Trends in Smoking and Tobacco Use
INTRODUCTION

Tobacco is a product native to North and South America. It believed to be one of the first cash crops grown in the United States, dating back to colonial Jamestown. Even though tobacco production has decreased significantly since the 1980s, the United States produces nearly 800 million pounds of tobacco per year. This makes the United States one of the largest tobacco-producing countries in the world behind China, India, and Brazil. Nineteen states grow tobacco. Three states, North Carolina, Kentucky, and Georgia, produce about 80% of the total US production.1

Each day in the United States, tobacco companies spend about $26 million marketing cigarettes and smokeless tobacco. For this reason, it is no surprise that the number one selling tobacco product in the United States is the cigarette. Cigars come in second, followed by smokeless products (see Table 1). Sales of e-cigarettes have increased in the last few years by 320% for disposable e-cigarettes, 72% for starter kits, and 82% for cartridges.1

Table 1: Tobacco Sales in the US1

<table>
<thead>
<tr>
<th>Product</th>
<th>Yearly Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarettes</td>
<td>$264 billion</td>
</tr>
<tr>
<td>Cigars</td>
<td>$13 billion</td>
</tr>
<tr>
<td>Smokeless Tobacco</td>
<td>$128 million</td>
</tr>
</tbody>
</table>

The first report on smoking by the US Surgeon General was published in 1964. Since that time, the rate of smoking has been cut in half.2 Today, about 40 million people or one in six adults smoke. Smoking is more prevalent in the Midwest and in the South than in the Northeast or West. Rates are higher among those living below the poverty level. They are lowest among those with a bachelor’s degree or higher education.2

Every day, more than 3,200 youths, age 18 or younger, smoke their first cigarette, and 2,100 become daily cigarette smokers. While cigarette use among youth has decreased, the use of other tobacco products has increased. Today, more youths smoke e-cigarettes (16%) than traditional cigarettes (9.3%). Flavoring seems to make tobacco products more attractive to youth, with 73% of high school students who used a tobacco product reporting it was a flavored one. Slightly more than 7% report using a hookah, and 6% use smokeless tobacco. An alarming trend is the use of more than one product, with 13% of high school age students reporting this type of usage. The use of multiple tobacco products has been shown to increase the development of nicotine dependence.4

The use of marijuana is also on the rise. A recent report found the use of marijuana to be more than double what it was ten years ago.4 Twenty-nine states plus the District of Columbia allow the use of marijuana for some medical conditions. Eight states (Alaska, California, Colorado, Maine, Massachusetts, Nevada, Oregon, and Washington) and the District of Columbia have some form of legalized marijuana.4 Marijuana disorders have also increased between 2001-2002 and 2012-2013.1

Smoking is the leading cause of preventable disease and death. It contributes to one of every five deaths, and 16 million people live with a smoking-related disease.5 Smoking affects nearly every organ of the body and causes inflammation and impaired immune function. Youths who smoke into adulthood are likely to die early from a smoking-related illness.6 Exposure to secondhand smoke is also causally linked to many diseases and chronic conditions.7 Fifty-eight million nonsmokers were exposed to secondhand smoke between 2011 and 2012. People living in rental housing are more likely to be exposed to secondhand smoke.7

Smoking has a negative impact on oral health. People who smoke tobacco or marijuana are more likely to develop periodontal disease than nonsmokers.8,9 Tobacco smoking appears to increase the risk of implant failure.10 Smoking and smokeless tobacco use are associated with an increased risk for oropharyngeal cancers.11 People exposed to secondhand smoke have been shown to be at increased risk for periodontitis.2 Children exposed to secondhand smoke have been shown to have a higher risk of decay in primary teeth.12

The Addictive Power of Nicotine

The 1988 Surgeon General’s Report concluded, “Cigarettes and other forms of tobacco are addicting.” Prior to that, smoking was considered habitual. At the time, smoking was considered socially acceptable, and there was a reluctance to use the term “addict” due to its connotation with illicit drug use. However, looking at smoking as an addiction helped refute the tobacco industry’s argument that people become smokers by their own choice.2

Disclosure Statement:

• The content for this self-study course was written by Carol A. Jahn, RDH, MS, an employee of Water Pik, Inc.
• This course was designed, developed, and produced by Water Pik, Inc.
• Water Pik, Inc., manufactures and distributes products addressed in this course.

Course Objective:

To help dental professionals understand changes in cigarette and tobacco use and how those changes are impacting oral and systemic health.

Learning Outcomes:

• Describe the changes in tobacco and cigarette use over the last decade.
• Evaluate the potential risks of e-cigarette use.
• Identify the health risks from using a hookah.
• Explain the detrimental effects of cigar and smokeless tobacco usage.
• Discuss the role of dental professionals in tobacco prevention and cessation.
• Understand the oral and systemic health risk from tobacco use...
Nicotine is what makes tobacco addictive. Today, more people are addicted to nicotine than to any other abused substance. Nicotine activates the reward pathways that regulate feelings of pleasure. The effect of nicotine on the brain from a cigarette occurs within seconds of inhalation. The drug stimulates the release of adrenaline, which causes an increase in blood pressure, respiration, and heart rate. As for other addictive substances, dependence upon nicotine is characterized by impaired control over drug use, compulsive use, continued use despite harm, and craving.

