

A String around Your Finger: Do We Really Need to Floss?



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Conflict of Interest Disclosure Statement

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Introduction – Hidden Sugars

A String around Your Finger: Do We Really Need to Floss? will review current literature on the effectiveness of flossing and other interdental cleaning in the age of “Flossgate,” the August 2016 assertion in the Associated Press that there is scanty research supporting flossing as a method to improve oral health outcomes. This course will look at the 2011 Cochrane systematic review upon which the government based its decision to omit the recommendation to floss from the 2015-2020 Dietary Guidelines for Americans as well as the broader literature and scientific rationale behind flossing and interdental cleaning. Finally, this course will evaluate the current best evidence for oral hygiene methods to prevent caries and periodontal disease.

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Overview

As a part of the update to the 2015-2020 Dietary Guidelines for Americans, the federal government omitted a recommendation for flossing previously included in the guidelines. Citing the reasons for the omission, the Dietary Guideline Advisory Committee (DGAC) stated they focused on food and nutrient intake (e.g., added sugar) and cited the 2011 Cochrane systematic review¹ which concluded there is currently a lack of strong evidence to support the use of floss as a preventative measure for caries and gingival disease. The Surgeon General, Centers for Disease Control (CDC), the Department of Health and Human Services, and other federal and state health agencies continue to support the importance of flossing and interdental cleaning and that advice is available to the public through the National Institute of Dental and Craniofacial Health (NIDCR),² CDC’s Division of Oral Health,³ and Healthy People 2020.⁴

Despite the support of these agencies and numerous nonprofit groups, there continues to be confusion in the lay media and the public with regard to the role of patient-administered oral hygiene for the prevention of oral diseases. Interdental cleaning continues to be an essential

part of oral hygiene to maintain a healthy oral environment.⁵ There are 700+ identified species of bacteria and up to 1,500 putative pathologic microorganisms found in dental plaque.⁶⁻⁸ Many of these organisms as well as other factors including bacterial nutrients, food debris, molecules that facilitate bacterial adhesion and invasion, and other extrinsic factors in the environment and the body’s own immune response contribute to diseases of the teeth and gingival tissues.^{9,10} Current recommendations include brushing for two minutes twice daily and cleaning between teeth to maintain a healthy mouth and smile!¹¹

Learning Objectives

Upon completion of this course, the dental professional should be able to:

- Address “Flossgate” questions generated by patients related to media coverage of the omission of flossing recommendations from the 2015-2020 U.S. Dietary Guidelines.
- Apply the current scientific literature about the benefits, if any, of flossing and other interdental cleaning aids in addition to tooth brushing in their practice for patient benefit.
- Discuss with patients the optimal strategies and rationale for oral hygiene, including interdental cleaning.
- Develop home care recommendations that focus on evidence based strategies for oral health and emphasize individualized patient care recommendations based upon patient needs.
- Discuss the importance of preventive strategies for oral diseases including maintaining good oral hygiene in order to promote oral and overall well-being with a wide range of interdisciplinary colleagues and patients.

Introduction

Dental plaque containing pathogenic microflora, is a necessary component in the initiation of both dental caries and periodontal disease, the two most prevalent oral diseases. As an integral part of the prevention and treatment of caries and periodontal diseases, patients become co-practitioners with their oral health providers and their sustained daily maintenance of oral hygiene becomes critical to the success of professional oral

health interventions. However, patient levels of home care vary considerably and are often suboptimal. Despite recommendations from the American Dental Association (ADA) that individuals brush for two minutes twice daily,¹² the average individual performs 45-70 seconds of toothbrushing daily.¹⁰ Similarly, patient compliance with regular and sustained daily use of dental floss for interdental cleaning has been estimated to be as low as 2%.¹³ In a survey from the American Academy of Periodontology (AAP), more than 35% of respondents stated they would rather perform an unpleasant task, like filing their tax return or cleaning their toilet, than floss.¹⁴

Given the lack of public enthusiasm for oral hygiene measures and, in particular, for flossing,¹⁴ there was a large amount of public interest in August 2016 when the U.S. government released a statement that discussed the rationale for the omission of references to oral hygiene from the 2015-2020 Dietary Guidelines for Americans.¹⁵ Included in this omission were recommendations for 1) consumption of fluoridated water, 2) reduction of sugary food and beverage consumption, and 3) tooth brushing and flossing as effective methods to reduce the risk of dental caries. In response to a government Freedom of Information Act request, it was reported by the Associated Press that the flossing recommendation was excluded due to a lack of definitive scientific evidence stating flossing prevents dental caries.¹⁶ This was purportedly based upon a 2011 meta-analysis that concluded current scientific evidence exists to support interdental cleaning for the prevention and treatment of gingivitis, but more studies may be needed to demonstrate definitive benefit for the prevention of dental caries and periodontitis.¹

Given the current oral hygiene practices and public interest in the omission of oral health references from the 2015-2020 Dietary Guidelines for Americans for the first time since 1979,¹⁵ it is critical for dental healthcare providers to be able to review the current scientific evidence and recent recommendations from government and non-profit groups to make individualized recommendations for their

patients, to allow for optimal implementation and compliance for oral self-care in their patients.

