WHAT'S HOT

A Newsletter of

THE GERONTOLOGICAL SOCIETY OF AMERICA®

In this issue:

Oral Health: An Essential Element of Healthy Aging

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Overview of Oral Health in Older Adults

As populations in the United States and around the globe move toward a world in which 25% of people will be 65 years or older, much attention is being paid to the management of chronic diseases and maintenance of activities of daily living. Cardiovascular disease, cancers, Alzheimer disease, and immunologic disorders are among the systemic conditions attracting the attention of researchers, pharmaceutical companies, government agencies, and health care professionals.

Often overlooked is the contribution of a healthy mouth to a person's overall well-being and its relationship with the disease processes occurring in the rest of the body. Yet the effects of poor oral health are similar to other uncontrolled disease processes. Without a healthy mouth, important aspects of general and health-related quality of life are affected, including nutrition, self-image, willingness to interact socially, mental health, and all too often, physical health.

The 32 adult teeth (including the third molars, or the "wisdom" teeth) and associated tissues serve a wide variety of functions in daily life. The mouth, tongue, and throat interface with the external environment, filter and process microbes and antigens, and send signals to the brain about ingested foods and other substances. The oral cavity is critically important in speech, mastication, swallowing, and digestion of foods as well as to one's appearance.[1] Deficiencies in any of these functions because of disease or injury can affect a person's self-image and desire to interact with others, which in turn can lead to social isolation and thereby contribute to depression.

In this issue of the *What's Hot* newsletter, published by The Gerontological Society of America (GSA), oral health is considered as an essential element of healthy aging. The topic encompasses the breadth of the human condition, including clinical, scientific, psychosocial, and policy considerations.

Normal/Pathological Aging

In the aging process, tooth loss, gum disease, and other dental problems have historically been considered inevitable outcomes. But like many aspects of "normal" aging, edentulism and poor oral health can be prevented. The outlook for oral health is changing because of shifts toward new ideas in dentistry, including an integrated preventive approach to care and maintenance of the natural teeth and oral tissues whenever possible. Rather than a norm of extracting teeth, followed by tooth replacement, dental professionals today prefer conservative approaches aimed

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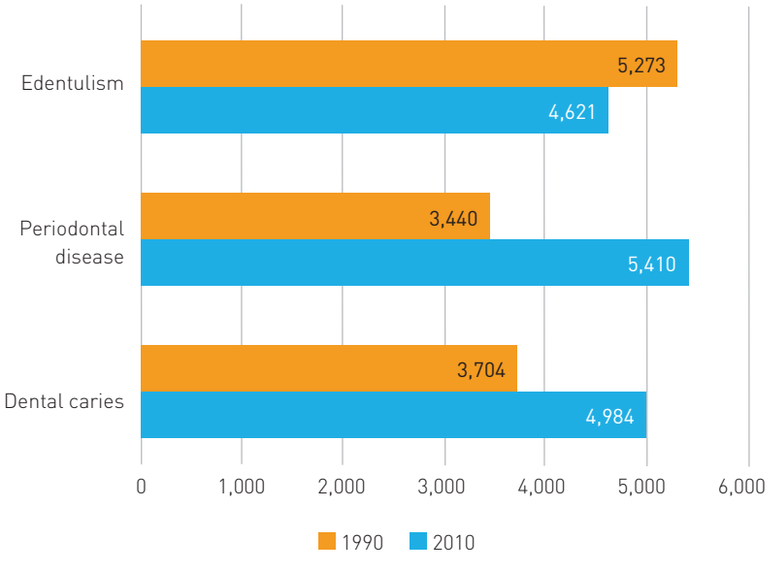
Figure 1. Global Burden of Major Oral Diseases in 1990 and 2010 as Measured in Disability-Adjusted Life-Years (DALYs X 10^3)



Source: Reference 5.

at preserving teeth, including restorations (e.g., fillings, crowns) and preventive care for older patients with dental caries, gum disease, injuries, or problems such as temporomandibular joint (TMJ) disorders and other orofacial conditions. Removal of teeth and prosthetic replacement are considered only a last resort.[1]

Evidence of the impact of advances in dentistry on oral health of older adults was summarized in the 2007 report *Trends in Oral Health Status* from the National Center for Health Statistics. Compared with 1988–1994, people in both younger and older age groups in 1999–2004 had fewer missing teeth, less severe gum disease, and fewer caries on the root surfaces of teeth, according to National Health and Nutrition Examination Surveys during those periods.[2] However, more recent data show a reduced or stagnated rate of improvement of oral health, especially among low-income and older adults.[3,4]

> Health professionals should routinely ask patients if they have a dentist who they see regularly and when was the last time they had their teeth cleaned.

Burden and Epidemiology of Oral Disease

While overall oral health has improved on a global level, dental disease remains one of the most

Dental Terms Used in this Article

Burning mouth syndrome: Daily pain in the mouth lasting for months or years. Possibly related to diabetic neuropathy in neurons innervating the tongue, upper palate, and mouth.

Caries: Dental decay. Caries can be located on the "crown" of the tooth (coronal caries). More common in older patients are the more serious root caries, in which decay is located on the exposed root of the tooth. Root caries are a common cause of tooth loss.

Dentition: Natural teeth.

Dentures: Prosthetic devices that replace some or all of the natural teeth. Dentures can be complete or partial. Dental prostheses that are supported through implants in the tissues of the mouth are referred to as implant dentures.

Edentulism: Loss of all natural teeth.

Gingivitis: Inflammation of the gingiva, or gums, of the teeth in response to bacterial plaque on adjacent teeth.

Halitosis: Bad breath.

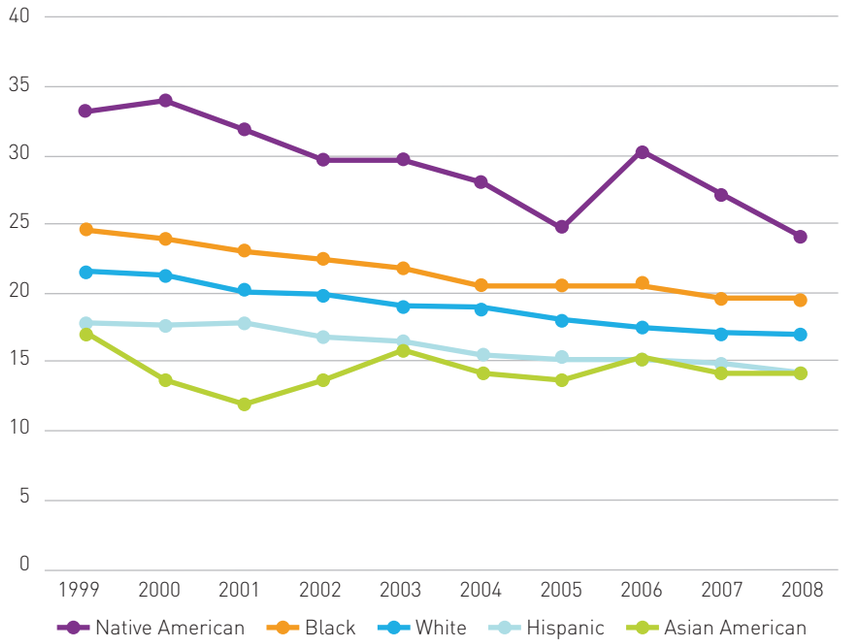
Periodontal: Relating to the gums and other supporting structures around the teeth.