Nicotine addiction is dependent upon dose and delivery. The bioavailability of nicotine is greatest via the lung or oral mucosa. Cigarettes are an ideal delivery system for creating nicotine dependence. The inhalation of tobacco smoke results in the intake of one to two milligrams of nicotine per cigarette. The average smoker takes about ten puffs per cigarette. People who smoke a pack of cigarettes per day would get up to 200 hits of nicotine to the brain every day. For cigar, pipe, or smokeless tobacco users, the nicotine is absorbed through the mucosal membrane and reaches the brain more slowly. A recent study indicates that cigarettes today may contain 15% more nicotine than in 1999, potentially making them even more addictive than in the past.

The adrenaline kick from a cigarette is short in duration, creating the need for another cigarette. The reward centers stimulated by nicotine are similar to those stimulated by other abused drugs. When people stop smoking, they experience withdrawal symptoms (see Table 2). The symptoms can begin within a few hours of smoking the last cigarette. This is a driving factor in why 85% of people who try to quit smoking relapse within the first week. In many cases, withdrawal symptoms will subside within a few weeks; however, in some people they may persist for months.

### Table 2: Nicotine Withdrawal Symptoms

- Irritability
- Anxiety
- Craving nicotine
- Depression
- Cognitive and attention deficits
- Sleep disturbances
- Increased appetite

The risk for nicotine addiction may be genetic. Some youth experimenting with smoking become addicted in as few as 100 cigarettes, yet others become addicted more slowly. Some individuals need a cigarette soon after waking; others profess to smoke only when drinking alcohol. Early smoking experiences are a factor in addiction. Adolescents who reported a feeling of intense dizziness after their first few cigarettes were more likely to be nicotine dependent as adults. Genetics may also play a role in tobacco cessation, making quitting harder for some individuals than others.4

### Cigarettes

The current rate of cigarette smoking was 16.8% in the United States for the last reported year, 2014. This represents nearly a 20% decrease since 2005. More males than females smoke. The highest percentage of smokers is in the 25–44 year age group (20%), and the lowest percentage is among people age 65 and over (8.5%). Slightly more than 80% of smokers consider themselves daily smokers; the rest report smoking intermittently. The mean number of cigarettes smoked per day is 13.8. Between 2005 and 2014, the number of people who reported smoking 1 to 9 or 10 to 19 cigarettes per day increased and the number of people smoking 20 or more cigarettes per day decreased.

About 90% of people who become addicted to cigarettes do so before the age of 18. The children of mothers who smoked during pregnancy may be more likely to become regular smokers. Tobacco advertising and the way tobacco is portrayed in the mass media also influence youth. Both parental and peer smoking may also encourage tobacco use.

There is a strong association between mental illness and cigarette smoking. People with a mental health disorder (see Table 3) are more likely to smoke and more likely to smoke more heavily than those who smoke and do not report a mental illness. The prevalence of smoking among those with mental illness has been shown to range from 34% for those with phobias or fears to 88% for people with schizophrenia. Youth who experience a depressive mood disorder or symptoms may be more likely to smoke.

### Table 3: Mental Health Disorders Associated with Smoking

- Social phobia
- Agoraphobia
- Panic disorder/panic attacks
- Major depression/persistent depression
- Bipolar disorder
- Alcohol abuse/dependence
- Drug abuse/dependence
- Post-traumatic stress disorder
- Generalized anxiety disorder
- Non-affective psychosis/schizophrenia

People with mental illness are less likely to stop smoking. One factor may be that the nicotine delivers a mood-altering boost, thus providing a self-medicating effect. Another possibility is that tobacco smoke may accelerate the metabolism of some mental health medications, and people compensate for that by increasing their intake of nicotine. Additionally, the tobacco industry markets cigarettes to this population and has funded research to show that nicotine can alleviate negative moods.
Cigars

Cigars are the second most used form of tobacco after cigarettes. Unlike nicotine in cigarettes, the nicotine from cigars is absorbed through the oral mucosa instead of the lungs. Because of this, people may mistakenly think that cigars are safer than cigarettes. The data shows that cigars carry many of the same health risks as cigarettes.

There are three types of cigars: large cigars, cigarillos, and little cigars (see Table 4). A large cigar contains as much as 20 grams of nicotine, which is the equivalent of a pack of cigarettes. When smoking a cigar, people generally do not inhale the smoke. A large cigar may take one to two hours to smoke. By comparison, little cigars generally have a filter; therefore, many people do inhale when they smoke this type of cigar.

Table 4: Overview of Cigars

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Nicotine Amount</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Cigars</td>
<td>≥ 7 inches</td>
<td>Up to 20 grams</td>
<td>96%</td>
</tr>
<tr>
<td>Cigarillos</td>
<td>3–4 inches</td>
<td>About 3 grams</td>
<td></td>
</tr>
<tr>
<td>Little Cigars</td>
<td>Size and shape of a cigarette</td>
<td>About 1 gram</td>
<td>4%</td>
</tr>
</tbody>
</table>

Cigar consumption doubled between 2000 and 2011. Slightly more than 8% of men and 2% of women reported smoking cigars. In the last few years, cigars have become increasingly popular with youth because of the flavoring and the availability in a single stick. Current cigar use among high school males is almost 11%, a rate similar to cigarette use. The reported cigar use for high school females is 5%. Youths who use other tobacco products or alcohol, marijuana, or inhalants are more likely to smoke cigars.

