air-dried between uses.(Schubert & Peterson ~~2009~~ 2016) Electric or ultrasonic brushes are acceptable if the patient is capable of using them without causing trauma and irritation. If patients are skilled at flossing without traumatizing the tissues, it is reasonable to continue flossing throughout treatment. Toothpicks and water irrigation devices should not be used when the patient is pancytopenic to avoid tissue trauma.(Schubert & Peterson ~~2009~~ 2016; ~~AAPD Antibiotic prophylaxis 2018~~)

Dental care

During immunosuppression, elective dental care should be deferred. ~~should not be provided~~. If a dental emergency arises, the treatment plan should be discussed with the patient's physician who will make recommendations for supportive medical therapies (e.g., antibiotics, platelet transfusions, analgesia). The patient should be ~~seen~~ reevaluated every six months (or in shorter intervals if there is a risk of dry mouth ~~xerostomia~~, caries, trismus, ~~and/~~or chronic oral GVHD) ~~for an oral health evaluation~~ during treatment, in times of stable hematological status and always after reviewing the medical history.

Management of oral mucositis and associated pain ~~oral conditions~~ related to immunosuppressive therapies

Oral mucositis (**OM**): The Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (**MASCC**/ **ISOO**) has published guidelines for treatment of OM.~~mucositis~~.(Peterson et al. 2015; ~~Lalla et al. 2014~~Elad et al. 2020) Currently, data for the pediatric population is limited; thus, recommendations are based largely on adult studies. The recommended ~~most common~~ prescriptions for prevention ~~management~~ of ~~mucositis~~ OM include good oral hygiene, bland mouth rinses (saline or sodium bicarbonate), benzydamine mouthrinse, cryotherapy, palifermin, and photobiomodulation therapy (**PBM**). (Elad et al 2020, Miranda-Silva 2021). ~~analgesics, non-medicated oral rinses (e.g., 0.9 percent saline or sodium bicarbonate mouth rinses four to six times/day), and parenteral nutrition as needed.(NCI 2016; Peterson et al 2015; Stiff et al. 2006)~~ Mucosal coating agents (e.g., ~~Amphojel®, Kaopectate®,~~ hydroxypropylmethylcellulose) and film-forming agents ~~(e.g., Zilactin® and Gelclair®)~~ also have been suggested.(PDQ NCI 2016) ~~Effective interventions for mucositis prevention include the use of palifermin, low-level laser therapy (**LLLT**), and cryotherapy.(Lalla et al. 2014)~~ The use of sucralfate, antimicrobial lozenges, chlorhexidine, pentoxifylline, and granulocyte–macrophage colony stimulating factor mouthwash for ~~oral~~ ~~mucositis~~ are not recommended.(Peterson et al. 2015~~ Lalla et al. 2014~~Elad et al. 2020)

Oral cryotherapy, the cooling of intraoral tissue with ice, ~~during chemotherapy treatment,~~ is recommended as OM ~~mucositis~~ prophylaxis for patients receiving bolus infusion of chemotherapy drugs with short half-lives.(~~ Lalla et al. 2014~~Elad et al. 2020; Peterson et al. 2013) ~~This includes patients treated with fluorouracil as well as patients receiving high-dose melphalan as conditioning for HCT.(Lalla et al. 2014)~~ Oral cryotherapy reduces the blood flow to the mouth by narrowing the blood vessels, thus limiting the amount of chemotherapy drugs delivered to the tissues. Cryotherapy is inexpensive and readily available, but further research is needed to confirm the effectiveness of oral cryotherapy in children ~~pediatric oncology.(~~Peterson et al. 2013; Miranda-Silva et al. 2021)

Palifermin (keratinocyte growth factor-1) is a drug approved by the U.S. Food and Drug Administration for the prevention ~~and treatment~~ of oral mucositis~~.~~(U.S. FDA 2015 ~~2013~~) ~~It is recommended for mucositis prophylaxis for~~ in patients undergoing conditioning with high-dose chemotherapy and total body irradiation followed by HCT.(~~ Lalla et al. 2014~~Elad et al. 2020) Palifermin ~~is believed to~~ exerts its effect by stimula~~teat~~ting epithelial cell reproduction, growth, and development so that mucosal cells damaged by chemotherapy and radiation are replaced quickly, accelerating the healing process.(~~U.S. FDA 2013~~ (Kwok et al, 2017; Logan et al. 2020)

The current MASCC/ISOO guidelines support the use of PBM ~~low-level laser~~ therapy to prevent OM~~oral mucositis~~ ~~for~~ in patients undergoing H~~SC~~CT conditioning with high-dose chemotherapy with or without total body irradiation as well as patients undergoing radiation treatment for head and neck cancer.(~~ Lalla et al. 2014~~Elad et al. 2020 ~~LLLT~~ PBM can decrease pain and the duration and severity of chemo-therapy-induced OM ~~mucositis~~ in children.(He et al. 2018; Amadori et al. 2016; ~~Kuhn et al. 2009~~ Eduardo et al. 2015) ~~LLLT~~ PBM may not be available at all cancer treatment centers due to the cost of the equipment and the need for trained personnel. Appropriate protocol must be followed when using ~~LLLT~~ PBM to prevent contamination and occupational risks to the child and dental team.

~~Oral cryotherapy, the cooling of intraoral tissue with ice during chemotherapy treatment, is recommended as mucositis prophylaxis for patients receiving bolus infusion of chemotherapy drugs with short half-lives.(Lalla et al. 2014Elad et al. 2020; Peterson et al. 2013) This includes patients treated with fluorouracil as well as patients receiving high-dose melphalan as conditioning for HCT.(Lalla et al. 2014Elad et al. 2020) Oral cryotherapy reduces blood flow to the mouth by narrowing the blood vessels, limiting the amount of chemotherapy drugs delivered to the tissues. Cryotherapy is inexpensive and~~

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~~readily available, but further research is needed to confirm the effectiveness of oral cryotherapy in pediatric oncology.(Peterson et al. 2013; Miranda-Silva et al. 2021)~~

~~Studies on the use of chlorhexidine for mucositis have given conflicting results.~~ With regard to chlorhexidine, ~~M~~most studies have not demonstrated a prophylactic impact or a reduction in the severity of OM ~~mucositis~~ Worthington et al. 2011; Kwok et al. 2017, Little et al. 2018; ~~Clarkson et al. 2010~~; Cardona et al. 2017), ~~although reduced colonization of candidal species has been shown.~~ Chlorhexidine is not ~~no longer~~ recommended for prevent~~ing~~ion of oral mucositis in patients undergoing head and neck radiation~~otherapy~~.(Peterson et al. 2015; ~~Lalla et al. 2014~~Elad et al. 2020; ~~McGuire et al. 2013~~)

Patient-controlled analgesia ~~has been~~ is helpful in relieving pain associated with OM~~mucositis~~, reducing the requirement for oral analgesics. (~~Lalla et al. 2014, McGuire et al. 2013~~) The use of topical anesthetics and mixtures containing topical anesthetics (e.g., Philadelphia mouthwash, magic mouthwash) ~~has~~ has been suggested for pain management~~,~~.(Peterson et al. 2015; Saunders et al. 2020) ~~although there are no studies available to assess the benefit and potential for toxicity~~. However, topical ~~Topical~~ anesthetics only provide short term pain relief.(Peterson et al. 2015; ~~McGuire et al. 2013~~) ~~Lidocaine~~ In addition to possible cardiovascular and central nervous system effects, their use may obtund or diminish taste and the gag reflex(~~McGuire et al. 2013~~ Kwok et al. 2017) and/or result in a burning sensation.~~, in addition to possible cardiovascular and central nervous system effects.~~ Currently, the evidence for its benefit is lacking (Hong et al. 2019) and potential for toxicity is a concern in young children.

Oral mucosal infections: The signs of oral mucosal inflammation and infection may be ~~greatly~~ diminished during neutropenic periods. Thus, the clinical appearance of infections may differ significantly from the expected ~~normal~~.(Little et al. 2018) Close monitoring of the oral cavity allows for timely diagnosis and treatment of fungal, viral, and bacterial infections. Oral cultures and/or biopsies of all suspicious lesions are appropriate if medical status permits. While waiting for the results, empiric therapy typically is initiated until laboratory results dictate more specific medications.(PDQ NCI 2016; Schubert & Peterson 2016; Little et al. 2018) Of note, ~~Prophylactic~~ nystatin is not effective for the prevention and/or treatment of fungal infections.(~~Lalla et al. 2011~~; Kwok et al. 2017; Gøtzche and Johansen 2014 ~~2002~~) ~~Oral cultures and/or biopsies of all suspicious lesions be performed. and prophylactic medications should be initiated until more specific therapy can be prescribed.(NCI 2016; Lalla et al. 2011; Schubert & Peterson 2009; Little et al. 2018)~~

Oral bleeding: Oral bleeding in patients undergoing immunosuppressive therapy commonly occurs due to thrombocytopenia~~, disturbance of coagulation factors,~~ and/or damaged vascular integrity. Management ~~should~~ consists of local ~~approaches~~ (e.g., pressure packs, antifibrinolytic rinses or topical agents, gelatin sponges) and systemic measures (e.g., platelet trans-fusions, aminocaproic acid).(~~Lalla et al. 2011~~ Kwok et al. 2017); Schubert & Peterson ~~2009~~ 2016; Little et al. 2018)

Dental sensitivity/pain: Tooth sensitivity ~~could~~ may be related to dry mouth ~~decreased secretion of saliva~~ during chemotherapy or head and neck radiation therapy and the lowered salivary pH.(~~Lalla et al.~~ Kwok et al. 2017; Schubert & Peterson ~~2009~~ 2016; Little et al. 2018) Patients who are using plant alkaloid chemotherapeutic agents (e.g., vincristine, vinblastine) may experience neurotoxicity that presents as~~with~~ deep, constant jaw pain (affecting the mandibular molars with greater frequency) or paresthesia in the absence of odontogenic pathology. The pain usually is transient and generally subsides shortly after dose reduction and/or cessation of chemotherapy.(~~Lalla et al. 2011~~; Kwok et al. 2017; Schubert & Peterson ~~2009~~ 2016; Little et al. 2018)

~~Xerostomia~~Dry mouth: Sugar-free chewing gum or candy, sucking tablets, special dentifrices for oral dryness, saliva substitutes, frequent sipping of water, alcohol-free oral rinses, and/or oral moisturizers are recommended.(Schubert & Peterson ~~2009~~ 2016; Carvalho et al. 2018; Chaveli-Lopez 2014 ~~Nieuw Amerongen and Veerman 2003~~) Placing a humidifier by the child's bedside at night may be useful.(Little et al. 2018) ~~Saliva stimulating drugs are approved for use in children~~. Fluoride rinses and gels are highly recommended ~~highly~~ for caries prevention in these patients.

Trismus: Daily oral stretching exercises/physical therapy should be implemented ~~must continue~~ during head and neck radiation treatment. Management of trismus may include prosthetic aids to reduce the severity of fibrosis, trigger-point injections, analgesics, muscle relaxants, and other pain management strategies.(~~Lalla et al. 2011~~; Kwok et al. 2017; Levi et al. 2018; Jensen et al. ~~2010~~ 2017)

Hematopoietic cell transplantation

Hematopoietic cell transplantation ~~can be~~ is used in children to treat malignancies and hematologic disorders, as well as certain metabolic syndromes. Examples include:(Majhail et al. 2015)

- malignant disorders treated with autologous HCT
  - brain tumors.
  - Ewing sarcoma.

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  – germ cell tumors.
  – Hodgkin lymphoma.
  – leukemia.
  – neuroblastoma.
  – non-Hodgkin lymphoma.
  – Wilms tumor.
- malignant disorders treated with allogenic HCT
  – acute lymphocytic leukemia.
  – acute myeloid leukemia.
  – high-risk solid tumors.
  – juvenile myelomonocytic leukemia.
  – myelodysplastic syndrome.
- non-malignant disorders treated with allogenic HCT
  – bone marrow failure syndromes.
  – chronic granulomatous disease.
  – Fanconi anemia.
  – metabolic storage disorders.
  – osteopetrosis.
  – severe aplastic anemia.
  – sickle cell anemia.
  – thalessemia.
  – Wiskott-Aldrich syndrome.

Specific oral complications can be correlated with phases of HCT. (PDQ NCI 2016; NIDCR 2016; Hong et al. 2009; da Fonseca 2018; Elad et al. 20~~08~~15; ~~Hong et al. Support Care Cancer 2010~~; ~~Lalla et al. 2011~~; Schubert & Peterson ~~2009~~ 2016)

Phase I: Preconditioning

The oral complications are related to the patient's current systemic and oral health, oral manifestations of the underlying condition, and oral complications of recent medical therapy. Oral complications observed include ~~oral~~ opportunistic infections, gingival leukemic infiltrates, bleeding~~,~~ and ulceration.~~, and temporomandibular dysfunction~~.(PDQ NCI 2016) Most of the principles of dental and oral care before the transplant are similar to those discussed for ~~pediatric~~ patients undergoing immunosuppressive cancer therapy.(Hong and da Fonseca 2008) The two major differences in HCT are: 1) the patient receives ~~all the~~ extremely high dose chemotherapy and/or total body irradiation ~~in just~~ immediately prior to (a few days before) the transplant, and 2) there will be prolonged immunosuppression following the transplant. Elective dentistry will need to be postponed until immunological recovery has occurred, at least 100 days following HCT.~~, or~~ This may be longer if chronic GVHD or other complications (e.g., persistent immunodeficiency) are present.(~~Lalla et al. 2011~~; Schubert & Peterson ~~2009~~ 2016) Therefore, all dental treatment should be completed before the patient undergoes HCT.~~the patient becomes immunosuppressed~~.

Phase II: Conditioning neutropenic phase

In this phase, which encompasses the day the patient is ad-mitted to the hospital to begin the transplant conditioning to 30 days post-HCT, the majority of oral complications are related to the conditioning regimen and supportive medical therapies.(Schubert & Peterson ~~2009~~ 2016) Mucositis, dry mouth~~xerostomia~~, oral pain, hemorrhage, opportunistic infections, taste dysfunction, neurotoxicity (including dental pain, muscle tremors), and temporomandibular dysfunction (including jaw pain, headache, joint pain) may be present.~~seen, typically with a high prevalence and severity of oral complications.~~(PDQ NCI 2016) Oral mucositis usually begins seven to 10 days after initiation of conditioning, and symptoms continue approximately two weeks after the end of conditioning.(PDQ NCI 2016) Among allogeneic transplant patients, ~~hyper~~acute GVHD can occur, causing more severe inflammation and severe mucositis symptoms. Acute GVHD may begin as early as two to three weeks after the start of HCT and continue up to two months post-transplant. The timing of this presentation may help distinguish acute GVHD from chemotherapy-induced OM. ~~although its clinical presentation is difficult to diagnose~~.(PDQ NCI 2016) The patient may ~~should~~ be followed closely to monitor and manage the oral changes and to reinforce the importance of optimal oral care. Avoid elective dental ~~Dental~~ procedures ~~usually are not allowed~~ in this phase due to the patient's severe immunosuppression. If emergency treatment is necessary, the dentist should consult and coordinate with the attending transplant team.

Phase III: Engraftment to hematopoietic recovery

The intensity and severity of acute complications observed in Phase II usually begin to decrease ~~normally~~ three to four weeks after transplantation. ~~Oral fungal infections and herpes simplex virus infection are most notable.(NCI 2016)~~ During this phase, acute ~~Acute~~ GVHD can become a concern for allogeneic graft recipients. ~~Xerostomia~~ Dry mouth, hemorrhage, neurotoxicity, temporomandibular dysfunction, and granulomas/papillomas ~~sometimes~~ are also observed sometimes.(PDQ NCI 2016) With regard to opportunistic infections, oral fungal infections and herpes simplex virus infection are most likely.(PDQ NCI 2016) HCT patients are particularly sensitive to intraoral thermal stimuli between two and four months post-transplant.(Schubert & Peterson 2016) The mechanism is not well understood, but the symptoms usually resolve spontaneously within a few months. Topical application of neutral fluoride or desensitizing toothpastes helps reduce the symptoms.(Schubert & Peterson 2016). A dental/oral examination should be performed and invasive dental procedures, including dental cleanings and soft tissue curettage, should be done only if authorized by the HCT team because of the patient's continued immunosuppression.(Schubert & Peterson 2009 2016) Patients should be encouraged to optimize oral hygiene and avoid a cariogenic diet. ~~Attention to xerostomia and oral GVHD manifestations is crucial. HCT patients are particularly sensitive to intraoral thermal stimuli between two and four months post-transplant.(Schubert & Peterson 2009) The mechanism is not well understood, but the symptoms usually resolve spontaneously within a few months. Topical application of neutral fluoride or desensitizing toothpastes helps reduce the symptoms.(Schubert & Peterson 2009)~~

Phase IV: Immune reconstitution/recovery from systemic toxicity

After day 100 post-HCT, the oral complications are predominantly ~~are~~ related to the chronic toxicity associated with the conditioning regimen, including dry mouth, ~~salivary dysfunction~~, craniofacial growth abnormalities, late viral infections, chronic oral ~~chronic~~ GVHD, and oral squamous cell carcinoma.(PDQ NCI 2016; Schubert & Peterson ~~2009~~ 2016) ~~Xerostomia and relapse-related oral lesions also may be observed.(NCI 2016)~~ Unless the patient is neutropenic or with severe chronic GVHD, mucosal bacterial infections are less frequently seen. Periodic dental examinations with radiographs can be performed, but invasive dental treatment ~~should~~ is to be avoided in patients with persistent profound impairment of immune function.(Schubert & Peterson ~~2009~~ 2016) Consultation with the patient's physician and parents regarding the risks and benefits of orthodontic care is recommended.

