THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
JADA

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J Am Dent Assoc 2009;140;1356-1365

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Preventing dental caries through school-based sealant programs

Updated recommendations and reviews of evidence

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Health care professionals often provide prevention services in schools to protect and promote the health of students.[1] School programs can increase access to services, such as dental sealant placement, especially among vulnerable children less likely to receive private dental care.[2] In addition, school programs have the potential to link students with treatment services in the community and facilitate enrollment of eligible children in public insurance programs, such as Medicaid and the Children's Health Insurance Program.[3]

In 2001, the independent, nongovernmental Task Force on Community Preventive Services completed a systematic review of published scientific studies demonstrating strong evidence that school sealant programs were effective in reducing the incidence of caries.[4,5] The median decrease in occlusal caries in posterior teeth among children aged 6 through 17 years was 60 percent. On the basis of these findings, the task force recommended that school sealant programs be part of a comprehensive community strategy to prevent dental caries.[4,5] These programs typically are implemented in schools that serve children from low-income families and focus primarily on those

ABSTRACT

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Background. School-based sealant programs (SBSPs) increase sealant use and reduce caries. Programs target schools that serve children from low-income families and focus on sealing newly erupted permanent molars. In 2004 and 2005, the Centers for Disease Control and Prevention (CDC), Atlanta, sponsored meetings of an expert work group to update recommendations for sealant use in SBSPs on the basis of available evidence regarding the effectiveness of sealants on sound and carious pit and fissure surfaces, caries assessment and selected sealant placement techniques, and the risk of caries' developing in sealed teeth among children who might be lost to follow-up. The work group also identified topics for which additional evidence review was needed.

Types of Studies Reviewed. The work group used systematic reviews when available. Since 2005, staff members at CDC and subject-matter experts conducted several independent analyses of topics for which no reviews existed. These reviews include a systematic review of the effectiveness of sealants in managing caries.

Results. The evidence supports recommendations to seal sound surfaces and noncavitated lesions, to use visual assessment to detect surface cavitation, to use a toothbrush or handpiece prophylaxis to clean tooth surfaces, and to provide sealants to children even if follow-up cannot be ensured.

Clinical Implications. These recommendations are consistent with the current state of the science and provide appropriate guidance for sealant use in SBSPs. This report also may increase practitioners' awareness of the SBSP as an important and effective public health approach that complements clinical care.

Key Words. Caries; evidence-based dentistry; pit-and-fissure sealants; preventive dentistry; public health/community dentistry.
JADA 2009;140(11):1356-1365.

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in second and sixth grades, because high percentages of these children are likely to have newly erupted permanent molars.[6]

Available data show that children aged 6 through 11 years from families living below the federal poverty threshold (approximately $21,800 annually for a family of four in 2008)[7] are almost twice as likely to have developed caries in their permanent teeth as are children from families with incomes greater than two times the federal poverty threshold (28 percent versus 16 percent).[8] Overall, about 90 percent of carious lesions are found in the pits and fissures of permanent posterior teeth, with molars being the most susceptible tooth type.[9,10] Unfortunately, only about one in five children, or 20 percent, aged 6 though 11 years from low-income families has received sealants, a proportion that is notably less than the 40 percent of children from families with incomes greater than two times the poverty threshold.[8] Significant disparities also exist according to race/ethnicity, with non-Hispanic African American (21 percent) and Mexican American (24 percent) children aged 6 through 11 years less likely to have received sealants than non-Hispanic white children (36 percent).[8]

School sealant programs can be an important intervention to increase the receipt of sealants, especially among underserved children. For example, the results of a study in Ohio confirmed that programs directed toward low-income children substantially increased the use of dental sealants.[11] Furthermore, sealant programs could reduce or eliminate racial and economic disparities in sealant use if programs were provided to all eligible, high-risk schools,[11] such as those in which 50 percent or more of the children are eligible for free or reduced-price meals.[6]

Differences of opinion among clinicians regarding the management of caries, caries assessment and sealant placement procedures[12-14] have led some to question the effectiveness of certain practices, such as sealing teeth that have incipient caries or sealing without first obtaining diagnostic radiographs. Partly on the basis of the need to address these questions, the Association of State and Territorial Dental Directors asked the Centers for Disease Control and Prevention (CDC), Atlanta, to review and update sealant guidelines last revised in 1994.[15] Staff members of CDC agreed to undertake this review, especially because new information had become available regarding the effectiveness of sealants, the prevalence of caries and sealants in children and young adults in the United States, and techniques for caries assessment and sealant placement.