Periodontitis: Inflammation of the gums and other supporting structures around the teeth. Caused by chronic presence of bacteria in nearby plaque.

Stomatitis: Inflammation of the mucous membranes of the mouth.

Xerostomia: Dry mouth. The cause can be an actual decrease in salivary flow or a secondary factor that creates the perception of dry mouth. Both types are associated with increased risk for cavities and poor oral health. ◆

Figure 2. Estimated Percentages of Edentulism in Middle-Aged and Older Adults in the United States by Race/Ethnicity, 1999–2008



Data weighted and adjusted for time, race/ethnicity, sociodemographic characteristics, and level of education.

Source: Reference 7.

Reasons older Americans don't see dentists

MONEY

INSURANCE

CULTURE

TRANSPORTATION

DISABILITIES

COGNITION

AVAILABILITY

common human ailments. Dental caries and periodontal disease are among the most common chronic conditions, and these along with other conditions of the oral cavity affect an estimated 90% of people worldwide at some point in their lives.

The Global Burden of Disease 2010 study shows that oral health problems affect 3.9 billion people and are the most prevalent health conditions. Data from the Global Burden of Disease studies conducted in 1990 and 2010, as re-examined with respect to oral diseases by Murray et al., show that the number of disability-adjusted life-years (DALYs) increased by 20.4% for dental caries, periodontal disease, edentulism, oral cancer, and cleft lip/palate, accounting for nearly 19 million DALYs in 2010.[1,5] The prevalence based on DALYs per 100,000 population rose for dental caries by 34.5% and for periodontal disease by 57.3%; edentulism decreased by 12.4% during these two decades because of many more people keeping their own teeth throughout the lifespan (Figure 1). DALYs from oral cancer rose by 45.1%.[5]

As people age, dental problems accumulate, periodontal disease tends to worsen, and other oral conditions appear. Evidence increasingly shows that poor oral health is associated with functional disability that can lead to deficits and decline.

Despite the relative affluence of Americans and widespread availability of dental care and oral health products in the United States, maintaining a healthy mouth throughout one's lifetime is difficult for many Americans, especially older adults. As part of its Oral Health Strategic Framework for 2014–2017, the U.S. Department of Health and Human Services outlined the challenges faced by older Americans[6]:

- Older Americans are keeping their teeth at greater rates than in the past, but they are also developing dental caries at rates equivalent to or higher than the high rates seen in children.
- Fifty-three million people have untreated caries and loss of all natural teeth remains relatively common among Americans, causing substantial disease burden (Figures 2 and 3).[7] Older adults frequently have medical conditions that worsen oral health as well as oral health problems that can worsen medical conditions.
- Among Americans older than 65 years of age, 70% have periodontal disease, which is associated with colonization and infections of gum tissues by pathogenic gram-negative anaerobic bacteria.[3] One in four older Americans is edentulous.

Prevention: Key to a Healthy Mouth

As discussed in more detail in the next section of this *What's Hot* newsletter, oral health is connected with a person's general physical and psychological health and with specific disorders. To maintain oral health, older adults need adequate daily oral hygiene and routine preventive visits with the dental team (see Preventive Oral Care in Older Adults sidebar). "An ounce of prevention is worth a pound of cure" for health in general, and certainly this is true with care of the mouth and oral cavity. ◆

Mouth/Body Connection

It is important to recognize that the mouth is attached to the rest of the body, and therefore can be reflective of, and contributory to, systemic conditions. Poor oral health is associated with a number of physical and behavioral disorders. Studies have even suggested that the number of natural teeth could be a predictor of longevity and that loss of teeth could signal increased risk for early mortality.[8–19]

The interrelatedness of oral health and overall well-being should not be a surprise, but it is easily overlooked in a siloed, specialist-driven health care system, and in a health care system that does not routinely include informed examination of the oral cavity. In this section, examples of the problems with poor oral health and systemic diseases illustrate the operative pathophysiologic mechanisms.

Diabetes

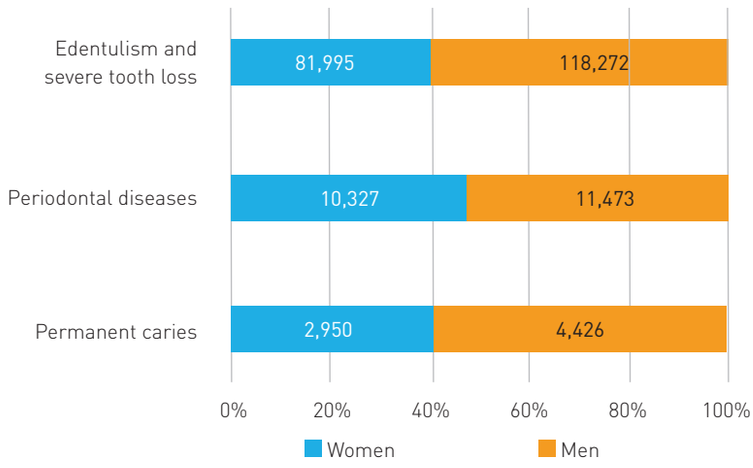
Diabetes is perhaps the "prototype" condition that illustrates the bidirectional and interrelated nature of oral health and systemic disease.[20] Patients with poorly controlled diabetes have a threefold greater risk of developing gingivitis and periodontitis, and those with diabetes whose periodontal disease is treated have improved metabolic control of diabetes, fewer complications, and improved quality of life.[21] Tooth loss is greater among adults with diabetes than among those without the disease.[22]

Diabetes worsens oral health primarily through its effects on the body's microbe-fighting capabilities; as blood glucose levels rise, the body is less adept at fighting pathogens and more susceptible to infections. Bacteria and fungi can proliferate in the oral cavity when hygiene is poor. Biofilms form in plaque and tartar (calculus) on the teeth, and these can more easily extend into gingival tissues. Fungal infections such as thrush (candidiasis) can occur in the mouths of patients with diabetes, and lichen planus and lichenoid reactions can occur on the skin. Diabetes can reduce salivary gland function and thereby produce dental caries. Taste is often impaired in patients with diabetes.[23,24]

Diabetic neuropathy can produce oral complications, including altered taste and smell, dry mouth, and burning mouth syndrome. Neuropathy-associated reduction in salivary production can cause dental caries and gum/periodontal disease through xerostomia as described below in the Chronic Oral and Systemic Conditions section.[25]

In patients with diabetes, burning mouth syndrome is thought to result from disease-related damage to neurons innervating the tongue, upper palate, and mouth; it can also occur in patients without diabetes through poorly understood mechanisms. Symptoms of burning mouth syndrome include

Figure 3. Disability-Adjusted Life-Years for Major Oral Diseases Among Adults Aged 70 Years or Older in 2015, United States



Source: Global Burden of Disease Study 2015 (GBD 2015) Results. Seattle, WA: Institute for Health Metrics and Evaluation (IHME), 2016. Available from http://ghdx.healthdata.org/gbd-results-tool. Methods and related data published as: GBD 2015 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;388(10053):1603–1658.