Dental and oral care after ~~the~~ immunosuppressive therapy and head and neck radiation ~~is~~ have been completed:

Objectives

The objectives of a dental/oral examination after immunosuppressive therapy ends are three-fold:

- to maintain optimal oral health.
- to reinforce to the patient/parents the importance of optimal oral and dental care for life.

- to address ~~and/or treat~~ any dental issues that may arise as a result of the long-term effects of immuno-suppressive therapy and/or head and neck radiation.

Dental care

Periodic evaluation: The patient should be seen ~~at least~~ every six months (~~or in shorter intervals~~ or more frequently if issues such as chronic oral GVHD, dry mouth~~xerostomia~~, or trismus are present). Patients who have experienced moderate or severe mucositis and/or chronic oral GVHD should be followed closely for signs of malignant transformation of their oral mucosa (e.g., oral squamous cell carcinoma).(Elad et al. 20~~08~~15; PDQ NCI 2016; Inamoto, 2015~~Euvrard et al. 2003~~)

Education: The importance of optimal oral and dental care for life must be reinforced. It is also important to emphasize the need for regular follow-ups with a dental professional, especially for patients who are at risk for or have developed GVHD and/or ~~xerostomia~~ dry mouth and those who were younger than six years of age during treatment due to potential dental developmental problems.

Orthodontic treatment: Orthodontic care may start or resume after completion of all therapy and after at least a two-year disease-free survival when the risk of relapse is decreased and the patient is no longer using immunosuppressive drugs.(da Fonseca 2018) A thorough assessment of any dental developmental disturbances caused by the therapy must be performed before initiating orthodontic treatment. The following strategies ~~should~~ may be considered when providing orthodontic care for patients with dental sequelae: (1) use appliances that minimize the risk of root resorption, (2) use lighter forces, (3) terminate treatment earlier than normal, (4) choose the simplest method for the treatment needs, and (5) do not treat the lower jaw. (Zahrowski 2007) However, specific guidelines for orthodontic management, including optimal force and pace, remain undefined. Patients and their families may be made aware of the potential for a higher risk of orthodontic relapse among cancer survivors (Mitus-Kenig, 2021). Patients who were on intravenous antiresorptive or anti-angiogenic agents as part of their cancer treatment, or in those who have had head and neck radiation, may ~~have used or will be given medications associated with osteonecrosis of the jaw in the future~~ present a challenge for orthodontic care. Although bisphosphonate inhibition of tooth movement has been reported in animals, it has not been quantified for any dose or duration of therapy in humans.(Zahrowski 2007, Bhatt et al. 2014) Consultation with the patient's ~~parents~~caregivers and physician regarding the risks (e.g. prolonged treatment time, MRONJ, treatment modifications) (Bhatt et al. 2014) and benefits (e.g., reduced root resorption, anchorage, less relapse) (Bhatt et al 2014) of orthodontic care in this situation is recommended.

Oral surgery and invasive periodontal therapy: Patients at risk for MRONJ or osteoradionecrosis should be managed in coordination with the oncology team in the hospital setting. ~~Consultation with an oral surgeon and/or periodontist and the patient's physician is recommended for non-elective oral surgical and invasive periodontal procedures in patients who have used or are using bisphosphonates or those who received radiation therapy to the jaws in order to devise strategies to decrease the risk of osteonecrosis and osteoradionecrosis, respectively.~~(~~Saad et al. 2012;~~ Kuhl et al. 2012; ~~Dodson 2009~~ Yarom et al. 2019; Migliorati 2019) Elective invasive procedures are best ~~should be~~ avoided in these patients.(Yarom et al. 2019; Bhatt et al. 2014)~~Dahllöf et al. 2001)~~ ~~Patients with a high risk of BRONJ are best managed by in coordination with the oncology team in the hospital setting.~~

Long-term concerns

Craniofacial, skeletal, and dental developmental issues are some of the complications faced by survivors (NCI 2016; da Fonseca 2018; Schubert & Peterson ~~2009~~ 2016, Gawade 2014) and usually develop among children who were less than six years of age at the time of their cancer therapy.(da Fonseca 2018; Schubert & Peterson ~~2009~~ 2016) Long term effects of immunosuppressive therapy may include tooth agenesis, microdontia, crown disturbances (size, shape, enamel hypoplasia, pulp chamber anomalies), root disturbances (early apical closure, blunting, changes in shape or length), reduced mandibular length, reduced alveolar process height, and reduced vertical growth of the face.(da Fonseca 2018, Gawade 2014; Chaveli-Lopez 2014) The severity of the dental developmental anomaly will depend on the age and stage of development during exposure to cytotoxic agents or ionizing radiation . Patients may experience permanent salivary gland hypofunction/dysfunction or xerostomia.(Jensen et al. 2017 ~~2010~~) Relapse or secondary malignancies can develop at this stage.(PDQ NCI 2016, Inamoto 2015) Routine periodic examinations are necessary to provide comprehensive oral healthcare. Careful examination of extra-oral and intra-oral tissues (including clinical, radiographic, and/or additional diagnostic examinations) are integral to diagnosing any secondary malignancies in the head and neck region. Dental treatment may require a multidisciplinary approach, involving a variety of dental specialists to address the treatment needs of each individual. Consultation with the patient's physician is recommended if relapse occurs or the patient's immunologic status declines.

References

Amadori F, Bardellini E, Conti G, et al. Low-level laser therapy for treatment of chemotherapy-induced oral mucositis in childhood: A randomized double-blind controlled study. Lasers Med Sci 2016;31(6):1231-6.

~~American Academy of Pediatric Dentistry. Antibiotic prophylaxis for dental patients at risk for infection. Pediatr Dent 2018;40(6):386-91.~~

American Academy of Pediatric Dentistry. Management of pediatric dental patients receiving chemotherapy and/or radiation. Colorado Springs, Colorado: American Academy of Pediatric Dentistry; May, 1986.

American Academy of Pediatric Dentistry. Best practices for dental management of pediatric patients receiving immunosuppressive therapy and/or radiation therapy. Pediatr Dent 2018;40(6):392-400.

~~American Academy of Pediatric Dentistry. Management considerations for oral surgery and oral pathology. Pediatr Dent. 2018;40(6):373-82~~.

American Academy of Pediatric Dentistry. Management considerations for pediatric oral surgery and oral pathology. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:450-60.

American Association of Oral and Maxillofacial Surgeons. Management of third molar teeth. 2016. White Paper Accessed July 12, 2021. ~~June 21, 2018~~ Available at: "https://www.aaoms.org/docs/govt_affairs/advocacy_white_papers/management_third_molar_white_paper.pdf". ~~(Archived by WebCite® at: "http://www.webcitation.org/70KgisFtO")~~

Bhatt RN, Hibbert SA, Munns CF. The use of bisphosphonates in children: Review of the literature and guidelines for dental management. Aust Dent J 2014;59(1):9-19.

Cardona A, Balouch A, Abdul MM, et al. Efficacy of chlorhexidine for the prevention and treatment of oral mucositis in cancer patients: A systematic review with meta-analysis. J Oral Pathol Med 2017;46(9):680-8.

Carvalho CG, Medeiros-Filho JB, Ferreira MC. Guide for health professionals addressing oral care for individuals in oncological treatment based on scientific evidence. Support Care Cancer 2018;26(8):2651-61.

Chaveli-López B. Oral toxicity produced by chemotherapy: A systematic review. J Clin Exp Dent 2014;6(1):e81-e90.

~~Clarkson JE, Worthington HV, Furness S, McCabe M, Khalid T, Meyer S. Interventions for treating oral mucositis for patients with cancer receiving treatment (Review). Cochrane Database Syst Rev 2010;4(8): CD001973.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

da Fonseca M. Childhood cancer. In: Nowak AJ, Casamassimo PS, eds. The Handbook of Pediatric Dentistry. 5th ed. Chicago, Ill.: American Academy of Pediatric Dentistry; 2018:361-9.

~~Dahllöf G, Jönsson A, Ulmner M, Huggare J. Orthodontic treatment in long-term survivors after bone marrow transplantation. Am J Orthod Dentofacial Orthop 2001;120(5):459-65.~~

~~Dodson TB. Intravenous bisphosphonate therapy and bisphosphonate-related osteonecrosis of the jaws. J Oral Maxillofac Surg 2009;67(suppl 1):44-52.~~

~~Elad S, Thierer T, Bitan M, Shapira MY, Meyerowitz C. A decision analysis: The dental management of patients prior to hematology cytotoxic therapy or hematopoietic stem cell transplantation. Oral Oncol 2008;44(1):37-42.~~

Eduardo Fde P, Bezinelli LM, de Carvalho DL, et al. Oral mucositis in pediatric patients undergoing hematopoietic stem cell transplantation: clinical outcomes in a context of specialized oral care using low-level laser therapy. Pediatr Transplant 2015;19(3):316-25.

Elad S, Raber-Durlacher JE, Brennan MT, et al. Basic oral care for hematology-oncology patients and hematopoietic stem cell transplantation recipients: a position paper from the joint task force of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO) and the European Society for Blood and Marrow Transplantation (EBMT). Support Care Cancer 2015;23(1):223-36.

Elad S, Cheng KKF, Lalla RV, et al; Mucositis Guidelines Leadership Group of the Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO). MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer 2020;126(19):4423-31.

~~Euvrard S, Kanitakis J, Claudy A. Skin cancers after organ transplantation. N Engl J Med 2003;348(17):1681-91.~~

Gandhi K, Datta G, Ahuja S, Saxena T, G Datta A. Prevalence of oral complications occurring in a population of pediatric cancer patients receiving chemotherapy. Int J Clin Pediatr Dent 2017;10(2):166-71.

Gawade PL, Hudson MM, Kaste SC, et al. A systematic review of dental late effects in survivors of childhood cancer. Pediatr Blood Cancer 2014;61(3):407-16.

~~Gøtzche PC, Johansen HK. Nystatin prophylaxis and treatment in severely immunocompromised patients. Cochrane Database Syst Rev 2002;(2):CD002033. Up-date in Cochrane Database Syst Rev 2002;(4):CD002033.~~

Gøtzsche PC, Johansen HK. Nystatin prophylaxis and treatment in severely immunodepressed patients. Cochrane Database Syst Rev 2014;2014(9):CD002033.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

He M, Zhan B, Shen N, Wu N, et al. A systematic review and meta-analysis of the effect of low level laser therapy (LLLT) on chemotherapy-induced oral mucositis in pediatric and young patients. Eur J Pediatr 2018;177(1):7-17.

~~Hong CH, Allred R, Napenas JJ, Brennan MT, Baddour LM, Lockhart PB. Antibiotic prophylaxis for dental procedures to prevent indwelling venous catheter-related infections. Am J Med 2010;123(12):1128-33.~~

Hong CHL, Gueiros LA, Fulton JS, et al.; Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society for Oral Oncology (MASCC/ ISOO). Systematic review of basic oral care for the management of oral mucositis in cancer patients and clinical practice guidelines. Support Care Cancer. 2019;27(10):3949-67.

~~Hong CH, Brennan MT, Lockhart PB. Incidence of acute oral sequelae in pediatric patients undergoing chemotherapy. Pediatr Dent 2009;31(5):420-5.~~

Hong CH, da Fonseca M. Considerations in the pediatric population with cancer. Dent Clin North Am 2008;52(1):155-81.

~~Hong CH, Napeñas JJ, Hodgson BD, et al. A systematic review of dental disease in patients undergoing cancer therapy. Support Care Cancer 2010;18(8):1007-21~~.

Hong CHL, Hu S, Haverman T, Stokman M, et al. A systematic review of dental disease management in cancer patients. Support Care Cancer 2018;26(1):155-74.

Inamoto Y, Shah NN, Savani BN, et al. Secondary solid cancer screening following hematopoietic cell transplantation. Bone Marrow Transplant 2015;50(8):1013-23.

~~Jensen SB, Pedersen AM, Vissink A, et al. A systematic review of salivary gland hypofunction and xerostomia induced by cancer therapies: Prevalence, severity, and impact on quality of life. Support Care Cancer 2010;18 (8):1039-60.~~

Jensen SB, Vissink A, Limesand KH, Reyland ME. Salivary gland hypofunction and xerostomia in head and neck radiation patients. J Natl Cancer Inst Monogr 2019(53):lgz016.

Kwok, K, Vincent, E and Gibson, J. Antineoplastic drugs. In: Dowd FJ, Johnson BS, Mariotti AJ, eds. Pharmacology and Therapeutics for Dentistry. 7th ed. St. Louis, MO: Mosby Elsevier, 2017:530-62.

~~Kuhl S, Walter C, Acham S, Pfeffer R, Lambrecht JT. Bis phosphonate-related osteonecrosis of the jaws – A review. Oral Oncology 2012;48(10):938-47.~~

~~Kuhn A, Porto FA, Miraglia P, Brunetto AL. Low-level infrared laser therapy in chemotherapy-induced oral mucositis: A randomized placebo-controlled trial in children. J Pediatr Hematol Oncol 2009;31(1):33-7.~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~Lalla RV, Bowen J, Barasch A, et al. MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer 2014;120 (10):1453-61.~~

~~Lalla RV, Brennan MT, Schubert MM. Oral complications of cancer therapy. In: Yagiela JA, Dowd FJ, Johnson BS, Marrioti AJ, Neidle EA, eds. Pharmacology and Therapeutics for Dentistry. 6th ed. St. Louis, Mo.: Mosby-Elsevier; 2011:782-98.~~

Levi LE, Lalla RV. Dental treatment planning for the patient with oral cancer. Dent Clin North Am 2018;62(1):121-30.

Little JW, Miller CS, Rhodus NL. Cancer and oral care of patients with cancer. In: Little and Falace's Dental Management of the Medically Compromised Patient. 9th ed. St. Louis, Mo.: Elsevier; 2018:501-13.

Logan RM, Al-Azri AR, Bossi P, et al.; Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO). Systematic review of growth factors and cytokines for the management of oral mucositis in cancer patients and clinical practice guidelines. Support Care Cancer 2020;28(5):2485-98.

Migliorati CA, Brennan MT, Peterson DE. Medication-related osteonecrosis of the jaws. J Natl Cancer Inst Monogr 2019;2019(53):lgz009.

Miranda-Silva W, Gomes-Silva W, Zadik Y, et al.; Mucositis Study Group of the Multinational Association of Supportive Care in Cancer / International Society for Oral Oncology (MASCC/ISOO). MASCC/ISOO clinical practice guidelines for the management of mucositis: Sub-analysis of current interventions for the management of oral mucositis in pediatric cancer patients. Support Care Cancer 2021;29(7):3539-62.

Mitus-Kenig M, Derwich M, Czochrowska E, Pawlowska E. Cancer survivors present significantly lower long-term stability of orthodontic treatment: A prospective case-control study. Eur J Orthod 2021;43(6):631-8. Available at: "https://doi.org/10.1093/ejo/cjaa083". Accessed March 27, 2022.

Nirmala SV, Popuri VD, Chilamakuri S, et al. Oral health concerns with sweetened medicaments: Pediatricians' acuity. J Int Soc Prev Community Dent 2015;5(1):35-9.

Majhail NS, Farnia SH, Carpenter PA, et al. Indications for autologous and allogenic hematopoietic cell trans-plantation: Guidelines from the American Society for Blood and Marrow Transplantation. Biol Blood Marrow Transplant 2015;21(11):1863-96.

~~McGuire DB, Fulton JS, Park J, et al. Systematic review of basic oral care for the management of oral mucositis in cancer patients. Support Care Cancer 2013;21(11): 3165-77.~~

~~National Cancer Institute. PDQ® Oral Complications of Chemotherapy and Head/Neck Radiation. Bethesda, Md.: National Cancer Institute; Modified December 16, 2016. Available at:~~

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~“http://cancer.gov/cancertopics/pdq/ supportivecare/oralcomplications/HealthProfessional.” Accessed September 28, 2017. (Archived by WebCite® at: “http://www.webcitation.org/70FodU3oF”)~~

National Institute of Dental and Craniofacial Research. Dental management of the organ or stem cell transplant patient. Bethesda, Md.: National Institute of Dental and Craniofacial Research; Modified July, 2016. Available at: “https://www.nidcr.nih.gov/sites/default/files/2017-09/dental-management-organ-stem-cell-transplant.pdf ”. Accessed June 18, 2021~~. (Archived by WebCite® at: “http://www.webcitation.org/70HPdWeYn”)~~

~~Nieuw Amerongen AV, Veerman EC. Current therapies for xerostomia and salivary gland hypofunction associated with cancer therapies. Support Care Cancer 2003; 11(4):226-31.~~

Peterson DE, Boers-Doets CB, Bensadoun RJ, Herrstedt J, Roila F, ESMO Guidelines Working Group. Management of oral and gastrointestinal mucosal injury: ESMO clinical practice guidelines for diagnosis, treatment, and follow-up. Ann Oncol 2015;26(Suppl_5):vi139-v151.

