

REVIEW ARTICLES

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Review article

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ROLE OF PHYSICIANS IN ELIMINATING RISK OF CANCER CAUSED BY COMBUSTIBLE TOBACCO SMOKE

ULOGA LEKARA U ELIMINISANJU RIZIKA OD RAKA UZROKOVANOG KOMBUSTIBILNIM DUVANSKIM DIMOM

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Summary

Introduction. Combustible tobacco smoking accounts for nearly 30% of all cancer deaths in the United States of America and about 7 million deaths worldwide each year. Nowadays, e-cigarettes are increasingly used, especially among young people, but nicotine addiction that develops by such smoking easily converts to smoking combustible tobacco. Therefore, public health efforts must be directed to the prevention of initiation of smoking all nicotine-containing products. **Role of Physicians.** Medical doctors are very influential in smoking-related changes in local society, especially those who work in primary care, and they have an important role in both prevention and cessation of tobacco smoking. Tobacco smoking should be eliminated among medical doctors, yet many of them still smoke. The lowest percentage of smoking among physicians is in Oceania and North America (less than 11%) and the highest in Eurasia (25%). Smoking prevalence among medical students is higher than 35% in Georgia, Greece, Spain, and Italy, but less than 5% in the United States of America and Australia. In Serbia, 23% of physicians smoke. The age of physicians does not affect the number of smokers, but gender has a significant effect; women smoke less than men. **Smoking Prevention and Cessation.** Education about the effects of combustible tobacco smoking is a critical issue for successful smoking prevention and cessation; the best way is to provide educational programs on smoking at medical schools by introducing a mandatory course on combustible tobacco smoking at the beginning of the first year of study, especially in societies with a large percentage of smokers. **Conclusion.** In this paper, we showed how smoking can be eliminated among physicians and how they can affect the patients, public health policies, and antismoking campaigns.

Key words: Tobacco; Smoking; Physician's Role; Risk Factors; Neoplasms; Smoking Cessation; Smoking Prevention

Sažetak

Uvod. Sagorevanje duvana dovodi do blizu 30% karcinoma s letalnim završetkom u Sjedinjenim Američkim Državama i oko sedam miliona umrlih godišnje u svetu. Danas se elektronske cigarete sve češće koriste, posebno u mladoj populaciji, ali navika na nikotin koja se razvije takvim pušenjem lako pređe u naviku na pušenje kombustibilnog duvana. Zato je javno zdravstvo usmereno na prevenciju početka pušenja svih produkata nikotina uloga doktora medicine. **Uloga lekara.** Doktori medicine mogu snažno uticati na promene pušenja u lokalnoj sredini, posebno oni koji rade u primarnoj zaštiti i njihova je uloga veoma važna kako u otpočinjanju, tako i u prekidu pušenja. Pušenje lekara mora se eliminisati, ali mnogi lekari još uvek puše. Najmanji procenat lekara-pušača je u Okeaniji i Severnoj Americi (manje od 11%) a najveći u Evropi i Aziji (25%). Prevalencija pušenja studenata medicine je viša od 35% u Gruziji, Grčkoj, Španiji i Italiji, a manja od 5% u Sjedinjenim Američkim Državama i Australiji. U Srbiji puši 23% lekara. Životno doba lekara ne utiče na broj pušača, ali pol ima značajan uticaj – žene puše manje od muškaraca. **Prevencija i prekid pušenja.** Edukacija o efektima pušenja kombustibilnog duvana veoma je važna za prevenciju i prekid pušenja; najbolje je obezbediti edukacione programe o pušenju na medicinskim fakultetima uvođenjem obaveznog kursa o kombustibilnom duvanu na početku prve godine studija, naročito u društvima u kojim postoji veliki procenat pušača. **Zaključak.** U ovom članku ukazujemo kako može da se eliminiše pušenje lekara i kako lekari mogu da utiču na pacijente, propise javnog zdravlja i antipušačke kampanje.