Preventive Oral Care in Older Adults

Older adults can maintain their dentition through daily home oral hygiene and regular professional care. As noted throughout this issue of *What's Hot,* these steps are very important to patients' longevity and oral health–related quality of life.

With advice from dental and other health professionals (including mental health practitioners), older adults can properly select toothbrushes, toothpastes, flosses, and mouth rinses. Older adults and their families need to remember that good dental care doesn't have to be complicated or expensive.

For older adults with limited dexterity and those who are disabled, powered **toothbrushes** offer distinct advantages over manual models. Powered toothbrushes require less movement of the wrist joint, they have larger handles that are easier to grasp, and the rapid rotation of the toothbrush head is more effective in removing plaque.

Toothpastes generally contain mild abrasives such as calcium carbonate or silicates, fluoride, humectants that prevent water loss (glycerol, propylene, glycol, or sorbitol), flavoring agents (saccharin or other sweeteners), thickening agents (gums or colloids), and detergents (usually sodium laurel sulfate [SLS] or its derivatives). A basic fluoride toothpaste is all most people need.

Adults with gum recession or periodontitis can require special toothpastes. The abrasives in regular toothpaste are too rough for the dentin and cementum layers that are exposed when gums recede. Toothpastes for sensitive teeth use less abrasive cleaners and contain minerals such as potassium nitrate that block microscopic tubules in exposed dentin that can allow hot, cold, acidic, and sweet foods to create painful sensations.

Dry mouth can be managed with dentifrices (toothpastes) and mouth rinses formulated to help stimulate salivary flow. These products are fluoridated and alcohol free, and do not contain the harsh SLS detergent that can irritate oral soft tissues.

Daily removal of plaque using **dental floss** or other interdental cleaners is important. Without removal, gum tissues can become inflamed and caries can develop.

Waxed floss or floss made from polytetrafluoroethylene (a slippery material) is better for patients with tightly spaced teeth, because it is more easily maneuvered into the interdental space. Woven floss facilitates pick up and removal of bacteria from tooth and gum surfaces. Patients might also have personal preferences for mint or other flavors, or for thicker or thinner flosses.

Mouth rinses contain many of the same ingredients as dentifrices. For older adults, key differentiating characteristics of mouth rinses are fluoride content, antimicrobial actions, alcohol content, and usefulness for xerostomia. Alcohol-free mouthwashes and those mouthwashes specifically formulated for dry mouth are preferable for many older patients.

Fluoridated mouth rinses offer an additional dose of protection in older adults at high risk of dental caries. Several nonprescription products are available, and more concentrated fluoride formulations can be prescribed by dental professionals.

Removable dentures require the same cleaning regularity as natural teeth but with different products. Dentures should be brushed twice daily with a **denture brush** and minimally abrasive **denture cleaners** or mild soap and water. Dentures can

then be soaked in marketed solutions that contain alkaline peroxide, hypochlorite (bleach), or dilute acids for the length of time given in product instructions. The prosthesis can be rinsed with water or nonalcoholic antimicrobial mouth rinse and the mouth rinsed with an antimicrobial mouth rinse for 30 to 60 seconds before reinserting the denture.

Even with the best home care, adults still need **regular professional dental care** and examinations. Dental professionals recommend twice-yearly cleanings for most patients, but frequency is determined on an individual basis with regard to risk status. Some older adults with ongoing problems secondary to caries or periodontal disease might need cleanings and examinations every 3 or 4 months. Many older adults with full upper and lower dentures require only annual dental check-ups. ◆

Dental professionals expect to be part of an interdisciplinary team.

daily pain lasting for months or years. Psychological factors can also be involved in burning mouth syndrome, as anxiety and depression appear to play a role in the condition.[25]

Periodontal disease is considered detrimental to diabetes management. Infected gums and periodontal structures produce inflammation in the mouth as the body attempts to fight invading bacteria. These inflammatory processes can challenge glycemic control in those with prediabetes or diabetes. Thus, meticulous oral hygiene is imperative for older adults with diabetes (see Preventive Oral Care in Older Adults sidebar).

Respiratory Diseases/ Aspiration Pneumonia

As with diabetes, microorganisms and inflammation are at the heart of interplay between periodontal and respiratory diseases. Pathogens can easily travel between the mouth and lungs. Inflammatory overreactions to microbes are involved in damage to tissues in the gums and connective tissue of the lungs. Plaque in the mouth and biofilms in the upper respiratory tract can also serve as a reservoir of respiratory pathogens, creating an additional source of infection.[26]

Case–control and cohort studies have shown an association between various respiratory disorders and poor oral health. Bacteria from plaque can be transported into the respiratory tract and there produce aspiration pneumonia or complicate conditions such as chronic obstructive pulmonary disease. The passage of periodontal bacteria into many tissues and organs of the body supports a microbiologic basis for many of the connections between oral health and systemic disease.[27]

Osteoporosis/ Bisphosphonates

Osteoporosis is another disease with multiple potential effects on oral health. Through its effects on bone, osteoporosis can produce weakness in the jaw bones that support the teeth, and patients taking medications in one of the drug classes used for treating the condition are at risk for a rare but serious adverse effect involving the jaw.

Bisphosphonates, used for treating osteoporosis and bone cancers, can contribute to osteonecrosis of the jaw, a painful and potentially disabling condition in which the bone is exposed for more than 8 weeks. It can occur after invasive dental procedures such as a tooth extraction but can also occur in the absence of dental procedures (the condition can also be caused by other medications or radiation therapy of head and neck cancer). While the risk of jaw osteonecrosis with lower doses of bisphosphonates typically used for preventing osteoporosis is quite small in healthier older adults, additional comorbidities and immunosuppression can elevate the risk. The risk of jaw osteonecrosis remains more significant in adults taking higher-dose bisphosphonates for treating bone disease and cancer. Most patients with the condition are treated conservatively by discontinuance of the bisphosphonate and the use of mouth rinses and antibiotics. Surgical interventions have also been used, as has hyperbaric oxygen therapy. Scant evidence supports any of these approaches.[28,29] It is now considered wise for physicians to refer their patients for dental evaluation and treatment before initiating bisphosphonate therapy for osteoporosis,[30] especially when high-dose therapy is planned for other bone diseases.