This report provides updated recommendations for sealant use in school-based sealant programs (SBSPs) (that is, programs that provide sealants in schools).[2] We also inform dental practitioners about the evidence regarding the effectiveness of SBSPs and practices. This evidence provides the basis for the updated recommendations.

Practitioner awareness is important because dentists in private practice likely will see children who have received sealants in school-based programs and might themselves be asked to participate in or even implement such programs. In addition, this report can help address questions from parents, school administrators and other stakeholders. Finally, we discuss the consistency between these recommendations for SBSPs and evidence-based clinical recommendations for sealant use developed recently by an expert panel convened by the American Dental Association (ADA) Council on Scientific Affairs[16] (the ADA sealant recommendations).

METHODS

The CDC supported two meetings (in June 2004 and April 2005) of a work group consisting of experts in sealant research, practice and policy, as well as caries assessment, prevention and treatment. The work group also included representatives from professional dental organizations. The work group addressed questions about the following topics (Box):

- effectiveness of sealants on sound and carious pit and fissure surfaces;
- methods for caries assessment before sealant application;
- effectiveness of selected placement techniques;
- risk of developing caries in sealed teeth among children who might be lost to follow-up and for whom sealant retention cannot be ensured.

Based in part on the content of the meeting presentations and discussions, the work group drafted recommendations and identified areas in which additional evidence review was necessary.

The work group used published findings of systematic reviews when available. Since the last

ABBREVIATION KEY. ADA: American Dental Association. **CDC:** Centers for Disease Control and Prevention. **IFUs:** Instructions for use. **RCTs:** Randomized controlled trials. **SBSPs:** School-based sealant programs.

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BOX

Topics and questions discussed by work group.

EFFECTIVENESS OF SEALANTS

- What is the effectiveness of sealants in preventing the development of caries on sound pit and fissure surfaces?
- What is the effectiveness of sealants in preventing the progression of noncavitated or incipient carious lesions to cavitation?
- What is the effectiveness of sealants in reducing bacteria levels in cavitated carious lesions?

ASSESSMENT METHODS

- Which caries assessment methods should be used in school-based sealant programs (SBSPs) to differentiate pit and fissure surfaces that are sound or noncavitated from those that are cavitated or have signs of dentinal caries?

SURFACE PREPARATION BEFORE ACID ETCHING

- What surface cleaning methods or techniques are recommended by manufacturers for unfilled resin-based sealants (self-curing and light-cured) commonly used in SBSPs?
- What is the effect of clinical procedures—specifically, surface cleaning or mechanical preparation methods with use of a bur before acid etching—on sealant retention?

FOUR-HANDED TECHNIQUE

- Does use of a four-handed technique in comparison with a two-handed technique improve sealant retention?

CARIES RISK ASSOCIATED WITH LOST SEALANTS

- Are teeth in which sealants are lost at a higher risk of developing caries than are teeth that were never sealed?

meeting of the group in 2005, staff members of CDC and another expert group completed a systematic review to determine the effectiveness of sealants in managing caries progression and bacteria levels in carious lesions. The results of that review[17,18] also supported the ADA sealant recommendations.[16] For questions about other topics for which there were no existing reviews, CDC staff members conducted analyses of the available evidence and published these results in peer-reviewed journals.[19-21]

Clinical studies. For these analyses, we searched electronic databases (that is, MEDLINE, Embase, Cochrane Library and Web of Science) to identify clinical studies that focused primarily on sealant outcomes resulting from different surface preparation and placement techniques. In some cases, few, if any, clinical trials directly compared in the same study sealant retention resulting from different placement techniques. In these situations, we performed bivariate and multivariate analyses to compare sealant retention across studies. For example, we compared sealant retention in studies that involved handpiece prophylaxis with retention in studies that involved toothbrush prophylaxis, and studies that involved a four-handed technique with studies that involved a two-handed technique.[19,21] Lastly, in light of the work group's recommendation that clinicians consult manufacturers' instructions regarding surface preparation before acid etching, we described the range of manufacturers' instructions for surface preparation for unfilled resin-based sealants,[21] which commonly are used in school programs.[22]

Scientific evidence. For each question addressed by the work group, we summarized the relevant scientific information. On the basis of recognized systems for grading the quality of scientific evidence, we assigned the highest level of confidence generally to findings of systematic reviews and randomized controlled trials (RCTs).[23-25] Random assignment of study participants to treatment and control groups is the study design most likely to fully control for the effect of other factors on sealant effectiveness or retention. The systematic review involves the use of a standard procedure to synthesize findings from the best available clinical studies, usually RCTs.