Peterson DE, Ohrn K, Bowen J, et al. Systematic review of oral cryotherapy for management of oral mucositis caused by cancer therapy. Support Care Cancer 2013;21(1):327-32.

PDQ® Supportive and Palliative Care Editorial Board. PDQ Oral Complications of Chemotherapy and Head/Neck Radiation. Bethesda, MD: National Cancer Institute. Updated December 16, 2016. Available at: “https://www.cancer.gov/about-cancer/treatment/side-effects/mouth-throat/oral-complications-hp-pdq”. Accessed June 15, 2021.

Ritwik P, Chrisentery-Singleton TE. Oral and dental considerations in pediatric cancers. Cancer Metastasis Rev 2020;39(1):43-53.

Ruggiero SL, Dotson TB, Fantasia J, et al. American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on medication-related osteonecrosis of the jaw--2014 update. J Oral Maxillofac Surg 2014;72(10):1938-56.

~~Saad F, Brown JE, Van Poznak C, et al. Incidence, risk factors, and outcomes of osteonecrosis of the jaw: Integrated analysis from three blinded active-controlled phase III trials in cancer patients with bone metastases. Ann Oncol 2012;23(5):1341-7.~~

Santos PS, Tinôco-Araújo JE, Souza LM, et al. Efficacy of HPA Lanolin® in treatment of lip alterations related to chemotherapy. J Appl Oral Sci 2013;21(2):163-6.

Saunders DP, Rouleau T, Cheng K, et al.; Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO). Systematic review of antimicrobials, mucosal coating agents, anesthetics, and analgesics for the management of oral mucositis in cancer patients and clinical practice guidelines. Support Care Cancer 2020;28(5):2473-84.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Schiffer CA, Bohlke K, Delaney M, et al. Platelet transfusion for patients with cancer: American Society of Clinical Oncology Clinical Practice Guideline Update. J Clin Oncol 2018;36(3):283-99.

Schubert MM, Pizzigatti Correa, ME, Peterson DE. Oral complications of hematopoietic cell transplantation. In: Antin JH, Appelbaum RF, Forman SJ, Negrin RS, eds. Thomas' Hematopoietic Cell Transplantation: Stem Cell Transplantation. 5th ed. Oxford, UK: Wiley-Blackwell; 2016: 1242-68.

~~Schubert MM, Peterson DE. Oral complications of hematopoietic cell transplantation. In: Appelbaum RF, Forman SJ, Negrin RS, Blume KG, eds. Thomas' Hematopoietic Cell Transplantation: Stem Cell Transplantation. 4th ed. Oxford, UK: Wiley-Blackwell; 2009: 1589-607.~~

~~Stiff PJ, Emmanouilides C, Bensinger WI, et al. Palifermin reduces patient-reported mouth and throat soreness and improves patient functioning in the hematopoietic stem-cell transplantation setting. J Clin Oncol 2006;24(33):5186-93.~~

U.S. Food and Drug Administration. Palifermin (marketed as Kepivance). ~~August 26, 2013~~. July 16, 2015. Available at: "https://www.fda.gov/drugs/postmarket-drug-safety-information-patients-and-providers/palifermin-marketed-kepivance." Accessed July 12, 2021. ~~"https://www.fda.gov/Drugs/DrugSafety/PostmarketDrugSafetyInformationfor PatientsandProviders/ucm110263.htm". Accessed October 12, 2017. (Archived by WebCite® at: "http://www.webcitation. org/70FsywwYs")~~

Velten DB, Zandonade E, Monteiro de Barros Miotto MH. Prevalence of oral manifestations in children and adolescents with cancer submitted to chemotherapy. BMC Oral Health 2017;17(1):49.

Wang Y, Zeng X, Yang X, et al. Oral health, caries risk profiles, and oral microbiome of pediatric patients with leukemia submitted to chemotherapy. Biomed Res Int 2021:6637503.

~~Wilson W, Taubert KA, Gewitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association: A guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. Circulation 2007;116(15): 1736-54. Erratum in Circulation 2007;116(15):e376-7.~~

Wilson WR, Gewitz M, Lockhart PB, et al; Prevention of viridans group streptococcal infective endocarditis: A scientific statement from the American Heart Association. Circulation 2021;143(20):e963-e978. Erratum in: Circulation 2021;144(9):e192.

Worthington HV, Clarkson JE, Bryan G, et al. Interventions for preventing oral mucositis for patients with cancer receiving treatment. Cochrane Database Syst Rev2011(4):CD000978.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

~~Yamagata K, Onizawa K, Yanagawa T, et al. A prospective study to evaluate a new dental management protocol before hematopoietic stem cell transplantation. Bone Marrow Transplant 2006;38(3):237-42.~~

Yarom N, Shapiro CL, Peterson DE, et al. Medication-related osteonecrosis of the jaw: MASCC/ISOO/ASCO Clinical Practice Guideline. J Clin Oncol 2019;37(25):2270-90.

Zahrowski JJ. Bisphosphonate treatment: An orthodontic concern for a proactive approach. Am J Orthod Dentofacial Orthop 2007;131(3):311-20.

Best Practices for Risk Assessment and Management of Periodontal Diseases and Pathologies in Pediatric Dental Patients

Adopted
2022

Abstract

This best practice supports clinicians in assessing risk for and clinical decision-making in the management of periodontal diseases and pathologies in pediatric dental patients. This document highlights principles of periodontal disease diagnosis, risk assessment, and therapies to be applied to pediatric dental patients with special considerations for individuals with special health care needs when indicated. Recommendations on the management of contributing factors and conditions that increase the risk of periodontal disease and pathologies, as well as treatment considerations on the use of adjunctive antibiotics and surgical therapies are reviewed. Special attention is focused on care coordination, collaborations and/or referral of care to specialists. In cases where the published data regarding periodontal diseases and pathologies among children and adolescents was limited, recommendations were extrapolated from evidenced-based literature among adult patients, as well as on the consensus opinions of the working group.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance regarding risk assessment and management of periodontal diseases and pathologies in pediatric dental patients.

KEYWORDS: CHILD, ADOLESCENT, PERIODONTAL DISEASE, PERIODONTAL RISK ASSESSMENT, ANTIBIOTIC THERAPY, PERIODONTAL THERAPY

Abbreviations

AAPD: American Academy of Pediatric Dentistry. **BoP**: Bleeding on probing. **CAL**: Clinical attachment loss. **CEJ**: Cementoenamel junction. **CHX**: Chlorhexidine. **MM**: Millimeter.

NSAIDs: Nonsteroidal anti-inflammatory drugs. **PDL**: Periodontal ligament. **PPD**: Periodontal pocket depth. **PRA**: Periodontal risk assessment. **SHCN**: Special health care needs. **SIB**: Self-injury behavior. **SRP**: Scaling and root planning. **TDI**: Traumatic dental injuries.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes the importance of periodontal health and its effect on the well-being of pediatric patients, including those with special health care needs (**SHCN**). Periodontal risk assessment (**PRA**) and management protocols are essential elements of contemporary clinical care for pediatric dental patients. These recommendations are intended to assist practitioners in assessing risk for and clinical decision-making in the management of periodontal diseases and pathologies in pediatric dental patients.

Methods

This best practice document was developed utilizing the resources and expertise of AAPD members and an expert consultant in periodontics operating through the Council on Clinical Affairs. Literature searches of PubMed®/MEDLINE and Google Scholar databases were conducted using the terms: periodontitis as a manifestation of systemic diseases, necrotizing periodontitis, aggressive periodontitis, localized periodontitis; fields: all; limits: within the last 10 years, human, English, clinical study, clinical trial, comparative study, multicenter study, observational study, randomized clinical trial, meta-analysis, and systematic reviews. The search returned 1,222 articles that matched the criteria. The articles were evaluated by title and/or abstract and relevance to dental care for children and adolescents. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background

A periodontal examination and risk assessment are important parts of the routine dental examination of pediatric dental patients. The gingival and periodontal tissues in the primary, mixed, and permanent dentition are subject to morphological changes due to normal patterns of oral growth and development. Gingivitis occurs in half of the population by age of four or five years and peaks nearly to 100 percent at puberty (Perry et al, 2019; Stenberg, 2017). Distinguishing normal physiological changes during growth and development from gingival and periodontal diseases helps prevent erroneous diagnoses and unnecessary treatment.

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Maintenance and restoration of gingival and periodontal health during childhood and adolescence will facilitate healthy gingival and periodontal health at older ages.

Diagnostic phase

The diagnostic criteria for gingivitis are based on clinical features, taking into consideration the presence of plaque and that the inflammatory response to plaque is an age-dependent phenomenon. Three distinct forms of periodontal disease have been defined as: (1) periodontitis (single category grouping the two forms of the disease formerly recognized as aggressive or chronic); (2) necrotizing periodontitis; and (3) periodontitis as a manifestation of systemic conditions (Caton et al, 2018). Early diagnosis ensures more promising treatment outcomes and effective periodic maintenance protocols (Alrayyes & Hart, 2011).

Periodontal risk assessment (PRA)

In health care, risk is defined as the probability that an individual will develop a disease during a specific time period (Bouchard et al, 2017; Elangovan et al, 2019). Risk factors are defined as characteristics of individuals that increase their probability to developing the disease (Bouchard et al, 2017; Elangovan et al, 2019). Risk factors for periodontal disease are complex and may be biological, environmental (social), and behavioral (Elangovan et al, 2019). PRA identifies risk factors that place individuals at an increased risk of developing gingival and periodontal diseases and pathologies, as well as factors that influence the progression of the disease. PRA can improve clinical decision making and allow the implementation of individualized treatment planning and proactive targeted interventions (Douglass CW, 2006). Evidenced-based PRA tools have been developed based on studies conducted among adult patients (Chapple, 2020). Due to the limited literature regarding PRA among children and adolescents, factors associated with elevated risk were extrapolated from evidence from adult patients (Tables 1 and 2)(Lang et al, 2015; Sai Sujai et al, 2015; Mullins et al, 2016; Bouchard et al, 2017; Trombelli et al, 2017; Petsos et al, 2020).

Prognosis and treatment planning

Determination of the prognosis follows the diagnostic phase and is a dynamic process to be reevaluated at all therapeutic phases (i.e., systemic, behavioral, non-surgical, surgical, maintenance). Prognosis, basedon the probability of disease progression and clinical parameters, can be categorized as favorable, questionable, unfavorable, and hopeless (Kwok & Caton, 2007).

Treatment planning

Table 1. Factors Associated with the Development and Progression of Periodontal Diseases and Pathologies for < 13 Years Old

Factors	High Risk	Moderate Risk	Low Risk
Biological Factors			
Systemic conditions/genetic susceptibility (e.g., family history of aggressive periodontitis) and syndromes[a]	Yes		
Immunosuppressive or radiation therapy		Yes	
Medication(s) known to affect the periodontal tissues		Yes	
History of traumatic injury to the periodontal apparatus (e.g., avulsion, luxation)		Yes	
Traumatic gingival/oral mucosa lesions		Yes	
Nutritional deficiencies		Yes	
Social and Behavioral Factors			
Socioeconomic stability (e.g., adequate health literacy, regular dental care)			Yes
Adequate daily at-home oral hygiene either performed or supervised by caregiver			Yes
Tobacco or marijuana smoking/smokeless tobacco use	Yes		
Clinical and Radiographic Factors			
Adequate attached gingiva and normal frenum attachments			Yes
Tooth-related factors contributing to plaque retention and physical barriers for proper oral hygiene		Yes	
Generalized gingivitis (≥30% of teeth affected)		Yes	
Disproportional gingival inflammation in relation to age, amount of plaque accumulation, or oral and systemic developmental changes	Yes		
Presence of calculus	Subgingival	Supragingival	None
Bleeding on probing	Yes		
Periodontal probing depths > 3mm	Yes		
Chronic pericoronitis		Yes	
Abnormal tooth mobility	Yes		
Furcation involvement	Yes		
Radiographic alveolar bone loss	Yes		
Tooth loss due to periodontitis	Yes		

Circling those conditions that apply to a specific patient helps the practitioner and caregiver understand the factors that contribute to the development and progression of periodontal diseases and pathologies. Clinical judgment may justify the use of one or more factors in determining the overall risk.

Overall assessment of the child's risk: High □ Moderate □ Low □

[a] Most common examples include, but are not limited to, agranulocytosis, Chédiak-Higashi syndrome, cyclic neutropenia, diabetes, Ehlers-Danlos syndrome, human immunodeficiency virus infection, hypophosphatasia, idiopathic immune disorders, Langerhans cell histiocytosis, leukemia, leukocyte adherence deficiency, osteoporosis, neutropenia, trisomy 21, Papillon Lefèvre syndrome, plasminogen deficiency, and respiratory diseases.

Table 2. Factors Associated with the Development and Progression of Periodontal Diseases and Pathologies for ≥ 13 Years Old

Factors	High Risk	Moderate Risk	Low Risk
Biological Factors			
Systemic conditions/genetic susceptibility (e.g., family history of aggressive periodontitis) and syndromes[a]	Yes		
Immunosuppressive or radiation therapy		Yes	
Medication(s) known to affect the periodontal tissues		Yes	
History of traumatic injury to the periodontal apparatus (e.g., avulsion, luxation)		Yes	
Traumatic gingival/oral mucosa lesions		Yes	
Nutritional deficiencies		Yes	
Mental health disorders (e.g., stress, depression)		Yes	
Pregnancy		Yes	
Social and Behavioral Factors			
Socioeconomic stability (e.g., adequate health literacy, regular dental care)			Yes
Adequate daily at-home oral hygiene			Yes
Tobacco or marijuana smoking/smokeless tobacco use	Yes		
Drug abuse (e.g., crack cocaine, methamphetamine)	Yes		
Intraoral/perioral piercing and oral jewelry/accessories		Yes	
Individuals with special health care needs living in supported community (group) homes		Yes	
Clinical and Radiographic Factors			
Adequate attached gingiva and normal frenum attachments			Yes
Adequate plaque biofilm control			Yes
Tooth-related factors contributing to plaque retention and physical barriers for proper oral hygiene		Yes	
Generalized gingivitis (≥30% of teeth affected)		Yes	
Disproportional gingival inflammation in relation to age, amount of plaque accumulation, or oral and systemic developmental changes	Yes		
Presence of calculus	Subgingival	Supragingival	None
Bleeding on probing	> 25% of sites	10% to 25% of sites	0% to 9% of sites
Periodontal probing depths	> 5mm	3.5mm to 5mm	< 3.5mm
Chronic pericoronitis		Yes	
Abnormal tooth mobility	Yes		
Furcation involvement	Yes		
Radiographic alveolar bone loss over 25% of sites	Yes		
Tooth loss due to periodontitis	Yes		

Circling those conditions that apply to a specific patient helps the practitioner and caregiver understand the factors that contribute to the development and progression of periodontal diseases and pathologies. Clinical judgment may justify the use of one or more factors in determining the overall risk.

Overall assessment of the child's risk: High □ Moderate □ Low □

[a] Most common examples include, but are not limited to, agranulocytosis, Chédiak-Higashi syndrome, cyclic neutropenia, diabetes, Ehlers-Danlos syndrome, human immunodeficiency virus infection, hypophosphatasia, idiopathic immune disorders, Langerhans cell histiocytosis, leukemia, leukocyte adherence deficiency, osteoporosis, neutropenia, trisomy 21, Papillon Lefèvre syndrome, plasminogen deficiency, and respiratory diseases.

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Table 3. Example of Management Pathways for Periodontal Diseases and Pathologies

Risk Category	Diagnostics	Non-surgical therapy						Surgical therapy	Counseling					
		Oral prophylaxis: supragingival plaque and calculus removal	Debridement, scaling and root planing	Systemic antibiotics and/or use of adjunctive topical anti-microbials	Management of plaque retentive factors[a]	Monitor previous traumatic injuries to the periodontal apparatus	Management of oral conditions and side effects from therapies, medications, infections, gingival injuries, etc.	Plastic, aesthetic, resective, and/or regenerative procedures	Twice daily brushing and daily flossing	Healthy diet and nutrition	Injury prevention[a]	Tobacco use and drug misuse[b]	Use of oral hygiene adjuncts[C]	Compliance with medical care and/or periodontal treatment or maintenance
Low Risk	- Recall every six to 12 months - Radiographs every 12 to 24 months	Every six to 12 months							YES	YES	YES	Prevention		
Medium Risk	- Recall every six months - Radiographs every six to 12 months - Monitoring of systemic conditions by laboratory analysis and consultation with medical specialists, if indicated	Every six months	Every six months	YES	YES	YES	YES	YES	YES	YES	YES	Prevention or cessation	YES	YES
High Risk	- Recall every three months - Radiographs every six months - Close monitoring of systemic conditions by laboratory analysis and consultation with medical specialists, if indicated - Consultation with and/or referral to periodontist, if indicated	2-4 months depending on disease severity and disease response to treatment	2-4 months depending on disease severity and disease response to treatment	YES			YES	YES	YES	YES	YES	Prevention or Cessation	YES	YES

[a] Plaque retentive factors include, but are not limited to, caries lesions, enamel defects, dental anatomical anomalies, malposed teeth, defective restorations, inadequate contoured crowns, orthodontic appliances, dental prostheses.

