Quality Resource Guide

Eighth Edition

Clinical Decision-Making for Caries Management in Children

Author Acknowledgements

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Educational Objectives

Following this unit of instruction, the practitioner should be able to:

1. Describe the factors, besides clinical examination and radiographs, that are involved in diagnosing the dental carious process in children.
2. List several significant caries risk indicators in children.
3. Understand clinical methods that can arrest the progression of carious lesions.
4. Be able to integrate patient-specific care, evidence-based care, and parent preferences in developing a caries management care pathway for a child.

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The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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Introduction

Dental caries is a multifactorial disease that involves microbial, behavioral, genetic and environmental factors. It is the most prevalent chronic disease of children and adults, with approximately 525 million children having untreated caries in primary teeth, and approximately 3 billion individuals with permanent teeth having untreated caries.[1] Dental caries is defined as a biofilm-mediated, sugar-driven, multifactorial dynamic disease that results in an imbalance between the processes of demineralization and remineralization of dental hard tissues. This review intends to integrate current knowledge of diagnosis and cariology into clinically usable concepts and procedures to aid in the management of dental caries in children. The type and intensity of preventive and restorative therapy should be determined using data from not only clinical and radiographic examinations, but also from a broad understanding of cariology applied to a specific child.

Historically, the management of dental caries in primary and permanent teeth has involved clinical and radiographic identification of carious lesions followed by restorative intervention to remove and restore affected enamel and dentin. Only modest changes have occurred in this surgical approach to dental caries treatment over the years. However, there are convincing trends from clinical research showing that caries management encompasses disease prevention, arresting caries progression, and restoring teeth. Such therapy in a child patient requires an understanding of the natural history of caries progression, caries risk assessment, the ability to reduce a child's caries risk, caries management pathways, as well as the parents' preferences and expectations.

Natural History of Dental Caries

Dental caries results from a shift in the oral microbiome from a diverse symbiotic community to a state of bacterial dysbiosis. This imbalance, primarily driven by sugar stress, is characterized by reduced diversity and an overgrowth of aciduric bacteria that can thrive in low-pH environments. Such tooth adherent bacteria metabolize dietary carbohydrates (mainly sugars) to produce acids that, if they lower the tooth biofilm to a "critical pH" long enough, demineralization of the tooth will result. The management of dental caries is dependent on its extent and depth. With incipient dentinal caries, arrestment is possible by changing the environment and enhancing preventive procedures. However, if the lesion cavitates, remineralization is less likely to be possible, and restorative treatments may be necessary to restore function, esthetics, and most importantly, seal the dentin from the oral cavity.

Caries Risk Assessment

The process of caries risk assessment (CRA) affords the provider and the patient an understanding of the individual's disease factors, anticipates if there will be progression or stabilization of the caries, aids in determining the intensity of preventive measures, and recall intervals. Risk factors strongly associated with increased dental caries prevalence include the presence of enamel hypoplasia, a history of caries experience, a high dental plaque index, and non-cavitated (white spot) lesions.[2] Most CRA tools categorize risk into three categories (*i.e.*, low, moderate, and high), but from a practical perspective, it is not possible to separate patients into more than two risk categories. In practice, it

Table 1 - Caries risk indicators, diagnostic procedures, preventive and restorative therapy based on a child's risk.

	Low Risk	Elevated Risk
Caries Risk Indicators	• Child has no caries • No new lesions in one year • No white spot lesions • High SES*	• Child has one or more proximal lesions • More than two new lesions/year • Numerous white spot lesions • Mother/caregiver has active caries • Low SES* • Appliances in the mouth • High frequency sugar consumption
Diagnostic Procedures	• Examination interval 12 months • Radiograph interval 24 months	• Examination interval three months • Radiograph interval six months • Diet analysis
Preventive Therapy	• Brushing with fluoride toothpaste twice daily	• Brushing with fluoride toothpaste twice daily • Systemic fluoride supplements** • Professional topical fluoride treatment every three months • Sealants • Brushing with high potency fluoride gel (over age six) • Dietary counseling
Restorative Therapy	• None	• Active surveillance white spot lesions • Restoration of enamel approximal lesions • Restoration of progressing lesions • Restoration of cavitated lesions

* SES = socioeconomic setting ** Age and water supply considerations

is sufficient to focus on identifying patients at the extremes of the risk spectrum, as those at "low risk" and those at "elevated risk" have distinct management needs (**Table 1**).

