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Health Consequences of Tobacco Use

and the Impact on Oral Health

Course #17-5UK

Disclosure Statement:

- The content for this self-study CPD course was written by Carol A. Jahn, RDH, MS, and Deborah M. Lyle, RDH, BS, MS, employees of Water Pik, Inc.
- This article was designed, developed and produced by Water Pik, Inc.
- Water Pik, Inc., manufactures and distributes products addressed in this article.

Article Overview:

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

Learning Outcomes:

- Understand the oral and systemic health risk from tobacco use
- Discuss the role of dental professionals in tobacco prevention and cessation

THE HEALTH CONSEQUENCES OF TOBACCO

Smoking is believed to account for approximately 96,000 deaths a year in the UK. Cigarettes have been causally linked to diseases of nearly every organ in the body. Smoking compromises the immune system and often results in overall poor health **(Table 1)**. People who smoke report more absenteeism from work[1] and increased health care costs. Exposure to second hand smoke is a causative agent for cancer, respiratory and cardiovascular disease. It harms the developing fetus and adversely effects infants and children.[2] What's more, the use of multiple tobacco products has been shown to increase development of nicotine dependence **(Table 2)**.

Table 2: Health Consequences Causally Linked to Exposure to Second Hand Smoke

Children	Adults
Middle ear disease	Stroke
Respiratory symptoms, impaired lung function	Reproductive effects in woman; low birth weight
Lower respiratory illness	Nasal irritation
Sudden infant death syndrome	Lung cancer
	Coronary heart disease

Tobacco smoke contains more than 7,000 chemicals and at least 69 are known to cause cancer. People who smoke are 25 times more likely than a never smoker to develop lung cancer.[3] Lung cancer is the most common cause of cancer death among men and women in the UK, accounting for 35,895 deaths in 2014 — more than a fifth (22%) of all cancer deaths.[4] Smoking is also a causative factor in bowel cancer, the fourth most diagnosed cancer and the type responsible for the third largest number of cancer deaths.[5] Smoking increases the risk of dying from cancer and other diseases in cancer patients and survivors. Risks from smoking for woman are now equal to men for lung cancer as well as COPD, pulmonary disease and cardiovascular disease (CVD). There is a causal relationship between exposure to second hand smoke and lung cancer. People who live with a smoker have a 20% to 30% increased risk of lung cancer.[6]

COPD, of which smoking is the biggest preventable factor, is estimated to affect more than 1 million people and has caused 113,000 emergency hospital admissions in England in 2013 and 2014. Approximately 25,000 people die each year from COPD in England (twice the European average) and smoking is thought to be responsible for around 86% of these deaths, Men and women who smoke are 22 times more likely than a never smoker to develop COPD.[7] Exposure to second hand smoke may also increase the risk of COPD.

Table 1: Cancers and Chronic Diseases Casually Linked to Smoking

Cancers	Chronic Diseases	
Oropharynx	Stroke	Diabetes
Larynx	Blindness, cataracts, age-related macular degeneration	Reproductive effects in woman, including reduced fertility
Oesophagus	Congenital defects-maternal smoking; orofacial clefts	Hip fractures
Trachea, bronchus, lung	Periodontitis	Ectopic pregnancy
Acute myeloid leukaemia	Aortic aneurysm, early abdominal aortic atherosclerosis in young adults	Male sexual function-erectile dysfunction
Stomach	Coronary heart disease	Rheumatoid arthritis
Liver	Pneumonia	Immune function
Pancreas	Atherosclerotic peripheral vascular disease	Overall diminished health
Kidney and ureter	Chronic Obstructive Pulmonary Disease (COPD), tuberculosis, asthma, & other respiratory effects	
Cervix		
Bladder		
Colorectal		

Cardiovascular disease (CVD) was the second most common cause of death in the UK in 2014 (after coronary heart disease), with a total of 155,000 deaths. Current smoking is associated with a three-fold greater risk of sudden cardiac death versus a never smoker. People who smoke or are exposed to second hand smoke are also at a higher risk of having a stroke.[8] 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.[9]

Other health conditions related to smoking include rheumatoid arthritis, adverse reproductive and pregnancy outcomes, erectile dysfunction and age-related macular degeneration. A growing body of evidence also suggests that smoking is a risk factor for Type 2 diabetes,[10-13] identifying smoking as a possible risk factor for insulin resistance and deteriorated glucose metabolism.[14] It is estimated that 12% of all Type 2 diabetes in the US could be attributed to smoking,[15] so by applying the same percentage in the UK, smoking might account for 360,000 cases of diabetes.

