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a celkové podmínky

Tobacco control in the CR and Canada aimed especially at socioeconomic, political
and environmental aspects

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TABLE OF CONTENTS

LIST OF PUBLICATIONS.....	6
SUMMARY (English).....	8
SUMMARY (Czech).....	10
1.0 Introduction.....	12
1.1 Tobacco Use in Canada and Czech Republic.....	13
1.2 Canada's Tobacco Control Strategy.....	14
1.3 Current Tobacco Control Policies.....	14
1.4 Economics of Tobacco Use.....	16
1.5 Tobacco Dependence and Treatment.....	17
2.0 Tobacco dependence and treatment in the Czech Republic.....	18
2.1 Society for the treatment of tobacco dependence.....	18
2.2 Pharmacotherapy.....	19
2.3 Clinical practice guidelines.....	19
2.4 Cardiovascular disease (CVD) and smoking.....	20
2.5 Continued smoking among the critically ill.....	21
3.0 Framework Convention on Tobacco Control (FCTC).....	22
3.1 Organizational capacity for tobacco control.....	23
3.2 What is a capacity assessment?.....	23
3.3 What is the end product of a capacity assessment?.....	23
3.4 Aim and objectives.....	24
3.5 Original contribution to knowledge.....	24
4.0 FCTC implementation: The role of state or non-government organizations? An example of Czech Republic.....	25
METHODS.....	26
RESULTS.....	28
DISCUSSION.....	31
CONCLUSION.....	36
5.0 Cardiovascular disease and nicotine dependence.....	37
4.1 Tobacco Dependence, the Most Important Cardiovascular Risk Factor: Treatment in the Czech Republic.....	38
METHODS.....	39
RESULTS.....	41
DISCUSSION.....	41
CONCLUSION.....	42
6.0 Tobacco use among the critically ill.....	44
6.1 Continued Smoking in Lung Transplant Patients.....	45
METHODS.....	46
RESULTS.....	48
DISCUSSION.....	49
CONCLUSION.....	52
7.0 Translating research into practice.....	53
7.1 Treatment of Tobacco Dependence: A critical gap in Czech Clinical Practice Guidelines.....	54
METHODS.....	55
RESULTS.....	56
DISCUSSION.....	57

CONCLUSION.....	59
8.0 CONCLUSIONS.....	60
REFERENCES.....	61

LIST OF ABBREVIATIONS

CDT	Centre for Tobacco Dependant
CDP	Chronic Disease Prevention
CF	Cystic Fibrosis
COPD	Chronic obstructive pulmonary disease
COT	Urinary cotinine
CPG	Clinical Practice Guidelines
CR	Czech Republic
CVD	Cardiovascular disease
EU	European Union
FCTC	Framework Convention on Tobacco Control
GOV	Government Organization
ICD-10	International Classification of Diseases 10
MPOWER	Monitor tobacco use and prevention policies; Protect people from tobacco smoke; Offer help to quit tobacco use; Warn about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; and Raise taxes on tobacco
NGO	Non-government organization
NRT	Nicotine Replacement Therapy
RF	Risk Factor
SLZT	Společnost pro léčbu závislosti na tabáku
TC	Tobacco control
Tx	Transplant
WHO	World Health Organization
WL	Waiting list

LIST OF PUBLICATIONS

Impact Factor	Publication
0.636	Fraser K , Pankova A, Zvolská K, Králíková E. FCTC implementation: The role of state or non-government organizations? An example of Czech Republic. Central European Journal of Public Health. Cent Eur J Public Health. 2019 Sep;27(3):175-181
0.800	Zvolská K, Fraser K , Zvolský M, Králíková E. Treatment of tobacco dependence, a critical gap in Czech clinical practice guidelines. Cent Eur J Public Health. 2017 Jun;25(2):141-144.
0.800	Kučerová J, Rameš J, Fraser K , Králíková E. Brand Awareness and Access to Cigarettes among Children 8-12 Years Old in the Czech Republic. Cent Eur J Public Health. 2017 Sep;25(3):206-210.
2.092	Pankova A, Kralikova E, Fraser K , Lajka J, Svacina S, Matoulek M. No difference in hypertension prevalence in smokers, former smokers and non-smokers after adjusting for body mass index and age: a cross-sectional study from the Czech Republic, 2010. Tob Induc Dis. 2015 Aug 11;13(1):24.
0.429	Zmeškal M, Králíková E, Kurcová I, Pafko P, Lischke R, Fila L, Valentová Bartáková L, Fraser K . Continued Smoking in Lung Transplant Patients: A Cross Sectional Survey. Zdr Varst. 2015 Dec 16;55(1):29-35.
1.461	Králíková E, Kmetová A, Štěpánková L, Zvolská K, Felbrová V, Kulovaná S, Bortlíček Z, Blaha M, Fraser K . Tobacco dependence, the most important cardiovascular risk factor: treatment in the Czech Republic. Physiol Res. 2014;63 Suppl 3:S361-8.
3.974	O'Loughlin J, Maximova K, Fraser K , Gray-Donald K. J Adolesc

Health. Does the "healthy immigrant effect" extend to smoking in immigrant children? 2010 Mar;46(3):299-301.

2.761 Harding SV, Adegoke OA, **Fraser KG**, Marliss EB, Chevalier S, Kimball SR, Jefferson LS, Wykes LJ. Maintaining adequate nutrition, not probiotic administration, prevents growth stunting and maintains skeletal muscle protein synthesis rates in a piglet model of colitis. *Pediatr Res.* 2010 Mar;67(3):268-73.

4.145 Harding SV, **Fraser KG**, Wykes LJ. Probiotics stimulate liver and plasma protein synthesis in piglets with dextran sulfate-induced colitis and macronutrient restriction. *J Nutr.* 2008 Nov;138(11):2129-35.

SUMMARY (English)

Smoking is the leading cause of premature mortality and morbidity globally (WHO, 2018). Within the Czech Republic (CR) tobacco consumption ranks among the highest in the world, and tobacco control measures rank among the poorest globally (Joossens and Raw, 2014; American Cancer Society, 2018). Smoking related chronic diseases and the loss of active part of life are an enormous and growing burden on the Czech system. There is urgency to invest in efforts that will control and decrease the demand for tobacco products (OECD, 2017). Experiences and lessons learned in tobacco control (TC) by other countries, such as Canada, may provide valuable insight to help guide Czech decision makers in identifying policy *best buys* moving forward.

The basic research carried out as part of this PhD project focuses specifically on a comparison of TC in Canada and the CR. It also includes: 1) a national cross-sectional survey of all organizations involved in TC to describe capacity and involvement in TC measures outlined by the WHO Framework Convention on Tobacco Control (FCTC) (Fraser *et al.* 2019); 2) a prospective cohort study which describes the results of intensive smoking cessation treatment offered by Centers for Tobacco Dependent (CTD) (Králiková *et al.* 2014); 3) a cross sectional survey of patients (N=203) in the national lung transplant program to describe the prevalence of smoking post lung transplantation and prior to inclusion on the transplant waiting list (Zmeškal *et al.* 2015); and 4) a keyword search of clinical practice guidelines (N=91) from 20 medical professional societies to determine whether tobacco dependence treatment recommendations were included (Zvolská *et al.* 2017).

Our findings provide evidence that many of the organizations involved in TC activities are under resourced, lack core chronic disease prevention skills and face many barriers to moving the tobacco control agenda forward (Fraser *et al.* 2019). CTD across the CR offer intensive treatment which was found to be highly effective (Králiková *et al.* 2014). Among patients who used pharmacotherapy as part of treatment, the 12-month abstinence rate was 43.4 % (N=2470) compared to 15.9 % (N=573) among those who did not (Králiková *et al.* 2014). CTD were underutilized and many physicians did not routinely refer patients. We also found that among those who are critically ill, smoking resumption may be an under-recognized risk, particularly among patients with chronic obstructive pulmonary disease (COPD). We

found that 15.1% (95% CI 0.078 to 0.269) of all lung transplant recipients had urinary cotinine levels corresponding to active smoking; and a further 3.8% (95% CI 0.007 to 0.116) had borderline results. Compared to patients with other diagnoses, patients with COPD were 35 times more likely to resume smoking post- transplantation (95% CI 1.92 to 637.37, p-value 0.016). More rigorous screening, as well as support and treatment to stop smoking among critically ill patients are needed (Zmeškal et al, 2015).

Further to this, clinical practice guidelines (CPG) do not adequately address tobacco use (Zvolská *et al.* 2017). Nearly one third of CPG (27.7%) related to cardiovascular and respiratory diseases, as well as cancer, made no mention of smoking. Only 13.8% of CPG included a section on tobacco dependence, referenced tobacco dependence treatment guidelines or mentioned specialized treatment centres where smokers can be referred. This represents a major gap in translation of research findings into clinical practice.

