EVIDENCE-STATEMENT:

CHILD HEALTH PROMOTION (Screening, Counseling, Immunization, Preventive Medication, and Treatment)

Dental Caries Prevention Through Oral Fluoride Supplementation (Preventive Medication)

Clinical Preventive Service Recommendations

U.S. Preventive Services Task Force (USPSTF) Recommendation

The U.S. Preventive Services Task Force (USPSTF) recommends that primary care clinicians prescribe oral fluoride supplementation at currently recommended doses to preschool children older than 6 months of age whose primary water source is deficient in fluoride.[1]

***Evidence Rating:* B (Recommended/ At Least Fair Evidence**

The USPSTF found fair evidence that the service improves important health outcomes and concluded that the benefits of oral fluoride supplementation outweigh the harms. The USPSTF found fair evidence that, in preschool children with low fluoride exposure, prescriptions of oral fluoride supplements by primary care clinicians lead to reduced dental caries. The USPSTF concluded that the benefits of caries prevention using oral fluoride supplementation outweigh the potential harms of dental fluorosis, which in the United States are primarily in the form of mild discoloration of the teeth.[1]

Centers for Disease Control and Prevention (CDC) Recommendation

The Centers for Disease Control and Prevention (CDC) has developed recommendations for preventing tooth decay while reducing the risk of enamel fluorosis, or the hypo-mineralization of the tooth's enamel surface that results from ingesting fluoride during tooth formation. The CDC recommends the judicious prescription of fluoride supplements in preschool-aged children, and for those at risk, supplementation may continue through 16 years of age. Fluoride supplements may be prescribed for children who are at high risk for tooth decay and whose primary source of drinking water has low fluoride concentration, based on the child's risk of developing decay without fluoride supplements; the benefit of decay prevention; the potential for enamel fluorosis; and the child's sources of fluoride, especially drinking water. Parents and caregivers should be informed of both the benefits and the risks associated with fluoride supplementation. The dosage of prescribed fluoride supplements should be consistent with the schedule established by American Dental Association (ADA), American Academy of Pediatric Dentistry (AAPD), and American Academy of Pediatrics (AAP) which is available online (www.cdc.gov/fluoridation/other/spplmnt_schdl.htm). Fluoride supplements may be prescribed for specific children (as appropriate) or they may be given through school-based programs. When practical, supplements should be prescribed as chewable tablets or lozenges to maximize the topical effects that aid with enamel remineralization.[2]

Other Recommended Guidance

The American Dental Association (ADA), American Academy of Pediatrics (AAP), and American Academy of Pediatric Dentistry (AAPD) concur with the USPSTF and CDC recommendations described above.

Information Sources

The recommendations and supporting information contained in this document came from several sources, including the:

- American Academy of Pediatric Dentistry (AAPD)

- American Academy of Pediatrics (AAP)
- American Dental Association (ADA)
- Centers for Disease Control and Prevention (CDC)
- Peer-reviewed research
- U.S. Preventive Services Task Force (USPSTF)

The background and supporting information in this document is based on research findings. All information presented in this document should be attributed to its referenced source and should not be considered a reflection of the opinions of other organizations cited in the text.

Condition/Disease-Specific Information

Epidemiology of Condition/Disease

Dental caries (tooth decay) is an infectious, transmissible disease in which bacterial by-products (i.e., acids) dissolve the hard surfaces of teeth.[3] It is the most common chronic disease of childhood and is five times more common than asthma and seven times more common than hay fever.[4] Dental caries can result in pain and loss of tooth structure or teeth, and can progress to acute systemic infection.

Condition/Disease Risk Factors

Populations believed to be at increased risk of dental caries are those with low socioeconomic status or low levels of parental education, those that do not obtain regular dental care, and those without dental insurance or access to dental services.[5-7] Persons can be at high risk of dental caries even if they do not have any recognized risk factors. Individual factors that might increase risk include active dental caries; a history of high levels of caries in older siblings or caregivers; high levels of infection with cariogenic bacteria; impaired ability to maintain oral hygiene; malformed enamel or dentin; reduced salivary flow because of medications, radiation treatment, or disease; low salivary buffering capacity (i.e., decreased ability of saliva to neutralize acids); and the wearing of space maintainers or dental prostheses. Risk can increase if any of these factors are combined with dietary practices conducive to dental caries, such as frequent consumption of refined carbohydrates, while risk decreases with adequate exposure to fluoride.[5,8] An individual's risk of developing caries can vary over time as his or her risk factors change.

Value of Prevention

Economic Burden of Condition/Disease

Expenditures for dental services in the United States in 2004 totaled $81.5 billion, which was slightly more than 4% of the amount spent on healthcare that year. Private health insurance paid for $40.5 billion, or about half, of this amount.[9]

Workplace Burden of Condition/Disease

In 1996, 3.7 days of restricted activity per 100 employed people aged 18 years and older were reported to be associated with an acute dental conditions and over 2.4 million work days (1.9 days per person) were lost because of an acute dental conditions.[10] These statistics do not include days that parents were absent from work to care for children with dental conditions. Parental caregiving requirements associated with child dental problems can be extensive as children

miss a significant number of school days due to dental problems. In 1996, U.S. schoolchildren missed 1.6 million days of school as a result of acute dental conditions. Preventing tooth decay can reduce school absenteeism[10] and therefore reduce lost productivity among adult caregivers.