Fluoride

Community water fluoridation and topical fluoride therapy can be complex and sometimes controversial. The initial study demonstrating the efficacy of community water fluoridation was the Newburgh and Kingston study, which reported a 50% decrease in caries after the addition of fluoride (1 part per million concentration) to the Newburgh community water supply.[3] Later studies in the US reported an 18% lower caries rate in communities with fluoridated water. The variance from the initial study was ascribed to a "halo effect" of food and beverages produced in communities having water fluoridation.[4] Studies in children at low risk for caries indicated smaller caries reductions due to community water fluoridation.[5] An established risk associated with fluoride ingestion is dental fluorosis, which is esthetically apparent in 12 percent of children consuming water with fluoride levels of 0.7 mg/liter (ppm).[5] Some have proposed that fluoride can negatively affect a child's intelligence quotient (IQ). There is no established biological basis for a neurological risk associated with fluoride, and a systematic review of 31 studies found that fluoride exposure at the recommended concentration levels is not associated with lower IQ scores.[6]

The daily use of fluoride toothpaste is considered the principal reason dental caries has declined worldwide. It is generally accepted that individuals brush their teeth twice a day. A meta-analysis of 70 efficacy studies on fluoridated toothpaste revealed that fluoridated toothpaste has an overall preventive fraction of 24% compared to placebo toothpastes.[7] To reduce the risk of fluorosis in preschool children it is recommended to reduce the quantity of toothpaste applied to the brush. Children under age three should have their teeth brushed twice a day with a "smear" or "grain size amount" of toothpaste. Children aged three to five should brush their teeth twice a day with a "pea-size" amount of toothpaste (**Figure 1**).[8] Prescription fluoride gels or pastes with a concentration of 0.5% can be used instead of conventional strength toothpaste (0.1% fluoride) for individuals over the age of six with a high caries risk.

Fluoride varnish is ideal for children due to its ease of use and safety due to single-dose dispensers. Products are available in dispensers containing either 0.25, 0.4, or 0.6 mL of varnish, corresponding to 5.5, 8.8, or 13.2 mg of fluoride, respectively. A systematic review of 24 randomized controlled trials found an average preventive fraction of 30% compared to untreated controls.[9]

Silver diamine fluoride (SDF) is another professionally applied topical fluoride approach used to arrest cavitated carious lesions. SDF arrests caries by the antibacterial effect of silver and by remineralization of enamel and dentin. Studies on caries arrest show the most effective results on primary anterior teeth when repeated twice a year. It is essential to note that SDF will permanently stain carious lesions black after treatment and may temporarily stain the skin upon contact. Therefore, parents must be informed and agree to this potential risk.

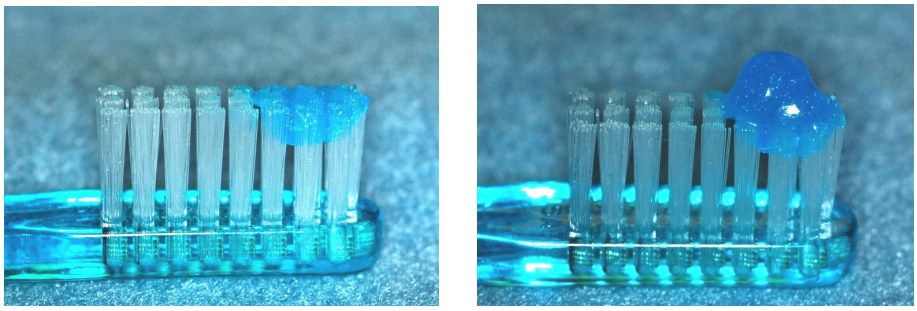
Topical fluoride preparations, whether professionally applied or as a home product (**Table 2**) should be recommended based on caries risk and preference of the dental professional and patient.

Table 2 - Topical Fluoride Products

Category	Concentration of Fluoride Ion*
Professional Strength	
APF in trays	1.23% Fluoride
NaF in trays	0.9% Fluoride
NaF Varnish	2.5% Fluoride
Tray/Brush-on	
NaF gel	0.5% Fluoride
SnF_2 gel	0.1% Fluoride
Rinses	
Weekly	0.09% Fluoride
Daily	0.02% Fluoride
Dentifrices	0.1% Fluoride

* Some of these products are advertised as the concentration of the fluoride compound rather than the fluoride ion (*e.g.*, weekly rinse of 0.09% F is advertised as 0.2% NaF).