Our findings provide empirical evidence that there are major gaps relating to treatment of tobacco dependence, as well as tobacco control more generally within the CR. To change this should become a priority.

SUMMARY (Czech)

Globálně je kouření vedoucí příčinou morbidity a předčasné mortality (WHO, 2015). ČR se spotřebou tabáku řadí na přední pozice ve světě, zatímco úroveň kontroly tabáku (KT) naopak patří celkově k nejnižším (Joossens and Raw, 2014; American Cancer Society, 2018). Chronická onemocnění v důsledku kouření a ztráta ekonomicky aktivních let v důsledku kouření jsou pro ČR významnou zátěží. Investovat do kontroly tabáku a snižovat tak poptávku po tabákových výrobcích by mělo být prioritou (OECD, 2017). Zkušenosti a znalosti na základě KT v jiných zemích, jako například v Kanadě, by mohly významně pomoci v rozhodování a pokroku správným směrem v KT v České republice volbou těch nejvhodnějších a nejúčinnějších opatření.

Základní výzkum, který je součástí této dizertační práce, se zaměřuje specificky na porovnání KT v Kanadě a ČR. Zahrnuje také: 1) národní průřezovou studii všech organizací zabývajících se kontrolou tabáku včetně popisu jejich kapacity a zapojení do aktivit KT podle doporučení Rámcové úmluvy o kontrole tabáku Světové zdravotnické organizace (FCTC) (Fraser *et al.* 2019); 2) prospektivní kohortovou studii, která popisuje výsledky intenzivní léčby závislosti na tabáku ve specializovaném Centru pro závislé na tabáku (CZT) (Králiková *et al.* 2014); 3) průřezovou studii mezi pacienty v národním programu transplantace plic (Tx plic, N=203), popisující prevalence kouření po Tx plic a před ní po zařazení na čekací listinu (Zmeškal *et al.* 2015); and 4) vyhledávání klíčových slov v doporučených postupech hlavních klinických oborů (N=91) dvaceti odborných společností s cílem posoudit, zda obsahují doporučení léčby závislosti na tabáku (Zvolská *et al.* 2017).

Naše výsledky ukazují, že mnohé organizace zabývajících se KT jsou podfinancovány, nejsou vyškoleny v prevenci chronických nemocí a ve snaze o lepší úroveň KT se potýkají s mnohými překážkami (Fraser *et al.* 2019). CZT po celé ČR nabízejí intenzivní léčbu závislosti na tabáku, která je velmi účinná (Králiková *et al.* 2014): roční abstinence u pacientů užívajících farmakoterapii byla 43,4 % (N=2470) v porovnání s 15,9 % (N=573) bez farmakoterapie (Králiková *et al.* 2014). Tato centra však nejsou dostatečně využívána a pacienti tam nejsou rutinně doporučováni. Kouření je podceňovaným zdravotním rizikem i u kriticky nemocných, konkrétně u

pacientů s chronickou obstrukční plicní nemocí (CHOPN): v našem souboru (Tx plic) mělo 15,1% (95% CI 0,078 - 0,269) všech pacientů po Tx plic hladinu kotininu v moči odpovídající aktivnímu kouření a dalších 3,8 % (95% CI 0,007 – 0,116) hodnoty hraniční. V porovnání s pacienty s ostatními diagnózami byla pravděpodobnost kouření po Tx plic 35x vyšší u pacientů s CHOPN (95% CI 1,92 – 637,37, p= 0,016). U kriticky nemocných je žádoucí pečlivý screening a podpora v nekuřáctví i nabídka léčby závislosti na tabáku (Zmeškal et al, 2015).

Dále, doporučené postupy (DP) klinických oborů se adekvátně nezabývají užíváním tabáku (Zvolská *et al.* 2017). Téměř třetina DP (27,7%) v oborech spojených s kardiovaskulárními, respiračními či nádorovými nemocemi kouření vůbec nezmiňuje. Závislost na tabáku, odkaz na doporučení léčby závislosti na tabáku či CZT, kam mohou být doporučení kuřáci, zmiňuje jen 13,8 % DP. To je významným nedostatkem v aplikaci výsledků výzkumů do klinické praxe.

Z uvedených výsledků plyne empirický závěr, že v ČR jsou nejen mezery v oblasti léčby závislosti na tabáku, ale i v úrovni kontroly tabáku obecně. Změna v této oblasti by měla být prioritou.

1.0 Introduction

Tobacco use is the leading cause of preventable death, disease and impoverishment globally (WHO, 2015). Within the Czech Republic, tobacco consumption ranks among the highest in the world, and tobacco control measures rank among the poorest globally (Joossens and Raw, 2014) (American Cancer Society, 2018). Smoking related illnesses claim the lives of about 14,000 people in the CR each year (Peto R, *et al.*, 2015). Smoking related chronic diseases are an enormous and growing burden on the Czech health care system. There is growing urgency to invest in efforts that will decrease the demand for tobacco (OECD, 2017).

Between 1985 and 2007-8 the prevalence of smoking among males decreased in the Czech population (from 49.2 % to 34.0 %), while the prevalence of smoking among women remained unchanged (Allender, *et al.*, 2002) (Cifkova, *et al.*, 2004). Undoubtedly, this decrease in tobacco consumption contributed to the massive decline in cardiovascular and stroke mortality in the CR (40% and 60% respectively) during this same time period (European Society of Hypertension, 2019). By 2011, the prevalence of tobacco use had declined but was still high compared to other developed western countries of the European Union (EU), about 29% (32.6% men, 25% women) (Cifkova, 2006; Sovinová *et al.*, 2012).

While the public health system has traditionally played a central role in chronic disease prevention, it is critical that other sectors, as well as actors outside the public sector are involved in tobacco control (WHO, 2014). Tobacco use is a complex societal problem, influenced by an array of factors- many of which lie outside the influence of the health sector. Tobacco control requires comprehensive and integrated action across sectors to improve coherence, effectiveness and efficiency of tobacco control policies (WHO, 2014, Christensen and Lægreid, 2006).

1.1 Tobacco Use in Canada and Czech Republic

As the CR continues to strengthen tobacco control (TC) measures, experiences and lessons learned in other countries may provide valuable insight. Canada, in particular, has long been viewed as a leader in TC globally. In Canada scientists, non-government organizations, community groups and other advocates have lobbied government for decades to adopt tougher TC legislation. Thanks to these efforts, since 1965 the prevalence of smoking in Canada has dropped from nearly 50% to 15.1% (Reid et al, 2017). In 2015, the prevalence of daily tobacco use among Canadian adults (age 15 years and older) was 12.7% of males and 8.5% of females. In contrast, smoking was considerably higher among Czech adults in the same age category, with 21.8% of males and 14.8% of females using tobacco daily (American Cancer Society, 2018). In 2013, daily use of smokeless tobacco products among Czech adults was 1.7%, more than four times greater than that (0.4%) among Canadians (American Cancer Society, 2018 and 2020).

Among children age 10-14 years in the CR daily tobacco use was twice that of their Canadian counterparts in 2015 (American Cancer Society, 2018 and 2020). In Canada, 1.24% boys and 1.86% girls used tobacco daily, compared to 3.3% boys and 4.5% of girls in the Czech Republic (American Cancer Society, 2018 and 2020).

While Canada has made significant progress in TC in recent years, smoking attributed death and disease continues to be an enormous problem with a high cost to society. Each year, tobacco use is responsible for 19.4% and 15.6% of all deaths in Canada, among males and females respectively (American Cancer Society, 2020). This being said, much of Canada's success to date has largely been attributed to political will, community engagement and dedicated human and financial resources to move the country's tobacco control agenda forward (Smoke Free Kings, 2013). Canada's experiences offer a roadmap that may help guide other countries, such as the Czech Republic in strengthening their tobacco control measures and identifying policy *best buys*.

1.2 Canada's Tobacco Control Strategy

In 2001, Nova Scotia one of Canada's smallest provinces, released a landmark comprehensive tobacco control strategy that outlined a series of strategic directions aimed to reduce tobacco harms among Nova Scotians. In the 8-year period between 2000 and 2008 the smoking rate dropped from 30% to 20% in Nova Scotia (Smoke Free Kings, 2013). During this same period youth smoking decreased by 50% and the percentage of children exposed to second hand smoke at home dropped from 30% to 10% (Smoke Free Kings, 2013). In 2015, Nova Scotia became the first jurisdiction in the world to ban menthol and other flavored tobacco products; by 2017 this ban was nation wide (Canadian Cancer Society, 2020). Nova Scotia's landmark strategy engaged partners across sectors and multiple levels of government. It was rooted in the shared understanding that tobacco use is a complex societal problem that requires diverse multi-sectorial action to achieve a shift in social norms to effectively decrease the prevalence of smoking (Smoke Free Kings, 2013).