We generally assigned lower levels of confidence to findings from studies with other designs. Beyond this qualitative assessment of the evidence, neither the work group nor CDC staff members made any attempt to grade the quality of the evidence or directly relate each recommendation to the strength of the evidence. We did not independently review the design or quality of the systematic reviews and comparative studies. All included studies were published in the peer-reviewed scientific literature.

QUESTIONS AND KEY FINDINGS

The work group addressed the following questions.

Sound pit and fissure surfaces. What is the effectiveness of sealants in preventing the development of caries on sound pit and fissure surfaces?

Systematic reviews have found strong evidence of sealant effectiveness on sound permanent posterior teeth in children and adolescents. A meta-analysis of 10 studies of a one-time placement of autopolymerized sealants on permanent molars in children found that the sealants reduced dental caries by 78 percent at one year and 59 percent at four or more years of follow-up.[26] (A meta-analysis is a review that involves the use of quantitative methods to combine the statistical measures from two or more studies and generates a weighted

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average of the effect of an intervention, the degree of association between a risk factor and a disease or the accuracy of a diagnostic test.)[27]

Similarly, a meta-analysis of five studies of resin-based sealants found reductions in caries ranging from 87 percent at 12 months to 60 percent at 48 to 54 months.[28] A third meta-analysis of 13 studies also found that sealants were effective, but estimates of caries reductions attributed to sealant placement were lower (33 percent from two to five years after placement).[29] The lower estimates might reflect the inclusion of studies that examined sealants polymerized by ultraviolet light (that is, first-generation sealant materials no longer marketed in the United States) and studies involving exposures to other preventive interventions, such as fluoride mouthrinses.[29]

Summary of evidence. Systematic reviews[26,28,29] have found that sealants are effective in preventing the development of caries on sound pit and fissure surfaces in children and adolescents.

Systematic reviews have found that sealants are effective in preventing the development of caries on sound pit and fissure surfaces in children and adolescents.

Noncavitated or incipient lesions. What is the effectiveness of sealants in preventing the progression of noncavitated or incipient carious lesions to cavitation?

A meta-analysis of six studies of sealant placement on teeth with noncavitated carious lesions found that sealants reduced by 71 percent the percentage of lesions that progressed up to five years after placement in children, adolescents and young adults.[17] We define noncavitated carious lesions as lesions with no discontinuity or break in the enamel surface. Findings across each of the six studies were consistent.

Summary of evidence. A systematic review[17] found that pit-and-fissure sealants are effective in reducing the percentage of noncavitated carious lesions that progressed to cavitation in children, adolescents and young adults.

Bacteria levels. What is the effectiveness of sealants in reducing bacteria levels in cavitated carious lesions?

A systematic review of the effects of sealants on bacteria levels in cavitated carious lesions found no significant increases in bacteria under sealants.[18] Sealants lowered the number of viable bacteria, including *Streptococcus mutans* and lactobacilli, by at least 100-fold and reduced the number of lesions with any viable bacteria by about 50 percent.

Summary of evidence. A systematic review[18] found that pit-and-fissure sealants are effective in reducing bacteria levels in cavitated carious lesions in children, adolescents and young adults.

Assessment of caries on surfaces to be sealed. Which caries assessment methods should be used in SBSPs to differentiate pit and fissure surfaces that are sound or noncavitated from those that are cavitated or have signs of dentinal caries?

In 2001, investigators conducting a systematic review for the National Institutes of Health Consensus Development Conference on Diagnosis and Management of Dental Caries Throughout Life[30] concluded that the relative accuracy of methods of identifying carious lesions could not be determined from the available studies. The systematic review evaluated evidence regarding the following methods: visual inspection, visual/tactile inspection, radiographic assessment, fiber-optic transillumination, electrical conductance and laser fluorescence. The authors also examined the improvement in accuracy resulting from the addition of radiographs to visual assessment in the detection of dentinal lesions on occlusal surfaces.