Figure 1 - Optimal Amount of Fluoride Toothpaste for Preschool Children



"Smear" (for children under age three) or Pea-sized (for children between the ages of three to six)

Dental Sealants

Pit and fissure caries account for approximately 80-90% of all caries in permanent posterior teeth and 44% in primary teeth. Since their introduction in the early 1970s, numerous reports have confirmed the effectiveness of sealants in preventing dental caries in pits and fissures. An analysis of 24 studies showed that dental sealants reduced

caries on these surfaces by 76%.[10] However, for sealants to be cost-effective, a CRA should be conducted to identify patients who are most susceptible to pit and fissure caries. There may be less benefit in placing sealants in a child who is at low risk for fissure caries, while sealants should be placed as soon as feasible on the fissures of molars and even premolars of children who are at high risk of caries.

Diet

The role of sugar in promoting the dental caries process has been confirmed through numerous epidemiological, laboratory, and clinical studies. As mentioned previously, tooth-adherent bacteria metabolize sugars to produce acids that can lower the pH of the biofilm to a point where tooth demineralization occurs. In preschool children, high-frequency sugar consumption, including its use in baby bottles or sippy cups, has been implicated as a significant causative factor for caries. A behavior that is most harmful, but often overlooked, is the frequent consumption of sugar-sweetened juices. Furthermore, the large consumption of juice is not healthy for children because it may lead to a reduction in the consumption of essential foods. The American Academy of Pediatrics has recommended that juice should not be introduced into the diet of infants before 12 months of age; and be limited to no more than 4 ounces for toddlers between the ages of 1-3 years.[11] For any individual at high risk for caries, reducing high-frequency sugar consumption should be an essential component of the caries prevention program.

Oral Hygiene

Poor oral hygiene is widely recognized as a contributing factor to caries activity. Thus, tooth cleaning has long been promoted as a fundamental component of programs aimed at preventing dental caries. Yet, literature reviews on this topic have not found a relationship between dental plaque scores and dental caries prevalence, or between brushing with non-fluoridated toothpaste and dental caries prevalence. In preschool children, however, visible plaque on the labial surfaces of the maxillary incisors is strongly associated with caries development. Furthermore, dental caries reduction has been noted in children who receive monthly professional prophylaxis combined with some form of fluoride therapy or frequent tooth brushing with fluoridated dentifrice. The specific contribution of the tooth cleaning procedure to these regimens remains unknown. Nevertheless, regular tooth brushing should be encouraged, at least as a means of delivering a fluoride dentifrice.

Caries Management Pathways

Decisions for preventive therapies should be based on an understanding of the risk indicators as applied to the individual child. Children at elevated caries risk require intense prevention to avert caries initiation and arrest caries progression. Conversely, risk-based therapy assumes that there will be less benefit of preventive therapies for those children who are at low risk for dental caries.

The longitudinal evaluation of lesion progression (increased dimension/ cavitation of a white spot lesion or presence of a new lesion) at recall visits is the best method to determine lesion activity and progression. Along with other caries risk factors, the likelihood of a patient returning for periodic recalls and their compliance with preventive therapy can determine the intensity of future preventive therapy and restorative care. Such patient-and tooth-specific evaluations of caries diagnosis and progression may allow for “active surveillance” where there is careful monitoring of caries progression and the preventive program, instead of definitive decisions regarding the restoration of a lesion at the first sign of disease. Decisions regarding when to restore carious lesions, at least, should include the clinical criteria of visual detection of a cavitation in the enamel, visual identification of shadowing under the enamel, and/or radiographic recognition of enlargement of lesions over time.

Patient and Practitioner Preferences

The responsible parent(s), with the advice of the dental professional, are the ones who must make decisions for dental therapy. In many cases, due to their past experiences, parents assume that only surgical procedures are available to manage dental caries. The dental professional is obligated to inform the parent about alternative therapies, including disease monitoring (active surveillance), risk assessment, expected outcomes, and associated costs. Enabling parents to be active participants and share in decision-making should lead to better compliance from both parents and patients. A positive outcome of dental care should be that a carious lesion shows no evidence of progression at periodic recall.

Summary

Sufficient evidence now exists to enable practitioners to consider other options beyond the traditional surgical management of dental caries in children. Information on the dynamic nature of the carious process and risk assessment allows increased emphasis on patient-specific approaches that include disease monitoring and prevention, and when necessary, restorative therapies.