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Worldwide, smokeless tobacco products are linked to death and disability. Each year, smokeless products contribute to 250,000 deaths and a loss of 6 million disability adjusted life years. Globally, in 2010, smokeless tobacco contributed to more than 62,000 deaths from cancers of the oropharynx, larynx and oesophagus. During the same time frame, these products were associated with more than 200,000 deaths from ischemic heart disease. Three-quarters of the deaths were in males.[16]

While perceived as a safer alternative to cigarettes, cigars, shishas and e-cigarettes have real and potential health risks.[17] Primary cigar smoking (no history of cigarette smoking) is associated with oral cancer, oesophageal cancer, pancreatic cancer, laryngeal cancer, lung cancer, heart disease and aortic aneurysm. Level of inhalation was a factor in the risk for lung cancer but not for oral, oesophageal and laryngeal cancers.[18]

The health effects of using a waterpipe are not well documented. There is some evidence to suggest that shisha use is associated with heart disease[19] and lung cancer.[20] Sharing of the mouthpiece/tube may put people at risk of infectious and transmittable disease.

The systemic health risks of e-cigarettes and its vapours are yet to be determined. Toxic cancer causing chemicals including formaldehyde have been found in e-cigarettes. A recent study showed that diacetyl, a flavouring 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.[21]

A recent study found that long-term marijuana use in people aged 26-38 was not associated with declines in general health.[22] 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 abilities did not return after quitting. People who smoke marijuana may have breathing problems and a higher risk of lung infections, but it is not known whether it increases the risk of lung cancer.[23]

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 up to 6 times more likely to show periodontal destruction than non-smokers, with poorer responses to treatment and a higher risk of reoccurrence.[24] A dose-response relationship between smoking and periodontal disease has been observed, with the heaviest smokers having the most disease severity. People who smoke have been shown to have a less favourable healing response to periodontal surgery.[25] Younger adult smokers (19-30 years) often have a higher prevalence and severity of periodontitis than young non-smokers. The “periodontal cost” of smoking has been calculated as 27 years of disease progression. This means that a 32-year-old smoker has similar periodontal attachment loss to a 59-year-old non-smoker.[26]

Smoking has also been shown to negatively impact the healing and clinical outcomes of implants.[27] Regular cigar smoking[28] and marijuana use are both associated with poor periodontal health.[29] Emerging evidence also indicates that daily smoking may increase the risk for decay in adults.[30] The impact of shisha use and e-cigarettes on oral health has not been determined, although a recent study found that the aerosols produced by e-cigarettes were toxic to oral epithelial cells *in vitro*.[31]

Exposure to second hand smoke has been shown to increase the risk of periodontal disease. People exposed for more than 26 hours per week were 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.[32] Children exposed to second hand smoke may have more dental caries in deciduous teeth — infants exposed at four months were twice as likely to have caries by age 3.[33]

Prevention & Cessation

There are now more former smokers than there are current smokers. The rate of quitting has increased, as has interest in quitting. Last year, ASH (Action on Smoking and Health) proposed new targets for the nation to aim for following the end of the government's *Tobacco Control Plan for England* in 2015. Endorsed by the Oral Health Foundation (formerly the British Dental Health Foundation), its *Smoking Still Kills*[34] campaign is designed to challenge all stakeholders in tobacco control to increase efforts and help accelerate the decline of smoking prevalence among adults to reach 13% by 2020 and 9% by 2025. The proposal also suggests reducing regular and occasional smoking among 15-year-olds to 9% by 2020 and 2% by 2025.

People who quit smoking before the age of 35 have mortality rates similar to people who have never smoked.[35] About two-thirds of UK smokers report that they would like to quit, although only around 30-40% actually make an attempt to quit in a given year.[36] The use of nicotine replacement therapy (NRT) has been shown to increase the rate of quitting by 50%-70%.[37] NRT is available over-the-counter as a patch, gum, mouth spray, inhalator or nasal spray. Various NRT products are also available on the NHS by prescription, as is one-to-one and group counselling through local stop smoking services. There are now even mobile phone apps to assist with quitting.

