



## Millennials and the Future of Dentistry

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### Abstract

Millennials are a larger population with a very different in attitude, than Baby Boomers and should have a greater impact than Baby Boomers on the traditional American society and dentistry in particular. There are many reasons for their altered attitude, one of which is their brains have changed morphologically from the excess digital screen time at moment when the frontal lobes were maturing. They will be very good in a dental office with computers, CAD/CAM, robots, internet and internet-of-everything, but will have difficulty with thinking about complex problems, e.g. the complex medical problems of the aging population and how it affects dentistry and how dental diseases are affecting systemic health of the patient. Dental treatment is becoming more complex because of the aging population with more systemic illnesses that uses more pharmaceuticals and requires more understanding on the part of the practitioner. They are more sophisticated and value oriented than the in past. This complex medical understanding is further complicated with recent developments that describe the relationships of periodontal disease and dental caries to being related to systemic disease. To deliver high quality value oriented treatment requires digital dental equipment and the talents of the Millennials, however, they do not like to think about complex diagnostic medical and dental problems. For a variety of reasons dentistry maybe at a turning point where it will be necessary to train some dentists to behave more like technicians of digital equipment, while others should be trained more like internal medicine physicians.

The systemic illness aspect of dentistry and the more complicated medical problems of our population may require more education than is currently provided in most dental educational settings, while at the same time traditional dental education is simplifying and reducing clinical experiences. This may provide a separation of dental care providers into 1. "Dentist-physician", who is relationship based with patients/clients and global thinking minded, and 2. "dentist-technician" who is non-relationship based and shallow thinking minded using more computers and robotics to perform dentistry. The analogy in the medical field would be in the arena of eye care; ophthalmologist (MD) and optometrist (O.D.). Dentists who train for oral surgery frequently also get a MD degree. Why not have dentists-physicians trained in internal medicine? This would be a conventional way to bridge this area of dental disease causing systemic illness and the aging population with complicated medical conditions and dental treatment.

### Introduction

Now is a critical period for American dentistry. This topic can be discussed in four different areas, namely, people, providers, payment and policy [1]. This paper is concerned mostly with the people and providers.

Diringer et al. [1] found that the population of the U.S. is getting older, more diverse, leading to different disease patterns, care seeking behavior, and have the ability to pay. While providers are increasing as more dentists are trained, but mounting debt load and changing demographics anew, altering the practice choices for new dentists. At the same time there are pressures for increasing expanded duty personnel to provide for prevention and restorative procedures, which is an area of concern for this paper. Is dentistry going to retain its professional status by training dentists to understand the medical and dental health relationships and treat patients accordingly or is the pathway downward to continue to a dentist-technician and/or to train an expanded duty personnel to a level where understanding is minimal and digital technical skills are the aim of the training?

With the increased demand for value in dental care spending, practices will need to become more efficient. This occurring in larger, multi-site practices, which are sometimes corporate. Health care reform and Medicaid expansion with an increasing emphasis on outcomes and cost effectiveness will encourage alternative models of dental care [1].

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Public health models of delivery dental care will not be examined, but our attention will be focused on private and corporate delivery systems with moderate changes in dental education and more changes in the technical practice of dentistry.

It is the thesis of this paper that the nature of the provider is changing with the Millennials and internet/digital age that will drive the dental education and lead to changes in the private domain. Meanwhile the public is changing and has more complicated medical status, which requires more understanding of the medical conditions and how they interface with dentistry. Additionally research has shown that periodontal disease directly and dental caries indirectly influence total health. This should also lead to changes in delivery of dental care and dental education.

## The Millennials

As the age of information morphs into the age of internet of things and robotics, so are people morphing, namely the brains of the millennials are changing from the intense interaction with computers. These factors and more will have a profound effect on dentistry.

The Millennial generation has variously defined birth times between 1980 to 2000, are relatively unattached to organized politics and religion, linked by social media, burdened by debt, distrustful of people, in no rush to marry- and optimistic about the future. They are also America's most racially diverse generation. In all of these dimensions, they are different from today's older generations. And in many, they are also different from older adults back when they were the age Millennials are now. Pew Research Center surveys shows that half of Millennials (50%) now describe themselves as political independents and about three-in-ten (29%) say they are not affiliated with any religion. These are at or near the highest levels of political and religious disaffiliation recorded for any generation in the quarter-century that the Pew Research Center has been polling on these topics [2].

Taylor et al. [3] found that Millennials surpassed Baby Boomers to become the largest living generation in the United States. By analyzing 2015 U.S Census data they found there were 75.4 million Millennials compared to 74.9 million Baby Boomers.

Just as baby-boomers had a profound effects on American society due to their different mentality and large size, so too will the larger Millennial generation have profound effects on our society [4,5].

While 49% of Millennials state that the country's best years lie ahead, they are the first in the modern era to have higher levels of student loan debt and unemployment [2].