Economic Benefit of Preventive Intervention

Fluoride modalities are most cost-effective for persons at high risk of dental caries. Limited benefit is gained by providing additional caries-preventive modalities to persons consuming fluoridated water.

Estimated Cost of Preventive Intervention

In 2004, the private-sector cost of fluoride supplementation averaged $33; approximately 95% of all paid claims fell within the range of $0 to $42).[11] This cost does not include the cost of physician time for counseling and risk assessment.

Estimated Cost of Treatment

The ADA has estimated per-capita dental care expenditures (in year 1995 dollars) at $174 per person, per year.[12] The Health Care Financing Administration (now called the Centers for Medicare and Medicaid Services) came up with a similar estimate of $164 per person, per year.[13]

Cost-Effectiveness and/or Cost-Benefit Analysis of Preventive Intervention

The USPSTF found consistent evidence showing that fluoride supplementation prevents 32% to 81% of caries lesions in primary teeth or tooth surfaces.[14] No long-term cost-benefit analyses are available.

Preventive Intervention Information

Preventive Intervention: Purpose of Preventive Medication

Appropriate fluoride supplementation can prevent dental caries, infections, and other complications, thereby improving overall oral and physical health. Preventing tooth decay in preschool children can have a positive impact on oral health and quality of life in later years.

Benefits and Risks of Intervention

Fluoride controls early dental caries by both preventing caries from occurring and controlling caries when they do occur. Fluoride has a pre-eruptive effect on developing tooth enamel and a post-eruptive topical effect. Although community water fluoridation is recommended as the ideal way to provide fluoride's benefits to both children and adults, fluoride supplements are an effective alternative for children who lack access to fluoridated drinking water.[2]

However, fluoride ingested during tooth development can result in a range of changes in the appearance of teeth, broadly known as enamel fluorosis. Certain extremes of enamel fluorosis are cosmetically unacceptable. Severe forms of this condition occur only when young children ingest excess fluoride, from any source, during critical periods of tooth development. The use of dietary supplements in areas with fluoridated drinking water, which is inconsistent with the recommended supplement schedule, might increase the risk of enamel fluorosis.[15] Although the studies assessing the appropriateness of primary care clinicians' prescription of fluoride supplements have uncertain external and internal validity, they indicate that the majority of physicians in the United

States, especially pediatricians, prescribe oral fluoride supplements for at least some of their patients.[2] Research shows that many physicians do not know the fluoride status of their patients or the fluoridation level of their patients' water supplies, raising the possibility of inappropriate fluoride supplement prescriptions that may lead to excessive fluoride intake.[1]

Initiation, Cessation, and Interval of Preventive Medication

When healthcare providers identify preschool children who live in non-fluoridated areas as being at high risk of dental caries, they should consider prescribing dietary fluoride supplements for these children. These supplements are normally taken once per day and are not recommended for children younger than 6 months of age. Depending on the child's level of risk, supplementation may continue from age 6 months to 16 years.[2] Fluoride supplements should not be initiated or should be discontinued if the assessed risk of dental caries decreases to a low level or if the child obtains access to fluoride through other sources, especially drinking water.

Intervention Process

When prescribing any pharmaceutical agent, primary care providers should attempt to maximize benefit and minimize harm.[16] Although fluoride's posteruptive action can benefit the primary (i.e., "baby") teeth of children aged 1 to 6 years and provide some protection for developing permanent teeth, fluoride supplements can also increase the risk of enamel fluorosis.[17-18] Before prescribing fluoride supplements, clinicians should verify that the patient is not obtaining fluoride from any source of drinking water, medications, or swallowed toothpaste.[2]

Dietary fluoride supplements in the form of tablets, lozenges, or liquids (including fluoride-vitamin preparations) have been used throughout the world since the 1940s. Sodium fluoride is the active ingredient in most supplements. Tablets and lozenges typically contain 1.0, 0.5, or 0.25 mg of fluoride. To maximize the topical effect of the fluoride, tablets and lozenges should be chewed or sucked for 1 to 2 minutes before being swallowed. For infants, supplements are available in liquid form and are dispensed with a dropper.

Treatment Information

Health benefits should include provisions for routine dental care and the treatment of dental caries and other forms of dental disease.

Strength of Evidence for the Clinical Preventive Service

The level of evidence supporting the recommendations contained in this section is described below.

Evidence-Based Research:

U.S. Preventive Services Task Force (USPSTF)
Strength of Evidence: B (Recommended/At Least Fair Evidence)

- The USPSTF found at least fair evidence to recommend oral fluoride supplementation for preschool children older than 6 months of age whose primary water source is deficient in fluoride.[1]

Recommended Guidance:

Centers for Disease Control and Prevention (CDC)
Strength of Evidence: Expert Panel

- The CDC recommends the judicious prescription of fluoride supplements in preschool-aged children, and for those at risk, supplementation may continue through 16 years of age. Fluoride supplements may be prescribed for children who are at high risk for tooth decay and whose primary source of drinking water has low fluoride concentration, based on the child's risk of developing decay without fluoride supplements; the benefit of decay prevention; the potential for enamel fluorosis; and the child's sources of fluoride, especially drinking water. Parents and caregivers should be informed of both the benefits and the risks associated with fluoride supplementation. The dosage of prescribed fluoride supplements should be consistent with the schedule established by American Dental Association (ADA), American Academy of Pediatric Dentistry (AAPD), and American Academy of Pediatrics (AAP).[2]

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