Innovations in Geriatric Oral Health Care

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KEYWORDS

• Aging • Geriatric dental medicine • Innovations • Oral health care • Geriatrics

KEY POINTS

- Older adults are retaining their teeth and need strategies for a lifetime of oral health care.
- Innovations in geriatric oral health care must include integration of dental care with medical care, because older adults manifest multiple chronic conditions and take numerous medications that can affect oral health.
- Innovations in geriatric oral health care involve advances in clinical oral health care, delivery and models of care, funding, research, education, and policy.
- Daily prevention with interprofessional collaboration and professional preventive care have the most significant impacts on reducing oral disease in the aging population.

INTRODUCTION TO INNOVATIONS IN GERIATRIC ORAL HEALTH CARE

Baby boomers differ from their predecessors in many ways. Their active life expectancy has increased relative to their parents, and their aging is accompanied by their own unique needs, many differing from those of their parents. One major difference is that many baby boomers are retaining most of their teeth for their life span. This change has increased the need for dental care, especially preventive care. The impact of maintaining teeth for a lifetime also creates new challenges for nonsurgical and surgical dental treatment options. As patients, the baby boomers also bring comorbidities of medical conditions and medications that affect oral health. Providing oral health care where senior populations reside requires innovations affecting care delivery. Addressing these complexities requires looking beyond traditional dental care settings and treatment options, including a variety of collaborative efforts within and outside of the dental profession.

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The purpose of this article is to describe innovations that are transforming geriatric oral health and geriatric oral health care. Advances in clinical oral treatments are addressed as well as delivery and models of care, funding, research, education, and policy.

INNOVATIONS IN CLINICAL ORAL HEALTH CARE

Diagnosis and Treatment Planning

Clinical care begins with a comprehensive history, oral examination, radiographic imaging, and diagnostic tests, depending on a patient's chief complaint. Radiographic imaging has seen advances with the use of the cone beam computer tomography (CBCT) in dentistry. CBCT is used most frequently for diagnosis and treatment in endodontics, implants, and oral surgery. For patients who are wheelchair bound, portable radiographic systems are available. In addition, when clinicians are using a portable radiographic system or taking radiographs for patients who are in wheelchairs, the extension cone paralleling radiographic positioning system, although not new, helps ensure that the radiographs taken are positioned correctly.

Once a patient's history and physical are taken and radiographic imaging completed, it is important to document findings in the patient's record. The electronic health record (EHR) can facilitate the recording of the patient's information and the integration of the patient's dental with medical findings. Most dental EHRs do not interface with medical EHRs. To the extent that future dental EHRs become part of a patient's medical record or can bridge with the patient's medical record, the patient's physician and dentist will be able to coordinate care better, in a more seamless manner.

Preventive Oral Health Care

Because baby boomers retain more teeth, they continue to suffer from preventable oral diseases. With increased comorbidities, such as chronic diseases and medication usage, both the need for and value of preventive oral health care increase. In addition, ageist stereotypes continue to promulgate the belief that poor oral health and tooth loss are a natural part of the aging process. Older adults do not lose teeth because they have an eightieth birthday; they lose teeth because they have dental diseases that can be prevented.

Older adults continue to be at risk for not only tooth-related diseases, such as coronal caries, root caries, and periodontal disease, but also various oral lesions, such as oral candidiasis and oral cancer. Thus, regular visits for dental examinations and preventive oral health care are critically important to successful aging by decreasing oral inflammation and maintaining overall health and oral health.

Daily home care is the first step in a successful oral care preventive program. If an older adult has medical diseases that inhibit the ability to provide self-care, such as a stroke, dementia, or severe rheumatoid arthritis, caregiver assistance may be required. For some patients, the most effective prophylaxis may occur in the dental office.