Smokeless Tobacco

Like cigars, smokeless products are absorbed through the oral mucosa and are often perceived as less harmful than cigarettes. In addition to nicotine, smokeless tobacco has been found to contain at least 28 cancer-causing chemicals. More men and boys than women use smokeless tobacco. Smokeless products can come in many forms (see Table 5). Today, not all smokeless tobacco products require spitting.

Nearly 7% of men and 10% of high school males report using smokeless tobacco compared to less than 1% of women and less than 2% of high school females. Young adults, age 18-25 years, are most likely to use smokeless tobacco and one other tobacco product. Smokeless products can deliver more nicotine than a cigarette. Holding an average size “dip” in the mouth for 30 minutes equates to smoking three cigarettes. An individual who uses two cans a week gets as much nicotine as a smoker who smokes one and a half packs a day.

Dissolvable tobacco products are newer to the market. Their emergence coincides with the increase in restrictions on cigarette smoking. No spitting is required, so these products may be deemed a more convenient way for a smoker to get a nicotine fix when cigarette smoking is not possible. Dissolvable products are attractive to youth because they may be flavored. An estimated 80,000 high school students reported using a dissolvable product in 2014. These products contain nicotine and can lead to nicotine addiction. Because the products are flavored and may look like candy, they may be attractive to young children and can cause accidental nicotine poisoning.

Hookahs

A hookah is an ancient form of smoking that began in southwest Asia and northern Africa. Hookahs have become increasingly popular in the United States. Use among college students ranges from 22% to 40%. High school students are also partaking, with 17% of boys and 15% of girls reporting use of a hookah device at least once in the past year.

Table 5: Types of Spit or Smokeless Tobacco

<table>
<thead>
<tr>
<th>Type</th>
<th>Forms</th>
<th>How It’s Used</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chewing Tobacco</td>
<td>Loose leaf, Plug, Twist or roll</td>
<td>Placed between the teeth and gums, Placed between the teeth and gums</td>
<td>17.5%, 0.5%, 0.2%</td>
</tr>
<tr>
<td>Snuff</td>
<td>Moist snuff, Dry snuff, Snus</td>
<td>Dip placed between the cheek and gum, Pinch is put in the mouth or inhaled through the nose, Pouch goes between the check and gum; no spitting required</td>
<td>80%, 1.1%, Unknown</td>
</tr>
<tr>
<td>Dissolvable Tobacco</td>
<td>Lozenges, Orbs, Sticks, Strips</td>
<td>Resembles pellets or tablets, Resembles small mints, Toothpick-like appearance, Thin sheets that work like dissolvable breath strips</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Table 4: Overview of Cigars

Table 5: Types of Spit or Smokeless Tobacco
The modern hookah typically has a head with holes in the bottom, a metal body, a water bowl, and a flexible hose with a mouthpiece (see Figure 1). The bowl is partially filled with water, and the head is filled with moistened tobacco, which is often flavored and placed over burning charcoal. Hookah smoking is generally done in a group at a hookah bar or café, with the mouthpiece passed from person to person. The average amount of smoke inhaled during a hookah session is about 90,000 milliliters (ml), compared to 500–600 ml from one cigarette. Hookahs are often perceived as less harmful than cigarettes; however, evidence indicates that one use of a water pipe is associated with 1.7 times more nicotine, 8.4 times more carbon monoxide, and 36 times more tar than a cigarette. Daily water pipe use has been correlated with smoking about ten cigarettes per day.

## Electronic Nicotine Delivery Systems

Electronic nicotine delivery systems are battery-powered products that deliver nicotine in the form of an aerosol (see Figure 2). They are commonly called e-cigarettes, and the delivery process is often referred to as vaping. E-cigarettes contain nicotine. The Federal Drug Administration (FDA) has found products labeled “nicotine-free” that have traceable amounts of nicotine. The FDA has also found little consistency in the amount of nicotine delivered by vaping. Newer vaping systems with higher voltage may deliver a greater concentration of nicotine, which increases the risk for nicotine addiction.

E-cigarette use increased 900% among high school students between 2011 and 2015. As a result, the US Department of Health and Human Services released a report in December 2016 from the Surgeon General on “E-cigarette Use Among Youth and Young Adults.” The Surgeon General called e-cigarette use among youth and young adults a major public health concern.

Teens try e-cigarettes for a variety of reasons, including the belief that the product is healthier than regular cigarettes (see Table 6). Factors that influence the continued use of e-cigarettes after experimentation include trying to quit regular cigarettes, the low cost, and the fact that e-cigarettes can be used anywhere. About 5% of middle school students and 16% of high school age students report using e-cigarettes. High school males are more likely to use e-cigarettes than females (19% versus 12.8%, respectively). In comparison, 3.7% of adults report using this product. Youth 18–44 years of age who have never smoked are more likely to try e-cigarettes than older people who have never smoked. E-cigarette use is also high among current (15.9%) and former (22%) smokers.