In 2018, the Canadian government released a new Federal Tobacco Control Strategy and committed to reducing tobacco use nationally to less than 5% by 2035 (Government of Canada, 2020). In order to achieve this 'endgame' target, the government committed \$300 million dollars to address TC in the next 5 years alone (Government of Canada, 2020). Strategy funding will be used to help Canadians quit tobacco products, protect the health of youth and non-smokers from the dangers of tobacco use, work with indigenous populations, and to strengthen science, surveillance and partnerships (Government of Canada, 2020). Canada's national tobacco strategy recognizes that tobacco use is not spread equally across the entire population (Government of Canada, 2020). The major challenge going forward will be to identify those interventions that have the greatest impact in decreasing the total number of smokers and address health and social inequalities associated with smoking (Chaiton and Callard, 2019).

1.3 Current Tobacco Control Policies

TC action in Canada and the CR has been strategic and align with evidence based measures outlined by the WHO's Framework Convention on Tobacco Control

(FCTC) (WHO, 2003). Both countries warn people about the dangers of tobacco use on products and have taken steps to reduce advertising. Since 2020, Canada has required that all tobacco products sold in retail shops to have plain standardized packaging. Branding with colours, graphics and logos on packages is prohibited (Canadian Cancer Society, 2020). Tobacco products are not displayed and advertising at point of sale is prohibited. In contrast, the Czech Republic still allows branding of tobacco products, point of sale advertising and product displays at point of sale (American Cancer Society, 2018). Both Canada and the CR use graphic health warnings to warn about the dangers of smoking, but the size of these warnings on packages differ by country. In 2012, new federal regulations in Canada came into effect increasing the size of health warnings to 75% of the front and back of cigarette packages and including a toll-free quit line number and web address in the warnings. While progress has been made in the CR, health warnings still fall below international *best practice* standards (plain package) and cover only 65% of the package surface area (American Cancer Society, 2018).

Smoking Bans and Advertising

In 2004, Manitoba, New Brunswick, Northwest Territories and Nunavut were the first Canadian provinces/territories to adopt legislation for smoke-free restaurants and bars, all remaining provinces/territories followed shortly thereafter (Canadian Cancer Society, 2020). After years of debate, it was not until 2017 that the CR finally enforced a similar ban on smoking in restaurants and bars. Presently both countries have smoking bans in all health care and educational facilities, universities, and public transport (American Cancer Society, 2018 and 2020). However, smoking is still permitted in some indoor offices in both countries, and as of 2020 only Canada had funding dedicated to smoke free enforcement (American Cancer Society, 2018 and 2020).

Since 2008 it has been illegal in many parts of Canada to smoke in a car or other motor vehicle if anyone age 15 years or younger is inside (Canadian Cancer Society, 2020). This smoke-free motor vehicle law went on to be implemented nationally and also includes vaping (Canadian Cancer Society, 2020). It is illegal in Canada to smoke or vape on the outdoor grounds of a community recreational facility and any

public areas within 20 metres of its grounds (Ontario Ministry of Health, 2020). Canada has a total ban on the publicity of financial or other sponsorship or support by the tobacco industry of events, activities, and individuals (American Cancer Society, 2020). Until recently publicity, sponsorship and/or support from the tobacco industry were still not completely banned in the CR (American Cancer Society, 2018).

1.4 Economics of Tobacco Use

The tobacco industry is a powerful entity that possesses enormous resources and market power globally. In 2016, the combined revenue of six largest tobacco companies in the world was 90% greater than the Czech Republic's Gross National Income (American Cancer Society, 2018). Comparatively, this sum represented about 23% of Canada's Gross National Income (American Cancer Society, 2020). Countries such as Canada, which have larger economies and population, have the opportunity to help smaller allies by leading the way in the fight against industry globally (American Cancer Society, 2020).

According to the WHO, increasing the price of tobacco products through aggressive tax measures is one of the most effective ways to decrease tobacco consumption and increase government revenues (WHO, 2008). Depending on the situation in a given country the ideal tax level may be a combination of two forms of excise tax, specific taxes and ad valorem. Specific taxes are a fixed amount per unit of tobacco (e.g. \$1 per 20 cigarettes), whereas, ad valorem taxes add a percentage to the price (e.g. a tax of 60% of pre-tax price). The tax benchmark set by the WHO recommends at least 70% excise tax share in final consumer price. Currently both countries fall short of this benchmark, with excise tax set at 58.06% and 55.35% in CR and Canada, respectively (American Cancer Society, 2018 and 2020).

Taxation of sale of tobacco products represents a lucrative source of income for governments, but comes at a high societal cost. Numerous studies have documented the economic impact of smoking in terms of both direct health care costs and indirect expenditures due to lost productivity and early onset illness and mortality (Goodchild *et al.* 2017). In 2012, smoking related diseases accounted for 5.7% of health

expenditures globally (Goodchild *et al.* 2017). The total economic burden of smoking was shown to be 1.8% of our global gross domestic product (GDP) (Goodchild *et al.* 2017). In the most recent data published by the American Cancer Society in the Global Tobacco Atlas it was estimated that the annual economic impact of smoking in the Czech Republic was near 103265 million koruna, and 32,018 million dollars in Canada (2018 and 2020). The seemingly unlimited resources of the tobacco industry, along with wide spread corruption and manipulation by industry have made this public health crisis difficult for countries to address.

In 2012, Shirane *et al.* uncovered clear evidence of ongoing manipulation of the tobacco industry over tobacco advertising and excise policies in the CR (Shirane *et al.* 2012). These findings helped illuminate why the country has had such a weak record of TC. The authors also highlighted that there is significant opportunity for the CR to create large increases in tobacco tax (rather than small incremental increases) that will help decrease the demand (Shirane *et al.* 2012). The only question that remains is whether or not there is *political will* to do so.

1.5 Tobacco Dependence and Treatment

Tobacco dependence is a chronic disease characterized by relapse and remission, which can be reported according to the International Classification of Diseases 10 (ICD-10) code F17 (Hughes *et al.*, 2004) (International Classification of Diseases and Related Health Problems, 2011). Among smokers who stop without help, or using methods with placebo effect, the long-term success rate is about 5% (Fiore *et al.* 2008). The World Health Organization (WHO) recommends that all physicians should provide a brief intervention for tobacco use to a patient at each clinical contact. With brief intervention the success rate is 5–10% (Fiore *et al.*, 2008). A brief intervention consists of 5 points known as the “5 A’s”. The intervention involves asking the patient about tobacco use, advising the patient to quit, assessing readiness to quit, assisting the patient in quitting, and arranging for follow up (Fiore *et al.*, 2008). If a patient is unable to stop smoking, they should be referred to receive more intensive specialized treatment. Within the CR, specialized treatment for tobacco dependence (psychobehavioural therapy and pharmacotherapy) is available and

delivered by clinicians at Centres for Tobacco-Dependent (CTD) (Zvolská and Králíková, 2017).

In Canada, smoking cessation supports are integrated into the provincial health care system. Free of charge, one-on-one or group cessation treatment and support are available to all smokers by phone, Internet or in person (Province of Nova Scotia, 2020). Nicotine replacement therapy (NRT) products or prescription smoking cessation drugs are either fully or partially reimbursed under all health insurance plans in Canada (Johnson and Johnson, 2018).

2.0 Tobacco dependence and treatment in the Czech Republic.

Since 2005, a network of Centres for Tobacco Dependent (CTD) has systematically grown in the CR mostly within large hospitals. Centres were based on the model of the Nicotine Dependence Centre at Mayo Clinic, Rochester, Minnesota, USA. Presently there are 36 CTDs across the CR (with the population of 10.49 million) (Zvolská and Králíková, 2017). The first Referential Center for Tobacco-Dependent was established in Prague at the General University Hospital in 2005. Since that time, the centre has treated about 500 new patients per year; representing approximately 60% of all patients treated by CTDs in the CR (Zvolská and Králíková, 2017). Among patients who receive intensive treatment at CTDs, the success rate is over 30% after one year (Králíková, et al 2013; WHO, 2014).