Association With Cardiovascular Disease and Stroke

Periodontal disease has been associated with atherosclerotic conditions such as ischemic heart disease and ischemic stroke in some case–control or cohort studies, probably because of general inflammation in blood vessels that each of these conditions can produce. Evidence to date indicates an associative, not causative, relationship between periodontal disease and atherosclerotic conditions. It should be noted that both share some common risk factors such as diabetes and smoking, which can complicate research. At this time, no evidence indicates that treatment of periodontal disease can lower the risks of poor outcomes of atherosclerotic disease, and studies of primary prevention have not been reported.[31]

Chronic Oral and Systemic Conditions

Because of the multifactorial nature of aging, most older adults have one or more systemic chronic conditions such as hypertension, dyslipidemias, urologic problems, bone and joint disease, and/or cognitive changes. Chronic conditions require long-term management using pharmacologic, surgical, and/or nonpharmacologic therapies, and conditions such as arthritis can affect older adults' ability to brush and floss their teeth. In addition, chronic oral conditions can develop, and some of these can increase patients' risk of developing caries or worsening periodontitis.

Medications are used most frequently for treating chronic diseases. When multiple medications are needed, several adverse outcomes are possible. Drugs could interact with each

other or with foods and nutrients. Medications for different diseases sometimes act through common mechanisms of action; for instance, first-generation antihistamines (such as chlorpheniramine [e.g., Chlor-Trimeton] and diphenhydramine [e.g., Benadryl]), antihypertensives, antidepressants, antipsychotics, and antispasmodic agents for muscle pain or gastrointestinal complaints all have anticholinergic activity, and this affects many different neuronal pathways and organ systems. The Beers list of agents provides guidance on medications that are potentially inappropriate for use by older adults.[32]

A common condition that can result from medication use is xerostomia. Dry mouth complicates oral health on many levels, from promoting tooth decay to impairing functions such as speaking, taste, chewing, and swallowing. Insufficient salivary secretion can also produce dry, cracked lips and lesions on the tongue and other oral soft tissues. Xerostomia predisposes patients to bad breath, which can have significant social interaction implications, especially in older adults and residents of long-term care facilities.

Teeth clenching and grinding, often during sleep, can lead to TMJ disorder as well as damage to teeth and dental work. In its most severe form, TMJ disorder can restrict opening of the mouth (trismus), leading to difficulties with both eating and dental hygiene. With the older adult patient unable to remove plaque and movement restricted, caries, gingivitis, and periodontal disease ensue.[33]

Radiation therapy of head and neck cancer can also produce TMJ disorder. Clinicians engage in differential diagnosis of other conditions that sometimes produce orofacial pain when patients describe a toothache or other dental disorders. Conditions with similar presentations to TMJ disorder include trigeminal neuralgia, temporal arteritis (an extremely serious condition more common in older adults), migraine, other types of headaches, as well as parafunctional activities such as nail biting and lip and cheek chewing.[33]

One of the key goals of care management of older adults is to prevent or delay development of functional disabilities, as these are associated with poor outcomes and a declining trajectory leading to end of life. While not as well recognized as geriatric syndromes such as incontinence, falls, pressure ulcers, and delirium, poor oral health and functional disabilities often occur together. Cross-sectional studies of older people have shown associations of functional disability with presence of more untreated caries, higher prevalence of edentulism, and less regular use of dental services. Longitudinal studies have shown that tooth loss can be a predictor of functional disability.[34] The association of functional disabilities with poor oral health could be the result of people being physically or cognitively unable to brush and floss, leading to poorer oral hygiene and declining oral health. Older people with functional deficits could also be relying on poorly trained or unskilled caregivers for help with brushing, flossing, and rinsing the mouth.[35]

Insights into the functional deficits that could be occurring in people with poor oral health can be derived from studies of the model in an increasing number of survivors of head and neck cancer, in whom a set of late symptoms revolve around xerostomia, burning pain in the mouth, mucosal soreness, difficulty with chewing and swallowing, voice alterations, and decreased taste sensation. The high doses of radiation

GSA Interest Group on Oral Health

Collaborating, networking, and staying informed are key missions of the GSA Interest Group on Oral Health. Participation in the Oral Health group provides an opportunity for persons interested in the issue of oral health as an essential element of healthy aging to meet, exchange information and resources, and make contacts with persons who have similar interests.

GSA interest groups meet at the Annual Scientific Meeting and provide opportunities for networking, collaboration on research projects, and increased involvement for members and nonmembers in the conference program. Contact persons for the Oral Health group are:

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used in treating head and neck cancer produce a permanent decrease in salivary output and an altered consistency of saliva. When a sufficient amount of pH-buffering saliva is not available during a meal to correct the acidic environment associated with eating, the equilibrium of demineralization/remineralization of the enamel of the teeth shifts toward demineralization, leading to more caries and a faster clinical course when decay occurs. Combined with difficulty swallowing and mucosal sensitivity that develop as late symptoms, these cancer survivors often make alterations to their diets to avoid pain and sensitivity. Maladaptive changes—including consumption of foods with a high refined carbohydrate content and a diet lacking in fruits, vegetables, and protein—must be recognized and addressed to prevent nutritional problems that can lead to general functional deficits and overall patient decline.[36]

Nutrition

Working collaboratively, dental care practitioners and professionals in geriatrics and gerontology can do much to give older adults the best possible chance of maintaining a healthy mouth throughout their lifetimes. The link between a healthy mouth and nutritional status is one of the most important reasons that this effort is worthwhile.