E-cigarettes appear to be both a gateway to cigarette use and a potential smoking cessation tool. Emerging data indicates that never-smoking youth who use e-cigarettes are 6.17 times more likely to initiate cigarette smoking than those who do not try e-cigarettes. E-cigarette users have also been shown to be more likely to use a hookah, cigar, or pipe. In regard to smoking cessation, a recent systematic review found that while a majority of studies did show a positive correlation between e-cigarettes and smoking cessation, the evidence overall is inconclusive due to the low quality of the published research. The authors noted that e-cigarettes might be helpful for some smokers who want to quit or reduce use because they can reduce nicotine withdrawal symptoms and cravings.

## Marijuana

Marijuana consists of the dried leaves, flowers, stems, and seeds from the hemp plant Cannabis sativa. The active agent in marijuana is delta-9 tetrahydrocannabinol (THC), a mind-altering agent. Marijuana is most commonly smoked as a rolled cigarette (joint) or in a bong. It can be mixed into food such as brownies or brewed as tea. When an individual smokes marijuana, the THC quickly passes from the lungs into the bloodstream, brain, and other organs, which results in a high within minutes. When a person ingests marijuana through eating or drinking, the body absorbs THC more slowly, with the effect occurring within 30–60 minutes.

The amount of THC in marijuana has increased over the last few decades. A new method is smoking or eating THC-rich resins extracted from marijuana. This practice is called dabbing. These extracts can deliver extremely large amounts of THC to users. Both the higher level of THC in marijuana and the use of dabbing have resulted in a rise in emergency room visits and may increase the risk for addiction. Edibles may also result in overconsumption of THC.

A recent report from the National Institute of Health found that between 2001-2002 and 2012-2013, the percentage of Americans using marijuana increased from 4.1% to 9.5%. Additionally, there was an increase in marijuana use disorders, with three in ten users meeting the criteria for abuse or dependence.
The highest rate of use is among young adults (ages 18–29), with 21.2% reporting use of marijuana. Over the same time period, increases in use were notable among women (2.6% to 6.9%), African Americans (4.7% to 12.7%), Hispanics (3.3% to 8.4%), and older people (0.04% to 1.3%).

Over the last several years, more than half of the states in the United States have legalized some form of medical marijuana to treat certain medical conditions and/or symptoms. A written statement from a physician is required to obtain marijuana in states where it is legal, and it must be purchased from an authorized seller of medical marijuana. Qualifying medical conditions vary by state law. Conditions that are most often treated by medical marijuana include chronic pain, nausea, and vomiting caused by chemotherapy. Because marijuana also stimulates appetite, it may be recommended for people who have lost weight due to illness. Prescription is limited to people over the age of 18 and is contraindicated for people with heart disease, women who are pregnant, and people with a history of psychosis.

The Role of the FDA in Tobacco and Medical Marijuana Regulation

The FDA regulates the manufacturing, distribution, and marketing of all tobacco products. The FDA has regulated cigarette tobacco, roll-your-own tobacco, and smokeless tobacco since 2009. In August 2016, the FDA extended its authority to include all tobacco products, including e-cigarettes, cigars, hookah tobacco, pipe tobacco, nicotine gels, and dissolvable tobacco products. Health warnings are now required on all products, and the distribution of free products is banned. The FDA prohibits the sale of tobacco products to anyone under the age of 18 and requires a photo ID for age verification. Tobacco products cannot be sold in a vending machine unless it is in an adults-only facility. Manufacturers of new tobacco products (including e-cigarettes) that were not on the market prior to 2007 must comply with additional requirements including submitting tobacco health documents, an ingredient list, and displaying a health warning statement on the package. Vaping stores that mix, prepare, or combine liquid nicotine are considered manufacturers. Manufacturers will have up to two years to submit appropriate applications to the FDA.

The FDA has not approved marijuana as a safe and effective drug for any indication. To receive FDA approval, clinical trials on medical marijuana would need to be conducted to determine its safety and effectiveness. Without FDA approval, the purity and potency of medical marijuana may vary considerably. Clinical research on the use of marijuana to treat medical conditions would involve three federal agencies: (a) marijuana would need to be obtained by the National Institute on Drug Abuse; (b) the FDA would need to review the drug application and research protocol; and (c) because marijuana is a schedule I controlled substance, the Drug Enforcement Administration would provide investigator registration and site licensure.

The Health Consequences of Tobacco

Each year, nearly half a million people die prematurely from a smoking-related illness. More than ten times as many people in the United States have died prematurely from smoking than have died in all the wars fought by the United States. Cigarettes have been causally linked to diseases of nearly every organ of the body. Smoking compromises the immune system and often results in overall poor health. People who smoke report more absenteeism from work and increased health care costs and utilization. Exposure to secondhand smoke is a causative agent for cancer, respiratory, and cardiovascular disease. It harms the developing fetus and adversely affects infants and children.