The review judged the quality of evidence available for assessment of the relative accuracy of the diagnostic methods as "poor." The authors rated the evidence as poor because there were few relevant studies, the study quality was lower than average and/or the studies included a wide range of observed measures of accuracy. Because of the poor quality of the available evidence, the investigators could not determine the relative accuracy of the assessment methods. Most of the studies compared assessment methods with a histologic determination of caries. For the identification of cavitated lesions, however, the authors of the systematic review also accepted visual or visual/tactile inspection—the principal methods dentists use to identify cavitated lesions—as a valid standard.[31,32]

More recently, an international team of caries researchers developed an integrated system for caries detection based on a review of the best available evidence and contemporary caries detection criteria.[33,34] In this system, clinicians use

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visual criteria alone to document the extent of enamel breakdown, including distinct cavitation into dentin, the presence of an underlying dark shadow from dentin and the exposure of dentin. Researchers have correlated the visual criteria in this integrated system with the extent of carious demineralization into dentin.[33,35] With this system, clinicians can determine cavitation into dentin or find evidence of dentinal involvement, such as an underlying dark shadow, without extensive drying of the tooth.[16,33]

Other widely used criteria for epidemiologic and clinical caries studies also have relied on visual and visual/tactile assessment.[36-38] These criteria describe frank cavitation as "a discontinuity of the enamel surface caused by loss of tooth substance"[38] or an "unmistakable cavity."[36] In these assessments, the examiner uses an explorer primarily in noncavitated lesions to determine the softness of the floor or walls or the presence of weakened enamel. Findings of clinical and in vitro studies, however, indicate that use of a sharp explorer, even with gentle pressure, can result in defects or cavitations that could introduce a pathway for caries progression.[39-42]

Technologically advanced tools such as laser fluorescence are designed to assist the dentist in interpreting visual cues in detecting and monitoring lesions over time, especially early noncavitated lesions. Findings of validation studies indicate that these tools increase the percentage of early carious lesions that are detected, but they also increase the likelihood that a sound surface will be described as carious.[31,32,43,44]

Finally, investigators in two in vitro studies[45,46] assessed changes in the accuracy of detecting carious lesions resulting from the addition of low-powered magnification to unaided visual inspection. One study found that inspection with a ×2 magnifying glass did not improve the accuracy of visual inspection alone in the detection of dentinal caries on noncavitated occlusal surfaces.[46] The other study[45] found that the addition of ×3.25 loupes to visual inspection alone did improve accuracy in the assessment of occlusal and interproximal surfaces, although more than 90 percent of the clinical decisions to describe a surface as decayed were correct with the use of either technique. The researchers did not report the percentage of clinically decayed surfaces that were limited to enamel or extended into dentin on histologic examination.[45] They also did not document the prevalence of cavitation among the decayed surfaces.[45]

Summary of evidence. In 2001, a systematic review[30] concluded that the relative accuracy of methods used to identify carious lesions could not be determined from the available studies. More recently, a team of international caries researchers supported visual assessment alone to detect the presence of surface cavitation and/or signs of dentinal caries.[33, 34] They based this determination on their review of the best available evidence and on contemporary caries detection criteria.

Published studies have suggested that use of a sharp explorer under pressure could introduce a pathway for caries progression[39-42] and that use of technologically advanced tools, such as laser fluorescence, increases the likelihood that a sound surface will be deemed carious.[31,32,43,44] Investigators in two in vitro studies[45,46] could not determine improvement in the accuracy of detecting cavitation or dentinal caries on occlusal surfaces with the addition of low-powered magnification.

Surface preparation. What surface cleaning methods or techniques are recommended by manufacturers for unfilled resin-based sealants (self-curing and light-cured) commonly used in SBSPs?

Gray and colleagues[21] reviewed instructions for use (IFUs) for 10 unfilled sealant products from five manufacturers and found that all directed the operator to clean the tooth surface before acid etching. None of the IFUs specifically stated which cleaning method should be used. Five of the IFUs mentioned the use of pumice slurry or prophylaxis paste and/or a prophylaxis brush, thereby implying, but not directly stating, that the operator should use a handpiece.

Summary of evidence. A review of manufacturers' IFUs for unfilled resin-based sealants[21] found that they do not specify a particular method of cleaning the tooth surface.

Effect of clinical procedures. What is the effect of clinical procedures—specifically, surface cleaning or mechanical preparation methods with use of a bur before acid etching—on sealant retention?