2.1 Society for the treatment of tobacco dependence

The Society for the Treatment of Tobacco Dependence (Společnost pro léčbu závislosti na tabáku, SLZT) provides on-going support, information and resources to medical professionals on evidence based tobacco dependence treatment measures within the CR. Doctors, nurses, pharmacists, and other health care practitioners are encouraged to provide brief interventions, just 2 of the 5 A's and R – the Ask, Advise, and Refer approach to treat patients who use tobacco. Unfortunately, treatment is still not widely accessible and many people within the CR have to travel long distances to receive treatment for nicotine dependence (Zvolská and Králíková, 2017)

2.2 Pharmacotherapy

Tobacco dependence medications are available within the CR, with the exception of nasal inhalers and lozenges. However, health insurance companies do not cover smoking cessation medications. This cost is a barrier for some smokers to stop (Zvolská and Králíková 2017). A 3-month supply of these medications costs about the same as a 3-month supply of cigarettes, based on a consumption of 20 cigarettes per day. There is evidence that patients of higher socio-economic status (SES) may be more aware of the health risks of smoking and may seek treatment for tobacco dependence more often than their low SES counterparts (Steptoe and Marmot, 2004). Therefore investment in tobacco control measures beyond cessation treatment, such as taxation, bans on advertising, health warnings on packages and creation of smoke free environments are important strategies recommended by the WHO Framework Convention on Tobacco Control (FCTC). These strategies address the determinants of health at a primordial level (WHO, 2003).

2.3 Clinical practice guidelines

Within the CR, most physicians partially use brief intervention with patients who smoke, but the 5A's are still not part of standard clinical practice. In 2011, Králíková *et al.* reported that eighty percent of Czech physicians ask about tobacco use and advise patients to quit. However, subsequent steps of the brief intervention were not delivered including; assess readiness to quit, assist and arrange follow up (Králíková *et al.*, 2015).

Clinical practice guidelines (CPG) are systematically developed statements to assist practitioners and patients in making appropriate decisions about health care for specific clinical circumstances (Field and Lohr, 1992). These guidelines facilitate the transfer of evidence into clinical practice. The WHO recommends a systematic approach for incorporating brief tobacco interventions into primary health care services (WHO, 2014).

Clinicians of all disciplines should be educated on and follow CPG relating to evidence based treatment of nicotine dependence and tobacco related co-morbidities.

Despite the clinical significance of smoking, few of the approximately 120 medical professional societies in the CR adequately addressed tobacco dependence and treatment in their CPG documents (Zvolská *et al.* 2017). According to Zvolská *et al.* CPG documents from selected medical professional societies in the Czech Republic did not adequately address the importance of smoking cessation (2017). Smoking cessation should not be viewed as a mere lifestyle change, but rather imperative to good health and a necessary part of treatment for many diseases. CPG are an important source of evidence-based information for clinicians. CPG should provide up to date information on tobacco dependence, treatment and highlight the importance of using brief intervention with patients who smoke at each clinical contact.

2.4 Cardiovascular disease (CVD) and smoking

Within developed countries cardiovascular diseases (CVD) rank among the main causes of death (Adámková, 2010). This trend is also true in the CR, where CVD constitutes one of the main causes of death and hospitalization (Zdrav. ročenka, 2016). Smoking is major preventable risk factors of CVD morbidity and mortality, together with high blood pressure, diabetes and hypercholesterolemia (Gikas *et al.* 2016). CVD are the most common cause of death among smokers. Within the EU, CVD is responsible for about 42 % of all deaths each year. In the Czech Republic, smoking is responsible for about 15 % of all CVD deaths, this accounts for more deaths each year than lung cancer, the most common form of cancer caused by smoking (Peto *et al.* 2015).

Since the mid 1980s, CVD mortality has declined in the CR (Zemřelí, 2011). Between 2003-2009, the standardized mortality among men in the CR decreased by 23.3%. During this same time period, CVD mortality decreased a similar percentage (23%) among women, from 384.4 to 296.2 per 100 thousand inhabitants. Compared to other EU countries, within the CR the incidence of CVD mortality at that time was higher (the standardized mortality in men 289.9/100,000 and women 190.3/100,000 in EU in 2009) (Cayotte and Buchow, 2009; Institute of Health Information and Statistics of the Czech Republic, 2009).

Since the mid 1980s, mean cholesterolaemia, as well as systolic and diastolic blood pressure have significantly decreased. As a result, CVD mortality, particularly due to stroke has declined (Cifkova, *et al.* 2010). In a random population sample of the CR over the period from 1997-98 to 2006-09, the prevalence of hypertension rose but treatment and control of hypertension and dyslipidemia improved (Jozifova *et al.* 2011).

Among patients in Europe with established coronary disease, the prevalence of smoking is very high (21 %) (Sumanen *et al.*, 2004; Scholte, 2006). More than half of coronary patients who were smoking at the time of their event were still smoking one year later, according data from the EUROASPIRE survey (Kotseva *et al.* 2009).

For patients with acute coronary syndrome, there is a system of twenty-two cardiocenters nationally and the CR is recognized for its' excellence in caring for these patients. Control of cholesterol and hypertension within the CR are among the best in Europe, which is a major advance in terms of population health. While smoking rates have continued to decrease since the late 1990s (Sovinova *et al.* 2012) (American Cancer Society, 2018) the Czech government continues to invest in initiatives that focus on public education and awareness of CVD risk factors (Tóthová *et al.*, 2018) rather than implementing evidence based policies that have been shown to have the biggest return on investment (WHO, 2003).

2.5 Continued smoking among the critically ill

Among tobacco users who suffer from chronic health conditions, nicotine dependence is a major barrier to cessation. Despite the severity of their illness and the knowledge that quitting would have important long-term benefits, many tobacco users are unable to stop smoking (Woodward M and Tunstall-Pedoe 1992; Archbold *et al.* 1995; van Berkel *et al.* 1999). This may not be due to the lack of motivation to stop smoking, but rather a matter of dependence for these patients (West, 2004).

Among patients with end-stage lung disease, for many lung transplantation (Tx) remains the best treatment option. However, the demand for lung transplantation greatly exceeds availability, yet developing rigorous selection criteria and methods to

identify suitable transplant recipients continues to present unique challenges. Furthermore, despite lung Tx candidates' reliable self-reported disclosure of active smoking, it is unlikely that their survival may depend on inclusion on the Tx waiting list (WL). Due to the limited number of suitable donors and the high demand for Tx, it is important that centres are able to detect patients who deceptively report smoking behaviour in order to select patients who will have the best outcomes long term. The implementation of routine screening protocols may help centers identify those candidates who are likely to have the best outcomes post transplantation. This is discussed further in chapter 6.

3.0 Framework Convention on Tobacco Control (FCTC)

The WHO Framework Convention on Tobacco Control (FCTC) and its guidelines provide the foundation for countries to implement and manage tobacco control (WHO, 2003). By 2025, the World Health Organization (WHO) and its Member States have set a voluntary global target of a 30% relative reduction in the prevalence of current tobacco use (WHO, 2013). Strengthening WHO FCTC implementation through the Health 2020 policy framework and the roadmap of actions to strengthen implementation will ensure that the Czech Republic is not left behind.

The FCTC outlines six evidence-based MPOWER measures that are *best buy* interventions, proven to reduce the demand for tobacco. The MPOWER measures are: Monitor tobacco use and prevention policies; Protect people from tobacco smoke; Offer help to quit tobacco use; Warn about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; and Raise taxes on tobacco. Each has been shown to reduce the prevalence of tobacco smoking, but the effect depends on their level of implementation and the implementation of other tobacco-control policies (Levy et al., 200; United States Department of Health and Human Services, 2014). To meet WHO global targets and support national tobacco control efforts, policymakers must know the individual and combined effects of MPOWER measures (WHO, 2013). In addition to this, countries must coordinate TC efforts across sectors and ensure groups and organizations have the necessary resources, skills, leadership and supports to work effectively.

3.1 Organizational capacity for tobacco control

Within the Czech Republic, little is known about i) what types of organizations are involved in tobacco control; ii) what structures, supports, resources and skills these organizations possess to work on tobacco control or; iii) their level of involvement in tobacco control related activities. In order to better understand current tobacco control efforts in the Czech Republic, we conducted a capacity assessment with all organizations activity involved in tobacco control at a national level in the 3 years previous to data collection. This study is described in section 4.0.

3.2 What is a capacity assessment?

A capacity assessment is a way to measure the strengths, opportunities, barriers and obstacles for the implementation of evidence based tobacco control measures. The purpose of conducting a capacity assessment is to assess the status and present development efforts of key tobacco control policies, leadership and commitment to tobacco control as well as partnerships and networks, human and financial resources, as well as infrastructure. The goal of building national capacity is a comprehensive and sustainable national strategy for multi-sectoral tobacco control programs and policies.

3.3 What is the end product of a capacity assessment?

The end product of a capacity assessment is a set of recommendations with potential actions to guide government and civil society at any stage in the process of developing, implementing or evaluating their approach to tobacco control. A capacity assessment can provide government with a better understanding of the strengths and limitations of current tobacco control efforts. It can also help inform specific recommendations on how best to increase political commitment and how to reorient and optimize policy interventions. It can also provide evidence to inform the development of national tobacco control strategy.