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The Role of the Dental Professional

Helping patients quit tobacco is beneficial for overall health including oral health. Quitting reduces the risk of early disease and death,[38] improves periodontal health[39] and may reduce the risk of tooth loss.[40] A large cohort study of more than 23,000 participants found that people who stopped smoking had a reduction in tooth loss and that after 10-20 years the risk of tooth loss approached that of a never smoker.[41]

Evidence indicates that dental professionals who incorporate behavioural interventions into the oral examination may increase the quit rate with both cigarette smokers and users of smokeless tobacco.[42] The periodontal exam and/or the oral cancer screening may be ideal times to discuss smoking cessation. In the dental practice setting, use of Ask, Advise, Act — also called the 3 A's — may be more manageable **(Table 3)**.[43]

Table 3: The Three A's

Ask	**All patients should have their tobacco use (whether past, current or non-existent) recorded and updated regularly.**
Advise	**After establishing that a patient smokes, it's important to advise them that the best way to quit is to utilize a combination of support and treatment.**
Act	**After providing all smokers with information on the value of using local stop smoking services, those who are interested should be referred to such services. For those who are not ready to quit, they should know that you are there to help when they are ready.**

Regular dental hygiene care, dental exams and daily self-care support are key to helping people who smoke manage their periodontal health. Because smoking can impair the immune response, smokers should be advised that they may not respond as well to any proposed treatment as a non-smoker. Many patients may be more concerned with staining and bad breath, being unaware of the more important implications from smoking. Focusing on the patient's values of aesthetics can be the lead in to improved oral hygiene but the goal should be smoking cessation.

Tooth brushing is the most common and often the only form of self-care used by many people, yet everyone needs some type of interdental cleaning. Dental floss has often been regarded as superior to other methods, but the research does not support this as people often lack the dexterity to floss at a level that provides a health benefit. A systematic review by the prestigious Cochrane Collaboration looked at the benefits of string floss as an addition to tooth brushing for the management of periodontal diseases and dental caries in adults.[44] The findings indicated that there was some evidence that the addition of floss to tooth brushing reduced gingivitis and very weak, unreliable evidence that it enhanced plaque reduction. The investigators also found that no studies had been conducted to provide evidence that flossing reduces caries in adults. These findings are supported by Berchier et al.[45] and Hujoel et al.[46] who found

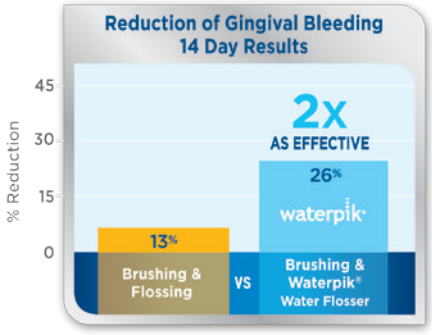

Figure 1. Reduction in bleeding versus string floss, Rosema et al.[50]

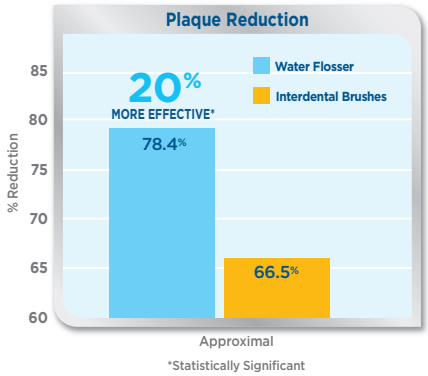

Figure 2: Reduction in plaque versus interdental brushing

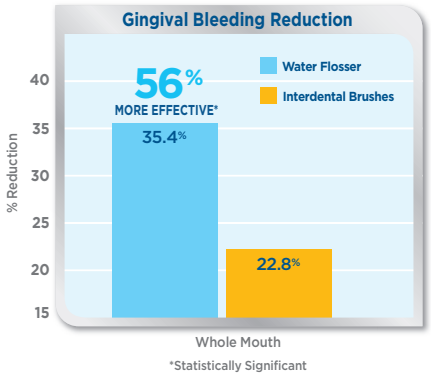

Figure 3: Reduction in bleeding versus interdental brushing

that the addition of flossing to tooth brushing did not contribute to greater plaque and gingivitis reductions and no clinical trials were found evaluating the effectiveness of flossing in adults. Both studies highlighted that dental professionals should determine on an individual basis whether high-quality flossing is an achievable goal.