### Table 7: Criteria for Marijuana Addiction

- Taking the drug in larger amounts or over a longer period than intended
- Persistent desire to cut down or control use is unsuccessful
- Failure to fulfill major obligations at work, school, or home

### Table 8: Cancers and Chronic Diseases Causally Linked to Smoking

<table>
<thead>
<tr>
<th>Cancers</th>
<th>Chronic Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oropharynx</td>
<td>Stroke</td>
</tr>
<tr>
<td>Larynx</td>
<td>Blindness, cataracts, age-related macular degeneration</td>
</tr>
<tr>
<td>Esophagus</td>
<td>Congenital defects from maternal smoking, orofacial clefts</td>
</tr>
<tr>
<td>Trachea, bronchus, and lung</td>
<td>Periodontitis</td>
</tr>
<tr>
<td>Acute myeloid leukemia</td>
<td>Aortic aneurysm, early abdominal aortic atherosclerosis in young adults</td>
</tr>
<tr>
<td>Stomach</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td>Liver</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Atherosclerotic peripheral vascular disease</td>
</tr>
<tr>
<td>Kidney and ureter</td>
<td>Chronic obstructive pulmonary disease (COPD), tuberculosis, asthma, and other respiratory effects</td>
</tr>
<tr>
<td>Cervix</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Bladder</td>
<td>Reproductive effects in women, including reduced fertility</td>
</tr>
<tr>
<td>Colorectal</td>
<td>Hip fractures</td>
</tr>
<tr>
<td></td>
<td>Ectopic pregnancy</td>
</tr>
<tr>
<td></td>
<td>Male sexual function, erectile dysfunction</td>
</tr>
<tr>
<td></td>
<td>Reproductive effects</td>
</tr>
<tr>
<td></td>
<td>Rheumatoid arthritis</td>
</tr>
<tr>
<td></td>
<td>Immune function</td>
</tr>
<tr>
<td></td>
<td>Overall diminished health</td>
</tr>
</tbody>
</table>

### Table 9: Qualifying Medical Conditions for Marijuana

- Chronic pain
- Nausea
- Vomiting caused by chemotherapy
- Chronic obstructive pulmonary disease (COPD)
- Tuberculosis
- Asthma
- Congenital defects from maternal smoking
- Orophacial clefts
- Macular degeneration
- Blindness
- Cataracts
- Age-related macular degeneration
- Periodontitis
- Aortic aneurysm, early abdominal aortic atherosclerosis
- Coronary heart disease
- Pneumonia
- Atherosclerotic peripheral vascular disease
- Reproductive effects in women, including reduced fertility
- Hip fractures
- Ectopic pregnancy
- Male sexual function, erectile dysfunction
- Rheumatoid arthritis
- Immune function
- Overall diminished health

### Table 10: Major Indications for FDA Approval

- Cancer
- Chronic obstructive pulmonary disease (COPD)
- Tuberculosis
- Asthma
- Congenital defects from maternal smoking
- Orophacial clefts
- Macular degeneration
- Blindness
- Cataracts
- Age-related macular degeneration
- Periodontitis
- Aortic aneurysm, early abdominal aortic atherosclerosis
- Coronary heart disease
- Pneumonia
- Atherosclerotic peripheral vascular disease
- Reproductive effects in women, including reduced fertility
- Hip fractures
- Ectopic pregnancy
- Male sexual function, erectile dysfunction
- Rheumatoid arthritis
- Immune function
- Overall diminished health
Tobacco smoke contains more than 7,000 chemicals, and at least 69 of them are known to cause cancer. A person who smokes is 25 times more likely than a never smoker to develop lung cancer. Lung cancer is the most common cause of cancer death among men and women. Smoking is also a causative factor in colorectal cancer, the fourth most diagnosed cancer, and is responsible for the second largest number of cancer deaths. Smoking increases the risk of dying from cancer and other diseases in cancer patients and survivors. Risks from smoking for women are now equal to those for men for lung cancer as well as COPD, pulmonary disease, and cardiovascular disease (CVD). There is a causal relationship between exposure to secondhand smoke and lung cancer. People who live with a smoker have a 20%-30% increased risk of developing lung cancer. Smoking is responsible for 85-90% of all cases of COPD, which encompasses chronic bronchitis and emphysema. More than 11 million people have COPD. Men and women who smoke are 22 times more likely than never smokers to develop COPD. Exposure to secondhand smoke may also increase the risk of COPD. Since 2000, more women than men have succumbed to COPD. Evidence suggests that women may be more susceptible to severe COPD at younger ages.

Cardiovascular disease (CVD) claims the lives of people over the age of 35 who smoke. Exposure to secondhand smoke also causes more death from CVD than lung cancer. Current smoking is associated with a threefold greater risk of sudden cardiac death in comparison to the risk for a never smoker. People who smoke or who are exposed to secondhand smoke are also at a higher risk of having a stroke. Tobacco use in adolescence and young adulthood has been shown to cause early abdominal aortic atherosclerosis in young adults. These lesions have been shown to be more severe and advanced than lesions in coronary arteries.

Other health conditions related to smoking include rheumatoid arthritis, adverse reproductive and pregnancy outcomes, erectile dysfunction, age-related macular degeneration, and diabetes. The risk of developing diabetes is 30%-40% higher in people who smoke versus nonsmokers. The relationship appears dose-dependent, with the heaviest smokers having the greatest risk.

Smokeless tobacco products are linked to death and disability worldwide. Each year, smokeless products contribute to 250,000 deaths and a loss of six million disability-adjusted life years. In 2010, smokeless tobacco contributed to more than 62,000 deaths globally from cancers of the oropharynx, larynx, and esophagus. During the same time frame, the product was associated with more than 200,000 deaths from ischemic heart disease. Males accounted for three-quarters of the deaths.

Cigars, hookahs, and e-cigarettes are perceived as a safer alternative to cigarettes, but they carry real and potential health risks. Primary cigar smoking (no history of cigarette smoking) is associated with oral cancer, esophageal cancer, pancreatic cancer, laryngeal cancer, lung cancer, heart disease, and aortic aneurysm. The level of inhalation was found to be a factor in the risk for lung cancer but not for oral, esophageal, and laryngeal cancers.