Glavne reči: duvan; pušenje; uloga lekara; faktori rizika; neoplazme; prestanak pušenja; prevencija pušenja

Abbreviations

WHO	– World Health Organization
USA	– United States of America
COPD	– chronic obstructive pulmonary disease
CAD	– coronary artery disease
CHF	– congestive heart failure
ENDS	– electronic nicotine delivery systems
ICD-10	– International Classification of Diseases, Tenth Revision

Introduction

According to the International Classification of Diseases 10 Tenth Revision (ICD-10), tobacco smoking is a behavioral disease. The World Health Organization (WHO) described smoking as an epidemic, because it causes premature death of several million individuals per year among about a billion smokers worldwide [1]. Disease and death in individuals who smoke are caused by combustible products in burning tobacco; these include cigarettes, pipe tobacco, cigars, or other products that allow inhalation of smoke from the burning tobacco. A smoker inhales about 1.0 - 1.8 mg of nicotine from each cigarette smoked to the end. Nicotine is a powerful drug and it induces addiction [2]. A cigarette

contains about 600 other chemicals, including several chemicals added to correct the taste and absorption of nicotine in the final products. After combustion, tobacco smoke contains an estimated 7,000 chemicals, including about 70 carcinogens [3]. All other combustible tobacco products used for smoking yield similar amounts of chemicals and carcinogens in the smoke. Smoking of combustible tobacco is the leading global cause of morbidity and mortality [4–7]. Yet, nearly two-thirds of lung cancer deaths attributable to smoking worldwide may be prevented through effective tobacco-control policies and regulations. In the INTERHEART study, smoking accounted for 35.7% of acute myocardial infarction worldwide [8, 9]. Because smoking causes many other adverse effects to health, including pharmacokinetic and pharmacodynamic drug interactions [10], elimination of tobacco use remains an important public health priority that requires special attention to prevent smoking by young people, and it must include all nicotine-containing products. Many adult smokers are interested in quitting, but self-quitting is not an easy process and it is not often successful. Motivation and encouragement for smokers to quit could be increased by firm public policy and regula-

Table 1. Policies and measures to reduce the prevalence of tobacco smoking

Tabela 1. Propisi i mere kojima se smanjuje prevalencija pušenja duvana

Place/Mesto	Methods/Metode
Country or area Država ili region	Implementation of public health polices/Implementacija propisa javnog zdravstva
	Offering help to quit tobacco use/Ponuda pomoći za prekid pušenja
	Anti-smoking campaigns/Antipućačke kampanje
	Prohibition of tobacco advertisement, promotion and sponsorship
	Zabrana reklamiranja duvana, promocija i spozorstva
Health institutions Zdravstvene institucije	Warning about the dangers of combustible tobacco
	Upozorenje o opasnosti kombustibilnog duvana
	Rising tobacco taxes*/Povećanje poreza na duvan*
	“No-smoke policy”*/“Zabrana pušenja”*
Medical schools Medicinski fakulteti	Short-term intervention to smokers/Kratkotrajna pomoć pušačima
	Intensive smoking cessation support*/Pomoć za intenzivno odvikavanje*
	Training of medical personnel in tobacco control
Dormitories for students Studentski domovi	Obuka medicinskog osoblja za odvikavanje pušača
	“No-smoke policy”*/Zabrana pušenja
Local cancer societies and sports organizations/Društva za borbu protiv raka i sportske organizacije	Mandatory module/s on tobacco smoking/Obavezni kurs o pušenju duvana
	Intensive smoking cessation intervention/Intenzivna pomoć za prekid pušenja
At home Kod kuće	“No-smoke policy” Zabrana pušenja
	Rapid elimination of combustible tobacco Hitra eliminacija kombustibilnog duvana
	Isometric and/or isotonic exercise* during and after smoking cessation/Izometrijske i/ili izotonične vežbe za vreme i posle prekida pušenja