Epidemiology and Etiology of Caries and Periodontal Disease in a U.S. Population

Caries

Dental caries, or tooth decay, results from the breakdown of the hard tissues of the tooth (enamel, dentin, and cementum) due primarily to the acid by-products of bacterial metabolism on a susceptible tooth surface. Bacteria use simple sugars as a food source and produce metabolic acids as a part of the process to break down sugars.^{17,18} Overall acidity within the mouth, the buffering capacity of the saliva, the hardness of tooth enamel, and available mineral content for remineralization of the hard tissues influence the rate and severity of the progression of carious lesions.¹³ Conditions and medications that affect salivary flow, poor tooth cleaning, dietary sugar and acid content, and fluoride availability can all affect the rate of caries.¹⁴

Within the oral cavity, the oral hard tissues constantly undergo remodeling through a demineralization-remineralization process.¹⁹ As pH within the oral cavity or at a local site drops, demineralization occurs and as the pH increased, remineralization of those tissues is seen. The net resultant mineral exchange is a determinant of caries development and progression.²⁰ Strategies for dental caries prevention include providing access to fluoride as a component of the remineralization process, which results in an increase in acid-resistance in the resulting remineralized enamel and limiting exposure to acids from dietary, intrinsic, and extrinsic sources that may decrease pH and facilitate the demineralization process.^{20,21} Water fluoridation has proven to be one of the most cost-effective methods for reducing overall caries rates in the population with every \$1 spent on water fluoridation returning from \$5-32 in decreased healthcare costs within the community!²²

Dental caries is a highly prevalent disease in both children and adults, despite declining

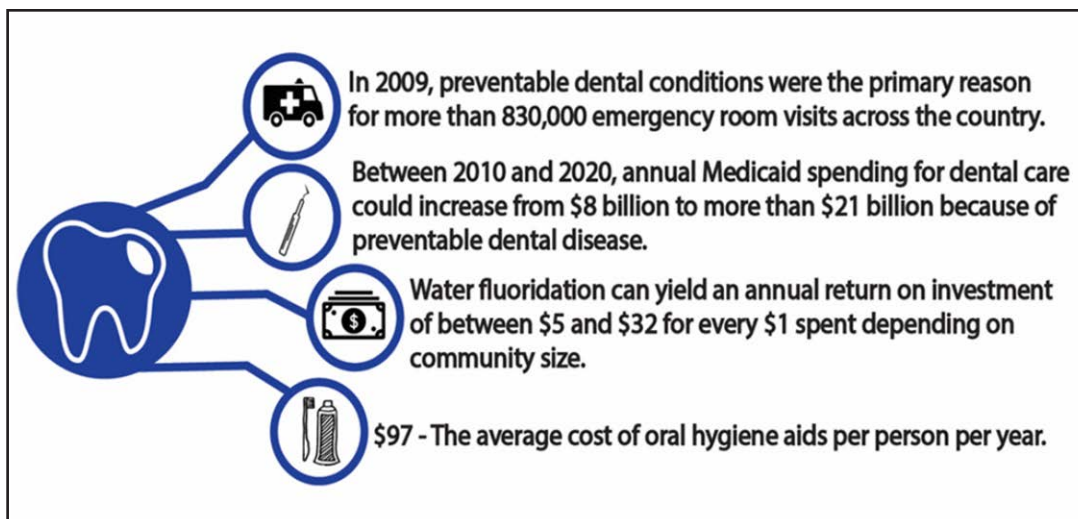


Figure 1. Caries Impact in the United States.^{22,113,114}

rates of both treated and untreated caries since the 1970s. Nearly 19% of US children ages 5-19 years have untreated caries and almost 32% of US adults ages 20-44 years have untreated caries.²³ The average adult has 3.28 decayed, missing, or filled teeth and tooth loss and decay are more prevalent in some groups of individuals, including: children and older adults, individuals with lower socioeconomic status, Hispanic ethnicity, and non-Hispanic blacks.^{23,24} Patients' quality of life is negatively affected by poor oral health and high caries and edentulism rates with the impact being significant in both children and adults.²⁵ Nearly 51 million school hours are lost each year to dental-related illnesses, and children from the lowest household incomes suffer 12 times more restricted-activity days than those from higher income households.²⁶ Employed adults also lose 164 million work hours each year to dental disease.²⁶ The emotional, financial, and educational impact of these diseases is of high importance and proper oral hygiene and home care is critical to the management and prevention of dental caries (Figure 1).