Preventive oral care in the dental office begins with the dental team conducting a risk assessment for oral diseases on each patient. If an older adult smokes and takes multiple medications, the risk for root caries, periodontal disease, and/or oral cancer all may be elevated. Caries risk assessment forms are available from the American Dental Association (ADA).[1] In 2013, the ADA provided clinical recommendations for the use of topical fluorides in adults.[2] Based on the literature review and consensus, the recommendations provide for professionally applied or prescription-strength

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home-use topical fluorides for patients at high caries risk. These include professionally applied 2.26% fluoride varnish or 1.23% acidulated phosphate fluoride gel. For home use, the recommendations included a 5000–parts per million (ppm) (0.5%) fluoride prescription strength home use gel or paste or 0.09% fluoride mouth rinse.

Once risk levels are identified, the dental team can implement new preventive technologies to lower an individual's risk. Topical fluorides and fluoride varnishes have been shown to be effective in adults as well as children.[2] Silver diamine fluoride (SDF), a new topical fluoride application, which has been used to prevent caries in children, now is being used to control root caries in older adults. A 2018 systematic review examined SDF applied to exposed root surfaces to control root caries.[3] The investigators included only studies with a 12-month follow-up. The review found that SDF applications performed better than the placebo in preventing root caries. SDF was as effective as chlorhexidine or sodium fluoride varnish. The investigators suggested that 38% SDF applications once a year to exposed root surfaces "are simple, inexpensive and effective way" to prevent root caries. They also noted that the complaints about the black staining of the carious lesions caused by SDF "were rare among older adults."

A disadvantage of the use of SDF is black staining of the tooth. If caries is present on the coronal or root surface, applying SDF causes the tooth to stain black. For some older adults, this side effect could be unacceptable. It is important for patients to be informed of this side effect and provide informed consent.

Fluoride varnishes and SDF along with 5000-ppm daily fluoride toothpaste provide important options to prevent caries in high-risk patients. An aggressive approach to preventing caries is warranted for patients with various medical conditions, particularly patients who suffer from a dry mouth or patients who are unable to cooperate with traditional restorative dental treatment.

Minimally Invasive Restorative Care

Like surgery in general, the trend in the management of dental caries has become more minimally invasive. In the past, recurrent caries was treated by removing the entire restoration and replacing it. Today, with greater understanding of the caries process, if recurrent caries is detected, it is recommended to remove the caries only. If the caries does not undermine the restoration, replace only that portion of the restoration affected by the recurrent caries.[4]

Minimally invasive therapy for the treatment of root caries has been described by Dr Jane Chalmers[5] at the University of Iowa, who advocated removing the caries using a round bur on a low-speed handpiece. The resulting preparation is conservative, having not removed any unnecessary hard tissue. Once the caries is removed, the operator can assess the surgical field for moisture control and then determine which restorative material to use to restore the tooth.[5] If a dry field can be maintained, then a composite resin can be placed. For patients who are unable to cooperate with restorative treatment and/or for whom moisture control is very difficult, fewer options are available for restoring the tooth, such as glass ionomers or silver amalgam.

Innovations in restorative materials center around bioactive materials. The mechanism of action for bioactivity varies by material. Some materials, such as glass ionomers, release fluoride and, thus, remineralize tooth structure. Other materials deposit hydroxyapatite, such as calcium aluminates. These materials also remineralize tooth structure. Newer materials being developed stimulate pulpal regeneration. These materials, primarily calcium silicates, such as mineral trioxide aggregate (MTA), can both remineralize and deposit hydroxyapatite. MTA is used most frequently in endodontic therapy.

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Endodontic Therapy

As older adults retain teeth, there is a greater likelihood that they need endodontic therapy. A study by the American Board of Endodontics of its diplomats found that 26% of their patients were over age 65.[6] Because older adults may have more increased calcifications in the root canals, imaging is critical to the diagnosis and success of root canal therapy. Recently, CBCT has been used more commonly in endodontic treatment and has been shown to be effective in diagnosing various endodontic problems.[7]

The use of magnification and smaller files can assist in identifying and instrumenting calcified canals. Nickel titanium rotary instruments can increase the efficiency of root canal therapy compared with hand instruments, thus enabling a shorter appointment for the older patient.[8]

Older adults also can experience root fractures in restored or endodontically treated teeth. MTA is a bioactive endodontic cement that has been used in vital pulp therapy, for root perforations, to treat both vertical and horizontal fractures and in preserving teeth that in the past may have been extracted.[9–11] Innovations in bioactive endodontic cements continue and now offer patients with endodontically diseased teeth more options for treatment and retention of their teeth.