The health effects of using a hookah are not well documented. There is some evidence to suggest that hookah use is associated with heart disease, negative pulmonary outcomes, and lung cancer. Sharing of the mouthpiece or tube may put people at risk of infectious, transmittable disease.

The systemic health risks of e-cigarettes and its vapors have yet to be determined (see Figure 3). Toxic cancer-causing chemicals, including formaldehyde, have been found in e-cigarettes. A recent study showed that diacetyl, a flavoring compound associated with the development of a damaging and irreversible condition referred to as popcorn lung, was found in 39 of 51 e-cigarettes tested. The American Lung Association supports the inclusion of e-cigarettes under smoke-free laws. A recent study found that long-term cannabis use in people 26-38 years of age was not associated with declines in general health. However, early and heavy use in the teen years has been associated with a loss of eight IQ points between the ages of 13 and 38. The loss in mental ability did not return after people stopped using cannabis. People who smoke marijuana may have breathing problems and a higher risk of lung infections, but it is not known whether marijuana use increases the risk of lung cancer.

### Impact on Oral Health

Cigarette smoking is a well-established risk factor for periodontal disease and tooth loss. Recent data indicates that cigarette smokers are 50% more likely than nonsmokers to have periodontal disease. A dose-response relationship between smoking and periodontal disease has been observed, with the heaviest smokers having the highest disease severity. People who smoke have been shown to have a less favorable healing response to periodontal surgery. Younger adult smokers (19-30 years of age) often have a higher prevalence and severity of periodontitis than young nonsmokers. The “periodontal cost” of smoking has been calculated as 27 years of disease progression. This means that a 32-year-old smoker has periodontal attachment loss similar to that of a 59-year-old nonsmoker.

### Table 9: Health Consequences Causally Linked to Exposure to Secondhand Smoke

<table>
<thead>
<tr>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle ear disease</td>
<td>Stroke</td>
</tr>
<tr>
<td>Respiratory symptoms, impaired lung function</td>
<td>Nasal irritation</td>
</tr>
<tr>
<td>Lower respiratory illness</td>
<td>Lung cancer</td>
</tr>
<tr>
<td>Sudden infant death syndrome</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td></td>
<td>Reproductive effects in woman, low birth weight</td>
</tr>
</tbody>
</table>

### Figure 3: E-cigarette vapors
Smoking has been shown to have a negative impact on the healing and clinical outcomes of implants.\textsuperscript{37} Regular cigar smoking adversely affects periodontal health.\textsuperscript{3} Marijuana use is also associated with poor periodontal health.\textsuperscript{4} Emerging evidence indicates that daily smoking may increase the risk of tooth decay in adults.\textsuperscript{46} The impact of hookah use and e-cigarettes on oral health has not been determined. A recent study found that the aerosols produced by e-cigarettes were toxic to oral epithelial cells \textit{in vitro}.\textsuperscript{47}

Exposure to secondhand smoke has been shown to increase the risk of periodontal disease.\textsuperscript{4,4} People who were exposed for more than 26 hours per week were found to be twice as likely to have periodontal disease as those who were not exposed. An exposure of 1–25 hours per week resulted in a 29% increased risk of periodontal disease.\textsuperscript{4} Children exposed to secondhand smoke may have more dental caries in deciduous teeth. Infants exposed at four months were found to be twice as likely to have caries by age three.\textsuperscript{39}

**Prevention and Cessation**

There are now more former smokers than current smokers. The rate of quitting and the interest in quitting has increased. The goal of Healthy People 2020 is to reduce the rate of smoking to 12%. Strategies that have been shown to help reduce the initiation and cessation of tobacco use include enacting smoke-free indoor air policies and increasing the price of tobacco products and excise tax. Thirty-six states and over 3,500 municipalities have adopted smoke-free legislation, which generally applies to the worksite, restaurants, and bars. Four states prohibit smoking in privately owned vehicles when a child is present. Recently, a Federal ban on smoking in public housing was enacted. It is scheduled to take effect in June 2018. Cities like New York and Chicago have an excise tax of more than $5 per pack of cigarettes. Litigation against tobacco manufacturers has also helped increase awareness of the need for tobacco control.\textsuperscript{2} States that have made the largest and longest investments in tobacco control have seen the largest declines in cigarette sales and smoking prevalence. California, one of the first states to have a tobacco control program, had a smoking prevalence of 11.9% in 2010.\textsuperscript{7}

People who quit smoking before the age of 35 have mortality rates similar to those of people who have never smoked.\textsuperscript{2} Nearly 70% of smokers report that they would like to quit.\textsuperscript{40} The use of nicotine replacement therapy (NRT) has been shown to increase the rate of quitting by 50%–70%.\textsuperscript{39} NRT is available over the counter in patch, gum, or lozenge form. Like inhalers and nasal sprays, patches are also available by prescription.\textsuperscript{40} Counseling in person, a quit line, and behavior therapies have also been shown to be effective. Additionally, there are mobile phone apps to assist with quitting. Treatment that uses counseling and pharmaceutical intervention together has been shown to be more effective than either treatment alone.\textsuperscript{30}