Periodontal Disease

Periodontal diseases include inflammatory and tissue-destructive diseases of the supporting structures around the teeth, comprised of the gingival tissues, periodontal ligament, alveolar bone, and cementum. Research shows all individuals are susceptible to gingivitis, a

reversible form of gingival inflammation and may be the precursor to more serious, irreversible forms of periodontal disease. Gingivitis is caused by bacterial plaque and a susceptible host and, in most cases, the severity is related to the amount and type of bacteria present on tooth and soft tissue surfaces throughout the mouth as well as the individual patient susceptibility to disease.^{27,28} Removal of plaque and local etiologic factors results in the reversal of gingivitis symptoms and reduces local and systemic levels of inflammatory markers in patients with gingivitis.^{8,29}

Periodontitis is a chronic disease of the hard and soft tissues supporting the teeth initiated by bacterial plaque, which then causes a host immuno-inflammatory response that, over time, may result in progressive destruction of the periodontal ligament and alveolar bone if not adequately resolved.³⁰⁻³⁵ The disease typically has a slow to moderate rate of disease progression, but episodes of accelerated attachment loss may be associated with local and/or systemic factors.^{32,33} Disease severity is classified as mild (1-2mm), moderate (3-4mm), or severe (≥ 5 mm) based on the amount of clinical attachment loss (CAL).^{36,37} The prevalence of periodontitis has been estimated to be over 47% of U.S. adults, or 64.7 million individuals.³⁸ Of those individuals, 8.7% showed mild disease, 30.0% demonstrated moderate

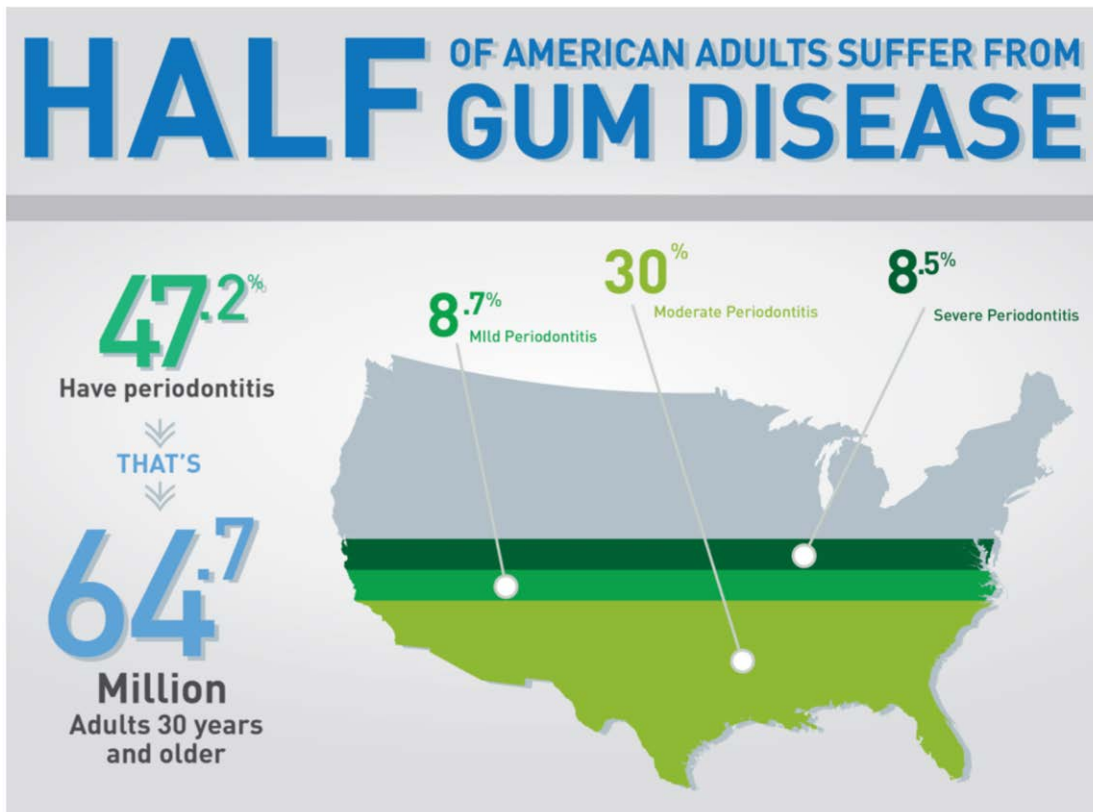


Figure 2. Periodontal Disease Prevalence in the United States.¹¹⁴

disease, and 8.5% had severe chronic periodontitis.³⁸ Risk indicators for periodontitis include male gender, Hispanic ethnicity, and lower socioeconomic status. Furthermore, cigarette smoking and uncontrolled or poorly controlled diabetes mellitus have been shown to be risk factors for periodontitis.³⁹ Prevalence of periodontitis varied two-fold between the lowest and the highest levels of socioeconomic status (Figure 2).³⁹

Disease progression of periodontitis has been categorized into subpopulations demonstrating rapid progression (10-15% of disease cases), moderate progression (80% of disease cases), and mild/no progression (5-10% of disease cases).³⁸⁻⁴⁰ The prevalence distribution of periodontal disease severity and disease progression in treated and untreated populations³⁸⁻⁴⁰ suggests host factors play a significant role in disease progression after bacterial initiation.⁴¹⁻⁴⁶

Because both gingivitis and periodontitis are initiated by bacterial plaque, the removal of

bacteria and their food sources from hard and soft tissues in the oral cavity is critical for the prevention, control, and management of periodontal disease.

“Flossgate” Controversy: Changes to the 2015-2020 Dietary Guidelines for Americans

The United States’ federal government published an update to the 2015-2020 Dietary Guidelines for Americans omitting their previous recommendation of daily flossing and other references to oral health that had been in place since 1979.¹⁵ The **omitted** paragraphs are as follows:

Drinking fluoridated water and/or using fluoride-containing dental products helps reduce the risk of dental caries. Most bottled water is not fluoridated. With the increase in consumption of bottled water, Americans may not be getting enough fluoride to maintain oral health.

