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## Chapter

# Oral Health: Fundamentals, Importance, and Perspectives

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## Abstract

Oral health is a fundamental and important part of the patient's general health. It is very common to find texts that focus on diseases rather than on health, the proposal of this chapter is to address the importance of oral health maintenance, its impact on people's lives, and the fundamental role of the dentist as a professional. Oral diseases are largely preventable or require only simple interventions if diagnosed and addressed at early stages. The aim of this chapter is to discuss the importance of the function of teeth and their supporting tissues for the health of the person, as well as the functions of esthetics, phonation, and mastication in the bio-psycho-social relationship of the human being, to demonstrate how fundamental, it is to maintain oral health.

**Keywords:** oral health, supporting tissues, quality of life, oral health concepts, diagnosis, oral

## 1. Introduction

Oral health is an integral part of general health since both share common causal pathways and affect each other in a bi-directional fashion [1]. The World Health Organization (WHO) defined oral health in 2011 as “a state of well-being, free from chronic orofacial pain, oral and throat cancer, oral ulcers, birth defects such as cleft lip and palate, periodontal or gum disease, dental caries, tooth loss and other diseases and disorders affecting the oral cavity” [2].

Oral health is essential for proper food intake. The condition of the teeth and supporting tissues have been shown to contribute to the maintenance of proper nutritional status, and consequently, to overall health [3]. The oral microbiome is comprised of over 600 prevalent taxa at the species level, with distinct subsets predominating in various oral habitats [4]. In the absence of effective oral hygiene, initial dental plaque formation on a clean tooth surface will occur within 48 hours and can be reflected in the oral environment [5]. Dental caries and periodontitis are the most common oral diseases and are major causes of tooth loss [6].

The area of oral health is very important because it is linked to the overall health of the patient, and much emphasis is placed on oral health problems rather than on oral health prevention. Prevention of oral diseases requires extensive knowledge of their causes such as socioeconomic inequalities, nutrition and dietary aspects, access to fluoride, and appropriate dental care, all of which may start early in life [7].

Many countries have established different policies and successful programs to reduce the prevalence and severity of oral diseases. Yet from a global perspective, much more needs to be done, positive action needs to be accelerated, and innovative solutions need to be evaluated and implemented at scale so that the vision of universal health coverage (UHC) for oral health becomes a realistic goal. This includes a renewed focus on integrating oral health care with primary health care (PHC) and integrating the promotion of prevention and oral health in settings outside specialist oral health facilities [1].

The aim of this chapter is to present the components and their function within oral health. In addition, show the impact of oral health on the quality of life, as well as comment on the role of the dentist in oral health.

## **2. Importance of teeth and supporting tissues**

The oral cavity is mentioned by some authors as the entrance door of the external environment to the organism and has been related as the link to systemic health. It is formed by two zones: an external or vestibular one limited by the inner part of the lips and cheeks and the vestibular face of all the teeth. The other zone, the internal zone, is the space inside the mouth, limited by the inner side of the teeth, the upper part by the palate, and the lower part by the tongue and the floor of the tongue [8–10].

### **2.1 Function**

It is in this place, the mouth, where the teeth are located, in which we differentiate between two zones, the visible portion called the crown, while the portion that is lodged in the dental alveolus is called the root. The tooth is a complex structure composed of different highly organized hard and soft tissues, including highly calcified enamel, dentin, and cementum, in addition to the soft tissues, which include the dental pulp and periodontal ligament [10–12].

Enamel, inorganic and calcified tissue, is the hard surface of the tooth and the hardest tissue in the body. It is directly exposed to the oral cavity and external stimuli such as mechanical stress. Dentin is the second layer of the tooth located below the enamel and cementum. It is a collagen mineralized structure formed of several micro-tubules that extend from the pulp wall to the dentin-pulp junction or cementum. Dentin has a mechanism in which its constituent cells called odontoblasts, are responsible for the secretion of the dentin matrix and the formation of secondary dentin which occurs in adult life during normal dentinogenesis. Once the tooth reaches adulthood, we consequentially find a decrease in the volume of the pulp cavity [13].

The pulp located in the central part of the tooth, the pulpar chamber and root canal, is the vital tissue that provides nutritional elements to the tooth. It also serves as a contributor of sensory function due to its composition of nerves and blood vessels that enter through the apical foramen. The pulp additionally fulfills its other formative and defensive functions through the formation of repair dentin, which it does as a response to harmful external stimuli [12, 13].