[b] Prevention of injuries resultant of accidents, piercings, habits.

[C] Oral hygiene adjuncts include, but are not limited to, powered toothbrushes, interdental brushes, or oral irrigation; chemical anti-plaque and anti-calculus agents.

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The treatment plan is formulated after completing a comprehensive examination, establishing a diagnosis, determining the prognosis, and identifying the individual needs and desires of the patient and caregiver. It addresses immediate, intermediate, and long-term goals to arrest or slow down the periodontal disease progression. Initial treatment plans may be subject to modifications based on unforeseen developments during care (Do et al, 2019A). Other important considerations include emergency treatment for pain or infections, need for exodontia, and esthetic demands (Do et al, 2019A).

General considerations

- A periodontal assessment includes a discussion of the chief complaint, detailed medical, dental, and social history reviews, extra- and intra-oral examinations, radiographs, and periodontal probing as indicated. Further investigations (e.g., genetic, microbiological, gingival biopsy, and biochemical tests) may be needed on an individual basis to differentiate types of periodontal diseases.
- Bleeding on probing (**BoP**) in primary teeth during early childhood, even at a low number of sites, is indicative of high susceptibility to periodontal diseases, due to the age dependent reactivity of the gingival tissues to plaque (Bimstein & Eidelman, 1988; Bimstein et al, 2013).
- Probing assessments may be initiated after the eruption of the first permanent molars and incisors and only if tolerated by the child. Pseudo pockets (> 3mm) may be present around partially and newly erupted teeth (Cole, 2014). Probing assessment on primary teeth are required before the eruption of the first permanent molars and incisors when clinical and radiographic findings indicate the presence of periodontal diseases.
- Assessing for generalized (i.e., involving ≥30 percent of the teeth) gingivitis may be performed for patients unable to undergo probing due to age, anxiety, or SHCN (Murakami, 2018).
- Alveolar bone loss in the primary dentition indicates increased susceptibility to periodontal disease (Bimstein & Soskolne, 1988; Sjödin & Matsson, 1994; Drummond et al, 2017).
- Good quality bitewing radiographs are necessary for diagnosing alveolar bone loss (Bimstein & Soskolne, 1988; Bimstein et al, 1994, Al Jamal et al, 2011). While bitewing radiographs are useful with assessing abnormal molar mobility (Bimstein & Soskolne, 1988; Al Jamal et al, 2011; Bimstein, 2018; Drummond et al, 2017), periapical radiographs may help rule out any other associated pathology (e.g. root resorption). For abnormal anterior tooth mobility, periapical radiographs are the most appropriate images. (Tugnait et al, 2000)

- 1 ± 0.5 millimeter (**mm**) distance from the most coronal portion of the alveolar bone crest to the cementoenamel junction (**CEJ**) is considered a normal alveolar bone height in the *primary dentition* (Bimstein & Soskolne, 1988; Sjödin & Matsson, 1994; Needleman et al, 1997), while a distance of more than two mm is considered to represent bone loss (Sjödin & Matsson, 1994). A distance of more than two mm may be considered normal when the bone is adjacent to exfoliating primary teeth or erupting permanent teeth (Bimstein and Matsson, 1999).
- 2-mm distance (on average, varying between 1.0 and 3.0 mm) from the most coronal portion of the alveolar bone crest to the CEJ is considered a normal alveolar bone height in the *permanent dentition* (Al Jamal et al, 2011).

Recommendations

- For patients in the primary dentition, a visual assessment of the gingiva should be part of every comprehensive examination. All dental radiographs should be examined for evidence of caries, alveolar bone loss, developmental anomalies, and other pathologies.
- A simplified basic periodontal examination is recommended for individuals aged seven to 17 years (Cole, 2014). After the eruption of the first permanent molars and incisors, six index teeth (the first permanent molars, the permanent maxillary right central incisor, and the permanent mandibular left central incisor) are assessed for: (1) BoP; (2) presence of calculus; (3) plaque retention factors; (4) periodontal pocket depth (**PPD**); (5) furcation involvement; and (6) recession. PRA, based on a child's age and biological, social/behavioral, and clinical/radiographic factors, should be a routine component of new and periodic oral examinations.
- Practitioners may use the estimated risk level to establish a periodicity and intensity of diagnostic, counseling, and therapeutic interventions (See Table 3).
- The treatment plan should be used to establish the methods and sequence of delivering periodontal treatment and include:
    - periodontal procedures to be performed;
    - medical consultation or referral for treatment when indicated;
    - consideration of diagnostic testing that may include genetic, microbiological, gingival biopsy, or biochemical tests or monitoring during the course of periodontal therapy;
    - consideration of adjunctive restorative, prosthetic, orthodontic, and/or endodontic consultation or treatment;
    - consideration of chemotherapeutic and antibiotic agents for adjunctive treatment;

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- provision for re-evaluation during and after periodontal or dental implant therapy; and
- periodontal maintenance program.

Behavioral Phase

The success of both prevention and treatment of periodontal diseases and conditions relies significantly on the ability of the patient/caregivers to comply with requested oral hygiene and dietary practices (e.g., brushing, flossing, adequate nutrition) and to change behaviors regarding harmful risk factors (e.g. smoking, drug use). Psychological models and theories of motivation (e.g., health belief model, motivational interviewing, self-determination theory) may be used to help patients adopt healthier behaviors (Renz & Newton, 2009; Chang et al, 2018).

Nutrition

The role of nutrition and, more specifically, the relevance of vitamins on periodontal health (Najeeb et al, 2016; Valera-López et al, 2018; Cagetti et al, 2020) are thought to be related to the effect on inflammation. Persistent lack of vitamin C, an essential nutrient for collagen synthesis, in the diet has been associated with more severe periodontitis (Luo et al, 2018). This deficiency, known as scurvy, manifests with gingival bleeding and swelling, proceeds to tooth loss, and can result in death.

Systematic reviews show a positive association between periodontal disease and obesity in children and adolescents (Li et al, 2015; Martens et al, 2017; Klokkevold & Mealey, 2019A).

Smoking and substance misuse

The association between smoking and drug use and periodontal diseases is clear (Goultchin el al, 1990; Akef et al, 1992; Machuca et al, 2000; Bergestrom et al, 2000; Antoniazzi et al, 2016; Shariff et al, 2017). Compelling evidence supports the significant benefits of tobacco use prevention and cessation on the periodontal and oral health in general, across all ages (Shibly 2008; Warnakulasuriya et al, 2010; Chaffee BW 2016).

Recommendations

Dental professionals should utilize psychological theories of motivation to help patients adopt healthier behaviors and counsel their pediatric patients and parents on:

- the role of diet in the development and progression of periodontal conditions;
- the harms of all tobacco products to help prevent or cease tobacco use; and

- the serious health consequences of drug misuse, as well as refer to an appropriate provider for cessation when the habit is identified.

Informed consent

Informed consent is essential in the delivery of healthcare. As part of the informed consent process, the clinician shares information and answers questions about the patient's oral health conditions and the nature, risks, and benefits of recommended and alternative treatments, including no treatment. For periodontal conditions, the discussion would also include the need for maintenance treatment due to the possibility of disease recurrence or progression. Written consent is advisable as it may decrease the liability from miscommunication, especially if risks, complications, or possibility of failure are expected with the proposed therapy. Referral is indicated when treatment needs are beyond the treating dentist's scope of practice. Patients should also be informed if referrals to other specialists are needed (Klokkevold, Takei, Carranza, 2019C).

Non-surgical periodontal therapy (Phase I Therapy)

"The major goal of phase I therapy is to control the factors responsible for periodontal inflammation; this involves educating the patient in the removal of bacterial plaque biofilm. Phase I therapy also includes scaling, root planing, and other therapies such as caries control, replacement of defective restorations, occlusal therapy, orthodontic tooth movement, and cessation of confounding habits such as tobacco use." (Takei, 2019A).

Management of bacterial plaque biofilm and calculus

Controlling gingival inflammation is the primary preventive strategy for periodontitis, as well as the secondary preventive strategy for recurrence of periodontitis (Trombelli et al, 2018). A systematic review demonstrated anti-plaque effectiveness for toothpastes containing stannous fluoride or chlorhexidine (**CHX**) (Chapple et al, 2015; Graziani et al, 2017). Toothpastes containing pyrophosphates reduce the formation of new supragingival calculus (Perry et al, 2019; Sambunjak et al, 2011), but no improvements have been reported in gingival inflammation and subgingival calculus. Mouthrinses with anti-plaque agents significantly improve gingival inflammation and plaque levels when compared to toothpastes with such agents (Chapple et al, 2015). The use of 0.12 percent CHX gluconate can help improve dental plaque, gingival bleeding, and gingival inflammation indexes (Montiel-Company & Almerich-Silla, 2002; Clavero et al, 2003; Featherstone et al, 2012; Varoni et al, 2012; James et al, 2017; Featherstone et al, 2018). Adverse effects of use (e.g, alteration in taste sensation; unpleasant taste; calculus formation;

brown staining of teeth, tongue, and restorations) compromise patient acceptance (Chapple, 2015; Graziani et al, 2017; Zhang et al, 2019; Quirynen et al, 2019) and are most common when used for four weeks or longer (Varoni et al, 2012; James et al, 2017). Rinses have higher anti-plaque efficacy than sprays (Zhang et al, 2019). The CHX-containing mouthrinse may be applied via toothbrush for patients unable to spit or at risk of aspirating the agents. Different proposed regimens of CHX include: (1) once or twice a day for one week every month; and (2) once or twice a day for two weeks every three months (Featherstone et al, 2012; Varoni et al, 2012; James et al, 2017; Featherstone et al, 2018). Preferred active agent, patients' preference, economic cost, compliance, and adverse effects influence selection of delivery system (Chapple et al, 2015). Although CHX allergy is extremely rare, prolonged exposure to CHX may lead to contact sensitization, allergic contact dermatitis or stomatitis, or even anaphylactic shock when used during surgery (Liippo et al, 2011; Pemberton et al, 2012; Chiewchalermsri et al, 2020)

Oral prophylaxis along with scaling and root planing (**SRP**) are the basis of professional mechanical plaque control. (Clerehugh & Tugnait, 2001; Drummond et al, 2017; Graziani et al, 2017; Takei, 2019A). Oral prophylaxis removes supragingival plaque and calculus via hand or powered instruments. Subgingival instrumentation, considered the gold standard of periodontal treatment, is divided into three procedures: (1) debridement (removal of subgingival plaque); (2) scaling (removal of supra- and sub-gingival plaque, calculus, and stains); and (3) root planing (removal of cementum or surface dentin that is rough, impregnated with calculus, or contaminated with toxins or microorganisms) (Takei, 2019A). Supra- and sub-gingival instrumentation is an important component of initial and recall dental appointments. When comparing subgingival instrumentation modes, hand instruments (e.g., curettes) remove a significantly greater amount of calculus and leave a smoother root surface than ultrasonic scalers (Graziani et al, 2017). On the other hand, ultrasonic devices cause less soft tissue trauma, require a shorter treatment time, and are less technique and operator sensitive (Graziani et al, 2017).

Recommendations:

- Dental professionals should provide oral self-care instructions that are individualized and include appropriate adjuncts.
- For adolescents and individuals with SHCN who exhibit poor oral hygiene, clinicians should consider the use of chemical anti-plaque agents in mouthrinses or incorporated into fluoridated toothpastes to control plaque accumulation and gingival inflammation, along with instituting more frequent recall appointments.

- Because plaque or biofilm and calculus serve as physical barriers for proper home oral hygiene execution, a dental prophylaxis and SRP should be performed at both initial and recall dental appointments when necessary.
- Use of ultrasonic devices and mouthrinses may be contraindicated for patients who are unable to expectorate and at risk for aspiration.

Management of local factors for periodontal disease and pathologies

In addition to plaque or biofilm and calculus, other local factors can contribute to plaque retention and physical barriers for proper oral hygiene execution increasing the risk of periodontal disease and pathology initiation and progression among pediatric patients (Clerehugh & Tugnait, 2001; Gorbunkova et al, 2016; Yu & Abbott, 2016; Drummond et al, 2017; Takei, 2019A, Kanellis et al, 2018, Silva et al, 2019).

Caries lesions: Caries prevention and adequate restoration of dental caries lesions are of great importance for the periodontal health of pediatric patients. Gingival inflammation is highly associated with dental caries and dependent on the degree of tooth destruction, the presence of bacteria in the biofilm, and host response (Drummond et al, 2017). Gingivitis and interproximal alveolar bone loss have been observed in young children with severe caries (Bimstein, 1992, Bimstein et al, 1996). The alveolar bone loss occurs with extensive interproximal caries due to food impaction and biofilm retention in the interdental area (Bimstein et al, 1996). Due to the dysbiotic nature of the caries-association microbiome, temporary or permanent restorations remove the reservoir of bacteria in these lesions helping to maximize the healing of the periodontal tissues (Takei, 2019A). Restorations with adequate proximal contour will promote healing of alveolar bone defects (Bimstein et al, 1996).

Defective restorations: The use of minimally-invasive restorative dentistry, when clinical conditions allow, can help avoid negative effects of restorations on the periodontal tissues. Gingivitis and clinical attachment loss (**CAL**) have been associated with defective restorations and crowns (i.e., subgingival restorations, margin discrepancies, overhanging restorations) (Takei, 2019A). In addition, a study among 354 children aged six to nine years revealed radiographic interproximal alveolar bone loss adjacent to proximal surfaces in the primary molar area in 30.8 percent of the sites without an adequate amalgam restoration and 25.8 percent of the sites with inadequate crown restoration (Bimstein et al, 1996). Inadequately contoured stainless steel crowns and residues of set cement remaining in contact with the gingival sulcus also may cause gingival inflammation and abnormal bone resorption (Bimstein, 1992;

Bimstein et al, 1996). If meticulous oral hygiene is not maintained, interproximal lesions of posterior teeth treated with caries-arresting agents (e.g., silver diamine fluoride, silver nitrate) but not restored are capable of "packing food" that can potentially cause severe gingival inflammation, bleeding, and patient discomfort (Kanellis et al, 2018). Arrested cavitated lesions may benefit from receiving a restoration in order to prevent food impaction or future caries lesion progression (Ng & Sulyanto, 2018).

Malocclusion and orthodontic appliances: An increased risk for periodontal disease has been associated with malocclusion, especially in cases of severe anterior teeth crowding and gingivitis among children and adolescents wearing orthodontic appliances (Clerehugh & Tugnait, 2001; Gorbunkova et al, 2016; Bernhardt et al, 2019). Gingival overgrowth, recession, and invagination are among the most cited soft tissues changes during orthodontic treatment (Gorbunkova et al, 2016). Due to dental plaque accumulation around appliances, patients undergoing orthodontic treatment with deficient oral hygiene are at higher risk of gingival inflammation, development of white spot lesions, and dental caries. Inflammatory changes associated with puberty gingivitis may be exacerbated in adolescent patients undergoing orthodontic treatment (Silva et al, 2019).

Dental enamel defects and other dental anomalies: Children and adolescents with dental defects (e.g., enamel hypoplasia, amelogenesis imperfecta) may present with less ideal oral hygiene due to the sensitivity associated with the condition. Desensitizing toothpastes containing remineralization compounds, fluoride varnishes, and toothbrushes with soft bristles (Elhennawy & Schwendicke, 2016; Drummond et al, 2017) may minimize the sensitivity and, consequently, allow better oral hygiene (Elhennawy & Schwendicke, 2016; Drummond et al, 2017).

Many teeth with dental defects are prone to fractures close to the gingival margin; crown-lengthening surgery is sometimes necessary to facilitate the placement of restorations with cleansable margins (Drummond et al, 2017). Other dental anomalies, such as enamel projections, enamel pearls, proximal and palatogingival grooves, and fused and supernumerary teeth, may impact the periodontal health. Some of these dental anomalies, for instance, are associated with gingivitis and CAL due to the impediment of proper oral hygiene or mucogingival problems as a consequence of developmental aberrations in eruption and deficiencies in the thickness of the periodontium (Clerehugh & Tugnait, 2001; Silva et al, 2019).