Legend: *Most young people, including university students, have limited financial means, and increasing the price of tobacco would result in a drop of students smoking; **No-smoke policy” means that smoking is only permitted at certain locations outside the buildings and all closed spaces; Penalties for violating smoking regulations (cigarettes, e-cigarettes or other ‘vapor’ products); *Intensive smoking cessation support includes help to smokers in specific situations to obtain temporary or permanent abstinence; *Isotonic physical exercises are recommended to younger smokers (up to 65); Isometric exercises for smokers in the geriatric age are recommended to prevent relapse

Legenda: *Većina mladih osoba, uključujući studente nema dovoljno novca i porast cene duvana dovodi do pada pušenja studenata. “Zabrana pušenja” znači da je pušenje dozvoljeno samo u određenim mestima izvan zgrade i svih zatvorenih prostora; kažnjavaju se svi prekršaji pušenja (cigarete, e-cigarete, pušeneje “vodene pare”). *Intenzivna pomoć za prekid pušenja dešava se pri specijalnim situacijama kada je nužna privremena ili trajna apstinencija. *Izotonične vežbe preporučuju se mlađim pušačima (do 65 godina); izometrijske vežbe preporučuju se pušačima u gerijatrijskim godinama da se suzbije relaps pušenja.

tions within the environment (**Table 1**). The proof for successful impact of such factors on tobacco smokers was studied recently within the context of acculturation [11]. The best way to help smokers to quit smoking is to provide adequate information about combustible tobacco products and smoking cessation [12]. The WHO emphasized the potential role of physicians in this fight against tobacco smoking [13], because even a short-term clinical intervention by a physician was highly effective in the cessation of cigarette smoking in patients. In addition, many countries employ various ways to help people quit tobacco use, such as the World No Tobacco Day, 31 May, and National No Smoking Day; for example 31 January, which was introduced in Yugoslavia by medical students from Tuzla (**Figure 1**). Today, it is accepted in Serbia and Bosnia and Herzegovina since 2000.



Figure 1. The postal stamp released on January 31, 1990 in recognition of the anti-smoking campaign in the whole Yugoslavia led by medical students from Tuzla and Banja Luka which started in 1980

Slika 1. Poštanska marka je puštena u promet 31. januara 1990. u znak priznanja studentima medicine iz Tuzle i Banjaluke koji su vodili anti-pušačku kampanju u Jugoslaviji otpočetku 1980. godine

Physicians have a key role in the fight against tobacco; they can educate their patients, support anti-smoking policies, lead smoking cessation programs within their communities, and support national tobacco control efforts. However, some physicians remain smokers themselves [14]. The aim of this paper is to consider how to reduce smoking prevalence among physicians and medical students. Because high smoking rates among physicians in some countries are still an important public health issue, one might assume that these doctors-smokers cannot help to curb tobacco use among the general population. According to Smith and Leggat [15], the reduction in smoking occurs more rapidly among doctors than among other healthcare workers. To gain even more rapid results, it will be

necessary to reduce smoking prevalence among medical students, who may become physicians-smokers. Therefore, tobacco use among medical students is included in this report, with particular attention to countries where high smoking rates are documented.

Combustible and noncombustible tobacco smoke products

Tobacco plants (*Nicotiana tabacum*) have been cultivated for centuries by Native American tribes around Peru and Ecuador [2]. When Columbus and his crew brought tobacco to Europe, smoking was considered to be an evil practice. However, the purported medical properties of tobacco smoke were accepted, especially for its presumed cure and prevention of cancer. The manufacture of cigarettes stimulated a global increase in tobacco smoking, probably related to the convenience of the device, as well as the use of a milder sort of tobacco. The small and convenient form of the cigarette enabled smokers to inhale and thus deliver greater amounts of product to a huge area of respiratory epithelium. The cigarette thus provided more rapid satisfaction than pipe or cigar by means of a rapid nicotine delivery via the vast area of the lungs to the brain and other tissues by the vascular system. In addition, an increase in absorption of nicotine through the lungs potentiates nicotine addiction.