During the time that sugars and starches are in contact with teeth, they also contribute to dental

caries. A combined approach of reducing the amount of time sugars and starches are in the mouth, drinking fluoridated water, and brushing and flossing teeth, is the most effective way to reduce dental caries.

In response to this omission, the Associated Press (AP) submitted a Freedom of Information Act (FOIA) request and was told the flossing recommendation was excluded due to a lack of definitive scientific evidence stating flossing prevents dental caries.¹⁶ In the AP's publication, it is argued that due to the lack of randomized controlled trials demonstrating efficacy in dental caries reduction, flossing should be considered "unnecessary."¹⁶ This conclusion is unfounded and hyperbolic, based upon the initial scientific discourse, but the headline was nonetheless repeated manifold in the lay press. There were of course, counterbalances to this initial reporting. For example, in his response to the AP article, "Flossing and the Art of Scientific Investigation," the *New York Times'* Jamie Holmes points out the pitfalls of performing the definitive studies on flossing and the current scientific evidence that does exist.⁴⁷ These publications and their coverage in the lay press resulted in confusion for patients and the public, but there are some significant problems with the assumption that flossing should be considered worthless.

The Cochrane review meta-analysis, which is cited in the U.S. government's justification for the omission of oral health and hygiene references in the 2015-2020 Dietary Guidelines for Americans, states that current scientific evidence does not allow for the conclusion that flossing results in decreased caries and periodontitis.¹ Specifically, the review states, *"There is some evidence from twelve studies that flossing in addition to toothbrushing reduces gingivitis compared to toothbrushing alone. There is weak, very unreliable evidence from 10 studies that flossing plus toothbrushing may be associated with a small reduction in plaque at 1 and 3 months. No studies reported the effectiveness of flossing plus toothbrushing for preventing dental caries."* The review also suggests further long-term interventional trials that would allow for conclusive data on the efficacy of flossing.¹ However, there are

several roadblocks to the performance of such studies. First, there are ethical dilemmas in performing a long-term randomized controlled trial where the intervention would require a lack of flossing for long periods of time and observations about the development of tooth decay without intervention. Secondly, there are randomized controlled trials that demonstrate flossing and other interdental cleaning methods are effective as an adjunct to toothbrushing in removing plaque, the primary etiology of both dental caries and periodontal disease and in reducing levels of gingival bleeding and inflammation.^{1,48-51} Finally, in observational trials, there is evidence, albeit less definitive than in randomized controlled studies, that interdental cleaning frequency is associated with lower rates of dental caries, periodontal disease, and increased overall longevity.⁵²⁻⁵⁵

It is widely accepted by a vast array of experts, including the U.S. Surgeon General,³⁰ the Centers for Disease Control,³ the National Institutes of Health,² the American Dental Association,^{5,11,12} the Academy of General Dentistry,⁵⁶ and the American Academy of Periodontology⁵⁷ that interdental cleaning is an essential part of optimal oral hygiene and this view was reaffirmed after the AP article.¹⁶ As dental healthcare providers, an awareness of the impetus for the changes to the Dietary Guidelines for Americans and the overall evidence for the performance of oral hygiene measures is important to convey to our patients so that they can do their part to prevent and treat the two most prevalent oral diseases: dental caries and periodontal disease.

Identification of At-risk Individuals for Oral Disease

Patients demonstrate different susceptibility to oral disease and these susceptibility levels may change throughout life. Adequate assessment of risk factors for caries and periodontal disease is critical to targeting adequate recommendations for individual patients.

Caries

Dental caries affect nearly all adults in the U.S. and worldwide, with a large number having untreated decay.^{58,59} Despite the widespread prevalence of this disease, a large proportion of

dental caries, particularly untreated disease, occur in a small select high-risk subset of individuals, including those with lower socioeconomic status.⁵⁸ Caries risk assessment should include an evaluation of: 1) food and beverage intake, including types, frequency, and quantities of foods/beverages consumed, 2) salivary flow/consistency, 3) history of previous carious lesions and restorations, 4) assessment of current oral hygiene methods and dexterity, 5) dental plaque accumulation calculation, 6) systemic medical conditions, 7) current medications, 8) history of dental visits and dental care, and 9) other factors that may influence dental caries rates.⁶⁰⁻⁶⁴

Dental caries prevention requires the treatment of active carious lesions; regular cleansing of the teeth, including both professional therapy and home care; limiting dietary sugar intake; fluoride application; and mitigation of other factors that may increase the rate of caries susceptibility.⁶³ Interventions for higher risk individuals can include removal and reduction of plaque biofilm, alteration of dietary habits to reduce bacterial substrate, and utilization of interventions that encourage remineralization and the bioavailable fluoride ions available during the remineralization process. The ADA Caries Risk Assessment protocol provides assessment criteria for children 0-6 years and patients over 6 years old.^{65,66} The Caries Management by Risk Assessment (CAMBRA) system may also be employed to identify at-risk children and adults and to identify proper treatment recommendations for those individuals.⁶⁷

Periodontal Disease

Periodontal disease risk is related to both the amount and type of bacteria/bacterial plaque present intraorally^{7,8} as well as myriad host and environmental factors.⁶⁸ Smoking is the largest modifiable risk factor for periodontal disease progression and attachment loss, and it appears to have a dose-dependent effect on periodontal disease progression.^{69,70} Other factors associated with periodontal disease risk include: age, race/ethnicity, socioeconomic status, diabetes mellitus, psychosocial stress, immune deficiency, gingival bleeding, and a history of previous periodontal attachment

loss.^{68,69} Careful assessment of the overall and oral health of a patient as well as identification of possible risk factors for disease allow for a more tailored approach to recommendations for oral hygiene and professional care.