Recent reviews, including one systematic review,[21,47] identified two controlled clinical trials that directly compared surface cleaning methods.[48,49] Donnan and Ball[49] found no difference in complete sealant retention between surfaces cleaned with a handpiece and prophylaxis brush with pumice and those cleaned with an air-water syringe after the clinician ran an explorer

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along the fissures. Similarly, Gillcrist and colleagues[48] observed no difference between surfaces cleaned with a handpiece and prophylaxis brush with prophylaxis paste and those cleaned with a dry toothbrush. Reported retention rates were greater than 96 percent at 12 months after sealant placement for all four surface cleaning methods. Furthermore, bivariate and multivariate analyses of retention data from published studies involving the use of supervised toothbrushing by the patient or a handpiece prophylaxis (also called rubber-cup prophylaxis or pumice prophylaxis) by the operator revealed similar, if not higher, retention rates for supervised toothbrushing.[19,21]

The ADA's expert panel,[16] in its review of evidence for the ADA sealant recommendations, found "limited and conflicting evidence" that mechanical preparation with a bur results in higher sealant retention rates in children.[50-52] In addition, a systematic review[47] identified only one controlled clinical trial[53] that compared use of a bur and acid etching with acid etching alone. The researchers found no difference in sealant retention at 48 months.[47,53]

Summary of evidence. The effect of specific surface cleaning or enamel preparation techniques on sealant retention cannot be determined because of the small number of clinical studies comparing specific techniques and, for mechanical preparation with a bur, inconsistent findings. Bivariate and multivariate analyses of retention data[19,21] across existing studies suggest that supervised toothbrushing or use of a handpiece prophylaxis may result in similar sealant retention rates over time.

Four-handed technique for applying dental sealant. Does use of a four-handed technique in comparison with a two-handed technique improve sealant retention?

The four-handed technique involves the placement of sealants by a primary operator with the assistance of a second person. The two-handed technique is the placement of sealants by a single operator. The work group could not find any direct comparative studies of the four-handed technique versus the two-handed technique with regard to sealant retention or effectiveness.

Furthermore, retention rates in single studies generally reflect multiple factors.[19] For example, Houpt and Shey[54] reported a sealant retention rate of more than 90 percent at one year in a single study that involved the use of two-handed delivery to apply sealants, while other authors[55,56] reported retention rates of less than 80 percent at one year for single studies in which four-handed delivery was used. Results of a multivariate analysis[19] of sealant effectiveness studies showed that use of the four-handed technique increased sealant retention by 9 percentage points when the investigators controlled for other factors.

Summary of evidence. In the absence of direct comparative studies, the results of a multivariate study of available data[19] suggest that use of the four-handed placement technique is associated with a 9 percentage point increase in sealant retention.

Caries risk associated with lost sealants. Are teeth in which sealants are lost at a higher risk of developing caries than are teeth that were never sealed?

A recent meta-analysis of seven RCTs found that teeth with fully or partially lost sealants were not at a higher risk of developing caries than were teeth that were never sealed.[20] In addition, although sealant effectiveness in preventing caries is related to retention over time, researchers conducting a systematic review that included only studies in which lost sealants were not reapplied found that sealants reduced caries by more than 70 percent.[20,26] Thus, children from low-income families, who are more likely to move between schools than are their higher-income counterparts,[57,58] will not be placed at a higher risk of developing caries because they missed planned opportunities for sealant reapplication in SBSPs.

Summary of evidence. Findings from a meta-analysis[20] indicate that the caries risk for sealed teeth that have lost some or all sealant does not exceed the caries risk for never-sealed teeth. Thus, the potential risk associated with loss to follow-up for children in school-based programs does not outweigh the potential benefit of dental sealants.

RECOMMENDATIONS FOR SCHOOL-BASED SEALANT PROGRAMS

The table presents the recommendations of the work group. These are based on the best available scientific evidence and are an update to earlier guidelines.[15] They provide guidance regarding planning, implementing and evaluating SBSPs and should be helpful for dental professionals working with sealant programs.

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TABLE

Recommendations for school-based sealant programs.

These recommendations update earlier guidelines[15] and support policies and practices for school-based dental sealant programs that are appropriate, feasible and consistent with current scientific information. This update focuses on indications for sealant placement on permanent posterior teeth that are based on caries status, and methods of assessing tooth surfaces. These recommendations also address methods of cleaning tooth surfaces, use of an assistant during sealant placement and follow-up issues. These topics should be considered in the context of the essential steps in sealant placement, including cleaning pits and fissures, acid-etching surfaces and maintaining a dry field while the sealant is placed and cured.[16] Practitioners should consult manufacturers' instructions for specific sealant products.