Implants

When older adults lose teeth, they can be replaced with dental implants to retain dentures or an implant-supported prosthesis. Although implants are more costly than traditional fixed and removable prostheses, for many patients, implants have become a more desirable treatment option because of their esthetics and function.[12] A 2018 study examining the prevalence of implants from 1999 to 2000 through 2015 to 2016 found that the 65-year-old to 74-year-old population had the largest absolute increase in implants use from 2000 to 2016 and the largest relative increase in prevalence of implants in 55-year-old to 64-year-old adults.[13] Although implant prevalence is low, the study showed that implant prevalence was increasing in older adults and is expected to continue to increase. The study also found that implant prevalence was higher in older adults with higher levels of education and more "advantaged groups."[13]

Although older adults may have more chronic diseases than younger adults, general health problems that contraindicate implant surgery are rare.[14] An historical prospective study examined implant survival in a cohort of patients born prior to 1950 who received dental implants in a single private dental office.[15] This study evaluated implant survival and success in an elderly population. It also assessed indicators and risk factors for success or failure of dental implants in older adults (ages 60 years and older). The study found that implants can be placed successfully in older adults. A variety of factors affect long-term success. One finding identified that implants that were placed where bone augmentation was performed before or during surgery did not have the same longevity as implants placed that did not require bone augmentation.[15]

Innovations in implant treatment continue. A minimally invasive approach and a digital workflow are revolutionizing the ease and efficiency of implant treatment of patients. The digital workflow with CBCT imaging is making the diagnosis and planning for the implant prosthesis much more convenient for patients, in addition to facilitating communication among the general dentist, specialist, and the dental laboratory. A minimally invasive approach to implant surgery is resulting in a decreased number of implants being placed to support a prosthesis. The sizes of the implants

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placed also are becoming smaller, shifting from standard diameter implants to more narrow diameter implants (or mini-implants). Mini-implants can reduce the need for bone augmentation and reduce complications associated with implant placement. Digital technologies and workflows will continue to advance the ease with which implant surgery and prostheses are planned and designed.

INNOVATIONS IN MODELS OF CARE TO IMPROVE ACCESS TO CARE

Daily Oral Care

As older adults are retaining their teeth for their lifetime, there has been a cultural shift from the expectation that people lose teeth as they age to an expectation that teeth will be kept. This marker of successful aging, however, requires an educational shift from denture care to an understanding that daily oral health care and prevention are critical to the maintenance of dentition. Education, communication, and resources are necessary to achieve this goal.

A priority for persons as they age is to maintain their autonomy. To the extent that a person can provide self-care, it is preferred. If and when cognitive and physical challenges arise and dependency on others increases, however, it becomes necessary for others to participate in the daily oral hygiene care. Autonomy should not be a priority to the detriment of appropriate care. Daily oral care assessment should be made to determine if the current level of care is appropriate or if further intervention is required.[16] These interventions could progress from verbal reminders to handing a toothbrush with toothpaste on it to complete toothbrushing and interdental cleaning by the caregiver.

There still exists significant need for education of family and professional caregivers to understand their critical role as evaluator and intervener. It is not uncommon for a family member's concern about halitosis to be resolved when they become aware of a removable partial denture that had not been removed and cleaned daily. Persons unable to perform activities of daily living independently need others to provide oral health care supplies and assess feasibility to sink access. Innovative educational Web sites and videos, such as Mouth Care without a Battle (http://www.mouthcarewithoutabattle.org/), have been produced to facilitate education of caregivers to provide oral health care for those with physical and/or behavioral challenges. Financial and transportation barriers can hinder the ability to purchase oral health care supplies. Innovative programs include providing toothbrushes, toothpaste, and interdental cleaners through Meals on Wheels program donations.