Several risk assessment tools may be used to evaluate periodontal disease risk, although there are no foolproof strategies to improve care (Figure 3). The UniFe tool uses five parameters: 1) smoking status, 2) diabetes status, 3) number of sites with PD \geq 5mm, 4) number of sites with bleeding on probing (BOP), and 5) bone loss/age to assign risk categories to patients.⁷¹ Using similar parameters, the Periodontal Risk Assessment (PRA) hexagonal diagram allows a visual imagery of the overall risk for a patient based upon BOP, number of PD \geq 5mm, number of teeth lost, bone loss/age, systemic and genetic factors, and environmental factors (smoking status).⁷² The BEDS CHASM model uses a scoring system that can be compared with average scores to estimate an odds ratio.⁷³ In this system, patients are scored on BMI, ethnicity, diabetic status, stress levels, education, oral hygiene, age, smoking status, and male gender.⁷⁴ All of these tools, modifications of these assessments, and other commercially available risk assessment tools may have utility in providing a periodontal risk analysis for the patient.

Review of Literature Demonstrating the Effectiveness of Oral Hygiene Methods

Microbial biofilm begins to form within seconds of thorough debridement of tooth surfaces and owing to the complexity of bacterial biofilms, biofilm associated infections are a challenge to treat.^{75,76} Well-organized biofilms grow within hours and biofilm must be completely removed at least every 48 hours in experimental settings to prevent inflammation.⁷⁷ Current ADA recommendations^{11,12} for oral hygiene include:

- Toothbrushing for at least 2 minutes twice daily with a fluoride-containing dentifrice.
- Clean between teeth daily
- Eat a balanced diet and limit between-meal snacks
- Visit your dentist regularly for professional cleanings and oral exams