Recommendations:

- Defective or failing restorations should be corrected by smoothing rough surfaces, removing overhangs with burs and/or hand instruments, or replacement (Clerehugh & Tugnait, 2001; Takei, 2019A).
- When placing preformed crowns, well-adapted restorations stainless steel crowns (i.e., contoured, well-fitted and crimped) are recommended to maintain the health of the periodontium.
- Clinicians should consider restoring open, arrested cavitated lesions when food impaction occurs causing gingival inflammation, bleeding, or patient discomfort.
- Because orthodontic appliances often hinder brushing and flossing, clinicians should:
    - consider more frequent recall appointments and prophylaxis depending on home oral hygiene compliance and degree of periodontal inflammation, and
    - consider suspension of the orthodontic treatment if patient is not able to maintain proper oral hygiene.
- In cases of sensitivity associated with dental defects, desensitizing toothpastes, fluoride varnishes, toothbrushes with soft bristles, and sealing the enamel of the teeth should be considered.

Topical antimicrobial adjuncts and systemic antibiotics

Topical (local) agents, available as fibers, gels, chips, microspheres, and solutions, are delivered directly inside the periodontal pocket and present fewer side effects than systemic agents (Feres et al 2015; Graziani et al, 2017; Kinane et al, 2017; Herrera et al, 2020). Compared to systemic agents, they utilize a smaller total dosage and provide higher localized concentration of the drug (Feres et al 2015; Graziani et al, 2017; Kinane et al, 2017; Herrera et al, 2020) but lack the capability to reach different oral surfaces and saliva (Feres et al 2015; Graziani et al, 2017; Kinane et al, 2017; Herrera et al, 2020). Although systematic reviews have reported that adjunctive local antibiotics improve PPD and CAL in short-term studies and PPD in long-term studies, their use is controversial due to high cost and small magnitude of clinically-relevant benefits (Feres et al 2015; Herrera et al, 2020). Local antibiotic therapies have been used more commonly during the maintenance phase to treat remaining and isolated recurrent pockets (Herrera et al, 2020).

SRP is effective in improving clinical parameters (e.g., BoP, PPD, CAL) for most patients with periodontitis, but not those with advanced periodontitis and deep periodontal pockets (Drisko, 2014; Feres et al, 2015; Graziani et al, 2017; Dar-Odeh et al, 2018). Several clinical trials, systematic reviews, and meta-analyses support the adjunctive effect of systemic antibiotics to improve the outcomes of SRP

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during both non-surgical and surgical therapies (Feres et al, 2015; Keestra et al, 2015; Dar-Odeh et al, 2018; Miller et al, 2017; Herrera et al, 2020; Nibali et al, 2019; Pretzl et al, 2019; Teughels et al, 2020). Systemic antibiotic therapy will be most effective if the disruption of subgingival biofilm by SRP occurs immediately before or during the antibiotic therapy (Keestra et al, 2015; Graziani et al, 2017). Stand-alone antibiotic therapy, however, is not effective in the treatment of periodontal disease (Drisko, 2014; Graziani et al, 2017). Systemic antibiotics are indicated when patients exhibit moderate periodontitis with three to four millimeters of CAL and PPD of less than five millimeters (Pretzl et al, 2019). Younger patients with periodontitis characterized by rapid attachment and bone loss (Drisko, 2014; Feres et al, 2015; Graziani et al, 2017; Dar-Odeh et al, 2018; Teughels et al, 2020), patients with necrotizing periodontitis (Drisko, 2014; Dar-Odeh et al, 2018), and those with periodontitis as a manifestation of systemic conditions (Graziani et al, 2017; Albandar et al, 2018; Dar-Odeh et al, 2018; Giannetti et al, 2020; Moghaddasi et al, 2021) may benefit significantly from adjunctive antibiotic therapies in combination with SRP. Several factors (e.g., patient's clinical parameters, health history, dental history, drug allergy, medication compliance, personal/parental preferences, adverse effects, bacterial resistance, treatment response in primary versus permanent dentitions) influence the decision to use topical or systemic antibiotic adjuncts to SRP (Merchant et al, 2014; Keestra et al, 2015; Miller et al, 2017; Kinane et al, 2017; Montenegro et al, 2020).

Systemic antibiotics have the advantage of reaching all oral surfaces and fluids, as well as the potential to reach periodontal pathogens that ultimately invade the host's tissues (Feres et al, 2015; Teughels et al, 2020). In addition, antibiotic therapy may reduce bacterial endotoxins helping to minimize the local inflammatory response (Kalash et al, 2015; Allin et al, 2016). Disadvantages of systemic administration include adverse drug effects (e.g., gastrointestinal symptoms, allergic reaction), poor patient compliance, and, very importantly, development of bacterial resistance due to indiscriminate use (Feres et al, 2015; Teughels et al, 2020). When compared to SRP alone, the combination of amoxicillin and metronidazole (and to a lesser degree, azithromycin and metronidazole) as an adjunctive therapy has shown to reduce the number of major periodontopathogenic bacteria, significantly improve CAL gain, and promote higher percentage of pocket closure, as well as reduce BoP, PPD, and frequency of pockets of $\geq$4 mm (Sgolastra et al, 2012; Feres et al, 2015; Keestra et al, 2015; Sgolastra et al, 2014; Rabelo et al, 2015; Miller et al, 2017; Herrera et al, 2020; Nibali et al, 2019; Pretzl et al, 2019; Teughels et al, 2020). Regimen durations of one to two weeks have been cited in the literature with respective advantages and disadvantages (Keestra et al, 2015; Graziani et al, 2017). For patients allergic to penicillin, antibiotic regimen using metronidazole alone is an alternative treatment (Rabelo et al, 2015). Additionally, azithromycin is

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effective against periodontal pathogens with positive immunomodulatory properties and has been proven effective in treating aggressive periodontitis in young patients (Haas et al. 2008) as well as adults (Zhang et al, 2016). Azithromycin is one of the safest antibiotics for patients allergic to the penicillins, but there are risks of cardiac complications including cardiotoxicity (Araújo & Demoly, 2008; Bartold et al, 2013). Cardiac risk in pediatric patients seems to be due to an increased risk of QT prolongation associated with higher dosage levels (Zeng et al, 2020) and caution should be exercised in patients with cardiac risk factors. *The Reference Manual of Pediatric Dentistry* includes information on recommended antibiotic dosage for children and adolescents, as well as for adults, available at https://www.aapd.org/globalassets/r_usefulmeds.pdf (AAPD Useful Meds 2022). Having the child drink a small cup of grape soda immediately after ingesting liquid antimicrobials may help mask the unpleasant smell and taste of the medication and increase compliance with the antibiotic regimen (Marek & Timmons, 2019).

Recommendations:

- Stand-alone antibiotic therapy is not recommended in the treatment of periodontal disease.
- Adjunctive antibiotic therapy to SRP should be considered for patients with advanced and/or aggressive periodontal disease.
- When adjunctive antibiotic therapy to SRP is indicated, the decision to use topical or systemic antibiotics should be carefully evaluated and based on patient's general health status, periodontal disease severity, compliance, and response to SRP.

Re-evaluation (determining success or lack of success of non-surgical therapy)

After procedures of phase I (e.g., debridement, scaling, root planing, caries control, correction of defective restorations) are completed, the periodontal tissues will go through a process of healing that may take four or more weeks to occur (Takei, 2019A). Transient tissue sensitivity is often observed during the healing process and usually diminished with good home plaque or biofilm control (Takei, 2019A). Re-evaluation findings help determine the need for any further non-surgical therapy procedure or periodontal surgery (Takei, 2019A).

Recommendations:

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- Components of re-evaluation appointments should include probing the periodontal tissues, examining all related anatomic structures, reinforcing home care regimens, and discussing existing harmful habits with a goal of cessation.
- The frequency of supportive periodontal therapy must be individualized and based on the patient's symptoms, clinical and radiographic findings, risk factors, the initial severity of the disease, as well as residual diseased sites at the end of the active periodontal treatment in relation to the patient's age, treatment outcome, caries risk, and plaque or biofilm control.

Systemic phase

The Reference Manual of Pediatric Dentistry includes information on several genetic and non-genetic systemic diseases and pathologies that are associated with manifestations on periodontal tissues (AAPD New resource pending). General characteristics, case definitions and/or diagnostic criteria, clinical and/or radiographic findings, as well as treatment considerations are presented for some of the conditions observed in pediatric patients.

Recommendations:

- Clinicians should consider systemic diseases and conditions that can affect the periodontal attachment apparatus or the course of periodontal diseases in order to achieve accurate diagnoses and plan treatment. (Albandar et al, 2018; Jepsen et al, 2018)
- Consultation with the patient's medical care provider may be necessary for management of at-risk patients. (Albandar et al, 2018; Jepsen et al, 2018)

Special management considerations

Respiratory diseases affecting the periodontium

Health of the periodontium depends on saliva's mechanical cleansing and antimicrobial properties. Respiratory diseases, either directly (e.g., mouth breathing) or through side effects (e.g., xerostomia) of therapeutic agents, may alter salivary flow (Ballikaya et al, 2018; Moraschini et al, 2018). Nasopharyngeal obstruction from adenoid and tonsillar hypertrophy, as well as significant neuromuscular weakness with a history of snoring, can also affect periodontal health (Ballikaya et al, 2018). Depending on the individual oral/dental needs of patients with respiratory diseases, the pediatric dentist plays an important role in early diagnosis of general and oral health problems associated with respiratory diseases, care management, and establishment of a multidisciplinary approach that may include, but is not limited to,

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orthodontists, primary care providers, otolaryngologists, and speech pathologists (Ballikaya et al, 2018). Regular dental check-ups with proper oral hygiene instructions for home plaque control, mouth rinsing after medications, and use of fluoride toothpaste are important preventive regimens to reduce the risk of periodontal disease and dental caries among patients with respiratory diseases (Ballikaya et al, 2018).

Recommendations:

- Clinicians should carefully evaluate the patient's health history and medications in order to identify respiratory conditions and medications that impact salivary flow and dental and periodontal health.
- If airway obstruction is determined to affect periodontal health, an evaluation by an otolaryngologist is recommended.
- Clinicians should consider a multidisciplinary approach, referral and/or care coordination for patients with general and/or oral health problems associated with respiratory diseases.

Oral conditions related to immunosuppressive or radiation therapies

Patients undergoing immunosuppressive and/or radiation therapies may present with periodontal problems associated with treatment. Gingival bleeding, soft tissue necrosis, salivary gland dysfunction, opportunistic infections (e.g., candidiasis, herpes simplex virus), and oral graft versus host disease are among the many acute and long-term complications associated with these therapies (Hong & da Fonseca, 2008; Epstein et al, 2012; da Fonseca, 2018; da Fonseca, 2019; AAPD Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Radiation Therapy, 2021). Special attention should be given to partially-erupted molars that may be at risk for pericoronitis (Hong et al, 2018, da Fonseca, 2019). When definitive periodontal therapy cannot be rendered, extraction of hopeless peridontally-involved teeth is the treatment of choice (Hong & da Fonseca, 2008; da Fonseca, 2019; AAPD Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Radiation Therapy, 2021). A periodontal assessment and appropriated therapy are indicated before patients undergoing cancer treatment receive bisphosphonates (AAPD Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Radiation Therapy, 2021). Refer to Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Radiation Therapy (AAPD Dental Management of Pediatric Patients Receiving Immunosuppressive Therapy and/or Radiation Therapy, 2021) for additional information on managing of periodontal considerations in these circumstances.

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Recommendations:

Clinicians should work closely with the patient and his caregivers, as well as with his multidisciplinary health care team, to ensure that any medically-necessary dental treatment is integrated, coordinated, and delivered in a timely and safe manner before, during, and after immunosuppression or radiation therapy (Epstein et al, 2012).

Drug-influenced gingival enlargements

Drug-influenced gingival enlargements have been associated with three types of medications: anticonvulsants (e.g., phenytoin, sodium valproate), calcium channel blockers (e.g., veramapil, diltiazem), and immunosuppressants (e.g., cyclosporine) (Camargo et al, 2019; Mawardi et al, 2021). In most cases, the gingival enlargement is induced by the combination of the drugs (i.e., fibrotic aspect) and the bacterial biofilm (i.e., inflammatory aspect) (Camargo et al, 2019). Treatment options may include: (1) possible drug discontinuation or change; (2) biofilm control by means of home oral hygiene, use of antimicrobial agents (e.g., CHX), frequent professional cleaning and SRP, removal of plaque-retentive areas (e.g., faulty restorations); and (3) surgical removal of enlarged gingiva (e.g., gingivectomy using a scalpel or laser-assisted therapy, flap surgery, or electrosurgery) (Murakami et al, 2017; Camargo et al, 2019; Mawardi et al, 2021).

Periodontal flap surgery to manage gingival enlargements are favored over gingivectomy in terms of minimizing the amount of tissue and time recurrences (Camargo et al, 2019). However, in general, gingivectomy is indicated for small areas of gingival enlargement (i.e., up to six teeth) where there is no evidence of CAL or the need for osseous surgery; while flap surgery is indicated for larger areas (i.e., more than six teeth) with evidence of CAL or the need for osseous surgery (Camargo et al, 2019). Antibiotic therapy as an adjunctive antimicrobial and anti-inflammatory agent has been proposed as another step in the management of gingival enlargements (Camargo et al, 2019; Mawardi et al, 2021).

Recommendations:

- Clinicians should understand the etiology of gingival enlargements before considering the best management approach.
- Biofilm control, SRP, and timely evaluation of the initial treatment response should occur before considering surgical therapy.

Oral soft-tissue and tooth-supporting structure injuries

Orofacial trauma can result in extraoral and intraoral soft tissue injuries such as lacerations, contusions, abrasions, and avulsions (Bourguignon et al, 2020; Levin et al, 2020). Traumatic dental injuries (**TDI**) (Drummond, 2017) almost always involve the periodontal tissues which may undergo ischemia, crushing, or loss. (Yu & Abbott, 2016; Drummond, 2017). Injuries to the periodontal ligament (**PDL**) may range from minor lacerations with dental concussion, tearing of the fibers with subluxation, to partial or complete separation with luxation or avulsion, (Hermann et al, 2012 [A]; Hermann et al, 2012 [B]) and loosening and displacement of the tooth can occur (Hermann et al, 2012 [A]; Hermann et al, 2012 [B]). When foreign bodies (e.g., gravel, tooth fragments) may be embedded within the injured soft tissues, clinical inspection is supplemented by a soft-tissue radiograph (Bourguignon et al, 2020). Removal of foreign bodies is necessary to avoid tissue infection, scarring, or tattooing (Andersson & Andreasen, 2018; Elias and Bauer, 2009). Cleansing, debridement, hemostasis, and closure are the major steps in managing soft tissue injuries with the goals to maintain tissue vascularity, enhance healing, and prevent tissue devitalization, as well as to minimize the risk of gingival recession and bone/root exposure (Elias and Bauer, 2009). Reapproximated soft tissue wounds are sutured using the minimal amount of small-diameter sutures (Andersson & Andreasen, 2018; Elias and Bauer, 2009). Because determining which wounds are tetanus prone is not possible, need for tetanus prophylaxis is based on the patient's current immunization status (Rhee et al, 2005). A decision for antibiotic prophylaxis is based on the severity and contamination status of the tissue injury (Day et al, 2019).

Splinting stabilizes traumatized teeth with the goals to optimize PDL reattachment and healing and to protect the teeth against further insult (Goswami & Eranhikkal, 2020; Sobczak-Zagalska & Emerich, 2020). Characteristics of an ideal splint for mobile traumatized teeth include being passive, flexible, and non-irritating to surrounding soft tissues as well as allowing for physiological tooth mobility and proper oral hygiene (Goswami & Eranhikkal, 2020; Sobczak-Zagalska & Emerich, 2020). Alveolar bone fractures require a more rigid splint with longer splinting time (Fouad et al, 2020).

The risk of PDL healing complications is very low for concussion, subluxation, extrusive and lateral luxation injuries and significantly more for TDI involving multiple teeth and teeth with full root development (Hermann et al, 2012 [A]; Hermann et al, 2012 [B]). The most common complications are "repair-related resorption (surface resorption), infection-related resorption (inflammatory resorption), ankylosis-related resorption (replacement resorption), marginal bone loss, and tooth loss" (Hermann et al, 2012 [B]). Ankylosis-related root resorption is an expected outcome in replanted teeth, especially with an extra-alveolar dry time longer than 60 minutes or transport medium other than one capable of maximizing the vitality of the PDL cells (e.g., milk, Hanks' Balanced Salt Solution) (Is Khinda et al, 2017; Fouad et al, 2020).

Recommendations:

- Management of orofacial soft tissue injuries should include cleansing, debridement, establishing hemostasis, and closure of wounds in a manner that maintains tissue vascularity, enhances healing, and prevents tissue devitalization.
- The clinician should determine the need for tetanus prophylaxis based on the patient's current immunization status. When immunization status is in doubt, evaluation by a physician within 48 hours is indicated. (Andersson & Andreasen, 2018; Day et al, 2019; Fouad et al, 2020; Callison & Nguyen, 2021).
- A decision for antibiotic prophylaxis should be based on the severity and contamination status of the tissue injury (Andersson & Andreasen, 2018; Day et al, 2019). Because the PDL of an avulsed tooth may have been contaminated by oral or environmental bacteria, systemic prophylactic antibiotics are recommended following tooth replantation (Fouad et al, 2020).
- Depending on the extent of the injury suffered by the periodontium, collaboration between the primary care dentist and a periodontologist may be needed to allow effective and successful clinical outcomes following dentoalveolar trauma.

