Quality Resource Guide

Clinical Decision-Making for Caries Management in Children

Author Acknowledgements

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MetLife designates this activity for **1.0 continuing education credits** for the review of this Quality Resource Guide and successful completion of the post test.

Educational Objectives

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

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

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The content of this Guide is subject to change as new scientific information becomes available.

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Introduction

The intent of this review is 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 utilizing data not only from clinical and radiograph examinations, but from a broad understanding of cariology that is applied to a specific child.

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

Natural History of Caries in the Primary Dentition

A unique feature regarding caries management in children is that a child's age is an important factor regarding caries initiation and progression. The age at which a child becomes colonized with the cariogenic bacteria, *mutans streptococci*, is a critical factor for caries risk. Those teeth that are first exposed to a cariogenic environment generally will be the first to show signs of disease. Consequently, infants and toddlers at high risk for early childhood caries may develop white spot lesions on their maxillary anterior teeth soon after eruption. If these lesions do not arrest, the carious process will continue and the initial lesions will become cavitated. With a sustained high caries risk environment, the child may develop fissure caries of the primary molars and later molar approximal caries. If there is no change in the oral environment this caries progression will also progress to the permanent teeth.

Caries Risk Assessment

The goal of caries risk assessment in dentistry is to deliver preventive and restorative care specific to an individual patient. The best caries risk indicators are the presence of caries and the longitudinal evaluation of lesion progression; however, in pre-school children these indicators may not particularly useful since it is important to determine caries risk before disease is manifest. Other caries risk indicators that have shown promise in children are: the level of *mutans streptococci* in the child; whether the mother/caregiver has active caries, the socioeconomic status of the family, and whether the child consumes sugar at high frequency.

Besides determining caries risk at initiation of therapy, ongoing reassessment of a child's caries risk at recall visits allows for refinement of decisions. If at a recall visit, existing lesions have not progressed and new lesions are not detected, caries risk may be considered to have decreased. If there are more new lesions detected, or there are changes in the oral environment due to appliance therapy, increase in *mutans streptococci* levels, increased frequency of sucrose consumption, risk status may have increased.

Preventive Management

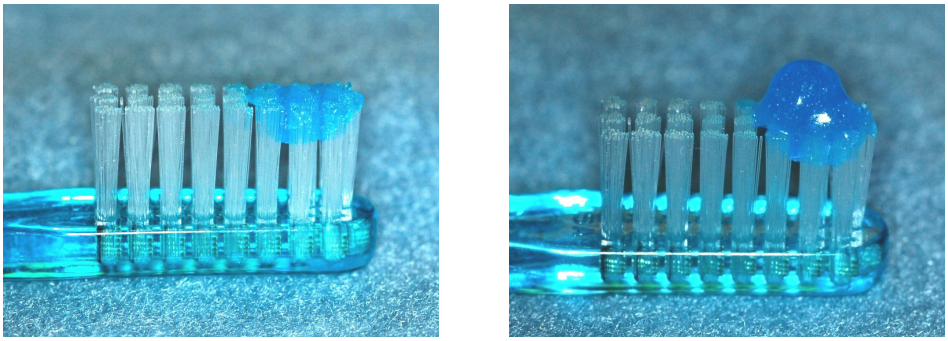
Fluoride

Daily fluoride exposure through optimizing the fluoride content of water supplies, historically, has been shown to be efficacious in reducing dental caries, with reductions in the range of 25-50 percent. The widespread consumption of processed beverages and foods prepared with fluoridated water by individuals in non-fluoridated areas has produced a "halo effect" in which the benefits of fluoride extend beyond the geographically fluoridated areas, thus reducing differences in caries rates between fluoridated and non-fluoridated communities.

If the fluoride content of water is sub-optimal or unknown, the drinking water can be analyzed for fluoride content. Dentists can contact their state's department of health to find out how the water can be evaluated. After analysis, systemic fluoride supplementation can be recommended considering water fluoride content and child's age and child's caries risk. Supplements only should be prescribed to children from non-fluoridated communities, who are identified as being at high caries risk, and whose parents understand the risks (mild fluorosis) and benefits of fluoride supplements.