Professional Oral Health Care

Typically, professional oral health care is obtained at a dental office by a dental team composed of dentists, dental hygienists, and dental assistants. Wheelchair-bound patients often require assistance to transfer to the dental chair or need a transfer device, such as a Hoyer lift. For older adults who cannot be transported to a dental office, innovative delivery systems have been developed to provide mobile services in home and at long-term care (LTC) facilities. Mobile care can be provided in an equipped van or by equipment set up in an available room on location. These unique environments use innovative transportable equipment, such as handheld radiograph machines and portable dental operatories complete with compressors.

Collaborative hygiene practice has expanded the ability of dental hygienists to provide preventive oral health care in LTC settings without a dentist present. Dental therapists are other dental providers licensed in some states with an expanded scope of duties, which enhance access to care for those in need of mobile dental services.

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Although both of these innovative practice models of care have expanded access to care in many states, the benefit has not been fully realized due to limited training, restrictive regulations, and minimal financial incentives.

Teledentistry

The virtual dental home is an innovation that has improved access to care for patients with limited mobility and access to care. It is "based on the principles of bringing care to places where underserved populations live, work or receive social, educational or general health services, integrating oral health with general health, social, and educational delivery systems. Using telehealth technologies to connect a geographically distributed, collaborative dental team with the dentist at the head of team-making decisions about treatment and location of services is paramount."[17] Teledentistry is evolving to enhance triage assessment often used in collaborative care settings when a dentist is not present for treatment.

The 2019 coronavirus disease (COVID-19) pandemic created an explosion in teledentistry with the inability of oral health providers to have in-person contact with patients, especially those residing in LTC settings. Teledentistry can be used when dental professionals are distant (off site) from patients to evaluate and suggest modifications to daily oral health care as well as troubleshoot other oral pathology issues, such as concerns about a dental abscess or a burning mouth. Missing fillings, presence of tori, denture sores, and retained roots can be triaged by assessing the level of urgency for care, determining an acute need for immediate care or chronic condition requiring observation. Treatment considerations include prescriptions (eg, antibiotics, antifungals, fluoride), referral to an outside provider, on-site treatment, and continued observation.

Educational training in teledentistry for the health care team includes all LTC staff from medical directors to nursing assistants and requires access and competency in digital technologies. Teledentistry in LTC facilities is underutilized where the dental providers and the health care teams have limited access to protocols (Health Insurance Portability and Accountability Act compliance, consent, and so forth), equipment, or experience. Lack of educational training in teledentistry due to cost (eg, minimal to no reimbursement), limited time (eg, competing priorities), and limited access to oral health care trainers jeopardizes the ability to identify oral health issues requiring attention. Webinars sponsored by aging and oral health organizations are being developed to enhance knowledge and interest in this area.

Interprofessional Collaborative Care in Long-Term Care

Given the complicated clinical conditions of older adults, dental providers need to collaborate with other health care providers in the assessment of the geriatric patient. Nationally recognized programs, such as the Oral Health Nursing Education and Practice Program (OHNEP) (http://ohnep.org/), are increasing interprofessional education across disciplines by including oral health in assessment tools (head, eyes, ears, nose, oral cavity, and throat [HEENOT] examination). An oral component should be included in annual history and physical examinations by all health care providers. Health care teams need to understand oral health conditions and disease processes, thereby becoming knowledgeable about what precipitates a need for immediate intervention versus oral disease that can be attentively observed. Smiles for Life (www.smilesforlifeoralhealth.org), a national oral health curriculum designed to enhance the role of primary care clinicians in the promotion of oral health, has a module dedicated to geriatric oral health. Practical guidelines for physicians in promoting oral health in frail older adults are being developed to educate and provide clinical

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directives to health care providers beyond the dental team.[18] Dental professionals can learn from medical and nursing teams how to manage behavioral and cognitive challenges, just as medical and nursing teams can learn oral pathology from dental professionals.