Infections of bacterial, fungal, and viral origins

The gingiva may demonstrate a variety of lesions that are not caused by plaque and usually do not resolve after plaque removal (Caton et al, 2018). Infections of bacterial (e.g., necrotizing gingivitis), fungal (e.g., candidiasis), and viral (e.g., primary herpetic gingivostomatitis, recurrent intraoral herpes simplex infection) origins are some examples of non-plaque induced gingival lesions observed in the pediatric population (Silva et al, 2019). Successful treatment of infectious lesions requires clinicians to perform a thorough medical history appraisal, assessment of local and systemic contributing factors, and comprehensive oral examination aimed to achieve appropriate diagnoses and treatment plan. Elimination or reduction of all local and systemic risk factors that contribute to the infection initiation or progression is needed for treatment completeness, followed by close monitoring to assess treatment effectiveness, patient compliance, and risk of recurrence.

Recommendations:

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- Initial therapy should focus on alleviating acute symptoms of pain and distress. This could include oral analgesics to control fever, malaise, and pain, as well as fluids to prevent dehydration.
- Antimicrobial therapy should be considered when an infection is not self-limiting or if there are frequent recurrences.

Traumatic gingival and oral mucosa lesions

Traumatic lesions can be accidental, iatrogenic, or self-inflicted and are physical (e.g., oral piercing, aggressive toothbrushing), chemical (e.g. dental materials, topical cocaine), or thermal (e.g. overheated foods and drinks) in nature (Rawal et al, 2004; Holmstrup et al, 2018). The appearance of the lesion (e.g., acute ulcerations vs chronic gingival defects) and a detailed history are crucial in achieving a diagnosis. Self-injury behavior (**SIB**) has been reported among individuals with psychiatric illnesses (e.g., personality disorders, bipolar disorder, major depression, anxiety disorders, obsessive-compulsive disorder) and congenital insensitivity to pain (e.g., familial dysautonomia), as well as a variety of developmental and intellectual disabilities (e.g., autism) (Romer & Doughtery, 2009). Gingival picking/ scratching is among the most common oral SIB (Krejci, 2000; Medina et al, 2003; Rawal et al, 2004; Dilsiz & Aydinb, 2009; Romer & Doughtery, 2009; Malaga et al, 2016). Management of self-inflicted traumatic lesions may be complicated due to lack of patient's compliance. The patient's primary care provider may help rule out any medical reasons for SIB (e.g., otitis media, infection, pneumonia) or specific genetic disorders (e.g., Lesch-Nyhan syndrome) or determine comorbid psychiatric conditions. An approach that includes medical and behavioral specialists may be indicated. Periodontal plastic surgery (e.g., placing a graft to create or widen the attached keratinized tissue) (Takei, 2019B), may be necessary for permanent gingival defects (Krejci, 2000; Rawal et al, 2004; Dilsiz & Aydinb, 2009).

Recommendations:

- Management of traumatic oral lesions requires removal of the offending agent and symptomatic therapy.
- Treatment of SIB should be individualized; diagnosis and treatment of the underlying mechanism comprise the most successful approach (Malaga et al, 2016).
- Behavior modification, pharmacotherapy, immobilization devices, oral appliances to control harmful habits, and/or psychological or psychiatric support may be beneficial (Romer & Dougherty, 2009; Malaga et al, 2016).

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- Re-evaluation and monitoring management approaches should occur while treating self-inflicted traumatic lesions.

Pericoronitis

Pericoronitis refers to an inflammatory lesion developed when food debris and bacteria are present beneath the excess flap of soft tissue surrounding partially-erupted teeth, most frequently involving mandibular third molars (Klokkevold & Carranza, 2019B). The pericoronal flap of soft tissue may be chronic without any symptoms; however, when acute, patients may experience severe pain, mouth opening restriction, gingival abscess, cellulitis, fever, lymphadenopathy, and presence or risk for systemic complications (Schmidt et al, 2021). A rare complication is Ludwig's angina, a life-threatening condition that occurs when infection spreads to submandibular, sublingual, and submental spaces thereby compromising the patient's airway (Schmidt et al, 2021). The first course of treatment for acute pericoronitis is infection and pain management (Klokkevold & Carranza, 2019B; Schmidt et al, 2021). Nonsteroidal anti-inflammatory drugs (NSAIDs) are the analgesics of choice since the control of inflammation helps to control acute pain (Moussa & Ogle, 2022). Patient compliance for home oral hygiene is also key for treatment success (Schmidt et al, 2021). Once acute symptoms resolve, decisions can be made regarding the need for further treatment (e.g., pericoronal tissue surgery or tooth extraction) (Klokkevold & Carranza, 2019B; Schmidt et al, 2021).

Recommendations:

- Management during the acute phase should consist of (Klokkevold & Carranza, 2019B); Schmidt et al, 2021):
    - debridement and irrigation of the pericoronal area,
    - drainage of purulence to relieve pressure,
    - occlusion evaluation to determine the need to reduce soft tissue or adjust occlusion of opposing tooth,
    - pain control using NSAIDs,
    - antibiotics if the infection is not localized and/or if there are systemic signs and symptoms, and
    - home care plan to include oral cleaning, warm saline rinses, antiseptic agents (e.g., CHX), and sufficient fluid intake.

- After the acute phase, practitioners should (Klokkevold & Carranza, 2019B; Schmidt et al, 2021): evaluate prognosis and likelihood that the tooth involved will either erupt without complications or continue to pose a risk for pericoronitis recurrence and decide to either remove the pericoronal flap (if not removed during the acute phase) or extract the tooth to prevent recurrence.
- Ludwig's angina requires early recognition, immediate intervention (e.g., early and aggressive antibiotic therapy, surgical drainage, nutrition, hydration), and close monitoring. Due to the threat of rapid airway compromise, emergency referral to otolaryngology or oral maxillofacial surgery should occur without delay (Bridwell et al, 2021).

Considerations for treatment, coordination, and/or referral of care with a periodontist

Most pediatric patients will attain periodontal disease control with non-surgical therapy and not require further surgical intervention. When PPD are >5 mm, referral to a periodontal specialist may be indicated. Periodontal surgery may improve tooth support through pocket reduction, bone augmentation, and regeneration procedures (Takei, 2019A). Other considerations for referral include: (1) extent of the disease (generalized or localized periodontal involvement); (2) presence of short-rooted teeth; (3) teeth hypermobility; (4) difficulty in SRP deep pockets and furcations; (5) possibility of damage to the developing permanent successor tooth; (6) restorability and importance of particular teeth for reconstruction; (7) lack of resolution of inflammation after thorough plaque or biofilm removal and excellent SRP; (8) presence of systemic diseases and other conditions that compromise the host response; and (9) very importantly for the pediatric population, the age of the patient (Takei, 2019A). Younger patients, both systemically healthy and compromised, with extensive CAL are more likely to have aggressive forms of periodontitis that can be rapidly destructive necessitating timely advanced therapy. Early loss of primary teeth and bone loss visible on posterior bitewing radiographs are important indicators of aggressive forms of periodontitis that require further follow-up and/or referral (Devi et al, 2015). The possibility of an underlying systemic disease cannot be discarded.

The treatment for periodontitis as a manifestation of systemic conditions is dependent on the systemic disorder. Two fundamental treatment differences exist: (1) patients for whom the systemic disease and a conservative periodontal treatment approach do not represent grave danger to life; and (2) patients for whom the systemic disease (e.g., hypophosphatasia, leukocyte adhesion deficiency syndrome, neutropenia) and a conservative periodontal treatment approach may represent grave danger to life. Managing the periodontal diseases in these children, even when extractions of primary teeth at an early

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age is the treatment of choice, is crucial since such systemic diseases may endanger the children's lives (Delcourt-Debruyne et al, 2000; Lozano et al, 2014; Thumbigere et al, 2018; Ajitkumar et al, 2021).

In terms of coordination and referral of care with a periodontist, important considerations include (Kraut, 1996; Kraut et al, 2010):

- the primary care dentist will be working closely with the medical team, and all pertinent patient information needs to be available to the periodontist to determine the necessity of advanced periodontal therapies;
- the level and frequency of communication between the primary care dentist and the periodontist will be more than is required for healthy patients. Timely communication before and after each diagnostic and surgical appointment is essential; and
- the types and levels of behavioral and pharmacologic pain and anxiety control available in the periodontal office may not be ideal for the young patient. Seeing the patient together may help meet these needs.

Recommendations:

- The treatment of periodontitis as a manifestation of systemic disease where a conservative periodontal treatment approach may represent grave danger to the child's life should include communication with pediatrician or medical specialist, as well as a periodontist, to consider the risk and benefit of conservative periodontal treatment versus tooth extractions. Extraction may be the best treatment with a continuing periodontal infection causing severe destruction of bone and developing permanent teeth and endangering the child's life.
- The treatment of periodontitis as a manifestation of systemic disease where a conservative periodontal treatment approach does not represent grave danger to the child's life should include:
    - communication with the child's pediatrician or medical specialist about the systemic condition, its diagnosis based on the oral, laboratory analyses, and systemic findings, as well as coordination of systemic and periodontal treatments;
    - consultation, coordination, and/or referral of care with a periodontist if beyond the scope of pediatric dentistry practice;
    - nutritional evaluation and counseling;
    - assessment of traumatic gingival lesions, harmful habits, and self-injurious behavior;
    - oral prophylaxis, SRP, and individualized patient oral hygiene instruction;

- consideration of chemical adjunctive anti-plaque and anti-calculus agents;
- management of risk factors (e.g., caries lesions, defective restorations, dental trauma);
- consideration of topical antimicrobial adjuncts and systemic antibiotics;
- consideration of periodontal surgery for severe gingival or periodontal diseases; and
- recall appointments based on each individual compliance and treatment achievements.

Surgical Therapy (Phase II Therapy)

Periodontal surgical therapy, which includes "plastic, aesthetic, resective, and regenerative procedures, becomes necessary when access for root therapy is required or correction of anatomic or morphologic defects is necessary" (Takei, 2019B). Placement of dental implants can also be part of phase II therapy. The main goals of surgical therapy are to improve prognosis of the teeth and their replacements, as well as improve aesthetics (Takei, 2019B). During this phase, the role of the primary care dentist is to provide treatment or refer/coordinate the care with a periodontal specialist when the needed treatment exceeds the practitioner's scope of practice. Prior to any surgical therapy, clinicians should provide the patient an opportunity to have questions answered and obtain written informed consent to proceed with the therapy proposed. Following are some surgical therapy considerations.

Pocket reduction surgery

The primary goal of surgical pocket reduction is to create access for professional SRP and reduce PPD (Graziani et al, 2017; Takei 2019B). It is especially useful for areas with bony defects and/or with furcation involvement (Takei 2019B) and best limited for pockets depths > 5mm (Graziani et al, 2017). If successful, surgery will enable the patient to perform adequate home cleaning and maintain long-term periodontal health. The most common pocket reduction surgical procedures are resective (e.g., gingivectomy and flaps) and regenerative (e.g., flaps with graphs or membranes) (Takei 2019B).

Resective surgery

Gingivectomy The indication of gingivectomy in the treatment of periodontal disease is to remove the soft tissue of the pocket wall in order to create visibility and access for complete SRP. In combination with gingivoplasty (i.e., recontouring of the gingiva), gingivectomy can achieve a favorable environment for soft-tissue healing and physiological gingival contour (Deas et al, 2016; Takei 2019B). The two main advantages of gingivectomy are the ease and simplicity of this surgical procedure (Camargo et al, 2019). Due to secondary wound closure, gingivectomy procedures cause more postoperative discomfort and bleeding when compared to periodontal flap surgeries (Camargo et al, 2019). With advances in flap

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surgeries, gingivectomy is less utilized (Takei 2019B) but remains beneficial in the treatment of gingival enlargements and supra-bony pockets when the pocket wall is firm and fibrous (Deas et al, 2016; Do et al, 2019B). Gingivectomy is not indicated in cases when access to bone is required, the keratinized tissue zone is narrow, aesthetics is a concern, and risk for postoperative bleeding is increased (Camargo et al, 2019; Do et al, 2019B).

<u>Flap surgery</u> Periodontal flap surgery, the most widely used procedure for pocket therapy, provides great access for SRP, periodontal regeneration, and gingival and osseous resections (Takei 2019B) in moderate and deep posterior pockets. Due to esthetic concerns, non-surgical periodontal treatment in the anterior maxillary area is preferred; however, surgery is indicated when better visualization and SRP access are needed (Camargo et al, 2019; Takei 2019B). In addition, flap surgery allows primary closure improving both wound healing and patients' post-surgical discomfort (Deas et al, 2016; Takei 2019B). Conversely, the periodontal flap approach is more technically difficult compared to gingivectomy (Camargo et al, 2019).

Regenerative surgery

Periodontal regeneration aims to restore the lost periodontal tissues and their respective functions by the formation of new alveolar bone, cementum, and PDL (Larsson et al, 2016; Reynolds et al, 2015; Kao et al, 2019; Aimetti et al, 2021). In addition to managing intrabony and furcation defects resultant of periodontal diseases (Kao et al, 2019), regeneration may correct undesirable outcomes associated with resective surgical techniques such as loss of CAL and soft tissue recession (Stavropoulos et al, 2021). In cases of hopeless teeth, regeneration therapy is less costly when compared to extractions and dental implants (Cortellini et al, 2020). Several regeneration therapies including guided tissue regeneration and bone grafts (e.g., autogenous, allogenic, xenogenic, synthetic or alloplastic) have been studied (Larsson et al, 2016, Kao et al, 2019; Stavropoulos et al, 2021; Aimetti et al, 2021). Systematic and meta-analysis reviews have shown periodontal regeneration in intrabony defects results in shallower residual PPD and greater CAL gain than flap surgeries (Stavropoulos et al, 2021; Aimetti et al, 2021). In addition, a combination of regenerative approaches appears to be more effective when compared to regenerative monotherapies (Stavropoulos et al, 2021). Disadvantages of regenerative therapies include their technically-demanding surgical procedures and dependence on patients' compliance with home oral hygiene and professional maintenance care, as well as the need for longitudinal randomized clinical trials to provide more evidence regarding their long-term benefits (Kao et al, 2019; Stavropoulos et al, 2021; Aimetti et al, 2021).

Laser therapy

Lasers have been used successfully in several periodontal therapies such as gingivectomy/gingivoplasty, frenectomy, drug-induced gingival overgrowth reshaping, crown lengthening and exposure, depigmentation, and management of excess tissue in gummy smile and pericoronitis (Klokkevold et al, 2019D; Mossaad et al, 2021). Advantages associated with the use of lasers include better visualization during the surgical procedure due to hemostasis and coagulation, easier use than scalpels, reduced need of sutures, wound detoxification, enhanced healing, better patient acceptance, and post-operative pain control (Behdin et al, 2015; Jha et al, 2018, Klokkevold et al, 2019D; Protásio et al, 2019). Laser-assisted new attachment procedure (LANAP) has shown to initiate regeneration and improve clinical outcomes in the non-surgical treatment of moderate to advanced periodontitis, as either a monotherapy or as an adjunct to SRP (Jha et al, 2018, Klokkevold et al, 2019D), due to its benefits of detoxification, calculus removal, minimally invasive access for SRP, and killing of periodontal pathogens (Behdin et al, 2015; Jha et al, 2018, Klokkevold et al, 2019D). However, more data is needed to support the use of lasers as adjuncts to resective and regenerative therapies (Behdin et al, 2015, Jha et al, 2018). The greatest risk associated with lasers is unintentional tissue necrosis due to excessive temperatures (Klokkevold et al, 2019D). The use of laser in labial frenectomies has shown to be superior to scalpel regarding post-operative pain and discomfort during speech and mastication (Protásio et al, 2019), while its use for lingual frenotomies has not shown to be superior to other techniques (Messner et al, 2020).

Extractions of teeth due to periodontal reasons

Extraction of periodontally-compromised teeth may be the best management for some patients. Important considerations include previous unsuccessful therapies, dental implants as an alternative, cost-effectiveness of periodontal procedures, as well as the patient's systemic health, compliance, and finances (Larsson et al, 2016; Kao et al, 2019; Cortellini et al, 2020; Aimetti et al, 2021). For pediatric patients, extraction of primary teeth may be indicated if the periodontal lesion approximates the developing permanent successor, endangering the dental development.

Dental Implants

The placement of dental implants in younger patients requires a carefully coordinated and multidisciplinary team approach. In general, conservative treatment is indicated for growing patients with missing teeth. Important considerations include:

- the number of missing teeth along with soft and hard tissue anatomy,

- growth and development,
- systemic conditions and psychological and behavioral maturity (Bohner et al, 2019), and
- alternative therapies such as orthodontic and prosthetic treatments.