Newer research shows that Millennials change jobs for the same reasons as other generations-namely, more money and a more innovative work environment. They look for versatility and flexibility in the workplace, and strive for a strong work-life balance in their jobs [6] and have similar career aspirations to other generations, valuing financial security and a diverse workplace just as much as their older colleagues [7]. Educational sociologist Andy Furlong described Millennials as optimistic, engaged, and team players [8].

Some more characteristics of Millennials [9] for those who may hire or have interactions with them:

- They're earnest and optimistic.
- They embrace the system.

- They are pragmatic idealists, tinkerers more than dreamers, life hackers.

- Their world is so flat that they have no leader, which is why revolutions from Occupy Wall Street to Tahrir Square have even less chance than previous rebellions.

- They want constant approval.
- They have massive fear of missing out and have an acronym for everything (including FOMO).

- They don't identify with big institutions.
- They want new experiences, which are more important to them than material goods.

- They are cool and reserved and not all that passionate.

## Brain Changes from Excess Screen Time

An important change in the Millennial generation is the excessive digital screen time, which has changed their brain anatomically and functionally as discussed below and may have facilitated their unique characteristics.

Dossey [10] has stated that during the past twenty years a digital sea change has affected our world. Digital devices have changed the way we live and especially the way we work in our professions. As dentists, we are able to work with far greater accuracy and precision than ever before; we would be foolish not to embrace these advances. But, as is often the case with rapid cultural changes, we need to be aware of the possibility of unintended consequences that may accompany this revolution. Sound scientific studies are beginning to warn of the psychological and physiological problems of overuse of digital devices in our daily lives. We should remember that these devices are neutral. It is up to each of us to use them in ways that enhance patient care.

Loh and Kanai [11] have stated that the Internet environment has profoundly transformed our thoughts and behaviors. Growing up with Internet technologies, "Digital Natives" gravitate toward "shallow" information processing behaviors, characterized by rapid attention shifting and reduced deliberations. They engage in increased multitasking behaviors that are linked to increased distractibility and poor executive control abilities. Digital natives also exhibit higher prevalence of internet-related addictive behaviors that reflect altered reward-processing and self-control mechanisms. Recent neuroimaging investigations have suggested associations between these internet-related cognitive impacts and structural changes in the brain.

*Taken together studies show that internet addiction is associated with structural and functional changes in brain regions involving emotional processing, executive attention [12].*

In short, excessive screen-time appears to impair brain structure and function. Much of the damage occurs in the frontal lobe of the brain, which undergoes massive changes from puberty until the mid-twenties. Frontal lobe development, in turn, largely determines success in every area of life-from sense of well-being to academic or career success to relationship skills [13].

Others would agree with these changes [14-16] Park, et al. [14] stated that the internet use disorder is associated with structural or functional impairment in the orbitofrontal cortex, dorsolateral

prefrontal cortex, anterior cingulate cortex, and posterior cingulate cortex. These regions are associated with the process or reward, motivation, memory, and cognitive control. Early neurobiological research results in this area indicated that internet use disorder shares many similarities with substance use disorders, including, to a certain extent, a shared pathophysiology.

## **Changes in View of Dentistry: Dental Caries and Periodontal Disease Affects Systemic Health**

Traditionally, there was compartmentalization of the mouth from the rest of the body and the relationship of oral diseases to systemic health was minimal. The understanding of the two major oral diseases, periodontal disease and dental caries is evolving from an etiopathologic view to our current concepts [17].

Historically, understanding of periodontal disease has been seen in three phases: the etiopathologic (host-parasite) era, the risk factor era and the periodontal disease-systemic disease era. The last era is seen as a two-way mechanism as periodontal disease affects the body and the body can affect periodontal disease [17].

### **Periodontal disease and Diabetes**

Diabetic patients [18-22] are more likely to develop periodontal disease, which in turn can increase blood sugar and diabetic complications.

People with diabetes are more likely to have periodontal disease than people without diabetes, probably because people with diabetes are more susceptible to contracting infections. In fact, periodontal disease is often considered a complication of diabetes. Those people who do not have their diabetes under control are especially at risk.

Research has suggested that the relationship between diabetes and periodontal disease goes both ways - periodontal disease may make it more difficult for people who have diabetes to control their blood sugar.

Severe periodontal disease can increase blood sugar, contributing to increased periods of time when the body functions with a high blood sugar. This puts people with diabetes at increased risk for diabetic complications.

### **Stroke**

Additional studies [18] have pointed to a relationship between periodontal disease and stroke. In one study that group looked at the causal relationship of oral infection as a risk factor for stroke, people diagnosed with acute cerebrovascular ischemia were found more likely to have an oral infection when compared to those in the control.

### **Heart disease**

Several studies have shown that periodontal disease is associated with heart disease [18,23]. While a cause-and-effect relationship has not yet been proven, research has indicated that periodontal disease increases the risk of heart disease.

Scientists believe that inflammation caused by periodontal disease may be responsible for the association.