Since a major function of the mouth is the intake and initial digestion of food, oral health and nutrition are inexorably linked. Older adults with poor oral health often cannot consume a normal diet, yet eating a nutrient-deficient diet can affect the body's ability to keep gum tissues and teeth healthy. Poor oral health could be a risk factor for significant weight loss in community-dwelling older patients.[37]

Both oral health and good nutrition are necessary for maintaining health, independence, and quality of life. Without either one, the other is sure to suffer, along with functional decline that otherwise might not have occurred.[38]

Dietary choices can be affected by many elements of poor oral health: sore and bleeding gums, tooth loss and pain, xerostomia, difficulties and pain while chewing and swallowing, mouth infections, stomatitis, gingivitis, periodontal disease, and discomfort with dentures and implants. When those conditions lead patients to limit their dietary intake of foods and beverages with necessary macronutrients, vitamins and minerals (including calcium for the teeth), trace elements, or fluids, malnutrition can develop and affect both oral and systemic health of the patient.[39]

Periodontal disease provides a window into the interconnectedness of poor oral health and nutrition. As noted in a recent review,[40] studies have shown that factors common in older people can compromise both oral health and nutrition. Loss of teeth puts increased functional pressure on the remaining teeth, leading to decreased masticatory efficiency and a reduction in the choice of foods. Similar results occur when dentures and xerostomia interfere with the normal intake of food. Medical conditions and medications can also reduce body metabolism and alter taste, leading to impaired nutritional status. Absorption of specific nutritional factors such as folic acid could be compromised. When making food choices, patients often avoid protein and other difficult-to-chew selections, fruits and vegetables that are fibrous, hard, or crunchy, and other abrasive foods. In such situations, the advice of a nutritionist who recognizes the complex clinical scenario might be needed to ensure the balanced diet necessary for restoration and maintenance of oral tissues, supporting bone, and overall health.[41–43]

Quality of Life and Psychosocial Health

Poor oral health can take away more than the older adult's physical health. A diet changed because of tooth loss and gum disease can make a social outing more of an embarrassment than a fun time with friends. Halitosis, common in poor oral health, can affect social interactions and quality of life. The resulting social isolation can lead to or worsen depressive states or contribute to bleak outlooks on one's life.

Community-dwelling older adults, especially those living alone, are at risk for the detrimental effects of social isolation. Social isolation and associated psychosocial/mental health disorders are often overlooked factors and deserve more awareness and attention from clinicians, caregivers, and those close to the older patient.

Instruments such as the Geriatric Oral Health Assessment Index have been developed and validated for measuring oral health–related quality of life among older people with varying degrees of dental function.[44,45] As noted in a World Health Organization report on oral health of older people, daily life

activities, self-esteem, and well-being are affected by declining oral health and complications such as pain, dental abscesses, difficulties with eating and chewing, and embarrassment about tooth loss and the condition of remaining teeth.[46,47]

Clinical Anxiety, Depression, and Other Disorders

Presence of psychiatric disorders, including anxiety and depressive conditions, in patients of all ages is associated with increased dental decay, missing teeth, and the need for fillings, according to a systematic review and meta-analysis of 26 published studies. A significant relationship was found between panic disorder and periodontal disease in this study.[48] Further, social isolation, personality traits, and factors such as poor adherence to recommended therapy or use of tobacco products can deter these patients from seeking care for their declining oral health.[49]

In the oral health module of the Health and Retirement Survey conducted in 2008, chronic moderate depressive symptoms were associated with poorer oral health in older adults. The interplay between depressive symptoms and poor oral health could be biologic (proinflammatory cytokines), medication related (antidepressants can decrease salivary flow), or nonbiological (suboptimal oral hygiene and less use of dental services).[50]

Psychiatric conditions and their treatments can also contribute to other aspects of poor oral health. Patients with eating disorders may have inappropriate diets, leading to both systemic and oral consequences of poor nutrition. Those being treated with psychotropic medications, especially agents with anticholinergic effects, could develop xerostomia and the oral consequences of poor salivary flow and function.

Cognitive Impairment

In addition to anxiety, depression, and social isolation, other mental health concerns tie into whether people can maintain a healthy mouth throughout their lifetimes.

Alzheimer disease and other forms of dementia occur with greater frequency in older adults, by decade of age. As patients lose the ability to brush and floss daily, caregivers must add these tasks to their daily routines. Online guidelines provide ideas for caregivers to consider in providing dental care, dealing with problematic patient behaviors during daily care, and helping the patient accept cleaning and other services provided during regular dental check-ups.[51]

Overall, the relationship between cognitive status and oral health measures remains unclear, with additional research in this area needed. In a systematic review published in 2016, researchers reported that some of 16 studies have shown an association between oral health (e.g., number of teeth, periodontal and caries problems, denture use) and cognitive status, but others have not. Small sample sizes and variable outcome measures limit interpretation. While weak, results indicated that "better oral hygiene and regular dental visits may reduce the rate of cognitive decline and the hazard of incident dementia," the authors reported. They also note that patients with dementia can maintain dentition with good dental care just as well as those without dementia.[52] ◆

Access and Barriers to Dental Care

If oral health and dental care are so important to people's health and longevity, why doesn't everyone take care of their teeth and mouth? For many people, the answer is complicated and multifactorial.

Financial Costs and Lack of Insurance

In the United States, Medicare is the government-sponsored health care plan for individuals who are 65 years of age or older (and certain others whose medical conditions fall within specified disease categories). Medicare does not provide coverage for oral health services, and many people lose their dental insurance when they retire. The combination of a fixed or reduced income and no insurance deters many older adults from getting the professional dental care they need.[53]

Currently, there is a movement to consider legislation to add preventive oral health care to Medicare coverage.[54] As changes are made to federal laws governing the health care financing system in the 115th Congress that convened in January 2017, addition of oral health services could be considered as amendments to bills or as separate legislation that could be supported by dental professionals, oral health organizations, associations concerned with the welfare of older adults, caregivers, and other concerned health professionals.

Transportation, Physical and Mental Function, Setting, and Cultural Competence

Lack of transportation and cognitive decline present challenges to obtaining routine dental care in older

Older adults and their families need to remember that good dental care doesn't have to be complicated or expensive.

patients. Those with limited mobility or who are more frail and susceptible to falls could have difficulty getting to dental offices. While dental professionals are increasingly offering on-site services to those residing in long-term care facilities, oral health services are not generally available for most home-dwelling older adults and many aging-in-place locations.

Despite a perception that dental care is widely available in the United States, access can be limited in rural areas, and culturally competent care is in short supply for an increasingly diverse U.S. population. Additional training in cultural competence is needed across the dental and other health professions.

Long-Term Care

Long-term care residents are among those with the poorest access to oral health care. In addition, older adult nursing facility (NF) residents who are unable to feed themselves generally will also have difficulty with daily tooth brushing, flossing, and denture care, increasing their risk for oral health problems. Increased training for NF staff, caregivers, and administrators about the importance of maintaining and improving residents' oral health and tools and techniques for doing so would provide critical foundational elements for successful oral health program implementation.