The portion of the maxillary and mandibular bone that surrounds the tooth is referred to as periodontal tissue and includes the gingival gingiva, the alveolar bone, and the periodontal ligament. The gingival gingiva is the mucosa that surrounds and protects the tooth acting as a barrier to mechanical trauma and infection specifically in the gingival sulcus where the gingiva inserts into the tooth. Its function within the gingiva is sensory, absorption of micronutrients and plays an important role in the innate immune response [14].

The periodontal ligament is a tissue composed of connective fibers containing specialized cells that surround the tooth. These fibers are responsible for keeping it attached to the alveolus in the maxillary bone, which contains a rich microvascular network within, thus performing the function of anchoring the tooth to the bone. A close relationship has also been demonstrated between the behavior of the periodontium and the support forces that act as “shock absorbers,” since it is in continuous tension from constant chewing forces [11, 14, 15].

Humans develop two sets of teeth: primary and secondary, which vary in shape and number, among others. The primary dentition is formed by 8 incisors, 4 canines, and 8 molars, with a total of 20 teeth. These are currently recognized as important to preserve because of their relationship with the permanent teeth, as they are their precursors and are essential to contribute not only to the health of children but also to the welfare of adults [10, 11, 16].

Primary teeth begin their formation during gestation and begin to erupt in the mouth at approximately 6 months following a sequential eruption pattern, thus in the first year of life, a new function begins: chewing. This action can be affected by the premature loss of a dental piece since it not only causes a simple setback but also affects the masticatory function and results in the appearance of malocclusion problems by providing the indispensable space that will later be occupied by the secondary dentition [17, 18].

The crowns of primary teeth are smaller than those of secondary or permanent teeth, their precursors, and are formed by three thin layers: enamel (hard and external layer whose function is to protect the tooth from injuries and infections), dentin (layer formed by tubules responsible for providing nutrients to the tooth, unlike the enamel can regenerate) and pulp (formed by nerves and vessels important for the health of the tooth). Both enamel and dentin are found as thin layers compared to permanent teeth, which makes primary teeth more susceptible to dental caries [18].

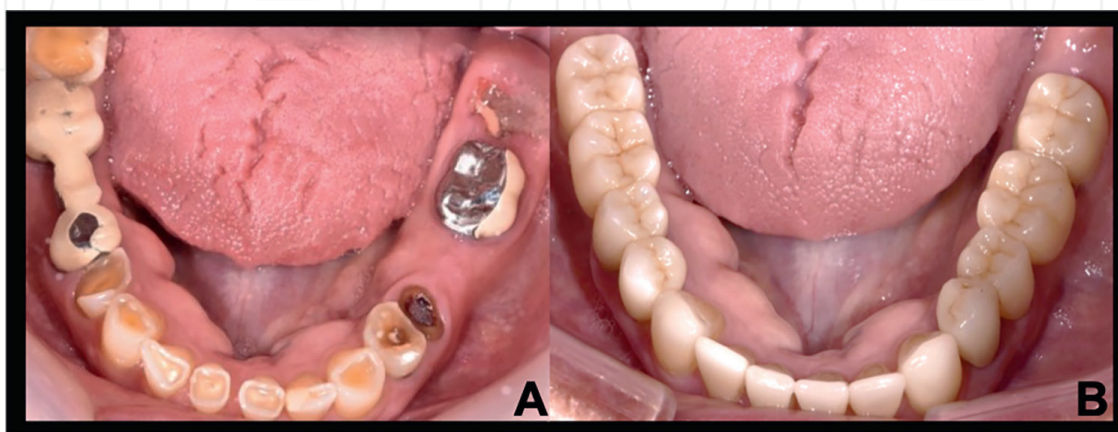
Permanent teeth are larger than deciduous teeth, as well as their crowns, because as the jaws mature the permanent teeth gradually adapt in the arch. These teeth are formed by 8 incisors, 4 canines, 8 premolars, and 12 molars for a total of 32 teeth. The different occlusal and incisal morphologies that we observe in each of the groups of teeth are closely related not only to the function they perform and the position in which they are distributed in the structures involved in oral dynamics but are also linked to the mandibular movements that aid in mastication. For example, the anterior teeth are so called because of the position in which they are located, they are called incisors because their function is to incise or cut the food. The upper teeth are especially important, not only for their function but also from a phonetic and esthetic point of view, since they are directly related to the pronunciation of certain letters such as c, d, f, s, t, v, z. While the back teeth, the molars, located at the back of the jaws with their occlusal faces, are responsible for grinding food and facilitating chewing [10, 11, 18–20].