Typically, daily oral hygiene care in the LTC setting is the responsibility of certified nursing assistants, who should be trained not only on oral hygiene techniques but also on how to provide an oral assessment, with clear guidelines to trigger appropriate referral, and on required personal protective equipment. Largely due to lack of reimbursement, the role of the registered dental hygienist in the management of oral health care in LTC settings has been woefully underutilized. The dental hygienist is capable of assessing and documenting residents' oral status, managing daily oral care, educating the LTC staff, providing routine professional care, and making referrals as needed.

Interprofessional collaboration initiatives in LTC need to provide sustainable oral health care for residents, especially when oral health care providers are not accessible. The COVID-19 pandemic created a critical opportunity for education of providers (eg, medical directors, health care providers, and caregivers) for assessments with use of pictures to provide dental professionals with information necessary to address oral hygiene, dental problems, and necessary referrals. Since the coronavirus pandemic, the use of video conferencing meetings has become a way of conducting daily business. A video meeting can serve as a means to conduct in-service education for the LTC team, with dental professionals showing clinical photographs of common conditions and answering LTC team questions. The pandemic also highlighted the need for an evidence-based approach to providing oral health care for patients throughout their life.

Oral Health Care Paradigms

A need for a structured, evidence-based approach to care for older adults resulted in the development of the Seattle Care Pathways.[19] As patients transition from robust to complete dependency, the model guides oral health care providers, detailing assessment, treatment planning, prevention, and communication. As dependency levels increase, goals change from comprehensive care to care focused on comfort, prevention, dignity, and safety.[20]

Treatment planning for the aging patient must be individually based and enhance their quality of life.[21] The rational treatment plan includes evaluation of numerous factors that affect both the patient and the dentist's ability to provide care. These factors include the patient's desires and expectations, the type and severity of the patient's dental needs, how the patient's dental problems affect quality of life, the patient's ability to tolerate the stress of treatment, the patient's ability to maintain oral health independently, the probability of positive treatment outcomes, the availability of reasonable and less-extensive treatment alternatives, the patient's financial status, the dentist's ability to deliver the care needed (eg, resources, skills, and equipment), and other issues (eg, the patient's life span, family influences and expectations, and bioethical issues).[22]

Models of Care Integrating Medicine and Dental Medicine

There are several innovative care models for older adults in the United States. The Administration for Community Living project (https://oralhealth.acl.gov) online database of community-based oral health programs assists state and local level groups in starting or enhancing oral health programs for older adults. A Community Guide to Adult Oral Health Program Implementation is a toolkit for community-based entities

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to find key tips, case studies, interactive tools, and other sources of support for creating cost-effective, sustainable programs.

Dental clinics in community health centers and federally qualified health centers often are physically located in a separate clinic but have collaborative relationships with the other medical disciplines housed under the same roof. Interdisciplinary clinics provide dental professionals with automatic referrals for medical care. The Geriatric Research, Education, and Clinical Centers in the Veterans Affairs Medical Centers (VAMCs) have a long-standing model of interprofessional care. In addition to VAMCs, other fully integrated systems of care that share medical and dental records include Programs of All-Inclusive Care for the Elderly (PACE), Kaiser Permanente, and Health Partners.[23]

INNOVATIONS IN FUNDING MODELS

Value-Based Models

New funding models are being evaluated for application to dentistry for older adults. For example, value-based care is being considered. Value in oral health care can be defined as quality/cost. Applied to oral health care, *value* aims to prevent rather than react to disease. For example, if a measure of quality is a dental visit once or twice a year, that measure of quality (visit) is divided by cost. Similarly, if a person is at high risk for dental caries, as defined by 1 or 2 new carious lesions that need treatment per year, the value of preventive treatment is the quality (fluoride treatments) divided by the cost. Tooth retention could be another measure. The Japanese 80/20 Movement promoted keeping 20 or more natural teeth by the age of 80 because tooth retention was an indicator for reduced medical expenses.[24] If the percent of 80-year-old adults with 20 or more teeth increases, the percent of the population with adequate tooth retention/cost could be measured.