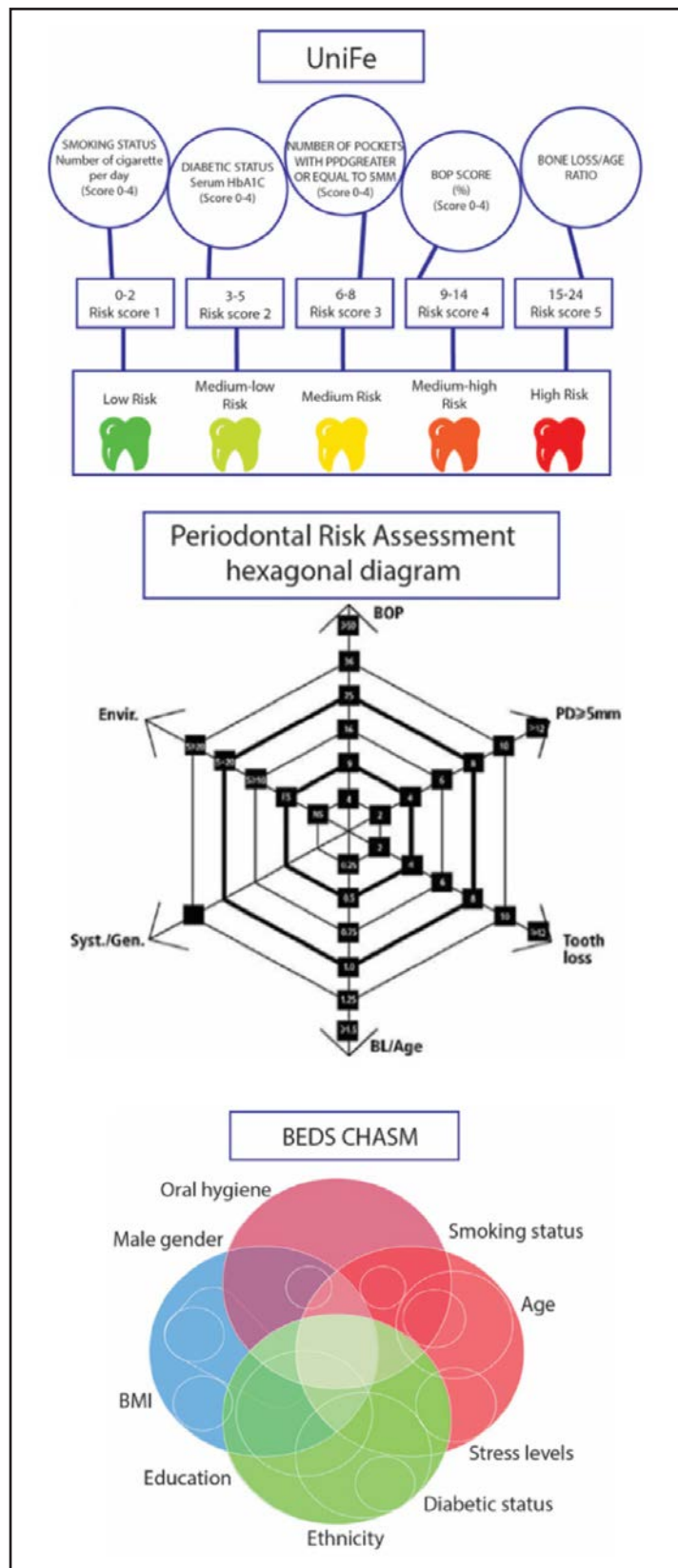


Figure 3. Three currently used periodontal risk assessment tools.⁷⁰⁻⁷³



Figure 4. Various oral hygiene aids for effective oral home care.

Several methods for dental biofilm removal will be reviewed, along with evidence of their effectiveness (Figure 4).

Toothbrushing

Toothbrushing with both manual and power brushes, has been shown to be effective in the removal of plaque on tooth surfaces.^{78,79} Time spent toothbrushing is associated with a significantly greater amount of plaque removal up to approximately two minutes.⁸⁰ Most individuals, however, brush for significantly shorter periods of time.^{81,82} Softer toothbrush bristles are associated with superior plaque removal subgingivally and interproximally and result in less gingival recession and abrasion to oral soft tissues than hard toothbrush bristles.^{83,84} Similarly, high amounts of force are not necessary for adequate plaque removal and can cause trauma to hard and soft tissues in the mouth.⁸² It is important to replace toothbrushes regularly as bristle wear after 9 weeks of normal use can affect the efficacy of plaque removal.⁸³

Power toothbrushes have been shown to be as effective as manual toothbrushes and power brushes with oscillating rotating action have been shown in several systematic reviews conducted by the Cochrane Collaboration, to

remove significantly more plaque and reduce gingival bleeding than manual toothbrushes.^{84,85} Acceptance of powered toothbrushes among patients of all ages has been reported to be high^{86,87} and thus recommending a power toothbrush to patients, particularly those who demonstrate difficulty in motivation, may be beneficial. Patients who have dexterity issues may also see an additional benefit from powered toothbrushes as there is evidence that powered toothbrushes improve gingival health and plaque removal for 1) children and adolescents, 2) children with physical or mental disabilities, 3) hospitalized patients, including older adults who need to have their teeth cleaned by caregivers, and 4) patients with fixed orthodontic appliances.^{88,89}

While no randomized controlled studies demonstrate that toothbrushing itself is effective in caries prevention, observational studies demonstrate that plaque accumulation is associated with increased rates of caries and proper toothbrushing has been shown to reduce plaque biofilms and improve gingival health.^{1,53,77,78}

Floss

Dental floss is the most widely recommended tool for removing dental plaque from proximal



Figure 5.

tooth surfaces.⁹⁰ Regular flossing as an adjunct to toothbrushing has been demonstrated to decrease plaque levels interproximally and to decrease gingival inflammation over toothbrushing alone.⁷⁸ Furthermore, individuals who floss demonstrate lower levels of caries and gingival inflammation in observational studies.⁵³ In a matched twin cohort the addition of flossing to toothbrushing alone decreased visible plaque, gingival bleeding, and altered the subgingival flora to reduce the proportions and amounts of bacterial species associated with periodontal disease and dental caries, including *T. denticola*, *P. gingivalis*, *T. forsythia*, *P. intermedia*, *A. actinomycetemcomitans*, and *S. mutans*.^{91,92} Additionally, while this increased plaque removal and a shift in microbial species may not necessarily translate into lower caries rates as it relates to flossing, decreased plaque scores are associated with decreased decayed, missing, and treated (DMT) scores in adults and children.^{1,93,94}

Despite the conclusions in the lay media, flossing efficacy has been demonstrated its adjunctive benefit in reducing gingival inflammation, bleeding upon probing, and plaque deposits as an adjunct to toothbrushing. Flossing is economical, effective when performed correctly, and aids in removal of plaque and food debris interproximally, however it may not be optimally effective in areas with anatomical challenges including diastemata, open embrasure spaces, radicular grooves and/or concavities, etc. Additionally, adequate flossing habits are difficult to establish. It is reported only 8% of teenagers floss daily and the number of all individuals who floss daily may be as low as 2%.^{14,95,96} Increasing patients' willingness to floss and their ability to sustaining the habit over time may depend upon the behavior modification techniques employed by the dental healthcare professional. Some patients may report better adherence with other methods of interdental cleaning.