Teeth are not essential for life, however, they are crucial for the health of the individual, as well as his or her wellbeing since together with saliva they begin the



processing of food, starting the digestive process in conjunction with hard and soft tissues and good salivation. The teeth crush the food during chewing and help the enzymatic action of the digestive system favoring the reabsorption of nutrients which is essential for growth and development in the infant stage. Good mastication is described as the act of grinding or crushing food through the teeth in a certain number of chewing cycles, which requires fine rhythmic motor coordination with the opening and closing of the mouth in synchrony with the lips and tongue. In this way, the anterior part of the tongue facilitates the formation of the food bolus and its transportation to a suitable position to continue grinding it together with the teeth in repeated cycles. Once sufficiently small particles are obtained, they are sent to the posterior part of the tongue to continue with the digestive process and in this way, the organism obtains the nutrients for the daily activities that the individual carries out [10, 21–23].

The deterioration of the occlusal surfaces or the absence of them has repercussions in the masticatory ability. This leads to changes in eating habits, food intake, as well as lack of nutrients, which results in alterations in nutrition. The rhythmic and repetitive function of mastication can be altered when form-related occlusal impairments occur. Most of the mastication is carried out by the premolars and molars, sometimes assisted by the canines, these movements are related to the anatomical and structural alignment of the teeth. Mastication includes a series of coordinated movements between teeth through occlusal contact with the tongue and jaws. Movements are guided by the dental anatomy and supporting structures, temporomandibular joints (TMJ), masticatory muscles, and central nervous system. This complex mechanism can be easily affected when any of the components such as teeth, periodontal articulation, and peripheral nervous system are altered. To maintain occlusal stability, it is necessary to maintain balance with the pressure of the lips and cheeks, occlusal and eruption forces, tongue pressure, periodontal support since they are intimately linked to the dental position. If any of them is altered in frequency or magnitude, the position of the tooth will change, modifying and altering the occlusion and consequently the function, which can lead to the loss of teeth, loss of partial structure, and deficiency in the support caused by trauma or periodontal disease. This will also affect occlusal stability, which is defined as the optimal functional state between teeth, articulation, arch, and muscles [18, 24] (**Figure 1**).



**Figure 1.** Absence or deterioration of the occlusal surface has a repercussion in the masticatory ability which results in alterations in nutrition. (A) Patient before and (B) after oral rehabilitation (photos kindly provided by Dr. Francisco Javier Macías García).

Within the oral cavity and actively participating with the teeth in mastication is located the tongue which is a mass of muscle (intrinsic and extrinsic) that does not have a skeletal base and is essential for chewing, swallowing, taste, and speech, by combining a series of synchronous movements. In the dorsal part, of the anterior segment, we observe that it is covered by four types of papillae: filiform, fungiform, foliaceous, and circumvallate. The glands are involved in the sense of taste, helping to detect the primary flavors such as sweet, sour, and bitter, in the same way, the sense of taste is linked to the sense of smell, that is, the perception of taste is altered when the sense of smell is affected [19].

## 2.2 Esthetics

The face has an important esthetic significance where dental appearance is considered an essential component. Anthropomorphic studies have shown that the anterior teeth have a harmonious relationship with the facial structures. To achieve a pleasing appearance, intraoral and extraoral factors such as the periodontium, perioral muscles, skeletal components of the jaws as well as the relationship of the smile to adjacent tissues such as the nose and chin must be considered as they have an indisputable effect on the smile.

The smile is the facial display of emotion that is produced once the muscles of facial expression undergo contraction showing the teeth of the maxilla. This facial expression can influence the way in which the individual fits in and performs within society playing an important role linked to emotions, such as self-esteem. Although esthetics is completely subjective, it is influenced by various factors such as culture, social status, and level of education. For example, it is common for adolescents to form their esthetic ideals according to their own experience and based on cultural stereotypes [25, 26].