In the nineteenth century, some European physicians believed that smoking may be harmful, but there was no proof to substantiate such a claim. Nonetheless, the opinion was expressed in the current artistic literature, and in 1886, A. P. Chekhov, a doctor/writer, published a one-act play: *On the Harmful Effects of Tobacco* [16]. Epidemiological studies done in Germany before the Second World War showed an association between smoking and lung carcinoma [17, 18]. These observations stimulated an extremely robust anti-smoking campaign in Germany [19]. Documentation of smoking contributing to lung carcinoma was published in 1950 and gained wide acceptance [20]. Nevertheless, Ronald A. Fischer, who is considered to be the father of modern statistics, continued to smoke a pipe and did not believe that smoking causes lung carcinoma. In 1957, Fisher published a letter in the *British Medical Journal* denying any connection [21]. Despite the fact that the observed association between smoking and tissue damage is the most extensively documented cause of various diseases, governments worldwide have been slow to reduce smoking, and this view prevails primarily only in culturally advanced countries.

In 2003, Hon Lik, a pharmacist and smoker in Beijing, created an electronic cigarette [22]. He created this device after his father, a heavy smoker, died of lung cancer. The terms “e-cigarettes” and “vaping” are used as synonyms, although the term “vaping” originates from “vapor”, which is not formed by such devices; both kinds of delivery systems form aerosols by using a variety of electronic battery-operated devices. These devices do not burn liquids to release nicotine and other substances, so the era of electronic nicotine delivery systems (ENDS) was born. It refers to the combination of liquids containing nicotine, water,

Table 2. Elements of teachable moments for combustible tobacco or nicotine smokers
Tabela 2. Elementi poučnih trenutaka za pušače kombustivnog duvana ili nikotina.

Carcinomas/ <i>Karcinomi</i> Elective surgery <i>Elektivni hirurški zahvat</i> Planned pregnancy <i>Planirana trudnoća</i> Pregnancy/ <i>Trudnoća</i> COPD/ <i>HOBP</i> CAD/ <i>KAB</i> CHF/ <i>KSI</i> All smokers who use combustible tobacco and/or nicotine/ <i>Svi pušači koji koriste kombustibilni duvan ili nikotin</i>	Perceived risk & new social perception of smoking <i>Percipirani rizik i nova društvena percepcija pušenja</i>	Emotions increase & social role redefined <i>Emocije se povećavaju i društvena uloga se redefiniše</i>	Increased motivation <i>Povećana motivacija</i>	Smoking cessation (immediate or after relapse/s) <i>Prekid pušenja (odmah ili nakon relapsa)</i>
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Legend: COPD – chronic obstructive pulmonary disease; CAD – coronary artery disease; CHF – congestive heart failure

Legenda: HOBP – hronična opstruktivna plućna bolest; KAB – koronarna arterijska bolest; KSI – kongestivna srčana insuficijencija

propylene glycol and flavorings that are heated, not burned, in e-cigarettes. For that reason, ENDS are much less harmful than combustible tobacco products used for smoking. However, non-combustible smoking also has its own risks and benefits [12]. The ENDS can be used as a smoking cessation option, but it is not recommended to be used by youths because they often turn to cigarettes.

Role of physicians in the cessation of tobacco smoking

Involvement of the medical community in smoking cessation is not equally pronounced across various medical specialties [23]. Ophthalmologists, specialists in infectious diseases, and general surgeons may lack an interest in smoking cessation, while pulmonologists, as well as thoracic surgeons, cardiologists and ear, nose, and throat specialists may be more inclined to influence their patients' smoking status. It should be in the interest of all physicians, regardless of their specialization. They should use their unique professional position to eliminate smoking in all patients. The harmful effects of smoking and the association of disease with combustible tobacco smoking may motivate patients to quit.