Other Interdental Cleaning Methods

While floss is the most widely recommended and used interdental cleaning aid,⁹⁰ it can be difficult to use properly and adherence may be low.^{95,96} In patients for whom flossing results in inadequate plaque removal or those who cannot adhere to a flossing regimen, additional interdental cleaning aids are beneficial.⁹⁶

Interdental brushes remove more plaque interproximally when compared to floss and have demonstrated similar reductions in interproximal probing depths and gingival bleeding in numerous studies.⁹⁷⁻⁹⁹ Interdental brushes can be particularly helpful in areas of concavities and root anomalies, such as the mesial of the maxillary first premolars. In patients who have received previous periodontal care interdental brushes have been shown to be more effective than floss overall.^{89,100} This is most likely due to less papillary fill in the embrasure spaces and additional access for interdental brushes. A comprehensive systematic review demonstrating the efficacy of interdental brushes demonstrated that in adult patients with adequate interdental space to utilize interdental brushes, plaque removal was greater with toothbrushing and adjunctive use of interdental brushes than toothbrushing alone, toothbrushing with floss, and toothbrushing with interdental wood sticks.¹⁰¹ Furthermore, patients have been shown to prefer the use of interdental brushes over flossing.⁹⁹⁻¹⁰¹ Nevertheless, they may not be correct for all sites as they require more interdental space, and less papillary fill, than floss does for their comfortable use.⁹⁶

Triangular wooden tips inserted in interproximal areas, while better accepted by patients than flossing, demonstrate no overall reduction in plaque or gingival index, but do demonstrate a reduction in BOP that is similar to that seen with flossing.¹⁰²

Powered flossers, have been shown to result in a reduction in interdental plaque deposits and gingival bleeding when compared to toothbrushing alone.^{89,100,103} The magnitude of this reduction is variable and dependent upon the type and design of powered flosser.⁸⁹ It has

also been noted that in patients with dental implants, given differences in cross-section and emergence profile these sites when compared to natural teeth, may benefit from the use of a powered flosser.¹⁰⁴ Additionally, in patients who lack the dexterity to perform other forms of interdental cleaning or who have not demonstrated adherence with an interdental cleaning regimen in the past, powered flossers may provide motivation and benefit for improved interdental cleaning.⁸⁹

Mouthrinses

Mouthrinses containing essential oils, cetylpyridinium chloride, stannous fluoride, and 0.12% chlorhexidine have demonstrated efficacy in reducing biofilm, signs of gingival inflammation and gingival bleeding when used as an adjunct to toothbrushing.^{105,106} Cetylpyridinium chloride mouthrinses demonstrated wider variability in their efficacy, depending upon the formulation of the mouthrinse.^{88,106} Furthermore, the use of fluoride mouthrinses as an adjunct to brushing and flossing for reduction of caries in children is well established.¹⁰⁷

Despite these benefits, we cannot conclude that mouthrinses are a replacement for proper interdental cleaning. While some studies demonstrate no statistically significant difference in gingivitis and plaque reduction when compared to floss,¹⁰⁸ it is important to note these studies were limited to patients without active caries and/or periodontal attachment loss. For patients who have experienced periodontal bone loss and/or who have significant interproximal restorations, these findings may not apply. Nevertheless, patient acceptance of mouthrinses is significantly higher than floss and thus may provide a reasonable adjunct to toothbrushing and interdental aids in the control of plaque and gingivitis in healthy patients.

Standards of Care for Oral Hygiene and Oral Hygiene Instruction

Current Oral Hygiene Recommendations

Many dental professional and advocacy groups have made statements regarding the importance of regular and effective oral

hygiene practices. A joint workshop between the European Federation of Periodontology (EFP) and the European Organisation for Caries Research (ORCA) concluded that “the most important behavioral factor, affecting both dental caries and periodontal diseases, is routinely performed oral hygiene with fluoride” and that “management of both dental caries and gingivitis relies heavily on efficient self-performed oral hygiene, that is toothbrushing with a fluoride containing toothpaste and interdental cleaning.”⁵⁴ These conclusions are echoed by the ADA¹² and the World Dental Federation (FDI).¹⁰⁹ To achieve optimal oral hygiene for the public, whose risk, current habits, and abilities may be heterogeneous, population and individual-based interventions must be employed and reinforced.

Patient-centered Behavior Management

Manual toothbrushing alone is inadequate in the treatment of gingivitis, once inflammation is established, however, coupled with interdental plaque removal, it has been shown to reduce rates of interdental caries.^{53,93} Improvement in effectiveness of oral hygiene measures requires multiple rounds of oral hygiene instruction and reinforcement over time.¹¹⁰ Given the low adherence to daily flossing and interdental tooth cleaning in the population and the suboptimal performance of all oral hygiene measures,^{14,95,96} effective communication and targeting of patients to improve oral hygiene is of critical importance for all dental healthcare professionals.¹¹⁰ A systematic review shows psychological interventions, such as social cognition models, cognitive behavioral therapy, and motivational interviewing, have an improved effect on patient performance of oral hygiene measures.¹¹¹

Individualized, patient-centered care, including individualized goal-setting and accountability, has been shown to increase the longevity of effectiveness of oral hygiene instructions and to demonstrate clinically superior outcomes.¹¹⁰⁻¹¹² While this approach may be more time consuming to perform for dental healthcare professionals, it may represent a cost savings if it results in decreased incidence of oral diseases and their sequelae.