Interdental brushes (IDB) and a pulsating Water Flosser have been shown to be superior to string floss in improving gingival health. A 2015 systematic review found that an IDB was better than string floss at removing plaque.[47] Five studies have compared a pulsating Water Flosser to string floss and in each instance, the Water Flosser was superior to string floss for improving oral health.[48-52]

In a 28-day study of 106 subjects, Rosema et al. found that the Water Flosser was twice as effective as string floss at reducing bleeding at two weeks (Figure 1).[50] This is supported by Magnuson et al. who also found water flossing twice as effective at reducing bleeding over a 30-day period.[52] In regard to plaque biofilm, when either the Water Flosser or string floss was added to manual tooth brushing, the Water Flosser was 29% more effective than string floss.[53]

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 reduction (Figure 2). All subjects used a manual toothbrush. At the conclusion of the study the Water Flosser was 56% more effective than IDB at reducing bleeding on probing. For plaque, both groups had significant reductions from baseline.[54] A single-use plaque study also compared the Water Flosser and IDB and found the Water Flosser was 20% more effective than the IDB at removing plaque (Figure 3).[55]

Since its introduction in 1962, the Water Flosser (Figures 4 and 5) has been evaluated in numerous clinical trials that have demonstrated its safety and efficacy.[56,57] It has been shown to benefit a wide variety of patients and clinical considerations including people with orthodontic appliances, implants, diabetes, in periodontal maintenance and non-flossers.[56] The Water Flosser is supported by 70 published scientific studies and over five decades of use by the public. Myths about product safety still 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 that it is detrimental to oral health and concluded that the Water Flosser is both safe and effective.[57]

Figure 4: Waterpik® Ultra Professional Water Flosser

Figure 5: Waterpik® Cordless Advanced Water Flosser

SUMMARY

The use of more than one product has also become more common and needs to be considered. Dental professionals need to talk with patients about the addictive nature of nicotine and advise patients about both the oral and general health risks.

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POST TEST COURSE #17-5UK
Health Consequences of Tobacco Use and the Impact on Oral Health

1. **How many chemicals does a single cigarette contain and how many of these are known to cause cancer?**

   a. 6,000 chemicals, 10 are known to cause cancer
   b. 7,000 chemicals, 10 are known to cause cancer
   c. 7,000 chemicals, 69 are known to cause cancer
   d. 6,000 chemicals, none are known to cause cancer

2. **People who smoke are 22 times more likely to develop:**

   a. Oesophageal cancer
   b. COPD
   c. Colon cancer
   d. Lung cancer

3. **What percent of Type 2 diabetes cases in the UK could be attributed to smoking, if the same statistics from the US are applied?**

   a. None
   b. 360,000
   c. 420,000
   d. 580,000

4. **An increase in periodontal disease has been linked to:**

   a. Cigarette smoking
   b. Exposure to second hand smoke
   c. Marijuana smoking
   d. All of the above

5. **Infants exposed to second hand smoke at four months were twice as likely to have caries by age:**

   a. 1
   b. 2
   c. 3
   d. 4

6. **Action on Smoking and Health (ASH) campaign *Smoking Still Kills* is designed to challenge stakeholders to help reach the goals of:**

   a. Reduce smoking prevalence among adults to 13% by 2020, 9% by 2025
   b. Reduce smoking prevalence among adults to 26% by 2020, 18% by 2025
   c. Reduce smoking prevalence among 15-year-olds to 9% by 2020, 2% by 2015
   d. a and c above

7. **People who quit smoking before the age of 35 have mortality rates similar to people who have never smoked; About two-thirds of UK smokers report that they would like to quit.**

   a. Both statement are true
   b. The first statement is true; the second statement is false
   c. The first statement is false; the second statement is true
   d. Both statements are false

8. **Helping patients quit tobacco use is beneficial for:**

   a. Improving oral health
   b. Improving overall health
   c. Reduces the risk of tooth loss
   d. All of the above

9. **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

10. **Research shows that the Water Flosser is beneficial for people:**

    a. With implants
    b. In periodontal maintenance programs
    c. With orthodontic appliances
    d. All of the above

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Please circle the correct answer for each question.

1.	a	b	c	d
2.	a	b	c	d
3.	a	b	c	d
4.	a	b	c	d
5.	a	b	c	d
6.	a	b	c	d
7.	a	b	c	d
8.	a	b	c	d
9.	a	b	c	d
10.	a	b	c	d

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