For a smile to be pleasing, harmony must be achieved with the size, shape, position, and color of the teeth as well as the proportion and relative symmetry between them plus the surrounding elements such as size and shape of the lip and the amount of visible gingiva. However, patient perception of an ideal smile corresponds to having white teeth that are oversized, while the literature points to dental alignment and color as the essential characteristics [27] (**Figure 2**).

In recent years, dentists and patients have turned their interest to dental esthetics and the facial appearance of treatments. The impact of having a pleasant dentition with a beautiful smile has even come to be considered a plus for employment,



**Figure 2.** Dental harmony between size, shape, position, and color. (A) Patient before and (B) after treatment (photos kindly provided by Dr. Francisco Javier Macías García).

interpersonal and social relationships, etc., increasing the demand for esthetic dental care every day [25, 28].

The oral cavity is involved in various functions among which are esthetics, speech, and mastication, the latter being where we observe the interrelationship with the intake and propulsion of food into the oropharynx, essential for the nutrition of the individual so that a decrease in masticatory function affects the overall health and welfare of the patient. Another function of the mouth is to serve as a second secondary airway to the nasal cavity.

As health professionals, dentists are committed to caring for the oral health of patients, keeping teeth in natural occlusion and function integrated in harmony with orofacial esthetics [13, 29–31].

### **3. Impact of oral health on people's quality of life**

Oral health varies over the life course from early life to old age, is integral to general health and supports individuals in participating in society and achieving their potential [32]. Oral diseases are a major public health problem for countries and populations worldwide, although they often are not publicly recognized as such [1].

In May 2021, a historic resolution concerned with the lack of attention to oral diseases recognizing was made by the World Health Assembly. It stated that Oral health should be firmly embedded within the noncommunicable disease (NCD) agenda and that oral health care interventions should be included in universal health coverage (UHC) programs [33].

The combined estimated number of cases of oral diseases globally is about 1 billion higher than cases of all five main NCDs (mental disorders, cardiovascular disease, diabetes mellitus, chronic respiratory diseases, and cancers) combined [1, 34].

Oral diseases are a concept that encompasses everything from temporary and permanent tooth decay, periodontal disease, edentulism to oral cancer, all of which are currently recognized as public health problems for countries and populations around the world. Globally, these diseases affect almost 3.5 billion people and three out of four people affected live in middle-income countries [1].

Apart from the five main diseases (caries of deciduous and permanent teeth, severe periodontal disease, edentulism, lip and oral cavity cancer), many other diseases and conditions are relevant to oral health [1, 35].

Quality of life of the population is one of the generally accepted and important indicators that define the real opportunities of people that they need for a comfortable life. From the point of view of dental health, four types of factors were identified that are directly related to the quality of life of patients: Pathology of the dental-maxillary system, the state of the dental-maxillary system, influence of the condition of the dental-maxillary apparatus, and the condition of the dental-maxillary apparatus [36].

The circumstances in which people are born, grow up, live, work, and age [1], is the framework that influences, together with genetic, sociocultural, and environmental factors, the development of oral diseases as well as non-communicable diseases (NCDs).

#### **3.1 Children**

As is highlighted in the 1990 United Nations (UN) Convention on the Rights of the Child which has since been ratified in 2019, all children shall have the right to



the best possible health and access to healthcare. This includes good oral health and access to dental care [37]. There is a clear connection between socio-economic factors and social vulnerability and oral health. Having parents with low educational level, single parents, unemployment in the family or parents from non-European countries increases the risk of the child having caries. For example, 95% of Swedish 3-year-old children and 73% of 6-year-old children are caries-free, but it has been shown that the worse the dental health of the parents, the higher the risk of caries in children [37]. The reality in the world population is that more than 2 billion people worldwide live with untreated dental caries. In primary teeth, untreated caries is the most common chronic childhood disease, affecting 514 million children worldwide [34, 38–41].

Traumatic dental injury is a widespread yet often overlooked condition. In March 2022, a revision of the International Classification of Diseases (ICD) was published, that now includes more detailed codes on dental trauma, allowing for better data collection and surveillance [1].

Nevertheless, oral mucosal conditions are underestimated and underdiagnosed not only by dentists but also by pediatricians, dermatologists, and other medical specialists. However, a retrospective study conducted in Poland in children aged 0-17 years found that the most frequent oral mucosal lesions were aphthae, mucocele, morsicatio buccarum, hairy tongue, fibroma, geographic tongue, papilloma, lip-tie, pyogenic granuloma, and traumatic erosions [38].