Inclusion of Dental Care in Medicare Part B

A large and growing number of organizations, including the Gerontological Society of America (https://www.geron.org/), American Association of Retired Persons (https://www.aarp.org/), the Santa Fe Group (https://santafegroup.org/) and the Center for Medicare Advocacy (https://medicareadvocacy.org/) have policies that support the inclusion of a dental benefit in Medicare. Measures to include a basic and expanded benefit have been described.[25] Premium costs are estimated to be $32 per person per month for a basic benefit, and an optional $32 per month for more extensive benefits.[25]

Volunteer Programs

Programs like the Volunteer for Dental (https://volunteerdental.org/) offer free dental care in exchange for volunteer service in local communities. The program in Muskegon, Michigan, offers free screening, basic dental care, referrals to dentists for additional services, oral health education, and community events in exchange for community volunteering.

Discount Programs

Some insurance companies and dentists in private practice offer discount card programs for those without dental insurance, providing reduced cost of care for participation or membership in the program. In addition, dental hygiene and dental schools offer moderately discounted services for the entire community; however, patients in educational institutions must be prepared to spend more time in the dental chair. Fortunately, these services are well supervised, with students undergoing strict evaluations of the care they provide in a learning environment.

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INNOVATIONS IN RESEARCH

Research has demonstrated the clear association between oral and systemic diseases, and findings in this area continue to strengthen.

Type 2 Diabetes Mellitus

Type 2 diabetes mellitus and periodontal diseases have a clear 2-way link.[26–29] People with type 2 diabetes mellitus are more likely to develop periodontal disease, and the presence of periodontal disease interferes with the control of diabetes. Although research suggests periodontal treatment can decrease systemic inflammation, allowing for better glycemic control,[30] further research will help clarify this relationship.

Cardiovascular Disease

The oral inflammation present in periodontal diseases is considered an independent risk factor for coronary heart disease, increasing risk by 24% to 35%.[31] The number of teeth remaining also is significantly associated with fatal and nonfatal myocardial infarctions. Myocardial infarctions are associated with low-grade chronic inflammation.[32] Research has yet to confirm, however, that treatment of periodontal disease improves cardiovascular outcomes.[31,33]

Rheumatoid Arthritis

Bacterial antigens found in the periodontium and gastrointestinal tract may contribute to the etiology of rheumatoid arthritis.[34] Studies show an association between rheumatoid arthritis and complete tooth loss as well as periodontal disease.[35,36]

Tooth Loss and Cognition

Recent studies suggest that oral diseases and tooth loss are associated with dementia.[37–39] Nilsson and colleagues[40] showed a positive association between tooth loss, periodontal bone loss, and cognitive function. A longitudinal cohort study among South Korean older adults reported an association of early-state cognitive impairment with increases in tooth loss.[41] Importantly, not all of the current studies control for education, income, smoking, self-reported health, and health status.

Independent of the number of teeth present, a 2019 study in *Science Advances* demonstrated that the bacterium, *Porphyromonas gingivalis,* a periodontal pathogen, was present in the brains of patients with Alzheimer disease. *P gingivalis* produces toxic proteases called gingipains, which also were found in the brains of Alzheimer patients and cause pathology to the tau proteins in the brain. This finding provided evidence for causation of Alzheimer's disease and a rationale for treatment with small molecule gingipain inhibitors to prevent neurodegeneration.[42]

Several systematic reviews also are available. Cerutti-Kopplin and colleagues)[43] conducted a systematic review (n = 10 studies) and meta-analysis (n = 8 studies) that showed that persons with a suboptimal dentition (<20 teeth) had a higher risk for developing cognitive decline (HR 1.26; 95% CI, 1.14–1.40) than persons with greater than 20 teeth. Chen and colleagues'[44] meta-analysis of 8 cohort studies reported that tooth loss was associated with a 1.3- times greater risk of developing dementia with an increase of number of teeth lost. Oh and colleagues[45] conducted a systematic review and meta-analysis of 11 cohort studies; they suggest that having more teeth is associated with an almost 50% lower risk of dementia. Oh and colleagues, however, rated the quality of the evidence as very low.