If a physician devotes only a few minutes to the patient who is a smoker, it can cause reduction in cigarette smoking by 5% to 15% [4, 23]. In such a brief time, the physician does not always have time to apply highly recommended 5A's (Ask, Advise, Assess, Assist, and Arrange) smoking cessation intervention [24]. Doctors should rather ask the patient if he/she smokes, when they light the first cigarette in the morning, and how many cigarettes they smoke daily. A doctor can then instantly decide whether the patient is a "light" or "heavy smoker" and whether the patient is psychologically or physically (or both) dependent on cigarettes. This will also help doctors to predict what type of smoking cessation should be applied if the patient decides to quit smoking [25].

The family physicians should obviously record the smoking status of each patient and provide smoking-cessation advice through brief oral information about associated health risks of combustible

tobacco smoke. However, in special circumstances, e.g., chronic obstructive pulmonary disease (COPD), coronary artery disease (CAD), congestive heart failure (CHF), planned pregnancy, confirmed pregnancy, and elective surgery, a high intensity smoking-cessation intervention is indicated (**Table 2**). Interestingly, the percentage of general practitioners who have never distributed a high intensity smoking-cessation intervention is lower in men (41%) than in women (45%) [26]. The patient may be offered a prescription for pharmacotherapy (bupropion, varenicline, cytisine) or for short-time usage of nicotine patches, gums, or e-cigarettes, and biochemical validation may be sometimes verified for smoking abstinence [27–30].

Prevalence of smoking among physicians

Almost a quarter of the global population smokes tobacco products and the majority of them smoke cigarettes, at least once a day. Four decades ago, the incidence of smoking among medical doctors in many European and Asian countries was almost as high as the prevalence in the general population (about 30%). Smoking habits of doctors and medical students often mirror those of the society in which they live, but additional factors sometimes contribute to maintaining the habit, such as the stress of academic studies, workload stress, and poor working conditions. However, from the very beginning of the third millennium, the perception of smoking has changed in many countries. The culture of the country influences tobacco use in both the general population and physicians. The smoking prevalence rate among female doctors is generally significantly lower than in their male counterparts at the same health institution. In some countries, e.g., China, India, Thailand, and Malaysia, smoking is considered an inappropriate behavior for women. This cultural reluctance also produces gender differences not only in the population's smoking rates but also among physicians [15].

Recent systematic review and meta-analysis on the predominance of smoking among physicians included 246 studies [14]. It showed that the total prevalence of smoking was high, around 21%. The

global smoking percentage of physician-smokers dropped from 28% before 1985 to 16% after 2015. The smoking prevalence among physicians is lowest in Oceania and North America (less than 11%) and highest in Eurasia (25%). In Serbia, about 34% of physicians used to smoke in 2010 [31], but ten years later the prevalence of smoking among physicians dropped to 23% [30]. Health care and educational facilities in the Republic of Serbia are completely smoke-free. However, in the indoor offices, restaurants, cafes, and bars designated smoking rooms are allowed under the current legislation. The prevalence of smoking among medical students is less than 5% in the USA and Australia, but over 35% in Georgia, Greece, Spain, and Italy [5, 14, 32]. The prevalence of smoking in medical students in Serbia is less than 25% [28]. Thus, smoking of physicians and future physicians in many regions still presents an acute public health issue in many countries [33].

The smoking prevalence is not affected by the age of physicians, but it is affected by gender; the prevalence of smoking is lower in women than in men. Education on the effects of combustible tobacco is a critical issue for successful smoking prevention and cessation. The best way to provide educational programs on smoking in medical schools is to introduce a mandatory module, a course on combustible tobacco, at the beginning of the first year. Setting up the unit for smoking counseling and intensive smoking cessation intervention at the university health office may also help to reduce the prevalence of tobacco smoking among medical students, especially in societies with a significant percentage of smokers [30].