Periodontal disease can also exacerbate existing heart conditions. Patients at risk for infective endocarditis may require antibiotics prior to dental procedures. Your periodontist and cardiologist will be able to determine if your heart condition requires use of antibiotics prior to dental procedures.

### **Osteoporosis**

Researchers have suggested that a link between osteoporosis and bone loss in the jaw [18]. Studies suggest that osteoporosis may lead to tooth loss because the density of the bone that supports the teeth may be decreased, which means the teeth no longer have a solid foundation.

### **Respiratory disease**

Research has found that bacteria that grow in the oral cavity can be aspirated into the lungs to cause respiratory diseases such as pneumonia, especially in people with periodontal disease [18].

### **Cancer**

Researchers found that men with gum disease were 49% more likely to develop kidney cancer, 54% more likely to develop pancreatic cancer, and 30% more likely to develop blood cancers [18].

## **Dental Caries and Systemic Disease**

Caries are frequently a sign of excess sugar intake and this can be related to systemic disease. The clinician should broaden their thinking to include the possibility that excess sugar intake can cause systemic disease from atherosclerosis, peripheral vascular disease, coronary heart disease, heart attack, stroke, type 2 diabetes and kidney disease. Excess sugar damages the body in the following manner, e.g. overloads and damages the liver, causes weight gain, creates metabolic syndrome, increases uric acid levels which is a risk factor for heart and kidney disease [24,25].

The changes in characteristics in the Millennial generation and the changes in view of oral health and systemic disease create a dissonance. Therefore additional education for the cognitive approach to health with the aid of computers will be a more likely pathway into the future.

## **Changes in Future Equipment for Dentistry**

Smart equipment; example sterilizers, chairs, CAD/CAM and almost everything else will be able to diagnose and report issues back to the manufacturer and will rely less on human intervention for maintenance and proper function. Currently home appliances and other home systems are featuring Smart attributes.

Currently we have digital dentistry, dental technology, dental radiography including 3D imaging, CAD/CAM cone beam, which are all computer based. Lasers are currently quite useful in dentistry and will likely be paired with computers into a robotic mechanism that will result in more precise preparations and soft tissue surgery.

The offices of today are largely digital based and include digital records, scheduling, accounting, marketing, inventory and ordering of supplies, payroll, etc. All of which illustrates, how the digital office will require a "digital" brain to interact with it. All of this does not include the human touch and insight of dentistry.

## **Changes in future treatments for dentistry - Nanotechnology**

Aeran, et al. [26] state that nanotechnology creates incredibly useful structures from individual atoms or molecules, which provides a new alternative and a possibly superior approach for the identification of oral health related problems and also in designing of more biocompatible dental materials with better properties and anti-caries potential.

In the year 2000, the term and maybe the field of nanodentistry were born. As nanomedicine advanced, dentistry also started evolving in the field of nanotechnology. It is envisaged that nanotechnology will affect the fields of diagnosis, materials, restorative dentistry and surgery. The exciting new branches nanorobotics, nanodiagnosis, nanomaterials, and nanosurgery and nanodrugs would profoundly impact clinical dentistry in the not-so-distant future [27].

Modern dentistry has a goal to prevent rather than treat biofilm dependent oral diseases, e.g. dental caries and endodontic and periodontal diseases. Nanotechnology offers new approaches for preventive therapies in oral diseases, particularly dental caries and periodontal diseases.

Controlling dental caries can be gained by inhibiting the bacterial action, reversing demineralization process and promoting remineralization. Nanotechnology offers means to these ends through: antibacterial nanotechnology, biomimetic remineralization, i.e. reversing an incipient caries, biomimetic remineralization of recurrent decay.

## Types of Dentists

The key element in describing the future practice of dentistry is ownership. Ownership status determines the dentist's freedom to determine the course of clinical treatment for the patient. Recent graduates have high levels of educational debt, a reduced educational experience, and a dearth of alternative career choices. Corporate entities have more access to capital resources to purchase practices which are coming to market from the baby-boomers, and have the advantage of pricing. The rising cost of services creates an environment where corporate entities can cost compete with traditional practices in a variety of locations [28].

These corporate practices are and will be digitally based and require the services of more technician minded dentists.

Increasingly, dental patients will be older, have more complex medical issues, and take routine medications. To treat these patients properly, dentists will need to have extensive knowledge of the relevant clinical sciences, including the foundational basic and medical services. Rather than emphasizing the training of dental care providers with an abbreviated educational experience, we should consider more extensive training to meet the more complex needs of the dental patient of the future [28]. In summary the "technician-dentist" has large debt and is in need of income upon graduation, has low clinical experience, has a "Millennial" set, will be comfortable using digital equipment, which they in all probability cannot afford to purchase, and will likely become employees of corporate dentistry. The "physician-minded" dentist would be in the position of integrating the medical health with the dental health of the patient to create the treatment plan and monitor the course of health, which either the "physician-minded dentist" or the "technician-minded" dentist would perform with digital, robotic and nanotechnology.

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