However, the most widely used method of applying fluoride topically is by toothpaste. Twice daily fluoride exposure by means of fluoridated toothpaste is now considered a major approach to the reduction of dental caries. Systematic literature reviews have shown that tooth brushing with fluoride toothpaste reduces dental caries by over 30%. Even greater benefit from fluoridated toothpaste can be achieved if children spit out the toothpaste, but not followed by rinsing with water. To prevent fluorosis from the swallowing of toothpaste, children's brushing should be supervised using a "smear" for children under age three and a "pea- sized" amount between the ages of three to six **(Figure 1)**.

Figure 1 - Optimal Amount of Fluoride Toothpaste for Preschool Children



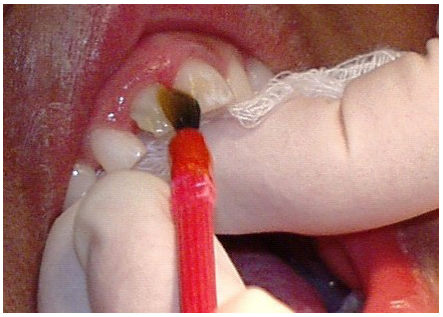
"Smear" (for children under age three) or "pea-sized (for children between the ages of three to six) amount of fluoridated toothpaste on the brush.

Professional topical fluoride therapies, tray/brush-on therapies and home fluoride mouth rinses have had a long history of use to prevent dental caries. However, most of the data on caries reduction with these products were conducted in clinical trials that were done over 30 years ago. Professional topical treatments have involved from placing 5-10 ml of fluoride gel in trays that are applied to the teeth for four minutes to fluoride varnishes. Fluoride varnishes have gained popularity, especially for preschool children, because of similar efficacy to the fluoride trays, while the total amount of fluoride delivery in single dose containers can be better controlled **(Figure 2)**. Fluoride varnish single use dispensers are available in quantities of 0.25, 0.4, or 0.6 ml, corresponding to 5.5, 8.8, or 13.2 mg F.

Silver diamine fluoride (SDF) is another professional topical fluoride approach that is used to arrest dentinal caries. SDF arrests caries by the antibacterial effect of silver and by remineralization of enamel and dentin. Studies of caries arrest show best effect on primary anterior teeth and when repeated twice yearly. It is important to note that SDF will stain the carious lesions permanently black after treatment and will temporarily stain skin with contact, thus it is important that parents are informed and agree to this risk.

Topical fluoride preparations, whether professionally applied or as home products **(Table 1)** should be recommended based on caries risk and preference of the dental professional and patient.

Figure 2 - Fluoride Varnish



Fluoride varnish application easily applied with a brush to a 4-year-old.

Dental Sealants

Since pit and fissure sealants were introduced to dentistry in the early 1970s, there have been numerous reports of the effectiveness of sealants in the prevention of dental caries of pits and fissures. Pit and fissure caries account for approximately 80-90% of all caries in permanent posterior teeth and 44% in primary teeth. With regard to evidence of effectiveness, an analysis of 24 studies has shown that dental sealant reduced caries on these surfaces by 71%. However, for this preventive procedure to be cost effective, caries risk assessment methods are needed to identify those subjects and those teeth that are susceptible to fissure caries. There may be little 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 moderate or high risk of caries.

Table 1 - Topical Fluoride Products

Category	Concentration of Fluoride Ion*
Professional Strength	
APF in Trays	1.23% F
NaF in Trays	0.9% F
NaF Varnish	2.5% F
SDF	5.0% F
Tray/Brush-on	
NaF Gel	0.5% F
SnF_2 Gel	0.1% F
Rinses	
Weekly	0.09% F
Daily	0.02% F
Dentifrices	0.1% F

* 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).