In the other direction, declines in cognitive function are associated with poor oral conditions. Foley and colleagues[46] conducted a meta-analysis of 28 studies that

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examined the oral health status of persons with dementia; they found that across a variety of oral health measures (tooth loss, oral hygiene, dental caries, and so forth), persons with dementia had worse oral health. Furthermore, work by Naorungroj and colleagues,[47] using data on cognitive function and oral health status in the Atherosclerosis Risk in Communities study, suggest that before even before dementia becomes apparent, cognitive decline may contribute to deterioration in oral health as measured by oral hygiene and tooth loss. Given the devastation of cognitive decline on individuals and families and the human and financial costs to society, further research on the association of tooth loss, oral diseases, and cognition is needed.

INNOVATIONS IN EDUCATION

Geriatric dental medicine in the United Kingdom and Australia is considered a specialty of dentistry. With specialty status comes advanced education programs in the field. Both the United Kingdom and Australia have seen research advance in the field of geriatric dental medicine along with funding to support these efforts. Although diplomate status exists for geriatric dental medicine (and hospital dentistry) conducted by Special Care in Dentistry, it is not recognized as a specialty by the ADA National Commission on Recognition of Specialties. To achieve this, geriatric dental medicine would need to develop criteria for advanced education programs in geriatric dental medicine and have these programs accredited by the Commission on Dental Accreditation. The organization, Special Care in Dentistry, has had discussions among its members about working toward the development of geriatric dental medicine and/or special needs dentistry as a specialty in the United States. It is not clear when this will occur.

With the lack of specialty status, dentists interested in learning more about geriatric dental medicine often pursue advanced education in general dentistry. A few geriatric dental fellowships continue to educate dentists in formal 1-year to 2-year programs. These programs focus on understanding the differences between age-associated changes and disease-associated changes in health and oral health. Clinical components of the program often focus on providing dental care to medically complex patients in outpatient settings, in LTC or assisted-living facilities, or using mobile or portable dental equipment. Because the number of advanced education programs in geriatric dental medicine is limited, most dentists interested in learning more about geriatric dental medicine attend short-term continuing education programs.

Dental hygienists, dental therapists, and expanded function hygienists have even fewer formal programs available to them in geriatric dental medicine. Many learn through continuing education courses and on-the-job education, working with a mentor in geriatric dental medicine.

Nowhere is the need for integration of medicine and dental medicine greater than in the geriatric patients. For dentists, it is critical to understand the medical history and medications the patient is taking, along with the social factors that affect a patient's ability to get to the dental office, daily hygiene care, and so forth. Similarly, it is critical for physician, nursing, and pharmacy colleagues to have a basic understanding of oral health and disease to make referrals to dental professionals as needed. In LTC facilities, often dental hygienists and dentists are invited to provide in-service continuing education to the nursing and medical staff. These interprofessional oral health education opportunities will continue to increase in importance as the older population increases.

Finally, as the population ages, consumers continue to be interested in learning more about health, including oral health. Social media and health Web sites serve

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as sources of information about oral health, with some much more reputable than others. Reputable sources, such as the ADA and the National Institute for Dental and Craniofacial Research at the National Institutes of Health, have developed Web sites, Mouthhealthy.org and https://www.nidcr.nih.gov/health-info/for-older-adults, that provide information for consumers on oral health. Various disease-specific Web sites for older adults, such as the Alzheimer's Association, provides information provide information on oral health for adults with dementia. "Tooth Wisdom: Get Smart About Your Mouth" is a seminar series developed for seniors to provide information about oral health and how to maintain it.