School-based sealant programs also can connect participating students with sources of dental care in the community and enroll eligible children in public insurance programs.[3] Programs should prioritize referral of students with cavitated carious lesions and urgent treatment needs. For students with cavitated carious lesions who are unlikely to receive treatment promptly, dental practitioners in sealant programs may use interim management strategies. Strategies could include placement of sealants for small cavitations with no visual signs of dentinal caries and atraumatic restorative procedures.[15,62-64]

TOPIC	RECOMMENDATION
Indications for Sealant Placement	Seal sound and noncavitated pit and fissure surfaces of posterior teeth, with first and second permanent molars receiving highest priority.
Tooth Surface Assessment	Differentiate cavitated and noncavitated lesions. ▬ Unaided visual assessment is appropriate and adequate. ▬ Dry teeth before assessment with cotton rolls, gauze or, when available, compressed air. ▬ An explorer may be used to gently confirm cavitations (that is, breaks in the continuity of the surface); do not use a sharp explorer under force. ▬ Radiographs are unnecessary solely for sealant placement. ▬ Other diagnostic technologies are not required.
Sealant Placement and Evaluation	Clean the tooth surface. ▬ Toothbrush prophylaxis is acceptable. ▬ Additional surface preparation methods, such as air abrasion or enameloplasty, are not recommended. Use a four-handed technique, when resources allow. Seal teeth of children even if follow-up cannot be ensured. Evaluate sealant retention within one year.

DISCUSSION

In the updated recommendations in this report, we use the presence or absence of surface cavitation as a key factor in the decision to apply sealant to the tooth surface. These recommendations complement the ADA sealant recommendations and are consistent with them on virtually all topics addressed by both (for example, sealing teeth that have noncavitated lesions and using a four-handed technique when possible).

The effectiveness of sealants in preventing the development of caries is well established.[5,26,28,29] Findings of a recent systematic review[17,18] also confirmed that sealants are effective in managing early carious lesions by reducing the percentage of noncavitated lesions that progress to cavitation and by lowering bacteria levels in carious lesions. These results should ease practitioners' concerns that placement of sealants on pit and fissure surfaces with early or incipient noncavitated carious lesions or on surfaces of questionable caries status is not beneficial.

One notable difference between the recommendations for sealant use in clinical versus school settings concerns the approach to caries risk assessment.[16] Clinicians periodically assess caries risk at the level of the patient or the tooth to determine if sealant placement is indicated as a primary preventive measure. In SBSPs, clinicians also must consider risk at the level of the school and community. Local and state health departments commonly use the percentage of children participating in the free or reduced-cost federal meal program as a proxy for income to prioritize schools for sealant programs.[6,11,22]

As described earlier in this report, children from low-income families are at a higher risk of developing caries than are children from wealthier families.[7] Caries risk among children from low-income families is sufficiently high to justify sealing all eligible permanent molars and is the most cost-effective prevention strategy.[59,60] Furthermore, providing sealants only to children in a free or reduced-cost lunch program is viewed as stigmatizing and is unacceptable in many schools and communities.[22] Thus, children participating in SBSPs usually receive sealants as a primary preventive measure without undergoing a routine assessment of their caries risk.

The context for making decisions in clinical care and in SBSPs also differs. Important distinctions exist related to the availability of diagnostic and treatment services and the use of care.[15] Clinical care in the private or public sectors typically includes comprehensive diagnostic and treatment services; in contrast, SBSPs limit services to those necessary for successful sealant placement and retention.[15] Furthermore, children who receive sealants only in SBSPs are likely to be from low-income families. Recent data indicate that less than 50 percent of children aged 6 through 12 years from families with incomes of

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less than two times the federal poverty threshold had a dental visit in the previous year compared with about 70 percent of their higher-income counterparts.[61]

As resources allow, SBSPs work with partners, such as local dental practices, public health clinics, parents, school nurses and local dental associations, to help students without a source of dental care receive comprehensive dental services. For children with cavitated lesions who are unlikely to receive treatment services promptly, dental practitioners in SBSPs may choose to use interim treatment strategies. These could include application of sealants for small cavitations with no visually detectable signs of dentinal caries and atraumatic restorative procedures for larger carious lesions.[15,62-64]