While many states have Medicaid programs that cover some emergency, preventive, and routine oral health services for NF residents, many more do not, even though federal law requires NFs that accept Medicare and/or Medicaid funds to be directly responsible for the dental care of their residents. Ideally, NFs should develop an oral health care program with a plan to provide these services.[55,56]

Care Delivery Models

Dental and other health professions are exploring additional alternative models of oral health care, including more expanded functions for dental hygienists and assistants and emerging roles for mid-level providers (see Dental Therapists sidebar).[57]

Some current successful models of care that address access issues include the dental components of Programs of All-Inclusive Care for the Elderly (PACE) such as On Lok PACE, other integrated medical and dental clinics such as the Gary and Mary West Senior Medical and Dental Clinics, rural outreach dental programs such as the University of Washington RIDE Program, and the Alpha Omega Henry Schein Cares Holocaust Program providing dental care to older adult World War II Holocaust survivors.[58–61] Many more models of care are needed to begin to make a large dent in the tremendous unmet and projected

Dental Therapists: Improving Access to Services

A new member of the dental services team is emerging as a midlevel practitioner who can provide services beyond those typically provided by dental hygienists. Dental therapists could prove to be especially important in the provision of mobile services that are needed in long-term care facilities and in improving access to services as the large number of baby-boomer dentists retire from general practice.

Like most midlevel health providers, dental therapists usually practice under collaborative practice agreements with licensed dentists. In 2009, two new dental therapy training programs were launched in Minnesota with the first classes graduating in 2011. A Bachelors and Masters in Dental Therapy were offered by the University of Minnesota and an Advanced Dental Therapy degree by Metropolitan State University/ Normandale Community College. In 2016, the University of Minnesota program was changed to a Bachelor of Dental Hygiene/ Master of Dental Therapy dual-degree program. Students can enter the new program after completing 30 semester hours of prerequisites and complete both degrees over 32 consecutive months of didactic and experiential courses.

Minnesota, Maine, Vermont, and parts of Alaska recognize dental therapists, according to an article in the December 2016 issue of *Health Affairs*.[57] Enabling legislation has been introduced in other states. In addition to practicing in dental offices, dental therapists can see younger patients in schools and older patients who are homebound or residents of long-term care facilities for whom traveling to dentists' offices is difficult and expensive. Dental therapists offer promise for meeting an increased demand for dental services as the population ages if the number of available dentists is inadequate. ◆

need for oral health care services in the older adult population with poor access to care.

Oral Health Literacy for Older Adults

Many older adults deal daily with a number of conditions and concerns beyond oral health, and dental care is not always the first priority for them.[62] Some older adults (as well as caregivers) might believe that it is no longer necessary to go for regular dental check-ups. In addition, cultural factors affect the use of dental care (e.g., perceptions of oral health and need for daily hygiene and periodic care by dental professionals).[63] Caregivers can help supplement or provide oral hygiene care to older adults.[64] Caregivers should be aware of the need to help aging adults with these necessary daily activities and be sure that appropriate oral hygiene supplies (e.g., toothbrushes, flossing devices, mouthwash) are available. These are detailed in the Preventive Oral Care in Older Adults sidebar of this *What's Hot* newsletter.

An active process is needed to encourage older adults to maintain their oral health on a daily basis throughout the life cycle. Patient education is important in this effort, and health promotional efforts are needed to reach those who are not accessing dental services regularly and to enlist all health professionals as well as family members/caregivers in the effort to improve oral health as part of the healthy aging concept.

Education in Clinical Settings

Routine visits to dental offices and other clinical settings can be key opportunities for older adults to be made more aware of the need for change and motivated to maintain and improve oral health. Education and motivational interventions provided when a tooth has broken or another event that has the patient's attention can make a difference in oral health. Regular reinforcement during routine preventive visits helps refine the techniques employed at home and keeps the patient on track over time. Dental professionals employ educational materials and a focus on prevention to leverage these moments and improve the health and quality of life of patients.

Educating patients about steps they can take at home is critical. Resources for dental education of older adults are available from dental professionals as well as on nonprofit, government, and industry websites.

Older adult patients should be instructed that they should bring a list of their medical conditions and medications (with doses) to their regular dental check-ups, and be ready to discuss any discomfort or other symptoms they have noticed in their teeth or mouth. In addition to examining and cleaning the teeth during these visits, dental professionals check for gum disease, oral cancer, and other soft tissue disease. The American Dental Association (ADA) recommends that all patients, including those older than 60 years of age, drink fluoridated water and quit smoking and use of other tobacco products. Both of these are important ways of guarding against tooth decay, periodontal disease, and other problems in the mouth.[65]

Resources for Older Adults and Their Caregivers

Among nonprofit organizations, the ADA leads the patient education effort regarding oral health. The organization has consumer-facing material available to all visitors to its website (www.ada.org) and provides content that dental practices can incorporate into patient education materials. Its publications catalogue includes many products useful in patient education.

An ADA publication, *The Chairside Instructor*, is a well-illustrated

flipbook that can be used to show patients what is happening inside their mouths. This publication is also available in Spanish and via a smartphone app.[66]

The ADA's Mouth Healthy website (www.mouthhealthy.org) has sections for adults older than 60 years (and for pregnant women as well as babies/children, teens, adults younger than 40 years, and adults 40 to 60 years old). Users can also search for dental providers in their area.

The nonprofit organization Oral Health America (https://oralthealthamerica.org) is another important resource for patient education materials and information useful for tailoring dental services. Its Wisdom Tooth Project (www.toothwisdom.org) focuses on the needs of older adults. It seeks to reach 40 million caregivers and support them in maintaining healthy mouths. Oral Health America's *A State of Decay* report details state-specific rates of edentulism, adult Medicaid dental benefits, community water fluoridation, and state oral health plans, and it summarizes responses to basic services surveys.

Within the federal government, the Administration for Community Living (ACL; www.acl.gov) brought together several programs in the U.S. Department of Health and Human Services when it was created

Educational Resources

Mouth Healthy: Consumer-facing website of the American Dental Association (www.mouthhealthy.org)

Smiles for Life: Resources useful for professionals in teaching students in the health professions or interacting directly with patients about oral health (www.smilesforlifeoralhealth.org)

Love the Gums You're With: Patient resources on the website of the American Academy of Periodontology (www.perio.org/consumer/patient-resources) and the organization's GUMBLR website for "all things gums" (www.loveyourgums.tumblr.com)

Oral Health: Federal resources are listed on the Health Resources and Services Administration website (www.hrsa.gov/publichealth/clinical/oralhealth/)

Tooth Wisdom: Health resources, developed by the nonprofit Oral Health America, for older adults regarding the importance of oral health, finding dental care services, and paying for care (www.toothwisdom.org) ◆

in 2012, including the Administration on Aging. Oral health is an area of emphasis for ACL, which will be releasing a Community Guide to model oral health programs for older adults in 2017.[67]

Patient education materials on oral health in older adults and other patients can also be found on the websites for the Healthy People 2020 program (www.healthypeople.gov/2020/topics-objectives/topic/oral-health),[68] the National Center for Health Statistics (www.cdc.gov/nchs/pressroom/01facts/olderame.html),[69] the Centers for Disease Control and Prevention (CDC; www.cdc.gov/oralhealth/index.html),[70] the National Institutes of Health (www.nidcr.nih.gov/OralHealth/OralHealthInformation/OlderAdults/),[71] and the Health Resources and Services Administration (www.hrsa.gov/publichealth/clinical/oralhealth/index.html).[72,73]

Many companies marketing dental devices and products have websites useful to both patients and dental professionals. Consumers can research the recommendations made by dental professionals and learn how to best care for their mouths.