Diet

The role of sugar in promoting the dental caries process has been derived from abundant epidemiological, laboratory, and clinical studies. In preschool children high frequency sugar consumption, including its use in baby bottles or sippy cups, has been implicated as an important causative factor for caries. The behavior that is most harmful, but poorly recognized, is the frequent consumption of sugar sweetened juices. Any sugar containing drink that is consumed frequently will very likely promote caries. Furthermore, large consumption of juice is not healthy for children because it will reduce the consumption of essential foods. Because of these issues 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. For any individual at high risk for caries, controlling of high frequency sugar consumption should be an important component of a caries prevention program.

Oral Hygiene

Poor oral hygiene is widely believed to be a contributor to caries activity. Thus, tooth cleaning has long been considered a basic 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 as part of these regimens remains unknown. Regular tooth brushing, nevertheless, should be encouraged, at least as a delivery system for the fluoride dentifrice.

Caries Management Pathways

Decisions for preventive therapies should be based on an understanding of risk indicators as applied to a specific child. Children at high caries risk require intense prevention to primarily prevent caries initiation and secondarily to arrest caries progression. Conversely, risk-based therapy assumes that there will be little benefit of preventive therapies for those children who are at low risk for dental caries.

Decisions regarding when to restore carious lesions, at least, should include the clinical criteria of visual detection of a hole in the enamel, visual identification of shadowing under the enamel, and/or radiographic recognition of enlargement of lesions over time. The longitudinal evaluation of lesion progression (increased dimension/ cavitation of a white spot lesion or presence of a new lesion) at recall visits are 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 compliance with preventive therapy, can determine the intensity of 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 treatment of a lesion at the first sign of disease **(Table 2)**.

Parent and Practitioner Preferences

The responsible parent(s), with the advice of the dental professional, is the one who must make decisions for dental therapy. In many cases, as a result of their past experiences, the parent assumes that only surgical procedures can treat dental caries. The dental professional is obliged to inform the parent about alternative therapies, including disease monitoring (active surveillance), risk assessment, expected outcomes, and cost. Enabling the parent to be an active participant and to share in decision making should produce better parent and patient compliance. A positive outcome of dental care should be that a caries disease activity shows no evidence of progression at a periodic recall.

Table 2 - Diagnostic, Preventive and Restorative Caries Management Based on a Child's Caries Risk

	Low Risk	Moderate Risk	High 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 lesions • One or more lesions/year • Infrequent white spot lesions • Middle 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 mouth • High frequency sugar consumption
Diagnostic Procedures	• Examination interval 12 months • Radiograph interval 24 months	• Examination interval 6 months • Radiograph interval 12 months	• Examination interval three months • Radiograph interval six months • Diet analysis
Preventive Therapy	• Brushing with F toothpaste twice daily	• Brushing with F toothpaste twice daily • Systemic fluoride supplements** • Professional topical fluorides treatment every six months • Sealants	• Brushing with F toothpaste twice daily • Systemic fluoride supplements** • Professional topical fluoride treatment every three months • Sealants • Brushing with high potency F gel (over age six) • Dietary counseling
Restorative Therapy	• None	• Active surveillance of white spot lesions • Active surveillance of enamel approximal lesions • Restoration of progressing lesions • Restoration of cavitated lesions	• 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

Summary

Sufficient evidence now exists to allow practitioners to go 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.

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1. **The BEST method to determine carious lesion activity is (are):?**
   a. longitudinal evaluation of the lesions.
   b. depth of the lesions.
   c. width of the lesions.
   d. plaque over the lesion.
   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. mutans streptococci infection.
   d. socioeconomic factors.
   e. All of the above

4. **Fluoride supplements (prescriptions) should be prescribed for:**
   a. children living in non-fluoridated areas.
   b. children under the age of 12.
   c. children living in non-fluoridated areas and at risk for caries.
   d. All of the above

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

6. **A three-year-old presents to your office with caries on four anterior teeth. Preventive therapy should include:**
   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

7. **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 uncavitated primary molar fissures.
   c. "active surveillance" of white spot lesions.
   d. a and b only
   e. All of the above

8. **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

9. **A six-year-old child, drinking well water with less than 0.1 ppm F, 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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