**The Role of the Dental Professional**

Helping patients quit using tobacco is beneficial for overall health, including oral health. Smoking cessation reduces the risk of early disease and death.\textsuperscript{49} Many patients may be concerned about stained teeth and bad breath. Focusing on the patient’s value of esthetics may be a motivator for ceasing to smoke. Quitting improves periodontal health\textsuperscript{35} and may reduce the risk of tooth loss.\textsuperscript{44} A large cohort study of more than 23,000 participants found that people who stopped smoking had a reduction in tooth loss, and after 10–20 years the risk of tooth loss approached that of a never smoker.\textsuperscript{42}

Evidence indicates that dental professionals who incorporate behavioral intervention into the oral examination may increase the rate of cessation of both cigarette smokers and users of smokeless tobacco.\textsuperscript{44} The periodontal exam and/or the oral cancer screening may be an ideal time to discuss smoking cessation. In the dental office setting, using the Ask, Advise, and Refer (2 A’s + 1 R) approach may be more manageable (see Table 10).\textsuperscript{44}

Regular dental hygiene care, dental exams, and daily self-care are key to helping people who smoke manage their periodontal health. There are no contraindications for providing periodontal therapy to people who smoke. Because smoking can impair the immune response, people should be advised that they might not respond as well to treatment as a nonsmoker.

![Figure 4: Waterpik® Aquarius™ Designer Series Water Flosser](image1)

![Figure 5: Waterpik® Cordless Advanced Designer Series Water Flosser](image2)

<table>
<thead>
<tr>
<th>Table 10: Ask, Advise, Refer Approach</th>
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<tbody>
<tr>
<td><strong>Ask about tobacco use.</strong></td>
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<tr>
<td><strong>Advise the patient to quit.</strong></td>
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<tr>
<td><strong>Refer the patient to resources.</strong></td>
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</tbody>
</table>

| Not ready to quit: Let them know you are there to help them when they are ready |

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\textsuperscript{1} glyphosate, an active ingredient in Roundup, can cause cancer and reproductive harm. \textsuperscript{2} Data from The CDC National Health and Nutrition Examination Survey 2011–2012. \textsuperscript{3} Dentists have found that smoking affects both how the mouth feels to the patient and how it looks. \textsuperscript{4} The role of the dental professional in tobacco control. \textsuperscript{5} The use of nicotine replacement therapy (NRT) has been shown to increase the rate of quitting by 50%–70%. \textsuperscript{6} NRT is available over the counter in patch, gum, or lozenge form. Like inhalers and nasal sprays, patches are also available by prescription. Counseling in person, a quit line, and behavior therapies have also been shown to be effective. Additionally, there are mobile phone apps to assist with quitting. Treatment that uses counseling and pharmaceutical intervention together has been shown to be more effective than either treatment alone. \textsuperscript{7} Helping patients quit using tobacco is beneficial for overall health, including oral health. Smoking cessation reduces the risk of early disease and death. Many patients may be concerned about stained teeth and bad breath. Focusing on the patient’s value of esthetics may be a motivator for ceasing to smoke. Quitting improves periodontal health and may reduce the risk of tooth loss. A large cohort study of more than 23,000 participants found that people who stopped smoking had a reduction in tooth loss, and after 10–20 years the risk of tooth loss approached that of a never smoker. Evidence indicates that dental professionals who incorporate behavioral intervention into the oral examination may increase the rate of cessation of both cigarette smokers and users of smokeless tobacco. The periodontal exam and/or the oral cancer screening may be an ideal time to discuss smoking cessation. In the dental office setting, using the Ask, Advise, and Refer (2 A’s + 1 R) approach may be more manageable (see Table 10). Regular dental hygiene care, dental exams, and daily self-care are key to helping people who smoke manage their periodontal health. There are no contraindications for providing periodontal therapy to people who smoke. Because smoking can impair the immune response, people should be advised that they might not respond as well to treatment as a nonsmoker. |
Former smokers’ response to therapy has been shown to be similar to that of never smokers. Therefore, smoking cessation should be considered as part of the periodontal treatment.61

Toothbrushing is the most common and, for many people, the only form of self-care. Yet everyone needs some type of interdental cleaning. Dental floss is often regarded as superior to other methods, yet the research does not support this.23,24,67 People often lack the dexterity to floss at a level that provides a health benefit. A systematic review by the prestigious Cochrane Collaboration8 looked at the benefits of string floss as an addition to toothbrushing for the management of periodontal diseases and dental caries in adults. Their findings indicated that there was some evidence that the addition of flossing to toothbrushing reduced gingivitis, and there was very weak, unreliable evidence that it aided plaque reduction. The investigators also found that no studies had been conducted to provide evidence that flossing reduces dental caries in adults.35 These findings are supported by Berchier et al.50 and Hujoel et al.51 Berchier et al. found that the addition of flossing to tooth brushing did not contribute to greater plaque and gingivitis reduction.35 In regard to dental caries, Hujoel et al. found no clinical trials evaluating the effectiveness of flossing in adults.35 Both studies determined that dental professionals should determine on an individual basis whether high-quality flossing is an achievable goal36,37

Interdental brushes (IDB) and a pulsating Water Flosser (see Figures 4 and 5) have been shown to be superior to string floss in improving gingival health.28,38–41 A 2015 systematic review found that an IDB was better than string floss at removing plaque.42 Five studies have compared a pulsating Water Flosser to string floss, and in each study the Water Flosser was superior to string floss for improving oral health.43–45