3.4 Aim and objectives

To better understand the strengths and limitations of current tobacco control efforts within the CR we conducted a cross sectional survey of all organizations actively involved in tobacco control at a national level in the 3 years prior to data collection. We focused specifically on organizations involved in chronic disease prevention activities that address tobacco use.

Our aims were

- to describe key determinants of organizational capacity including; organizational supports, partnerships, resources, leadership, and skills for tobacco control.
- to describe organizations' level of involvement across settings, strategies used, and level of involvement in MPOWER measures.

Our findings provide data, which identifies strengths and gaps in organizational capacity, and provide an evidence base to help guide decision makers to identify strategic priorities.

3.5 Original contribution to knowledge

- To our knowledge, this is the first national survey of organizational capacity and level of involvement in tobacco control related activities among organizations in the Czech Republic.
- Until now, little was known about the capacity of these organizations to deliver effective chronic disease prevention programs that address tobacco use.
- Our findings provide empirical evidence to local decision makers to help inform strategic priorities and decrease the demand for tobacco in the Czech Republic.

4.0 FCTC implementation: The role of state or non-government organizations?

An example of Czech Republic

Tobacco use is the leading cause of preventable death, disease and impoverishment globally (WHO, 2015). According to the World Health Organization (WHO), Europe has the highest prevalence of tobacco smoking among adults (28%) and among the highest prevalence of tobacco use by adolescents (WHO, 2019). In the Czech Republic, tobacco consumption ranks about 25% in the population age 15-65 years, and tobacco control (TC) measures rank among the poorest globally (Váňová *et al.* 2018; Joossens and Raw, 2014; American Cancer Society, 2018). Among all tobacco related chronic diseases, smoking is responsible for one in every six deaths in the Czech Republic (Peto R, *et al.* 2015). The burden of tobacco use on the Czech health care system and other tobacco-related costs call for growing urgency to invest in evidence based measures that will decrease the demand for tobacco (OECD, 2017).

Tobacco use is a complex societal problem, influenced by an array of factors- many of which lie outside the influence of the health sector. TC requires comprehensive and integrated action across sectors to improve coherence, effectiveness and efficiency of policies (WHO, 2014; Christensen and Lægreid, 2006). The WHO Framework Convention on Tobacco Control (FCTC) and its guidelines provide the foundation for countries to implement and manage tobacco control (WHO, 2003). The FCTC outlines six evidence-based measures that are *best buy* interventions, proven to reduce the demand for tobacco (WHO, 2008). These measures are referred to collectively by the acronym MPOWER which stands for; **m**onitor tobacco use and prevention policies, **p**rotect people from tobacco smoke, **o**ffer help to quit tobacco use, **w**arn about the dangers of tobacco, **e**nforce bans on tobacco advertising, promotion and sponsorship, and **r**aise taxes on tobacco (WHO, 2008).

In order for organizations to work effectively on TC related activities outlined by the FCTC, they must have the capacity to do so, in terms of resources, skills, leadership and supports. Within the Czech Republic, little is known about i) what types of organizations are involved in tobacco control; ii) the capacity these organizations may have in terms of structures, supports, resources and skills to work on TC related activities or; iii) their level of involvement in evidenced based TC activities.

Given the Czech Republic's history of weak TC, our aim was to conduct a capacity assessment to better understand the strengths and limitations of current TC efforts as they relate to the FCTC (Joossens and Raw, 2014; WHO 2008). We conducted a cross sectional survey of all known organizations (N=20) involved in activities that address tobacco use. Our findings describe key determinants of organizational capacity including organizational supports, partnerships, resources, leadership, and CDP skills to carry out TC activities. We also examined organizations level of involvement across settings, strategies used, and their level of involvement in MPOWER measures. Our findings provide data, which identifies strengths and gaps in organizational capacity, and provide an evidence base to help guide decision makers to identify strategic priorities. To our knowledge, this is the first national survey of organizational capacity and involvement in the Czech Republic, focused specifically on TC.

METHODS

Between June and November 2017, cross-sectional data were collected in a survey of all organizations in the CR engaged in primary or secondary prevention activities relating to tobacco control at a national level in the last 3 years. Organizations were first identified by local tobacco control experts, and then through an exhaustive Internet search using purposive sampling. Organizations included; government ministries, offices and departments, public health organizations clinics, centers and commissions (herein referred to collectively as government organizations (GOV), non-government and non-profit organizations, alliances, networks, professional associations and societies, and health agencies (herein referred to collectively as non-government organizations (NGOs)).

Prior to data collection, key informants with an in-depth knowledge of tobacco control in the CR validated the final list of organizations to be included in the study. A total of 20 organizations fit our inclusion criteria. This represented a complete census of all known organizations engaged in primary or secondary prevention of tobacco use in the CR at a national level, in the three years prior to data collection.

Organizations that operated at a regional or community level only were excluded, as were primary care facilities such as hospitals that focus mainly on tertiary prevention.

Study Variables

In this study, organizational capacity was conceptualized to include leadership, supports, skills, partnerships and resources. Tobacco related activities were defined as any programs, policies, strategies, initiatives, or interventions that focus on reducing the demand for tobacco. Our survey tool was developed based on a comprehensive review of peer-reviewed literature and published reports of organizational capacity for chronic disease prevention and healthy lifestyle promotion (Smith *et al.* 2001; MacLean *et al.* 2001; Taylor *et al.* 1998; Joffres *et al.* 2004). Survey questions were drawn from a psychometrically sound scale developed by Hanusaik *et al.* (2007) to measure determinants of organizational capacity for chronic disease prevention, and adapted to focus specifically tobacco control. Four internationally recognized tobacco control experts helped established face validity of the questionnaire. The final working version of the survey was pilot tested with public health practitioners working in tobacco control in three district health authorities in Nova Scotia, Canada.

The final version of the questionnaire consisted of 25 questions. The questionnaire gathered information about; organizational characteristics (that is, structural determinants of capacity); organizational supports of capacity; leadership, skills; resources; level of involvement in MPOWER measures and across settings; partnerships; facilitators and barriers to involvement in tobacco control related activities. Most response sets were five point Likert scales, with level of agreement response formats ranging from “1” (very low/ strongly disagree) to “5” (very high/strongly agree).

A certified Czech translator translated the questionnaire from English to Czech. Researchers at the Center for Tobacco-Dependent of the Third Medical Department – Department of Endocrinology and Metabolism, First Faculty of Medicine, Charles University and the General University Hospital in Prague, reviewed the questionnaire to ensure cross-cultural adaptation of all questions.

Organizations were initially contacted by email to solicit their participation in the study. A Czech-speaking interviewer followed up with each organization by phone or email, to confirm their participation and to set a date for data collection. One key informant per organization completed the survey. The survey respondent was identified by the head of the organization as most knowledgeable about tobacco control related activities within the organization. One survey was completed by each organization, with the exception of two organizations that worked closely on tobacco related activities and requested to complete one survey together. These two organizations were counted as a single organization in the analysis. Any incomplete data or inconsistencies were resolved with a follow up telephone call or e-mails.

Statistical Analyses

Since this study reports data collected in all organizations involved in tobacco control prevention at a national level (not a sample), significance testing was not relevant. Comparisons of means for continuous variables and frequencies for categorical variables were made between groups of organizations. Data analyses were conducted using IBM SPSS Statistics software, version 25.

Ethics Approval

The study received ethics approval from the ethics committee of the General University Hospital in Prague (study no. 39/16 S-IV). The head of each organization, as well as the survey respondent, provided written consent to participate in the study.

RESULTS

A total of 20 organizations met the inclusion criteria for the study. These organizations represented a complete census of all known organizations actively engaged in tobacco control from a chronic disease prevention perspective, at a national level in the CR in the three years prior to data collection. All organizations that met the inclusion criteria were invited to participate in the study. A total of fourteen organizations agreed to take part.

Organizational structure and commitment

Our final census included a total of 14 organizations, which included GOV (n=7) and NGO (n=7) organizations (Table 1). GOV organizations employed a median of 651 full time employees, with a median of 10 individuals per organization involved in tobacco control in some capacity. Only two GOV organizations had full time equivalents (FTEs) dedicated to working on tobacco control, but the majority had none. The majority of NGO, had no full time employees, and operated using a membership model or relied on volunteers. NGO had a median of four individuals per organization working specifically on tobacco control, but no FTEs. The majority of both GOV and NGO organizations served the general public. About one third of all organizations served specific sub-populations such as, health care professionals, individuals with mental illness, and those with substance abuse problems. Overall organizations rated their level of involvement in tobacco control related activities as 'high'. TC related activities were rated as a 'high' or 'very high' priority for all, but one, organization.