In some countries, lung cancer accounts for more deaths than three other types of cancer together (breast, colon, and prostate) [12]. For this and other health damages, combustible tobacco should be eliminated. Nowadays, e-cigarettes are increasingly used, especially by young people, including medical students, and nicotine addiction developed by noncombustible smoking can easily be changed to combustible tobacco smoking. Therefore, public health efforts must be directed to the prevention of all nicotine-containing products.

In order to reduce the use of all combusted tobacco products, it is necessary to eliminate smoking among physicians [3, 13]. When a medical doctor decides and succeeds to quit, this influences and encourages both smokers in his medical institution and the community [25]. Many physician-smokers try to quit themselves. Their success may be enhanced by public policy interventions, such as smoke-free hospitals and the support of friends and family members. In addition, the perception of smoking has recently changed. In earlier times, smoking was both socially acceptable and rewarding, but today it has a distinctly negative image, which generates strong motivation to quit.

Self-quit approaches, in the majority of smokers, often require multiple attempts before achieving long-term abstinence. Many physician-smokers often struggle to maintain nicotine abstinence. With that in mind, it is useful to consider the methods of enhancing

their success. To maximize the chances of achieving the desired outcome, prevent relapse, and obtain permanent smoking cessation, it is vital to increase physical activity [30]. Additionally, it also strengthens the negative connotations associated with the modern image of smoking in social life. Subsequently, it generates a strong sentiment supported by other members of society in support of smoking cessation.

Nonetheless, even backed by public policy intervention and the use of anti-smoking medications, the self-quit approach often requires multiple attempts before achieving long-term abstinence. Increased physical activity boosts the endogenous opioid peptides in such an individual to deal with withdrawal symptoms, and later prevents smoking relapse. This phenomenon can be attributed to the release of enkephalins and endorphins [34]. These peptides are under the influence of exercise and by increasing the level of exercise, it is easier to resist the temptations of smoking [35].

Conversely, studies show that smoking works as an external drug to stimulate endogenous peptides. In other words, a lot of people enjoy the feeling of pleasure when smoking; it presents a kind of psychological hedonism [36]. In the same manner, physical activity can be seen as an alternate method of increasing the production of endogenous peptides and pleasure. Hence, both smoking and physical exercise may have the same hedonistic value, and exercise ought to be considered a relevant factor in combating addiction. On that account, physical exercise can be perceived as a way of complementing public policy interventions in smoking cessation [32].

The prevalence of smoking among medical students varies between different countries and between male and female students within the same country. A major reason for this variation is the population-based influence on the student's decision to smoke [33]. Limited overall knowledge regarding health among university students is another motivation for taking up smoking and continuing the habit. Because it also affects the general adult communities in which medical students live, education about the effects of combustible tobacco is a critical issue in smoking cessation. The best way may be to provide medical schools with a mandatory module, a specific course on combustible tobacco, for all medical students at the beginning of the first year. This would apply especially to schools with a significant percentage of smokers. Setting up the unit for smoking counseling and intensive smoking cessation intervention at universities may help to reduce the prevalence of tobacco smoking in both medical and other university students. Later, in the final years of medical studies, a second module on the fight against tobacco should be optional. Taxes on tobacco products are very effective in reducing use, especially in students [37]. These measures, including smoke-free hospitals, can significantly reduce smoking prevalence of tobacco smoking in medical students and provide useful means for new generations of physicians to eliminate smoking in their patients and in society, as well [33, 38–41].

Conclusion

Combustible tobacco use is responsible for the majority of all cancer deaths in the United States of America, and about 7 million deaths globally. For this reason, combustible tobacco should be eliminated, and it should become the most important public health priority. To prevent relapse and obtain permanent abstinence, in addition to anti-smoking

medications, smokers should take on physical exercise which initially also reduces withdrawal symptoms, and later on leads to long term abstinence. Public health efforts should be directed to limiting usage of all nicotine-containing products, and physicians have an important role in prevention and cessation of tobacco smoking in each society. The first step to be accomplished is eradication of smoking in all health institutions, including medical schools.

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