Oral Health Promotion Programs

Working with individual older adult patients who are already in the dental chair is rewarding, but what about the more than one-third of older Americans who say they have not visited a dentist in the past year?[74] A number of studies demonstrate clear disparities in groups of Americans based on race, ethnicity, educational, and socioeconomic factors.[22,75–80] Community-based programs promoting oral health, especially water fluoridation combined with dental education, have shown positive effects in children.[81,82] Translating this success to the reluctant older adult and those with financial, transportation, dental literacy, and other challenges remains an area for future research.

Included in a review of the literature on dental health disparities among older adults was a proposed four-part solution: (1) improve access to dental care for minority elders; (2) increase older adults' dental literacy, which includes knowledge of the link between oral health and systemic conditions; (3) develop more programs to improve people's overall health behaviors as a means to increase retention of natural teeth and maintain good oral health; and (4) develop and improve culturally competent dental services by increasing recruitment of underrepresented minorities into the dental profession.[83]

Programs seeking to improve oral health among older adults and their caregivers should be designed to meet the needs of target communities. ElderSmile is an example of a program established in 2004 at Columbia University to meet the needs of older adults in sections of Manhattan.[84,85] Other oral health promotion efforts from around the world can be identified in the published literature. Depending on the needs of a state or local community, such programs can be adapted and customized.

A CDC report[74] shows clear oral health disparities in 2014 among some groups of Americans 65 years or older. These provide insights for public health practitioners to consider when assessing a state or community. The percentages of respondents reporting any dental visit in the past year were within the following ranges:

- *Race*—From 42.7% for blacks to 78.4% for multiracial individuals of white and black descent.
- *Poverty level*—From 35.1% among those with incomes under 100% of the federal poverty level to 81.5% for those in the 400% or more category.
- *Disability difficulty (including activities of daily living)*—From 49.4% of those with any complex activity limitation to 71.7% of those with no disability.
- *Geographic region*—From 58.7% in the South to 67.7% in the Northeast.
- *Population density*—From 54.8% for people living outside a metropolitan statistical area (MSA) to 64.2% of those within an MSA.

Targeting Health Professionals

In working with one patient at a time to increase dental literacy and collaborating with others to design oral health promotion campaigns, dental professionals need to enlist other health professionals in these efforts. Even within dentistry, more education and health promotion effort might be required. "As a profession, we need to change our philosophy from being a procedure-driven profession to one that focuses on prevention, which demands changes in how patients and doctors interact," said John D. B. Featherstone, dean of dentistry at the University of California, San Francisco. "This requires a whole different set of skills, including effective patient education and behavior management to encourage compliance."[86]

Toward this end, state and local dental organizations can conduct outreach efforts to their members and opinion leaders in education and in practice. Dental professionals are an integral part of an interdisciplinary team that includes physicians, nurse practitioners, physician assistants, occupational and physical therapists, speech–language pathologists, nurses, pharmacists, dietitians, and social workers.[87] These groups of professionals must be educated about the oral health needs of older adults and enlisted as partners in health promotion campaigns. Other health professionals must also be trained to work with older adults to improve their dental hygiene and use of dental care services.

Studies show that dental care provided to frail older patients and those in the last year of life needs to be improved[88,89]; oral health education and promotion should target staff of long-term care facilities and hospice in particular to ensure provision of a consistent quality of dental care. Access to dental care is a challenge, and patients with dementia might have special considerations since they sometimes refuse care or become combative during routine dental cleanings or other procedures. However, a study in a community-based geriatric dental clinic showed that most patients with dementia can maintain their dentition just as well as those without dementia when dental care is provided in a supportive setting.[90] ◆

Workforce Issues

A large number of current practitioners who were educated in the 1970s and 1980s are starting to retire, thus decreasing the number of practicing dentists (see Dental Therapists sidebar). A large proportion of dentists specially trained in caring for geriatric patients via geriatric fellowship programs are also nearing the end of their careers, and many of those still active professionally are in academic settings or in other positions that do not involve as much direct patient care. There are multiple medically/dentally underserved areas and dental health professions shortage areas in every state, resulting in poor access to dental care, as well as disparities in dental care, in most rural and inner city locations.

All these factors could limit the supply of dentists available to older patients in coming years, which is unfortunate timing as the number of Americans older than 65 years of age skyrockets. In addition, older adults demonstrate the highest utilization rate of any age group, which suggests that demand for oral health services by older adults might exceed the supply of providers educated to care for this special population.[91] Thus, it would be desirable for the dental profession to develop and study new models of intraprofessional care for dental services for older adults as well as expanding the training, functions, and licensing for dental hygienists (see Dental Therapists sidebar) and dental assistants, in addition to supplemental training for

Ethical Challenges With Oral Care of Older Adults

As in other aspects of the lives of older adults, dental and other health professionals can encounter moral and ethical challenges in the provision of oral care to those with declining cognitive abilities, functional impairment, and multiple chronic conditions. Consent to treatment, proxy decision making, behavior management, and abuse and neglect are some of the significant areas of concern that can arise in providing routine and preventive oral care for older adults.

In obtaining informed consent for therapy, older adults with known or suspected cognitive dysfunction can require additional evaluation and assistance from others. Practitioners can ask simple questions to determine whether the individual can understand relevant information, appreciate the situation and potential consequences, weigh treatment options, and communicate a choice about treatment. When questions arise about elective procedures for older adults who cannot express their own preferences, principles of substituted judgment can be applied with the help of designated family members, loved ones, and involved dental or health professionals.

If an urgent dental problem has sufficiently serious consequences, health professionals can provide care in the best interest of the older adult. Behavioral management strategies should be used in the provision of oral care only after alternative solutions have been considered carefully and the benefits of intervening to control behavior outweigh the risks of no care. In no case should physical restraints be employed to provide dental care for older adults because of the risk of increased stress, agitation, and physical injury.

For older adults in the care of others or institutions, potential abuse and neglect are possible concerns, and dental professionals are frequently in a position to identify and report them. Subtle or obvious oral health manifestations of abuse must be evaluated, and reporting to authorities is required in many states. A lack of adequate daily oral care or necessary dental treatment can constitute neglect under some circumstances for residents of care facilities.