Organizational Supports

Organizational capacity for tobacco control was conceptualized to include leadership, supports, skills, partnerships and resources (Table 2). Among the indicators for internal organizational supports, strategic priorities, leadership, managerial support, and professional development opportunities were rated relatively high. Adequate number of staff dedicated to working on TC activities was rated lower. Two thirds of organizations reported that they did not have an adequate number of staff working on TC activities to achieve their objectives. Fifty percent of organizations reported a low level of confidence in their staff's knowledge and skills to work effectively on tobacco control-related issues. In terms of access to necessary equipment and tools (e.g. software, computers, literature, etc.), this was not reported as a major barrier, but NGO tended to rate this lower than GOV.

Partnerships

Partnerships are an indicator of external support for TC activities (Table 2). More than half of all organization had formed partnerships of some kind to work on TC related activities. Although, NGO tended to form more partnerships than GOV, partnership effectiveness was rated slightly lower. Formation of cross sector partnerships was rated very low by all organizations.

Financial resources

The majority of organizations rated their funding to support TC activities as ‘less than adequate’ or ‘much less than adequate’. Funding stability was rated lower by NGO than GOV. Availability of external sources of funding to support tobacco control related activities was rated low by all organizations.

Core Chronic Disease Prevention (CDP) skills

Organizational capacity, as it relates to core chronic disease prevention (CDP) skills, focused on tobacco control are presented in Table 3. CDP practice skills including, assessment, identifying relevant practices, developing and implementing initiatives were rated more favourably than skills to evaluate these activities. Only half of all organizations reported confidence in their skills to evaluate the impact of their TC work.

Tobacco control efforts in specific settings

Among all organizations, involvement in tobacco control activities was highest in government settings, followed by health care settings. NGOs reported greater involvement in these settings, compared to GOV organizations. Few organizations were involved in tobacco control activities in workplaces or schools, with the lowest level of involvement in the community at large (Table 4).

Intervention strategies used

Overall, organizations were more involved in individual-level, rather than population-level, chronic disease prevention strategies to address tobacco use (Table 4). Among individual-level strategies, organizations reported the highest level of involvement in activities that focused on public education to raise awareness. In contrast, less than half of all organizations were ‘very involved’ in population-level strategies, such as policy development, advocacy and creation of healthy environments, to address tobacco use.

Level of involvement in MPOWER measures

Level of involvement in MPOWER measures was highest for activities that focused on creation of smoke-free workplaces and public places, followed by health information and warnings on packages, and monitoring of tobacco use. Half of all organizations reported that they were ‘very involved’ in activities that focused on helping smokers to quit. Organizations reported the lowest level of involvement in MPOWER measures that focused on raising taxes, enforcing bans on tobacco advertising, promotion and sponsorship, as sales to minors.

Barriers faced by organizations

Organizations reported a range of barriers in working on tobacco control related activities (Table 4). Insufficient funding, inadequate number of staff dedicated to working specifically on TC, lack of political will or competing priorities, and strong interference from the tobacco industry were all reported as major barriers.

DISCUSSION

To our knowledge, this is the first national survey of organizational capacity for tobacco control, and level of involvement in MPOWER measures among organizations in the Czech Republic. Our findings show that despite the high economic costs of tobacco use, few organizations are actively involved in chronic disease prevention activities that address tobacco use. Organization’s tobacco control

activities are under-funded and most do not have enough people working on tobacco control to achieve their organizations objective. Further to this, our findings provide evidence that Czech organizations are highly involved in intervention strategies that focus too far downstream to have any real impact on population health outcomes.

In terms of organizational supports, most organizations reported that they had strategic priorities and good leadership to guide their tobacco control related work. Professional development opportunities were available, but less so to NGOs. Less than one third of organizations had a sufficient number of staff dedicated to working on tobacco control related activities, and many did not have the proper equipment or tools (e.g. software, computers, literature, etc.) to work effectively. NGOs reported a greater disadvantage in these areas, compared to GOV organizations. Our findings show that most organizations did not have a sufficient number of human resources dedicated to working on tobacco control to achieve their objectives. In addition to developing a critical mass of professionals dedicated to working on tobacco control, there is also a need to invest in helping these professionals to develop the specialized skills, knowledge, and tools to support evidence-based practices and policy decisions relating to tobacco control (Mereu A. *et al* 2015).

Partnerships

More than half of all organizations had formed partnerships to work on tobacco control activities, but cross-sector partnerships were less common. Because tobacco use is a complex societal problem, and smoking rates are determined by an array of factors- many of which lie outside the influence of the health sector, diverse multi-sectorial partnerships are key to achieving better outcomes. Diversity improves collective understanding and problem solving capacities (Page, 2007). Our findings suggest that greater co-operation within, and across, sectors is needed. Success stories of partnership and collaboration in other countries provide an excellent example of how organizations can engage, share resources and enhance knowledge exchange to build capacity and advance the national tobacco control agenda (McDonald and Viehbeck, 2007).

Resources for Tobacco Control

Despite tobacco control being rated as a 'high' or 'very high' priority for organizations, funding adequacy for tobacco control related activities was rated low. Our findings are similar to those reported by global survey findings, which showed that despite being a high priority, less than 40% of countries (n=65 out of 167) had allocated a specific budget for prevention and control of non-communicable disease (WHO, 2001). The availability of external sources of funding to support tobacco control activities was rated very low by all organizations. Inadequacy funding for tobacco control related activities may reflect chronic underfunding of the healthcare system as a whole. In the Czech Republic, the health care system has undergone major re-structuring since the end of communism in 1989 (Kinkorová J and Topolčan O., 2012). Health care spending accounts for 7.2% of the country's GDP, but it is not known how much of this is allocated to specifically to health promotion and chronic disease prevention activities that focus on TC (OECD, 2014). The country's high smoking rates, which increased between 2000-2011, and the high incidence of smoking related diseases (OECD, 2014) are evidence that chronic disease prevention efforts are focused to far down stream to have any real impact on population health.

Skills for Tobacco Control

In terms of core CDP practices, evaluation skills were rated low by all organizations. Evaluation is critical to building an evidence-base to inform best practices in CDP programming (Milstein, *et al* 2002). Our findings provide evidence that organizations must put a greater emphasis on the importance of evaluation, by dedicated more resources to evaluation activities and offering training in evaluation methodology. In Canada, Hanusaik *et al*, similarly found that compared to other core chronic disease prevention skills, skills for evaluation were consistently rated as low among organizations engaged in chronic disease prevention (2007).

Tobacco control intervention strategies

Overall, organizations reported the highest level of involvement in tobacco control strategies focused at the individual, rather than population-level interventions. Level

of involvement was highest for individual-level strategies that focused on public education to raise awareness. Although strategies targeting individuals are important, these activities tend to be resource intensive and have limited impact on population health, largely because they depend on long term individual behavioral change. (Frieden TR, 2010).

In general, population-level strategies require less individual effort, and have the greatest impact on population health outcomes (Frieden TR, 2010). For example, policies supporting smoke free public spaces change the environmental context to makes breathing clean air the default choice, regardless of an individual's level of education, income, access to health care, or other societal factors. An individual would have to expend significant effort to not benefit from a cleaner air policy. Population level strategies improve not only individual health, but also have economic benefits by reducing health care spending and mitigating productivity losses (Frieden TR, 2010). Less than half of all organizations reported that they were very involved in activities that focused on population-level strategies to address tobacco use. The only notable difference was that GOV organizations tended to be more involved in policy development and advocacy than NGOs.

Level of involvement in MPOWER measures

Evidence-based MPOWER measures outlined by the WHO FCTC are strategies countries can use to reduce the demand for tobacco. These measures are inexpensive for countries to implement and they work. Organizations reported the highest level of involvement in measures that focused on protection from exposure to tobacco smoke through creation of smoke free workplaces and public spaces, followed by warning about the dangers of tobacco use, and monitoring tobacco use. Half of all organizations were 'very involved' in measures to promote cessation and treatment for tobacco dependence. Just one-third of organizations were 'very involved' in measures that focused on bans on tobacco advertising, promotion and sponsorship. Among the lowest level of involvement was for activities that focus on raising taxes. Of all the MPOWER measures, increasing the price of tobacco through higher taxes is the single most effective way to encourage tobacco users to quit and prevent children from starting to smoke (WHO, 2008). Of all European countries, CR has the lowest

cigarette prices, due to low excise taxes. While low cigarette prices decrease the demand for illegal or contraband cigarettes, cheaper prices are associated with high smoking rates, and greater uptake among youth. Higher cigarette prices are particularly effective in encouraging cessation and motivate smokers to quit (Ross et al 2011), particularly young people and those living in poverty (WHO, 2008). Over time, simple and effectively implemented tax structures decrease tobacco consumption (WHO, 2008). Individuals living in poverty experience the greatest health disparities (Cheng *et al.* 2016). Higher tobacco taxes help decrease health disparities by helping people to stop using tobacco and allocate money to essentials such as food, shelter and education and health care. This improves families' health, productivity and wage earning capacity by decreasing smoking related illness and death (WHO, 2008).