Assessment of growth and development is key to successful outcomes for dental implants in pediatric patients. Early placement of implants in the growing patient can result in rotation of the dental implant and infra-occlusion as the adjacent teeth continue to erupt and the jaw grows (Bohner et al, 2019). Patients vary considerably in their growth patterns, and individual patients may have periods of rapid and slower growth (Gross & Nowak, 2019). Thus, chronological age is not a good indicator of completion of growth. In contrast, skeletal maturation, assessed by cephalometric analysis or hand wrist radiographs, is a good determinant (Kamatham et al, 2019). While age is not the determining factor for when implants are appropriate and the evidence from long-term studies is still evolving, case reports give some indication of success (Lambert et al, 2017; Kamatham et al, 2019). A general recommendation exists for the age of 15 in girls and 17 for boys for implants in the maxillary anterior region (Kraut 1996; Lambert et, 2017; Bohner et al, 2019).

Recommendations:

- If PPD inhibits subgingival access or anatomic/morphologic defects require correction, the clinician should inform the patient of the need for and benefits/risks of periodontal surgical therapy, as well as treatment alternatives.
- Extraction of periodontally-compromised teeth may be the best management for some patients.
- Clinicians should consider referral to a specialist when the surgical interventions are beyond their scope of practice.
- Determination for advisability and timing of implant placement must be based on the specific circumstances of the individual patient. The patient's stage of growth and development is critical to treatment success.

Maintenance Phase

The long-term success of periodontal therapy outcomes is highly associated with the quality of recall maintenance (Graziani et al, 2017; Trombelli et al, 2020). Following are some considerations of the maintenance therapy phase:

- Determination of recall procedures (i.e., prophylaxis, periodontal maintenance)

- Determination of recall interval based on risk factors and history of disease
- Use of antimicrobial adjuncts during maintenance
- Individualized home care reinforcement
- Decision to when re-enter Phase I or Phase II therapy

A classic study (Axelsson & Lindhe, 1981) assessing the efficacy of a maintenance care program demonstrated that patients placed on a three-month recall maintained excellent oral hygiene parameters and stable periodontal attachment levels for two to six years following periodontal therapy, while the non-recall control group demonstrated significant periodontal attachment loss. A 30-year outcome report (Axelsson, Nyström et al. 2004) from this study (Axelsson & Lindhe, 1981) demonstrated that patients placed on an individualized maintenance program with a three to 12-month recall interval maintained stable periodontal conditions for 30 years. A review (Trombelli, et al. 2020) assessing predefined periodontal recall intervals conducive to periodontal health and stability concluded that evidence supports a two to four month recall interval for patients affected by moderate to advanced periodontal disease. Moreover, evidence supports a maintenance therapy program with at least 12-month interval recalls for patients who are periodontally healthy, are stable periodontally, or have mild forms of periodontitis (Trombelli, et al. 2020).

Recommendations:

- Clinicians should educate their patients and caregivers about the importance of supportive periodontal therapy to prevent disease relapse and provide individualized periodontal supportive care when needed.
- Every two to four months and at least every 12-month interval recalls are recommended for patients with higher and lower periodontal disease risk, respectively.

References

Aimetti M, Fratini A, Manavella V, et al. Pocket resolution in regenerative treatment of intrabony defects with papilla preservation techniques: A systematic review and meta-analysis of randomized clinical trials. J Clin Periodontol 2021;48(6):843-58.

Ajitkumar A, Yarrarapu SNS, Ramphul K. Chediak Higashi Syndrome. 2021 Oct 12. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021.

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Allin N, Cruz-Almeida Y, Velsko I, et al. Inflammatory response influences treatment of localized aggressive periodontitis. J Dent Res 2016;95(6):635-41.

Akef J, Weine FS, Weisman DP. The role of smoking in the progression of periodontal disease: A literature review. Comped Contin Educ Dent 1992;13:526-30.

Al Jamal G, Al-Batayneh OB, Hamamy D. The alveolar bone height of the primary and first permanent molars in healthy 6- to 9-year-old Jordanian children. Int J Paediatr Dent 2011;21(2):151-9.

Albandar JM, Susin C, Hughes FJ. Manifestations of systemic diseases and conditions that affect the periodontal attachment apparatus: Case definitions and diagnostic considerations. J Periodontol 2018;89(Suppl 1):S183-S203.

Alrayyes S, Hart TC. Periodontal disease in children. Dis Mon 2011;57(4):184-91.

American Academy of Pediatric Dentistry. Dental management of pediatric patients receiving immunosuppressive therapy and/or radiation therapy. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:471-9.

American Academy of Pediatric Dentistry. Resource section: Systemic diseases associated with periodontal conditions. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022. PENDING.

American Academy of Pediatric Dentistry. Useful medications for oral conditions. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022. PENDING.

Andersson L, Andreasen JO. Soft tissue injuries. In: Andreasen JO, Andreasen FM, Andersson L, eds. Textbook and Color Atlas of Traumatic Injuries to the Teeth. 5th ed. Copenhagen, Denmark: Wiley-Blackwell; 2018:626-44.

Antoniazzi RP, Zanatta FB, Rösing CK, Feldens CA. Association among periodontitis and the use of crack cocaine and other illicit drugs. J Periodontol 2016;87 (12):1396-405.

Araújo L, Demoly P. Macrolides allergy. Curr Pharm Des 2008;14(27):2840-62.

Axelsson P, Lindhe J. The significance of maintenance care in the treatment of periodontal disease. J Clin Periodontol 1981;8(4):281-94.

Axelsson P, Nyström B, Lindhe J. The long-term effect of a plaque control program on tooth mortality, caries and periodontal disease in adults. Results after 30 years of maintenance. J Clin Periodontol 2004;31(9):749-57.

Ballikaya E, Dogan BG, Onay O, Tekcicek MU. Oral health status of children with mouth breathing due to adenotonsillar hypertrophy. Int J Pediatr Otorhinolaryngol 2018; 113:11-15.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Bartold PM, du Bois AH, Gannon S, Haynes DR, Hirsch RS. Antibacterial and immunomodulatory properties of azithromycin treatment implications for periodontitis. Inflammopharmacology. 2013;21(4):321-38.

Behdin S, Monje A, Lin GH, Edwards B, Othman A, Wang HL. Effectiveness of laser application for periodontal surgical therapy: Systematic review and meta-analysis. J Periodontol 2015;86(12):1352-63.

Bernhardt O, Krey KF, Daboul A, et al. New insights in the link between malocclusion and periodontal disease. J Clin Periodontol 2019;46(2):144-59.

Bergström J, Eliasson S, Dock J. Exposure to tobacco smoking and periodontal health. J Clin Periodontol 2000;27(1):61-8.

Bimstein E, Soskolne AW. A radiographic study of interproximal alveolar bone crest between the primary molars in children. J Dent Child 1988;55:348–50.

Bimstein E, Eidelman E. Morphological changes in the attached and keratinized gingiva and gingival sulcus in the mixed dentition period. A 5-year longitudinal study. J Clin Periodontol 1988;15(3):175-9.

Bimstein E. Frequency of alveolar bone loss adjacent to proximal caries in the primary molars and healing due to restoration of the teeth. Pediatr Dent 1992;14(1):30-3.

Bimstein E, Treasure ET, Williams SM, Dever JG. Alveolar bone loss in 5-year-old New Zealand children: Its prevalence and relationship to caries prevalence, socio-economic status and ethnic origin. J Clin Periodontol 1994;21(7):447-50.

Bimstein E, Zaidenberg R, Soskolne AW. Alveolar bone loss and restorative dentistry in the primary molars. J Clin Pediatr Dent 1996;21(1):51-4.

Bimstein E, Matsson L. Growth and development considerations in the diagnosis of gingivitis and periodontitis in children. Pediatr Dent 1999;21(3):186-91

Bimstein E, Huja PE, Ebersole JL. The potential lifespan impact of gingivitis and periodontitis in children. J Clin Pediatr Dent 2013;38(2):95-9.

Bimstein E. Radiographic Description of the distribution of aggressive periodontitis in primary teeth. J Clin Pediatr Dent 2018;42(2):91-4.

Bohner L, Hanisch M, Kleinheinz J, Jung S. Dental implants in growing patients: A systematic review. Br J Oral Maxillofac Surg 2019;57(5):397-406.

Bouchard P, Carra MC, Boillot A, Mora F, Rangé H. Risk factors in periodontology: A conceptual framework. J Clin Periodontol 2017;44(2):125-31.

Bourguignon C, Cohenca N, Lauridsen E, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. Dent Traumatol 2020;36(4):314-30.

Bridwell R, Gottlieb M, Koyfman A, Long B. Diagnosis and management of Ludwig's angina: An evidence-based review. Am J Emerg Med 2021;41:1-5.

Cagetti MG, Wolf TG, Tennert C, Camoni N, Lingstrom P. Campus G. The role of vitamins in oral health. A systematic review and meta-analysis. Int J Environ Res Public Health 2020;17: 938.

Callison C, Nguyen H. Tetanus Prophylaxis. 2021. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021. PMID: 32644434.

Camargo PM, Pirih FQ, Takei HH, Carranza FA. Treatment of gingival enlargement. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier; 2019: 628-35.

Caton JG, Armitage G, Berglundh T, et al. A new classification scheme for periodontal and peri-implant diseases and conditions–Introduction and key changes from the 1999 classification. J Periodontol 2018;89(Suppl 1):S1-S8.

Chaffee BW, Couch ET, Ryder MI. The tobacco-using periodontal patient: Role of the dental practitioner in tobacco cessation and periodontal disease management. Periodontol 2000 2016;71(1):52-64.

Chapple IL, Van der Weijden F, Doerfer C, et al. Primary prevention of periodontitis: Managing gingivitis. J Clin Periodontol 2015;42(Suppl 16):S71-6.

Chapple ILC. Risk assessment in periodontal care: The principles. In: Chapple ILC, Papapanou P, eds. Risk assessment in oral health: A concise guide for clinical application. Switzerland, GA: Springer International; 2020:77-88.

Chang CP, Barker JC, Hoeft KS, Guerra C, Chung LH, Burke NJ. Importance of content and format of oral health instruction to low-income Mexican immigrant parents: A qualitative study. Pediatr Dent 2018 1;40(1):30-6.

Chiewchalermsri C, Sompornrattanaphan M, Wongsa C, Thongngarm T. Chlorhexidine allergy: Current challenges and future prospects. J Asthma Allergy 2020;9;13:127-33.

Chugh A, Kaur A, Kumar Patnana A, Kumar P, Chugh VK. Unisystem Langerhans cell histiocytosis in maxillofacial region in pediatrics: Comprehensive and systematic review. Oral Maxillofac Surg 2021;25(4):429-44.

Clavero J, Baca P, Junco P, Gonzalez MP. Effects of 0.2% chlorhexidine spray applied once or twice daily on plaque accumulation and gingival inflammation in a geriatric population. J Clin Periodontol 2003;30:773-7.

Clerehugh V, Tugnait A. Diagnosis and management of periodontal diseases in children and adolescents. Periodontol 2000 2001;26:146-68.

Cole E, Ray-Chaudhuri A, Vaidyanathan M, Johnson J, Sood S. Simplified basic periodontal examination (BPE) in children and adolescents: A guide for general dental practitioners. Dent Update 2014;41(4):328-37.

Cortellini P, Stalpers G, Mollo A, Tonetti MS. Periodontal regeneration versus extraction and dental implant or prosthetic replacement of teeth severely compromised by attachment loss to the apex: A randomized controlled clinical trial reporting 10-year outcomes, survival analysis and mean cumulative cost of recurrence. J Clin Periodontol 2020;47(6):768-76.

da Fonseca M. Childhood cancer. In: Nowak AJ, Casamassimo PS, eds. The Handbook of Pediatric Dentistry. 5th ed. Chicago, Ill.: American Academy of Pediatric Dentistry; 2018:361-9.

da Fonseca M. Oral and dental care of local and systemic diseases. In: Nowak AJ, Christensen JR, Mabry TR, Townsend JA, Wells MH, eds. Pediatric Dentistry Infancy Through Adolescence. 6th ed. Philadelphia, PA: Elsevier; 2019:66-76.

Dar-Odeh N, Fadel HT, Abu-Hammad S, Abdeljawad R, Abu-Hammad OA. Antibiotic prescribing for oro-facial infections in the paediatric outpatient: A review. Antibiotics (Basel) 2018 25;7(2):38.

Day PF, Duggal M, Nazzal H. Interventions for treating traumatised permanent front teeth: Avulsed (knocked out) and replanted. Cochrane Database Syst Rev 20195;2(2):CD006542.

Deas DE, Moritz AJ, Sagun RS Jr, Gruwell SF, Powell CA. Scaling and root planing vs. conservative surgery in the treatment of chronic periodontitis. Periodontol 2000 2016;71(1):128-39.

Delcourt-Debruyne EM, Boutigny HR, Hildebrand HF. Features of severe periodontal disease in a teenager with Chédiak-Higashi syndrome. J Periodontol 2000;71(5):816-24.

Devi A, Narwal A, Bharti A, Kumar V. Premature loss of primary teeth with gingival erythema: An alert to dentist. J Oral Maxillofac Pathol. 2015;19(2):271.

Dilsiz A, Aydin T. Self-inflicted gingival injury due to habitual fingernail scratching: A case report with a 1-year follow up. Eur J Dent 2009;3(2):150-4.

Douglass CW. Risk assessment and management of periodontal disease. J Am Dent Assoc 2006;137 (Suppl):27S-32S.

Do JH, Takei HH, Carranza FA (A). The treatment plan. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 426-30.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Do JH, Takei HH, Whang M, Shin K (B). Periodontal surgical therapy. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 609-27.

Drisko CL. Periodontal debridement: Still the treatment of choice. J Evid Based Dent Pract 2014;14 Suppl:33-41.e1.

Drummond BK, Brosnan MG, Leichter JW. Management of periodontal health in children: Pediatric dentistry and periodontology interface. Periodontol 2000 2017;74(1):158-67.

Elangovan S, Novak KF, Novak MJ. Clinical risk assessment. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's clinical periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 410-12.

Elhennawy K, Schwendicke F. Managing molar-incisor hypomineralization: A systematic review. J Dent 2016;55:16-24.

Elias H, Baur DA. Management of trauma to supporting dental structures. Dent Clin North Am 2009;53(4):675-89

Epstein JB, Thariat J, Bensadou R, et al. Oral complications of cancer and cancer therapy: From cancer treatment to survivorship. CA Cancer J Clin 2012;62(6):400-22.

Fouad AF, Abbott PV, Tsilingaridis G, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. Dent Traumatol 2020;36:331-42.

Featherstone JD, White JM, Hoover CI, et al. A randomized clinical trial of anticaries therapies targeted according to risk assessment (caries management by risk assessment). Caries Res 2012;46(2):118-29.

Featherstone JDB, Chaffee BW. The evidence for caries management by risk assessment (CAMBRA®). Adv Dent Res 2018;29(1):9-14.

Feres M, Figueiredo LC, Soares GM, Faveri M. Systemic antibiotics in the treatment of periodontitis. Periodontol 2000 2015;67(1):131-86.

Giannetti L, Roberto Apponi R, Dello Diago AM, Jafferany M, Goldust M, Sadoughifar R. Papillon-Lefèvre syndrome: Oral aspects and treatment. Dermatol Ther 2020;33(3):e13336.

Gorbunkova A , Pagni G, Brizhak A, Farronato G, Rasperini G. Impact of orthodontic treatment on periodontal tissues: A narrative review of multidisciplinary literature. Int J Dent 2016;2016:4723589.

Goswami M, Eranhikkal A. Management of traumatic dental injuries using different types of splints: A case series. Int J Clin Pediatr Dent 2020;13(2):199-202.

Goultschin J, Cohen HD, Donchin M, Brayer L, Soskolne WA. Association of smoking with periodontal treatment needs. J Periodontol 1990;61(6):364-7.

Graziani F, Karapetsa D, Alonso B, Herrera D. Nonsurgical and surgical treatment of periodontitis: How many options for one disease? Periodontol 2000 2017;75(1):152-88.

Gross El, Nowak AJ. The dynamics of change. In: Nowak AJ, Christensen JR, Mabry TR, Townsend JA, Wells MH, eds. Pediatric Dentistry Infancy Through Adolescence. 6th ed. Philadelphia, PA: Elsevier;2019:181-99.

Haas AN, de Castro GD, Moreno T, et al. Azithromycin as an adjunctive treatment of aggressive periodontitis: 12-months randomized clinical trial. J Clin Periodontol 2008;35(8):696-704.

Hermann NV, Lauridsen E, Ahrensburg SS, Gerds TA, Andreasen JO (A). Periodontal healing complications following concussion and subluxation injuries in the permanent dentition: A longitudinal cohort study. Dent Traumatol 2012;28(5):386-93.

Hermann NV, Lauridsen E, Ahrensburg SS, Gerds TA, Andreasen JO (B). Periodontal healing complications following extrusive and lateral luxation in the permanent dentition: A longitudinal cohort study. Dent Traumatol 2012;28(5):394-402.