The following information might be helpful for practitioners who see children who have received sealants through SBSPs. First, sealants do not eliminate dental caries but predictably reduce the occurrence of disease. Thus, practitioners might observe a child with a permanent molar sealed in a school program in which caries has developed. They should keep in mind that the failure to prevent caries in that one sealed tooth does not constitute failure of the entire school sealant program. Similarly, the failure of a sealant to prevent caries in a patient treated in a private dental practice does not constitute failure of the entire sealant protocol. Available evidence consistently indicates that the overall incidence of caries in permanent molars is lower among children who received sealants compared with the incidence in similar children who did not.[5,26,28,29] Finally, sealant placement is a reversible procedure that easily allows the dentist to administer additional caries management and treatment strategies, such as placement of a restoration, if needed.

School-based sealant programs work with partners, such as local dental practices, to help students without a source of dental care receive comprehensive dental services.

In preparing these recommendations, the work group and CDC staff members also reviewed assessment methods for tooth surfaces in SBSPs. Visual assessment for the detection of cavitation is supported by many international experts.[33,65] Most SBSPs target children with newly erupted permanent molars. The low likelihood of caries in these newly erupted teeth, along with recommendations to seal both sound surfaces and those with noncavitated lesions, argue against the use of radiographs or technologically advanced tools to detect cavitated lesions in children in SBSPs.

Furthermore, when the likelihood of caries is low, such as in newly erupted molars, these modalities might increase the possibility that a sound surface will be misclassified as carious and be restored prematurely.[16,32] Thus, these teeth might not receive the preventive benefit of a sealant. In addition, children in SBSPs who are in need of treatment services will be referred to private dental offices or public dental clinics where dentists will obtain radiographs as necessary—and in accordance with current ADA/U.S. Food and Drug Administration guidelines[66]—and conduct additional diagnostic procedures, as appropriate.

The essential steps in placement of unfilled resin-based sealants include cleaning pits and fissures, acid etching tooth surfaces and maintaining a dry field while the sealant is placed and cured.[16] Available evidence suggests that cleaning pits and fissures with a toothbrush by the patient under supervision or with a handpiece prophylaxis by the operator results in similar sealant retention rates.[19,21,47,48]

Application of a hydrophilic bonding agent between the etched surface and the sealant is a supplemental technique that is not used routinely in SBSPs, and the work group did not evaluate the technique. The ADA's expert panel reviewed the evidence, developed guidance for practitioners and described current types of bonding systems.[16] The ADA panel noted that use of currently available self-etching bonding agents that do not include a separate etching step might result in lower retention than that achieved with the standard acid-etching technique and is not recommended.[16] In addition, the bonding agent must be compatible with the sealant material.

The work group also reaffirmed the importance of evaluating sealants after placement, but it stressed that children for whom follow-up cannot be ensured should still receive sealants. A recent meta-analysis found that teeth with partially or completely lost sealants were at no greater risk of developing dental caries than were teeth that were never sealed.[20] Dental professionals can check sealant retention among a sample of participants in an SBSP shortly after placement to ensure the quality of the procedure and materials

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used.[6,22] They also can check sealant retention and integrity during the following school year and seal any permanent molars that might have erupted since the procedure. The timing of the evaluation of sealant retention and integrity can depend on several factors, such as local program objectives; changes in dental materials, techniques or personnel; and student movement in and out of the school and school district.

CONCLUSION

The recommendations of the expert work group update earlier guidelines for SBSPs and support practices that are appropriate, feasible and based on the best available scientific evidence. These updated recommendations, along with the supporting rationale, should increase practitioners' awareness of the SBSP as an important and effective public health approach that complements clinical care systems in promoting the oral health of children and adolescents. ■

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Disclosure. Dr. Donly receives research support (no consulting fees) from 3M ESPE, St. Paul, Minn., and Ivoclar Vivadent, Amherst, N.Y., manufacturers of sealants. None of the other authors reported any disclosures.

The authors acknowledge the following people for their guidance and critical review of the information reported during the expert work group meetings and in earlier versions of the manuscript of this article: Dr. William Bailey, Ms. Laurie Barker, Dr. Eugenio Beltrán, Dr. Maria Canto, Ms. Kathleen Heiden, Dr. William Maas, Dr. Mark Macek, Dr. Dolores Malvitz, Ms. Linda Orgain, Dr. Scott Presson, Dr. John Rossetti, Dr. Robert Selwitz.

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