Barriers to working on tobacco control

More than half of all organizations reported that insufficient funding and inadequate number of staff dedicated to working on tobacco control were the main barriers faced by their organization. Lack of political will and competing priorities, as well as interference from the tobacco industry were all major barriers. Our findings support previously published reports, which showed that the tobacco industry enjoys a high-level of political support in the CR and continues to actively influence tobacco control policies (Shirane *et al.* 2012)

Limitations

This study had several limitations. One limitation is that data were collected from one respondent per organization. Although respondents were carefully selected by the head of each organization, and confirmed to be the most knowledgeable about their organization's tobacco control related activities, responses inevitably influenced by individual views and experiences. Further to this, there are no gold standard measures of organizational capacity. Ideally organizational level constructs such as leadership, supports, partnership effectiveness, resources and skills should be assessed using objective measures. However, within the domain of organizational research, self-report is the most common method of data collection. While cross sectional data are

helpful in identifying strengths and gaps in organizational capacity, and provide a snap shot of organizations' involvement in tobacco control activities, longitudinal data are needed to establish any causal associations. Future research should focus on the association between organizational capacity and level of tobacco control nationally, as well as the association with the prevalence of smoking over time. Another limitation of this study is that we did not ask organizations about facilitators to working on tobacco control related activities. In terms of facilitators, intangible outcomes such as trust, mutual respect, transparency, resource sharing and synergy that may emerge when organizations work together are valuable assets, which contribute to organizational capacity but are difficult to measure. Finally, the extent to which these findings are generalizable to other risk factors for chronic disease, such as physical activity, healthy eating or alcohol abuse is not known.

CONCLUSION

In conclusion, this paper provides the first national description of organizational capacity and involvement in FCTC measures within the Czech Republic. Our data identify areas of TC that need improvement including the need for increased funding and resources dedicated to TC activities, as well as a need for increased involvement in population-level strategies and cross sector collaboration. These findings provide empirical evidence to local decision makers that may inform strategic priorities and help move the TC agenda forward in the Czech Republic.

5.0 Cardiovascular disease and nicotine dependence

According to the WHO, all smokers, but especially those with increased cardiovascular (CV) risk, should be strongly advised to stop smoking and to avoid any exposure to tobacco including passive smoking (WHO, 2008). The risk of an acute CV event is high among smokers due to increased coagulation, which leads to thrombosis (Kannel *et al.* 1987; Wilhelmsen 1988; Fuster *et al.* 1992; Ernst 1994; Sambola *et al.* 2003).

Every clinician should provide a brief intervention with smokers and intensive treatment should be available to those who need it (Fiore *et al.*, 2008). Across the CR there are 37-hospital based Centers for Tobacco Dependence. These centres offer treatment to tobacco users, which include psychobehavioral intervention and/or pharmacotherapy (varenicline, nicotine, bupropion).

In order to demonstrate the efficacy of intensive treatment of nicotine dependence, we conducted the study presented in the following pages. Our cohort consisted of more than 3,000 patients who had completed the 12 month follow-up between 2005 and 2013 (intention-to-treat analysis). We compared one year abstinence rates in the following groups of patients: those who only came to the center for the initial screening visit + the 12-month follow-up visit, and those who also underwent the intervention (screening, intervention and attended at least one 12-month follow-up visit). Within the group that underwent the intervention, we also compared patients who used pharmacotherapy (varenicline, nicotine, and/or bupropion) versus those who did not. Our findings provide strong empirical evidence supporting the efficacy of treatment nicotine dependence.

4.1 Tobacco Dependence, the Most Important Cardiovascular Risk Factor: Treatment in the Czech Republic

The pathophysiological effects of smoking are broad due to more than 4000 chemicals, including polycyclic aromatic hydrocarbons and oxidizing gases, most of which have cardiotoxic effects (Haustein, 2002; Ambrose and Barua, 2004). Nicotine is a sympathomimetic agent with potential cardiovascular (increase in heart rate, blood pressure and cardiac output) and metabolic effects (increased lipolysis) (Benowitz 1998; Ambrose and Barua, 2004). It appears that pure nicotine itself has no significant influence on the development of CVD. Nicotine is highly addictive and causes addiction to tobacco, which results in inhalation of tobacco smoke with noxious agents (Asplund, 2003). The risk of an acute CV event is higher among smokers due to increased coagulation, which leads to thrombosis (platelet activation and aggregation, activation of coagulation, increased fibrinogen level, increased levels of tissue factor, leukocyte count, and D-dimer, and plasma viscosity) (Kannel *et al.*, 1987, Wilhelmsen, 1988; Fuster *et al.*, 1992; Ernst, 1994; Sambola *et al.*, 2003). Even a small dose, including passive smoking, increases platelet aggregation. These findings may at least partly explain the higher risk of coronary thrombosis in smokers (Lee *et al.*, 1995; Puranik and Celermajer 2003). Active and passive smoking are associated with endothelial dysfunction in a dose-dependent manner (Kato *et al.* 2006). There is reduced release and availability of NO and the formation of a chronic inflammatory condition (leukocytosis, elevated CRP).

Smoking and hypertension have the same effect on the progression of early atherosclerosis (Csányi *et al.*, 2001). Impaired relaxation of arteries observed in an animal model, suggests a possible degradation of NO by anionic superoxide of cigarette smoke (Török *et al.*, 2000). In vitro studies have demonstrated the association between smoking with altered endothelial-derived fibrinolytic and antithrombotic factors: t-PA/PAI-I reduction, lower 1-TFPI (tissue factor pathway inhibitor), and reduced production of NO (Barua *et al.*, 2002). Nicotine stimulates the production of endothelium-derived chemoattractants that enhance the migration of smooth muscle cells of blood vessels (Di Luozzo *et al.*, 2005). Endogenous NO production may be a protective mechanism against endothelial damage induced by smoking (Raveendran *et al.*, 2005). Nicotine increases the level of VEGF mRNA, as

well as proteins in the endothelium and may increase the release of TNF-alpha and IL-1beta from macrophages (Conklin *et al.*, 2002, Wang *et al.*, 2004). Inhibition of endothelial cell migration in the presence of a condensate of cigarette smoke leads to a higher probability of developing complications due to incomplete reendothelialization (Snajdar *et al.*, 2001). Smoking also has broad endocrine effects (Hruskovicova *et al.*, 2013).

Due to CV risk all smokers, but especially those with increased CV risk, should be strongly advised not to smoke (diagnosis F17), and to avoid any exposure to tobacco including passive smoking (diagnosis E58.7), according to the International Classification of Diseases, 10th version (WHO 2008).

Every clinician (physician, nurse, pharmacist) should provide a brief intervention with smokers and intensive treatment should be available to those who need it (Fiore *et al.* 2008). Treatment that includes a psychobehavioral intervention and pharmacotherapy (varenicline, nicotine, bupropion), is offered at Centers for Tobacco-Dependence. There are currently 37 hospital-based centers across the Czech Republic. Education of Czech physicians, pharmacists and nurses in smoking cessation regularly occurs under the Society for Treatment of Tobacco Dependence (info at www.slzt.cz).

METHODS

To demonstrate the efficacy of intensive treatment, we present a cohort of patients who visited the Center for Tobacco Dependence in the Czech Republic. Smokers were self referred or referred by a physician to the center for treatment. We compared one year abstinence rates in the following groups of patients: those who only came to the center for the initial screening visit + the 12-month follow-up visit, and those who also underwent the intervention (screening, intervention and attended at least one 12-month follow-up visit). Within the group that underwent the intervention, we also compared patients who used pharmacotherapy (varenicline, nicotine, and/or bupropion) versus those who did not.

The treatment in our center starts with an initial 1-h screening visit. Each patient's level of nicotine dependence is assessed using a series of measures, including the Fagerström Test of Cigarette Dependence (FTCD) (Fagerström *et al.*, 2012), CO in expired air, the number of cigarettes smoked in the past 12 h, Beck Depression Scale II (BDI-II) (Beck *et al.*, 1996), and the Minnesota Withdrawal Scale (Hughes, 2007). Within one week of the initial screening visit, patients undergo a 2-h intervention with a physician. There is a mean of 4 follow-up visits during the next 12 months. The first follow-up visit usually occurs within 2 weeks of the intervention, and monthly thereafter.