Identification and resolution of moral and ethical oral health dilemmas require a team approach to care focused on the goal of respecting individual autonomy and preferences for care while ensuring oral health care needs are still reasonably addressed for vulnerable older adults. ◆

Source: Reference 97.

> Risk assessment is particularly important when older adult patients acquire comorbid illnesses and lose the ability for adequate oral self-care.

dentists themselves.[60,92] Furthermore, nondental health professionals require more training in oral health to be able to participate more fully in inter- and intra-disciplinary health care teams.[93]

Disease prevention is always preferable to treatment. In dentistry, prevention would spare older adults from dental problems, and the cost of treating those conditions would be averted. Oral disease management also involves secondary and tertiary preventive approaches as well as ongoing maintenance of existing dental restorations (fillings, crowns, implants, bridges, full and partial dentures) and treatment when they fail.

Risk assessment is particularly important when older adults acquire comorbid illnesses and lose the ability for adequate oral self-care. Dental professionals should conduct both caries and periodontal risk assessments for their older patients and not only young patients. By using risk assessment, appropriate prevention, management, and maintenance plans can be tailored to the individual older adult to minimize negative sequelae of oral diseases and maximize oral function and outcomes.

A unique area of risk assessment comes at the end of life, including palliative and hospice care. Although older adults can have changes in health status that necessitate a move from hospice to palliative care, and vice versa, it is most important to keep those patients pain- and infection-free, and to manage any xerostomia while allowing as much oral communication and quality of life as can be assured, during this most stressful time at the end of life. Both dental and nondental health professionals should be better trained in this area.[89,94–96]

Lastly, one should not underestimate the importance of ethical considerations in approaches to oral health care for older adults. See the Ethical Challenges With Oral Care of Older Adults sidebar for a summary of this vital topic.[97] ◆

Oral Health and Healthy Aging: Areas of Future Focus

As an essential element of healthy aging, oral health in older adults deserves expanded attention in clinical, economic/financial, and humanistic aspects of care as well as in the curricula for dental and other health professionals.

Table 1 summarizes key ideas presented in this issue of *What's Hot* and makes recommendations about oral health in older adults. While tooth loss and poor oral health in general might seem inevitable during the aging process, older adults can maintain their dentition throughout an expanded lifespan by means of daily oral hygiene and periodic professional care. Prevention and patient education strategies—both for individuals and communities—are critical in oral health for older adults. When possible, maintenance and restoration procedures should be planned before patients lose employer-sponsored dental coverage. Practical, inexpensive home care strategies and professional attention can help maintain oral health for many older adults.

Further study of the underlying connections between systemic conditions and oral disease can shed more light on pathophysiologic mechanisms. Oral health–related quality of life should be included in studies using instruments such as the Geriatric Oral Health Assessment Index. Researchers and clinicians should collaborate to develop behavioral interventions for promoting oral health in family, community, and health care settings.

Systems of dental care and its financing can be improved. Research projects in this area might include studies of education programs, treatment provision, prevention strategies, and knowledge base. Specific research areas might include examples such as these:

- Including oral health benefits as part of Medicare plans and examining oral health service utilization increases in that population compared with a control group of older adults.
- Mandating oral health services for adults as part of Medicaid coverage and evaluating oral health outcomes in older Medicaid populations.
- Developing effective models for improving oral health in long-term care, including extent of involvement of dentists versus other dental professionals (e.g., hygienists, therapists).
- Assessing engagement of community dental health coordinators with underserved populations and evaluating their relative impact on dental service utilization.
- Improving attitudes, skill levels, and knowledge of nondental health care providers about normal and pathological findings in the oral cavity.

In education systems, dental professionals need more coursework and practical experience in caring for older adults with complex medical and dental needs. Dental professionals also need more training on working as part of interdisciplinary teams, including how to interact with other health care professionals to improve their oral health knowledge and willingness to support dental interventions. Evaluations of interprofessional education and interactions can assess the success of these efforts. Revisiting the educational experience of dental students working with dental assistants and dental hygienists as part of their training programs would also enhance the dental team approach in addressing oral health needs.

A healthy mouth is an important element in healthy aging. Through adoption of a more integrated model of care that is properly researched and funded, millions of Americans can keep their teeth throughout their lifespans and enjoy the far-reaching benefits of better oral health. ◆

ORAL HEALTH
AN ESSENTIAL ELEMENT OF
HEALTHY AGING

The Gerontological Society of America (GSA) launched an initiative called Oral Health: An Essential Element of Healthy Aging as part of its commitment to improving the oral health of older adults. Focusing on an interprofessional approach and guided by a team of oral health experts, GSA's goals in this effort are to enable older adults to maintain their oral health as part of a healthy aging process and to assist researchers, educators, practitioners, and policymakers to identify areas of needed activity and research on the topic of oral health in older adults. GSA has also added a special section on its website (www.geron.org) to house resources that assist members and other stakeholders with providing interprofessional oral health care to older adults. ◆

Table 1. Action Steps to Improve Oral Health for Older Adults

Preventive care

- Daily home care of the mouth and oral cavity
  - Tooth brushing twice a day with fluoride toothpaste
  - Use of floss or other interdental devices
  - Denture cleaning
- Routine preventive visits with dental professionals[a]
- Reduce intake of sugary foods
  - Limit access to between-meal snacks
  - Encourage sugar-free or low-sugar snacks
- Adjunctive therapy
  - Health care providers can promote oral health and engage dental professionals as appropriate

Oral health care supplies

- Recommendations for gifts (e.g., electric toothbrush) from families and friends
- Distribute oral health care supplies through local meal distribution programs

Education

- Sponsor oral health education for older adults through senior day programs
- Sponsor continuing education courses on oral health in older adults for health professionals through organizations or universities
- Sponsor in-service educational opportunities (didactic and hands-on) for caregivers and staff of long-term care facilities

Survey questions

- Add these questions to health care professionals' history intake forms and long-term care facility admissions form:
  - "Do you have a dentist you see regularly?"[a]
  - "When was the last time you had your teeth cleaned?"

Social services

- Use and coordinate social services to provide transportation for older adults to dental practices for oral health care
- Work with local dental and hygiene schools to coordinate lower cost care for older adults while providing valuable educational opportunities for students
- Often older adults could use assistance with contacting dental offices to determine an office that participates in their insurance plan and to schedule appointments for care

Research

- Incorporate oral health measures into population surveys to assess access and barriers to care, oral status, and treatment needs
- Use the Geriatric Oral Health Assessment Index to measure oral health–related quality of life

[a] Most people benefit from two preventive visits per year, while those with stable oral health or who are edentulous may need only one preventive visit per year. Those with periodontal disease, caries, or other problems may need more frequent cleanings and examinations.

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