Seeing the mouth as part of the body and that children's dental health can affect both general health and future caries development is an important message to convey. The right of all children to good and equal health must not only be a vision but also an important goal to strive for it [37].

### **3.2 Adolescents**

The WHO defined adolescents as “all persons between 10 and 19 years of age group and Youth as the 15–24 year age group. While Young People covers the age range 10–24 years.” This transition from childhood to adulthood can negatively impact oral health. In adolescents, hormonal changes, diet, and inadequate hygiene habits added to other factors that modify the internal and external environment of the individual make them a risk group for poor oral health. Thus, anxiety, depression, low self-esteem, and psychosocial problems are some factors that negatively affect the oral health of both children and adolescents, resulting in pathologies such as bruxism and temporomandibular disorders (TMD), affecting their quality of life [42].

Eating is the most frequently affected dimension and toothache is the first cause of impact, showing a generally mild intensity and severity of impact. The impact on oral quality of life is greater in younger adolescents [43]. Significantly improving factors such as self-esteem, esthetics, social interaction, and self-perception in adolescents is important [42].

### **3.3 Adults and seniors**

The dominant oral diseases are dental caries and periodontal diseases [44]. The dominant oral diseases in the adult population are dental caries and periodontal diseases. Tooth loss is often considered an inevitable result of aging and is socially accepted in many cultures. However, losing teeth and living with reduced or absent dentition can be psychologically traumatic, socially detrimental, and functionally limiting for the affected individual. A balanced diet can be difficult, especially when



partial or full dentures to replace missing teeth are not accessible or affordable. For people over 60 years of age, the global average prevalence of edentulism is much higher, estimated at 22.7%: almost one in four people over 60 years of age lacks teeth [1]. However, several factors make older people particularly sensitive to these diseases, such as the influence of the aging process on immune system function, morbidities, and medication that can reduce salivary flow [44].

Good oral health is important for the general health, comfort, and basic dignity of older members of society. Because of the interaction between oral health and general health that has become increasingly established, especially in relation to many chronic diseases, such as cardiovascular disease, stroke, and diabetes, the oral health was redefined by World Dental Federation (FDI) as “multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and discomfort of the Craniofacial Complex” [45].

Today, many older people in Sweden have many natural teeth remaining, and denture wearers are less frequent [46]. Similarly, in Japan, the goal is to ensure that people still have 20 of their teeth at age 80 so that they can maintain nutritional and social well-being, and campaigns are being conducted with a lifelong focus on preventing tooth loss, targeting all generations [1]. It is a reality that over the life course, oral diseases and conditions disproportionately affect poor and vulnerable members of society, which often include people with low incomes, people with disabilities, older people living alone or in residential care, refugees, prisoners, or people living in remote and rural communities, as well as people belonging to minorities or other socially marginalized groups [32]. Drawing on the experience of countries that have succeeded in turning this reality around, we must strive to raise awareness among these generations to establish preventive measures that will lead us to achieve the goal of better oral health.

Oral cancers are a disease group with high mortality and morbidity. The IARC Global Cancer Observatory (GLOBOCAN) estimated 377,713 new cases and 177,757 deaths from lip and oral cavity cancers worldwide in 2020 [1, 32, 46]. The main risk factors for lip, oral cavity, and oropharyngeal cancers are tobacco use, alcohol consumption, and betel quid use. Oral health plays a major role in well-being and self-esteem, while oral diseases heavily affect the quality of life, productivity, and ability to work as well as social participation [1].

#### **4. Fundamental role of the dentist in oral health**

Professional oral and dental supervision are critical components of patient health for quality life [47], oral functions such as eating, speaking, and relating to others are connected to prevention [48], and measures that have been incorporated into disease surveillance, facilitating comparisons of morbidity across health conditions, with the potential to guide large-scale priority setting [47]. The dentist has the role of the leader on the oral health team and, in this capacity; he/she is responsible for diagnosis, treatment planning, and the quality control of the oral treatment [49].

The clinical examination of the patient should start as the patient enters the clinic and is greeted by the clinician. The general examination includes:

1. Vital signs: Conscious state, pulse, blood pressure, and respiration.
2. Other signs: Weight, condition of the hands, skin lesions, and skin appendages.