Herrera D, Matesanz P, Martín C, Oud V, Feres M, Teughels W. Adjunctive effect of locally delivered antimicrobials in periodontitis therapy: A systematic review and meta-analysis. J Clin Periodontol 2020;47 Suppl 22:239-56.

Holmstrup P, Plemons J, Meyle J. Non-plaque-induced gingival diseases. J Periodontol 2018;89(Suppl 1): S28-S45.

Hong CH, Marcio da Fonseca. Considerations in the pediatric population with cancer. Dent Clin North Am 2008;52(1):155-8.

Hong CHL, Hu S, Haverman T, et al. A systematic review of dental disease management in cancer patients. Support Care Cancer 2018;26(1):155-74.

Is Khinda V, Kaur G, S Brar G, Kallar S, Khurana H. Clinical and practical implications of storage media used for tooth avulsion. Int J Clin Pediatr Dent 2017;10(2):158-65.

James P, Worthington HV, Parnell C, et al. Chlorhexidine mouthrinse as an adjunctive treatment for gingival health. Cochrane Database Syst Rev 2017;31;3(3):CD008676.

Jepsen S, Caton JG, Albandar JM, et al. Periodontal manifestations of systemic diseases and developmental and acquired conditions: Consensus report of workgroup 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol 2018;89(Suppl 1):S237-S248.

Jha A, Gupta V, Adinarayan R. LANAP, Periodontics and beyond: A review. J Lasers Med Sci 2018;9(2):76-81.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Kalash D, Vovk A, Huang H, Aukhil I, Wallet SM, Shaddox LM. Influence of periodontal therapy on systemic lipopolysaccharides in children with localized aggressive periodontitis. Pediatr Dent 2015;37(5):35-40.

Kamatham R, Avisa P, Vinnakota DN, Nuvvula S. Adverse effects of implants in children and adolescents: A systematic review. J Clin Pediatr Dent 2019;43(2):69-77.

Kanellis MJ, Owais AI, Warren JJ, et al. Managing caries in the primary dentition with silver nitrate: Lessons learned from a clinical trial. J Calif Dent Assoc 2018:46(1):37-44.

Kao RT, Takei HH, Cochran DL. Periodontal regeneration and reconstructive surgery. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019:642-52.

Keestra JA, Grosjean I, Coucke W, Quirynen M, Teughels WJ. Non-surgical periodontal therapy with systemic antibiotics in patients with untreated chronic periodontitis: A systematic review and meta-analysis. Periodontal Res 2015;50(3):294-314.

Kinane DF, Stathopoulou PG, Papapanou PN. Periodontal diseases. Nat Rev Dis Primers 2017 22;3:17038.

Klokkevold PR, Mealey BL (A). Influence of systemic conditions. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 208-24.

Klokkevold PR, Carranza FA (B). Treatment of acute gingival disease. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 488-92.

Klokkevold PR, Takei HH, Carranza FA (C). General principles of periodontal surgery. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 599-608.

Klokkevold PR, Butler B, Kao RT (D). Lasers in periodontal and peri-implant therapy. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 688-95.

Kraut RA. Dental implants for children: Creating smiles for children without teeth. Pract Periodontics Aesthet Dent 1996;8(9):909-13.

Kraut R. Implants for children. In: Babbush CA, Hahn JA, Krauser JT, Rosenlicht JL, eds. Dental Implants-E-Book: The Art and Science. 2nd ed. Maryland Heights, MO: Saunders Elsevier; 2010: 389-402.

Krejci CB. Self-inflicted gingival injury due to habitual fingernail biting. J Periodontol 2000;71(6):1029-31.

Kwok V, Caton JG. Commentary: Prognosis revisited: A system for assigning periodontal prognosis. J Periodontol 2007;78(11):2063-71.

Lambert F, Botilde G, Lecloux G, Rompen E. Effectiveness of temporary implants in teenage patients: A prospective clinical trial. Clin Oral Implants Res. 2017;28(9):1152-57.

Lang NP, Suvan JE, Tonetti MS. Risk factor assessment tools for the prevention of periodontitis progression a systematic review. J Clin Periodontol 2015;42 Suppl 16:S59-70.

Larsson L, Decker AM, Nibali L, Pilipchuk SP, Berglundh T, Giannobile WV. Regenerative medicine for periodontal and peri-implant diseases. J Dent Res. 2016;95(3):255-66.

Levin L, Day PF, Hicks L, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: General introduction. Dent Traumatol 2020;36(4):309-13.

Li L, Wong HM, Sun L, Wen YF, McGrath CP. Anthropometric measurements and periodontal diseases in children and adolescents: A systematic review and meta-analysis. Adv Nutr 2015;13;6(6):828-41.

Liippo J, Kousa P, Lammintausta K. The relevance of chlorhexidine contact allergy. Contact Dermatitis 2011;64(4):229-34.

Lozano ML, Rivera J, Sánchez-Guiu I, Vicente V. Towards the targeted management of Chediak-Higashi syndrome. Orphanet J Rare Dis 2014;9:132.

Luo PP, Xu HS, Chen YW, Wu SP. Periodontal disease severity is associated with micronutrient intake. Aust Den J 2018;63(2):193-201.

Machuca G, Rosales I, Lacalle JR, et al. Effect of cigarette smoking on periodontal status of healthy young adults. J Periodontol 2000;71:73-8.

Malaga EG, Aguilera EMM, Eaton C, Ameerally P. Management of self-harm injuries in the maxillofacial region: A report of 2 cases and review of the literature. Oral Maxillofac Surg 2016;74(6):1198.e1-9.

Marek CL, Timmons SR. Antimicrobials in pediatric dentistry. In: Nowak AJ, Christensen JR, Mabry TR, Townsend JA, Wells MH, eds. Pediatric Dentistry Infancy Through Adolescence. 6th ed. Philadelphia, PA: Elsevier;2019:128-41.

Martens L, Smet SD, Yusof MYPM, Rajasekharan S. Association between overweight/obesity and periodontal disease in children and adolescents: A systematic review and meta-analysis. Eur Arch Paediatr Dent 2017;18(2):69-82.

Mawardi H, Alsubhi A, Salem N, et al. Management of medication-induced gingival hyperplasia: A systematic review. Oral Surg Oral Med Oral Pathol Oral Radiol 2021;131(1):62-72.

This draft does not constitute an official AAPD health oral policy or clinical recommendation until approval by the General Assembly. Circulation is limited to AAPD members.

Medina AC, Sogbe R, Gómez-Rey AM, Mata M. Factitial oral lesions in an autistic paediatric patient. Int J Paediatr Dent 2003;13(2):130-7.

Merchant SN, Vovk A, Kalash D, et al. Localized aggressive periodontitis treatment response in primary and permanent dentitions. J Periodontol 2014;85(12):1722-9.

Messner AH, Walsh J, Rosenfeld RM, et al. Clinical consensus statement: Ankyloglossia in children. Otolaryngol Head Neck Surg 2020;162(5):597-611.

Miller KA, Branco-de-Almeida LS, Wolf S, et al. Long-term clinical response to treatment and maintenance of localized aggressive periodontitis: A cohort study. J Clin Periodontol 2017;44(2):158-68.

Moghaddasi M, Ghassemi M, Shekari Yazdi M, Habibi SAH, Mohebi N, Goodarzi A. The first case report of Haim Munk disease with neurological manifestations and literature review. Clin Case Rep 2021;9(9):e04802.

Montenegro SCL, Retamal-Valdes B, Bueno-Silva B, et al. Do patients with aggressive and chronic periodontitis exhibit specific differences in the subgingival microbial composition? A systematic review. J Periodontol 2020;91(11):1503-20.

Montiel-Company JM, Almerich-Silla JM. Efficacy of two antiplaque and antigingivitis treatments in a group of young mentally retarded patients. Med Oral 2002;7:136-43.

Moraschini V, Calasans-Maia JA, Calasans-Maia MD. Association between asthma and periodontal disease: A systematic review and meta-analysis. J Periodontol 2018;89(4):440-55.

Mossaad AM, Abdelrahman MA, Kotb AM, Alolayan AB, Elsayed SA. Gummy smile management using diode laser gingivectomy versus botulinum toxin injection: A prospective study. Ann Maxillofac Surg 2021;11(1):70-4.

Moussa N, Ogle OE. Acute pain management. Oral Maxillofac Surg Clin North Am 2022;34(1):35-47.

Mullins JM, Even JB, White JM. Periodontal management by risk assessment: A pragmatic approach. J Evid Based Dent Pract 2016;16 Suppl:91-8.

Murakami S, Mealey BL, Mariotti A, Chapple ILC. Dental plaque–induced gingival conditions. J Periodontol 2018;89(Suppl 1):S17-S27.

Najeeb S, Zafar MS, Khurshid Z, Zohaib S, Almas K. The role of nutrition in periodontal health: An update. Nutrients 2016;8(9):530.

Needleman HL, Ku TC, Nelson L, Allred E, Seow WK. Alveolar bone height of primary and first permanent molars in healthy seven- to nine-year-old children. J Dent Child 1997;64:188-96.

Ng MW, Sulyanto R. Chronic disease management of caries in children and the role of silver diamine fluoride. J Calif Dent Assoc 2018:46(1):23-34.

Nibali L, Koidou VP, Hamborg T, Donos N. Empirical or microbiologically guided systemic antimicrobials as adjuncts to non-surgical periodontal therapy? A systematic review. J Clin Periodontol 2019;46(10):999-1012.

Pemberton NN, Gibson J. Chlorhexidine and hypersensitivity reactions in dentistry. Br Dent J 2012;213(11):547-50.

Perry DA, Takei HH, Do JH. Plaque biofilm control for the periodontal patient. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier; 2019: 511-20.

Petsos H, Arendt S, Eickholz P, Nickles K, Dannewitz B. Comparison of two different periodontal risk assessment methods with regard to their agreement: Periodontal risk assessment versus periodontal risk calculator. J Clin Periodontol 2020;47(8):921-32.

Pretzl B, Sälzer S, Ehmke B, et al Administration of systemic antibiotics during non-surgical periodontal therapy-a consensus report. Clin Oral Investig. 2019;23(7):3073-85.

Protásio ACR, Galvão EL, Falci SGM. Laser techniques or scalpel incision for labial frenectomy: A meta-analysis. J Maxillofac Oral Surg 2019;18(4):490-9.

Quirynen M, Laleman I, de Geest S, de Hous C, Dekeyser C, Teughels W. Breath malodor. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 521-30.

Rabelo CC, Feres M, Gonçalves C,et al. Systemic antibiotics in the treatment of aggressive periodontitis. A systematic review and a Bayesian Network meta-analysis. J Clin Periodontol 2015;42(7):647-57

Rawal SY, Claman LJ, Kalmar JR, Tatakis DN. Traumatic lesions of the gingiva: A case series. J Periodontol 2004;75(5):762-9.

Renz ANPJ, Newton JT. Changing the behavior of patients with periodontitis. Periodontol 2000. 2009;51:252-68.

Reynolds MA, Kao RT, Camargo PM, et al. Periodontal regeneration - intrabony defects: A consensus report from the AAP Regeneration Workshop. J Periodontol 2015;86(2 Suppl):S105-7.

Rhee P, Nunley MK, Demetriades D, Velmahos G, Doucet JJ. Tetanus and trauma: A review and recommendations. J Trauma 2005;58(5):1082-8.

Romer M, Dougherty NJ. Oral self-injurious behaviors in patients with developmental disabilities. Dent Clin North Am 2009;53(2):339-50.

Sai Sujai GV, Triveni VS, Barath S, Harikishan G. Periodontal risk calculator versus periodontal risk assessment. J Pharm Bioallied Sci 2015;7(Suppl 2):S656-9.

Sambunjak D, Nickerson JW, Poklepovic T, et al. Flossing for the management of periodontal diseases and dental caries in adults. Cochrane Database Syst Rev 2011;(12):CD008829.

Schmidt J, Kunderova M, Pilbauerova N, Kapitan M. A review of evidence-based recommendations for pericoronitis management and a systematic review of antibiotic prescribing for pericoronitis among dentists: Inappropriate pericoronitis treatment is a critical factor of antibiotic overuse in dentistry. Int J Environ Res Public Health. 2021;18(13):6796.

Sgolastra F, Petrucci A, Gatto R, Monaco A. Effectiveness of systemic amoxicillin/metronidazole as an adjunctive therapy to full-mouth scaling and root planing in the treatment of aggressive periodontitis: A systematic review and meta-analysis. J Periodontol 2012;83(6):731-43.

Sgolastra F, Severino M, Petrucci A, Gatto R, Monaco A. Effectiveness of metronidazole as an adjunct to scaling and root planing in the treatment of chronic periodontitis: A systematic review and meta-analysis. J Periodontal Res. 2014;49(1):10-9.

Shariff JA, Ahluwalia KP, Papapanou PN. Relationship between frequent recreational cannabis (marijuana and hashish) use and periodontitis in adults in the United States: National Health and Nutrition Examination Survey 2011 to 2012. J Periodontol 2017;88(3):273-80.

Shibly O, Cummings KM, Zambon JJ. Resolution of oral lesions after tobacco cessation. J Periodontol 2008;79:1797-801.

Silva DR, Law CS, Duperon DF, Carranza FA. Gingival disease in childhood. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 277-86.

Sjödin B, Matsson L. Marginal bone loss in the primary dentition. A survey of 7-9-year-old children in Sweden. J Clin Periodontol 1994;21(5):313-9.

Sobczak-Zagalska H, Emerich K. Best splinting methods in case of dental injury: A literature review. J Clin Pediatr Dent 2020;44(2):71-8.

Stenberg WV. Periodontal problems in children and adolescents. In: Nowak AJ, Christensen JR, Mabry TR, Townsend JA, Wells MH, eds. Pediatric Dentistry Infancy Through Adolescence. 6th ed. Philadelphia, PA: Elsevier; 2019: 371-8.

Stavropoulos A, Bertl K, Spineli LM, Sculean A, Cortellini P, Tonetti M. Medium- and long-term clinical benefits of periodontal regenerative/reconstructive procedures in intrabony defects: Systematic review and network meta-analysis of randomized controlled clinical studies. J Clin Periodontol 2021;48(3):410-30.

Takei HH. Phase I periodontal therapy. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman And Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 506-10.

Takei HH. Phase II periodontal therapy. In: Newman MG, Takei HH, Klokkevold PR, Carranza FA, eds. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia, PA: Elsevier;2019: 585-9.

Teughels W, Feres M, Oud V, Martín C, Matesanz P, Herrera D. Adjunctive effect of systemic antimicrobials in periodontitis therapy: A systematic review and meta-analysis. J Clin Periodontol 2020;47 Suppl 22:257-81.

Thumbigere Math V, Rebouças P, Giovani PA, et al. Periodontitis in Chédiak-Higashi Syndrome: An altered immunoinflammatory response. JDR Clin Trans Res 2018;3(1):35-46.

Trombelli L, Minenna L, Toselli L, et al. Prognostic value of a simplified method for periodontal risk assessment during supportive periodontal therapy. J Clin Periodontol 2017;44(1):51-7.

Trombelli L, Farina R, Silva CO, Tatakis DN. Plaque induced gingivitis: Case definition and diagnostic considerations. J Periodontol 2018;89(Suppl 1):S46-S73.

Trombelli L, Simonelli A, Franceschetti G, Maietti E, Farina R. What periodontal recall interval is supported by evidence? Periodontol 2000 2020;84(1):124-33.

Tugnait A, Clerehugh V, Hirschmann PN. The usefulness of radiographs in diagnosis and management of periodontal diseases: A review. J Dent 2000;28(4):219-26.

Valera-López A, Navarro-Hortal MD, Giamperi F, Bullón O, Battino M, Quiles JL. Nutraceuticals in periodontal health: A systematic review on the role of vitamins in periodontal health maintenance. Molecules 2018;23(5):1226.

Varoni E, Tarce M, Lodi G, Carrassi A. Chlorhexidine (CHX) in dentistry: State of the art. Minerva Stomatol 2012;61(9):399-419.

Warnakulasuriya S, Dietrich T, Bornstein MM. Oral health risks of tobacco use and effect of cessation. Int Journal. 2010;7-30.

Yu CY, Abbott PV. Responses of the pulp, periradicular, and soft tissues following trauma to the permanent teeth. Aust Dent J 2016;61 Suppl 1:39-58.

Zeng L, Xu P, Choonara I, et al. Safety of azithromycin in pediatrics: A systematic review and meta-analysis. Eur J Clin Pharmacol. 2020;76(12):1709-21.

Zhang J, Ab Malik N, McGrath C, Lam O. The effect of antiseptic oral sprays on dental plaque and gingival inflammation: A systematic review and meta-analysis. Int J Dent Hyg. 2019;17(1):16-2.

Zhang Z, Zheng Y, Bian X. Clinical effect of azithromycin as an adjunct to non-surgical treatment of chronic periodontitis: A meta-analysis of randomized controlled clinical trials. J Periodontal Res 2016;51(3):275-83.