References

1. GBD 2021 Oral Disorders Collaborators. Trends in the global, regional, and national burden of oral conditions from 1990 to 2021: A systematic analysis of the Global Burden of Disease Study 2021. Lancet. 2025;405(10482):897-910. doi: 10.1016/S0140-6736(24)02811-3
2. Khan SY, Schroth RJ, de Jesus VC, et al. A systematic review of caries risk in children <6 years of age. Int J Paediatr Dent. 2024;34(4):410-431. doi: 10.1111/ipd.13140.
3. Ast DB, Smith DJ, Wachs B, Cantwell KT. Newburgh-Kingston caries-fluorine study XIV. Combined clinical and roentgenographic dental findings after ten years of fluoride experience. J Am Dent Assoc. 1956;52(3):314-25. doi: 10.14219/jada.archive.1956.0042.
4. Brunelle JA, Carlos JP. Recent trends in dental caries in US children and the effect of water fluoridation. J Dent Res. 1990;69 Spec No:723-7; discussion 820-3. doi: 10.1177/00220345900690S141.
5. Iheozor-Ejiofor Z, Walsh T, Lewis SR, Riley P, Boyers D, Clarkson JE, et al. Water fluoridation for the prevention of dental caries. Cochrane Database Syst Rev. 2024 Oct 4;10(10):CD010856. doi: 10.1002/14651858.CD010856.pub3.
6. Kumar JV, Moss Me, Liu H, Fisher-Owens S. Association between fluoride exposure and children's intelligence: A meta-analysis relevant to community water fluoridation. Public Health. 2023;219:73-84. doi: 10.1016/j.puhe.2023.03.011.
7. Marinho VCC, Higgins J, Logan S, Sheiham A. Fluoride toothpastes for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2003;2003(1):CD002278. doi: 10.1002/14651858.CD002278.
8. American Dental Association. Council on Scientific Affairs. Fluoride toothpaste use for young children. J Am Dent Assoc. 2014;145(2):190-191. doi:10.14219/jada.2013.47.
9. Petersson LG, Twetman S, Dahlgren H, et al. Professional fluoride varnish treatment for caries control: A systematic review of clinical trials. Acta Odontol Scand. 2004;62(3):170-6. doi: 10.1080/00016350410006392.
10. Wright, JT, Crall JJ, Fontana M, et al. Evidence-based clinical practice guideline for the use of pit-and-fissure sealants. J Am Dent Assoc. 2016;147(8):672-682.e12. doi: 10.1016/j.adaj.2016.06.001.
11. Heyman MB, Abrams SA. AAP Section on Gastroenterology, Hepatology, and Nutrition, and AAP Committee on Nutrition. Fruit juice in infants, children, and adolescents: Current recommendations. Pediatrics. 2017;139(6):e20170967. doi: 10.1542/peds.2017-0967.

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(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. Method(s) to determine carious lesion activity is (are):
a. longitudinal evaluation of the lesions
b. depth of the lesions
c. plaque over the lesion
d. a and c
e. All of the above

2. Indications for the need for restorative care include:
a. identification of a cavitation
b. shadowing under the enamel
c. radiographic recognition of enlargement of lesions over time
d. All of the above

3. Caries risk factors in children may include:
a. prior decay
b. presence of visible plaque on maxillary anterior teeth
c. enamel hypoplasia
d. socioeconomic factors
e. All of the above

4. Pit and fissure sealants should be placed:
a. on permanent teeth
b. on primary teeth
c. on fissures of all teeth after the teeth are fully erupted
d. on the teeth of children at caries risk
e. only a, b, d
f. only a, c, d

5. A three-year-old presents to your office with caries on four anterior teeth. Preventive therapy should include:
a. a recall examination every three months
b. dietary analysis
c. professional fluoride varnish therapy
d. tooth brushing instruction using a pea-sized amount of dentifrice
e. All of the above

6. A four-year-old child identified at moderate risk for caries and having several white spot lesions on incisors and two small cavitated lesions on his molars should receive:
a. a recall examination and professional topical fluoride at six-month intervals
b. sealants on non-cavitated primary molar fissures
c. "active surveillance" of white spot lesions
d. a and b only
e. All of the above

7. A five-year-old child who has caries on six tooth surfaces should receive?
a. a recall exam every 18 months
b. sealants on permanent molars at age nine
c. fluoride therapy only by dentifrice use
d. professional topical fluoride treatments at least semiannually
e. All of the above

8. A six-year-old child, drinking well water with less than 0.1 ppm fluoride presents to your office with no caries. Preventive regimen should include:
a. bitewing radiographs every three months
b. prescription of system fluoride supplements of 1 mg F per day
c. fluoride therapy by dentifrice use only
d. referring the child to a nutritionist
e. All of the above
f. None of the above

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