Summary

As dental healthcare professionals, it is imperative that we are able to adequately interpret the scientific literature in a manner that allows our patients to understand and implement the best practices for their oral health. The confusion associated with the changes in the 2015-2020 Dietary Guidelines for Americans and its reporting in the lay media caused many unsubstantiated conclusions that were not supported by current research.^{15,16} While the “Flossgate” controversy resulted in some splashy headlines and sensational news segments, the underlying science is less titillating. We currently lack the randomized, longitudinal studies necessary to make definitive conclusions about the effectiveness of flossing as a preventative measure for dental caries and periodontitis.¹ There are, however, data to suggest that plaque removal through toothbrushing and interdental cleaning improves oral health outcomes.

Caries and periodontal disease are prevalent, serious diseases that represent a huge burden to the health and well-being of the population as well as a cost burden on society. While professional dental prophylaxis has been shown to improve plaque levels and gingivitis in the short-term, these improvements cannot be maintained without subsequent optimization of home care by the patients themselves.

Clinical Recommendations:

- Both dental caries and periodontal disease are largely preventable diseases. Proper evaluation and diagnosis of patients as well as motivation to perform adequate oral hygiene and limit sugar intake is critical to their prevention and management.
- A regular, patient-centered, risk-assessment and oral health and hygiene recommendations should be designed for individual patients.
- Individualized oral hygiene practices that optimize plaque removal and reduction in signs of gingival inflammation should be employed and reinforced by dental professionals.
- Oral hygiene education should utilize psychological interventions that tailor approaches to patients’ needs and desires.

Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-us/professional-education/ce-courses/ce550/start-test

- 1. The American Dental Association recommends brushing for at least 2 minutes, twice daily. What is the average time that an U.S. adult brushes per day?**
 - A. 30 seconds
 - B. 45-70 seconds
 - C. 90-120 seconds
 - D. 240 seconds
- 2. Approximately what percentage of U.S. adults floss daily?**
 - A. 2%
 - B. 15%
 - C. 35%
 - D. 50%
- 3. Caries result from acid erosion of hard surfaces of the teeth due to metabolic acids produced from the metabolism of simple sugars.**
 - A. True
 - B. False
- 4. How many decayed, missing, and treated (DMFT) teeth does the average American adult have?**
 - A. 1.27
 - B. 2.89
 - C. 3.28
 - D. 5.65
- 5. In 2009, the number of emergency room visits related to dental conditions was:**
 - A. 550,000
 - B. 724,000
 - C. 830,000
 - D. 1,120,000
- 6. The prevalence of periodontitis has been estimated to be over ____% of U.S. adults?**
 - A. 25
 - B. 33
 - C. 47
 - D. 62
- 7. The prevalence distribution of periodontal disease severity and disease progression in treated and untreated populations suggests that periodontal disease is bacterially initiated and disease progression is propagated by host factors.**
 - A. True
 - B. False
- 8. Short-term studies and observational trials have not demonstrated that interdental cleaning leads to increased dental health and decreased tooth loss.**
 - A. True
 - B. False

9. **All of the following individuals/organizations have issued recent statements reaffirming the importance of interdental cleaning for oral health EXCEPT:**
- A. The Office of the Surgeon General
 - B. The American Dental Association
 - C. The Department of Health and Human Services
 - D. The Committee on Dietary Guidelines for Americans
10. **A caries risk assessment tool that can be used in the evaluation of children and adults is:**
- A. Caries Management by Risk Assessment (CAMBRA)
 - B. Risk Assessment for Tooth Decay (RATD)
 - C. ADA Caries Risk Assessment
 - D. A and C
11. _____ **is the largest modifiable risk factor for periodontal disease progression.**
- A. Diabetes mellitus
 - B. Psychosocial stress
 - C. Smoking
 - D. Compliance with dental care
12. **Current ADA recommendations for oral hygiene include:**
- A. Toothbrushing for at least 2 minutes twice daily with a fluoride-containing dentifrice.
 - B. Clean between teeth daily
 - C. Visit your dentist regularly for professional cleanings and oral exams
 - D. All of the above.
13. **Due to their superior bristle flexibility, toothbrushes with soft bristles are associated with greater subgingival and interproximal plaque removal.**
- A. True
 - B. False
14. **In a study of twins, use of dental floss was associated with decreased interdental plaque and bleeding and a shift in the bacterial microflora to a healthier, less pathogenic bacteria.**
- A. True
 - B. False
15. **Interdental brushes have been shown to remove _____ plaque interproximally when compared to floss and have demonstrated _____ reductions in interproximal probing depth and gingival bleeding.**
- A. more; greater
 - B. more; similar
 - C. less; similar
 - D. less; greater
16. **Mouthrinses containing _____ have demonstrated efficacy in reducing signs of gingival inflammation and gingival bleeding when used as an adjunct to toothbrushing.**
- A. Stannous fluoride
 - B. Chlorhexidine Gluconate 0.12%
 - C. Essential oils
 - D. All of the above.

- 17. Improvement in effectiveness of oral hygiene measures requires multiple rounds of oral hygiene instruction and reinforcement over time.**
- A. True
 - B. False
- 18. Psychological interventions that have shown an improved effect on patient performance of oral hygiene measures include:**
- A. Social cognition models
 - B. Cognitive behavioral therapy
 - C. Motivational interviewing
 - D. All of the above.

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