3. Extraoral head and neck examination: Swellings, pallor, rash, erythema, palpation of all cervical, submental, and submandibular lymph nodes, salivary and thyroid glands, the temporomandibular joints (TMJ), muscles of mastication's and the cranial nerves should be examined.

4. Intraoral examination: Dental, periodontal, and mucosa examination [49, 50].

#### 4.1 History of the present complaint

This should cover aspects relevant to the particular main complaint, such as:

Date of onset

Duration

Locations

Aggravating and relieving factors

Investigations thus far

Treatment already received.

The history and clinical examination are designed to put the clinician in a position to make a provisional diagnosis, or a differential diagnosis [50].

Clinical examination allows for a diagnosis, which often involves the patient's careful history (anamnesis). In fact, utilizing a patient's history provides a diagnosis in about 80% of cases [50].

#### 4.2 Communicating the diagnosis

The dentist is competent at recognizing the presence of systemic disease and knowing how the disease and its treatment affect the delivery of dental care and recognizing the clinical features of oral mucosal diseases or disorders, including oral neoplasia, and identifying conditions that require management [49]. Follow their ethical and professional responsibility to refer the patient to another appropriate health care professional (HCP) if this is likely to be in the patient's best interests [50].

### 5. The role of oral immune system

Innate immunity plays a unique role in oral immunity, by triggering a crucial systemic response to protect the host and maintain homeostasis. Furthermore, the innate defense is pivotal in the activation and regulation of adaptive immunity [51].

Oral and periodontal health impact systemic health, and vice versa [52] the oral mucosa acts as a first line of defense and is like a barrier to protect from environmental exposures, physical and chemical damage, microbes, and toxins. Through its physical and immunological barrier functions [51], the role of the oral microbiome is crucial to homeostasis and immune responses in the mucosal tissues [48, 49].

In the oral cavity exists a highly dynamic microbial environment that harbors many distinct substrata and microenvironments housing diverse microbial communities [52]. Commensal microbiota is considered as the main driver of barrier immune function, shaping protective and homeostatic immune responses at the mucosa tissue [51]. The cells of the innate immune system are located strategically at the host-microbiome and are composed of three major compartments: the epithelial layer, lamina propria, and the mucosal-associated lymphoid tissue (MALT) [51].

The lining of the oral cavity is called the stratified flat epithelium and can be keratinized or non-keratinized. Its function is to protect the underlying tissue from mechanical damage, as well as to function as a primary barrier site and a portal for the entry of food and microorganisms. The epithelium is constantly replaced by cell division [51].

The oral cavity, often described as a community of commensal, symbiotic, and pathogenic microorganisms with a body space or other environment, has the second largest and diverse microbiota after the gut. It harbors over 700 species of microbial communities that are involved in promoting oral health and exist in a dynamic balance with the host [51]. It is also presented with near-constant environmental challenges, including host diet, salivary flow, masticatory forces, and the introduction of exogenous pathogens. The composition of the oral microbiome is shaped throughout life by factors that include host genetics and maternal transmission, as well as by environmental factors, such as dietary habits, oral hygiene practice, medications, and systemic factors [52].

Besides its role in mastication, saliva contains specific digestive enzymes to support food digestion such as amylase, lipase, and proteases [53] and it is involved in defending against external pathogens including bacteria, viruses, and fungi [54].

## **6. Conclusions and future perspectives**

Some of the challenges in preventing and controlling oral diseases are related to the design and organization of (oral) health care systems, including oral health workforce models, individuals' capability for effective self-care, and access to and affordability of fluorides for oral health as well as data, surveillance, and research issues that limit the availability of basic information on oral health and disease [55–57].

More high-quality research is needed to understand fully the potential shared pathways between oral diseases, poor oral health, and other general diseases and conditions, the coexistence of multiple health conditions, as well as the impact of oral health interventions on general health [58]. It will require societal change addressing health care reform and social inequities to create better overall health and wellness, and more interest from many organizations in oral health heretofore [59].

Unprecedented advances in genomics, data science, and biotechnology are presented considering their contributions to a new era of health care in which interventions and treatment are increasingly tailored to individual patients [60]. Finally, mobile and remote technologies using smartphones and other digital approaches are expanding the scope of and approaches to health promotion and aspects of oral health care while challenging patient-provider relations and data protection [1].

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## **Conflict of interest**

The authors declare no conflict of interest.

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