INNOVATIONS IN POLICY AND COLLABORATION

The Fédération Dentaire International (World Dental Federation) developed a toolkit for healthy aging based on the principles of providing for the oral health care needs to today's older adults, reinforcing prevention activities throughout the life-course, and adapting health systems to set up evidence-based prevention and care strategies.[48] Eight core pillars were identified: (1) integration of oral care into general care; (2) promotion of oral health throughout the life-course; (3) shaping of

Box 1
Future directions for innovations in geriatric oral health care

Oral health policy
- Establish dental benefit in Medicare.
- National health organizations: establish policies to enhance importance of oral health for the aging and develop guidelines for policy and direction for research.
- National health authorities: develop policies, funding, measurable goals, and targets for oral health for the aging, including mandates for services in LTC facilities.
- Local coalitions and community organizations: develop collaborative partnerships with stakeholders and promote the implementation of policies that support evidence-based strategies to provide optimal oral health for the aging.

Oral health care
- National public health programs: incorporate oral health promotion and disease prevention based on a common risk factor approach.
- Investigate alternative models through mobile dentistry, telemedicine, and home care to improve access to professional oral health care for the aging.
- Enhance access to preventive daily oral care for the aging through trained caregivers.

Education and training
- Develop a specialty in geriatric dental medicine.
- Create interdisciplinary collaboration and training with health care teams and caregivers.
- Establish oral health care resources for providers of care for the aging targeting the patient, family, and caregivers.
- Address workforce shortage through training program funding, enhanced training of oral health care professionals in the care of the aging, and alternative workforce models.

Research
- Provide outcomes of oral health intervention programs and workforce models for policy development.
- Include oral health for the aging as a component of aging and chronic disease research.
- Investigate whether improvement of oral conditions will decrease cognitive decline.
- Examine the longitudinal impact of improving oral conditions on noncommunicable diseases (cardiovascular disease, type 2 diabetes mellitus, hypertension, and stroke).

Adapted from Ghezzi EM, Kobayashi K, Park DY, Srisilapanan P. Oral healthcare systems for an ageing population: concepts and challenges. International Dental Journal 67(Suppl. 2): 26-33; 2017.

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evidence-based oral health policies; (4) removal of financial barriers; (5) removal of physical barriers; (6) provision of appropriate oral health care; (7) mobilization of all stakeholders along the care pathways; and (8) fostering of community-based programs.

The Santa Fe Group (http://santafegroup.org/) has led efforts in research and advocacy convening a coalition of stakeholders from dentistry, aging, health care, and industry in support of Medicare coverage for medically necessary oral and dental health therapies. From this work, the Medicare Oral Health Coalition has been established by Families USA (https://familiesusa.org/).

The Gerontological Society of America[49] published a white paper on interprofessional solutions for improving oral health in older adults, addressing access barriers, and creating oral health champions by identifying the need for interprofessional education and practice, promotion of an oral health benefit in Medicare, and creation of coalitions and oral health champions for health promotion and public awareness campaigns while providing practical calls to action. An example is the Coalition for Oral Health for the Aging (https://www.micoha.org/), which works nationally (1) to be a resource for providers of care for the aging; (2) to promote the implementation of policies that support evidence-based strategies that provide optimal oral health for the aging; and (3) to develop collaborative partnerships that address the oral health needs of the aging.[50]

SUMMARY

Future innovations in geriatric oral health care (**Box 1**) must address oral health policy, care, education, training, and research. Only a life course approach will allow achieving the ultimate goal, to increase the number and percent of elders who maintain their natural teeth and oral health for a lifetime. This life course approach must be interprofessional and integrate dental care with medical care. For elders to age successfully, they must maintain health and function throughout their lives. Traditional dental professionals and delivery systems must be expanded. There is no way to predict what the next advancements in technology will bring what they will allow accomplishing.

CLINICS CARE POINTS

- The COVID-19 pandemic created an explosion in teledentistry, with the inability of oral health providers to have in-person contact with patients, especially those residing in LTC settings.
- Daily prevention with interprofessional collaboration should include toothbrushing with a fluoride toothpaste as well as prescription-strength topical fluoride application.
- Professional preventive care includes not only regular dental cleanings but also application of fluoride varnish to reduce decay.
- SDF is a novel and effective treatment to reduce progression of decay, especially for those older adults with difficulty in cooperating with dental treatment.

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