In a 28-day study of 106 subjects, Rosema et al. found that the Water Flosser was twice as effective as string floss in reducing bleeding at the two week mark.42 This finding is supported by Magnuson et al., who also found water flossing to be twice as effective at reducing bleeding over a 30-day period (see Figure 6).43 In regard to plaque biofilm, when either the Water Flosser or string floss was added to manual toothbrushing, the Water Flosser was 29% more effective than string floss (see Figure 7).42

A study of 28 subjects compared the use of the Water Flosser to IDB over a two-week time frame for plaque and bleeding on probing (BOP) reduction. All subjects used a manual toothbrush. At the conclusion of the study, the Water Flosser was 56% more effective than IDB at reducing BOP (see Figure 8). For plaque, both groups had significant reductions from the baseline.44 A single-use plaque study also compared the Water Flosser and IDB and found the Water Flosser to be 20% more effective than the IDB at removing plaque (see Figure 9).66

Since its introduction in 1962, the Water Flosser has been evaluated in numerous clinical trials that have demonstrated its safety and efficacy.46–47 It has been shown to benefit a wide variety of patients and clinical considerations, including people with orthodontic appliances (see Figure 10), implants (see Figure 11), diabetes, periodontal maintenance, and non-flossers.46 The Water Flosser is supported by over 65 published scientific studies and over five decades of use by the public. Myths about product safety persist despite the fact that there is no evidence that the Water Flosser pushes bacteria into the pocket, harms the junctional epithelium, or increases pocket depth. A 2015 literature review on the safety of the Water Flosser found no data to support the belief that it is detrimental to oral health and concluded that the Water Flosser is both safe and effective.47 In early 2017, the Waterpik® Water Flosser earned the ADA Seal of Acceptance for the removal of plaque along the gumline and between teeth and for helping prevent and reduce gingivitis.

**SUMMARY**

As cigarette smoking declines, the popularity of other tobacco/nicotine products has increased. The use of more than one product has also become more common. Dental professionals need to talk with patients about the addictive nature of nicotine and advise patients about both the oral and general health risks associated with tobacco/nicotine use.
1. Which statement is true about US tobacco production?
   a. Production has increased since the 1980s.
   b. Production is 800 million pounds per year.
   c. Ten states produce tobacco.
   d. The United States is the second largest tobacco producer in the world.

2. How many people smoke in the United States?
   a. 20 million
   b. 30 million
   c. 40 million
   d. 50 million

3. Which product is most used by teens today?
   a. Cigarettes
   b. Smokeless tobacco
   c. Hookah
   d. E-cigarettes

4. More people are addicted to nicotine than any other abused substance. The nicotine content of cigarettes is 15% higher than in the past.
   a. Both statements are true.
   b. The first statement is true, and the second statement is false.
   c. The first statement is false, and the second statement is true.
   d. Both statements are false.

5. People with a mental health disorder are:
   a. More likely to smoke
   b. More likely to be a heavy smoker
   c. Less likely to quit
   d. All of the above

6. In terms of nicotine uptake, smoking one large cigar is equivalent to:
   a. Smoking five cigarettes
   b. Smoking ten cigarettes
   c. Smoking half a pack of cigarettes
   d. Smoking a pack of cigarettes

7. Using two cans of smokeless tobacco per week provides as much nicotine as:
   a. A pack and a half of cigarettes a day
   b. A pack and a half of cigarettes a week
   c. A pack and a half of cigarettes every two weeks
   d. A pack and a half of cigarettes a month

8. Why are e-cigarettes attractive to teens?
   a. Good flavor
   b. Can be hidden from adults
   c. Perceived as less harmful than cigarettes
   d. All of the above

9. The percentage of adults reporting marijuana use is 9.5%. Three in ten users have a marijuana disorder.
   a. Both statements are true.
   b. The first statement is true, and the second statement is false.
   c. The first statement is false, and the second statement is true.
   d. Both statements are false.

10. CVD claims the life of more people over the age of 35 who smoke than lung cancer. Exposure to secondhand smoke causes more deaths from lung cancer than CVD.
    a. Both statements are true.
    b. The first statement is true, and the second statement is false.
    c. The first statement is false, and the second statement is true.
    d. Both statements are false.

11. People who smoke are 25 times more likely to develop:
    a. Esophageal cancer
    b. Pancreatic cancer
    c. Colon cancer
    d. Lung cancer

12. Which statement is true about the FDA regulation of tobacco products?
    a. They cannot be sold to people under the age of 18.
    b. They cannot be sold via a vending machine unless it is in an all-adult facility.
    c. They cannot be given out as free samples.
    d. All of the above

13. An increase in periodontal disease has been linked to:
    a. Cigarette smoking
    b. Exposure to secondhand smoke
    c. Marijuana smoking
    d. All of the above

14. There are more current smokers than former smokers. People who quit smoking before the age of 35 have mortality rates similar to those of people who have never smoked.
    a. Both statements are true.
    b. The first statement is true, and the second statement is false.
    c. The first statement is false, and the second statement is true.
    d. Both statements are false.

15. The Water Flosser has been shown to be more effective at improving oral health than:
    a. String floss
    b. Interdental brushes
    c. Both products
    d. Neither product
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