The intervention with a physician is performed individually or in small groups with 4-5 individuals. Following the intervention, based on our recommendation, the patient is offered either varenicline, nicotine replacement therapy or bupropion and/or a combination. We set a quit date. Follow-up visits take about 30 min and include checking the patient's weight, blood pressure, and heart rate. We measure CO in expired air and discuss withdrawal symptoms, as well as we check the treatment. The visit schedule and intervention structure are described in Table 5.

This analysis was approved by the Ethics Committee of the General University Hospital in Prague, registration FWA 00003027 – according to the Office for Human Research Protections, U.S. Department of Health and Human Services, under No. IRB 00002705. The General University Hospital is registered under No. IORG 0002175.

Standard descriptive statistics were used to characterize the sample data set. Statistical significance of differences in 12-month abstinence rate by gender and the type of pharmacotherapy used were assessed by Fisher- exact test. Statistical significance of differences in baseline characteristics between groups of patients who had undergone the intervention and those who did not was assessed by Mann-Whitney test or Pearson Chi-square test. A significance level of $\alpha = 0.05$ was used.

RESULTS

Our analysis included 3532 patients who had completed the 12 month follow-up between 2005 and 2013 (intention-to-treat analysis). The abstinence rate was 34.3 % in all patients including those who had attended only the initial screening and the 12-month follow up visit, compared to 38.2 % among those who had also undergone the intervention (initial screening visit, intervention and at least the 12-month follow-up visit). For more detail see Figures 1 and 2, and Table 6. In Table 7 selected CV risk factors are compared.

Pharmacotherapy (any kind) significantly increased the abstinence rate. The majority, 81 % of patients used some form of pharmacotherapy. Among patients who had used some form of pharmacotherapy the abstinence rate was 43.4 %, compared to 15.9 % among patients who tried to stop smoking without pharmacotherapy (Fig. 3).

Although health was the most frequent reason to stop smoking – in 68 %, only 28 % of patients said their physician had recommended they visit our center. Most patients learned about our center by way of media, including Internet – 49%, followed by the recommendation of other patient's – 18%. The rest learned about our center from other sources (5 %). For a more detailed description of our patients and results, including abstinence rates according to pharmacotherapy used, psychiatric comorbidity or CV risk factors see our other publications (Zvolska *et al.*, 2012; Kralikova *et al.*, 2013; Stepankova *et al.*, 2013; Kmetova *et al.*, 2014).

DISCUSSION

Stopping smoking without any help has a low long-time success rate, about 5 % (Fiore *et al.*, 2008). Intensive treatment may increase the number of former smokers substantially. Brief smoking cessation interventions are still not a usual part of clinical practice. Eighty percent of Czech physicians report asking about tobacco use and advising patients to stop smoking, but the next steps of the brief intervention are rarely followed. It is necessary to offer help in quitting (recommend treatment or refer

the patient to a Center for Tobacco-Dependence), and to plan follow-up visits (Kralikova *et al.*, 2011). For a center located in a large hospital we would expect more than 28 % of patients would be referred based on a physician's recommendation. The majority of smokers learn about intensive treatment possibility from sources other than their physician, which may suggest that brief smoking cessation intervention is not regularly used in clinical practice.

Also the diagnosis Z58.7 (passive smoking) may be a teachable moment, if used. Currently, this diagnosis is not used at all in the Czech Republic. Only 1.5 % of hospitalized patients was diagnosed F17 (tobacco dependence) in 2011 (Zvolsky *et al.* 2012) – despite a 30 % smoking prevalence in the population with about 80 % of smokers being dependent (Sovinova and Csémy, 2013). A similar situation was described in psychiatric care in the USA with an 88 % prevalence of tobacco use among psychiatric patients, while only 2 % were diagnosed. Among psychiatric patients who smoke, even more than 80 % were dependent (Peterson *et al.* 2003).

Our results are comparable with international results. For patients receiving outpatient treatment at the Nicotine Dependence Center (NDC) of the Mayo Clinic in Minnesota, USA, the 6-month smoking abstinence rate has been reported ranging from 22 % to 25 %. The 1-year smoking abstinence rate for patients who enter the residential treatment program at NDC is reported to be 52 %. But, one limitation is that abstinence is verified there mainly by telephone only (Hurt *et al.* 2009).

Choice of medication depends on the intensity of addiction, but also on the patient's previous experiences, preferences, financial options, etc. Interestingly there is a fear of adverse effects with smoking cessation pharmacotherapy (either nicotine, varenicline or bupropion) among patients as well as physicians, though no adverse cardiovascular (Mills *et al.*, 2013) or neuropsychiatric effects (Thomas *et al.*, 2013) have been proven.

CONCLUSION

Smoking cessation intervention is a missed opportunity in cardiology despite many pathophysiological CV links that could be used to enhance patients' motivation to stop smoking. The possibility of intensive treatment of tobacco dependence could be used more broadly especially in CV patients or patient with elevated CV risk.

6.0 Tobacco use among the critically ill

Among tobacco users, those who suffer from chronic health conditions and continue to smoke may be among the most heavily addicted. Despite poor health and the knowledge that cessation would bring important health benefits many of these tobacco users are unable to stop smoking (Woodward M and Tunstall-Pedoe 1992; Archbold *et al.*, 1995; van Berkel *et al.*, 1999). This may not be due to lack of motivation, but rather speak to their level of nicotine dependence (West, 2004).

Among patients that suffer from chronic health conditions, there is a need for more consistent screening protocols and referral procedures to help patients who may need treatment for nicotine dependence. This represents an important gap in the Czech health care system. In order to demonstrate point, we conducted a study focused on patients with end-stage lung disease. We conducted a cross-sectional survey of urinary cotinine to assess tobacco exposure in 203 patients in the Lung Transplant Program in the Czech Republic. We measured urinary cotinine in 163 patients prior to inclusion on the transplantation waiting list, and 53 patients post bilateral lung transplantation.

Our findings provide evidence that smoking resumption may be an under recognized risk for lung transplantation recipients, particularly among patients with chronic obstructive pulmonary disease. More rigorous screening, as well as support and treatment to stop smoking among these patients are needed.

6.1 Continued Smoking in Lung Transplant Patients

Cigarette smoking is the single greatest modifiable risk factor for death and illness due to lung disease (U.S. Department of Health and Human Services, 2004). The benefits of smoking cessation are well established. Despite advances in medical therapy, lung transplantation (Tx) remains the best treatment option for patients with end-stage lung disease. The demand for lung transplantation greatly exceeds availability, yet developing rigorous selection criteria and methods to identify suitable transplant recipients continues to present unique challenges.

Patients who actively abuse drugs, alcohol or use tobacco products are routinely excluded from Tx waiting lists (WL), until they have been abstinent for at least 6 months. Among patients with alcoholic liver disease, many programs require a minimum of 6 months of abstinence from alcohol before placement on the transplant waiting list (Lucey *et al.*, 1997). Similar to alcohol dependence, tobacco dependence is a chronic disease characterized by relapse and remission (Center for Tobacco Research and Intervention, 2015).

Pharmacological treatment combined with intensive counseling has been shown to improve smoking cessation rates (Dornelas *et al.*, 2000; Jorenby *et al.*, 1999; Gonzales *et al.*, 2006). While the risk of smoking on post lung Tx outcomes have not yet been adequately described (Corbett *et al.*, 2012), evidence in liver, heart and renal Tx patients suggest that smoking is associated with higher incidence of post-Tx complications and mortality (Vos *et al.*, 2010; Herrero *et al.*, 2005; Vallejo *et al.*, 2005; Pungpapong *et al.*, 2002; Botha *et al.*, 2008; Nguyen *et al.*, 2007). Despite efficacy of current cessation therapies, compliance among transplant recipients is often poor, with 10–40% returning to smoking post- Tx (Corbett *et al.*, 2012). Few centres actively screen patients for tobacco exposure or offer cessation support to patients, particularly post Tx (Vos *et al.*, 2010). Many centres rely on self-reported smoking status, which has previously been shown to be unreliable. (Nguyen *et al.*, 2007; Attebring *et al.*, 2001; Woodward M and Tunstall-Pedoe 1992).

Despite the severity of their illness and the knowledge that quitting would have important long-term benefits, many patients continued to smoke (Woodward M and

Tunstall-Pedoe 1992; Archbold *et al.*, 1995; van Berkel *et al.*, 1999). This may not be due to the lack of motivation to stop smoking, but rather a matter of dependence for these patients (West, 2004). Furthermore, despite lung Tx candidates' reliable self-reported disclosure of active smoking, it is unlikely that their survival may depend on inclusion on the Tx WL. Due to the limited number of suitable donors and the high demand for Tx, it is important that centres are able to detect patients who deceptively report smoking behaviour in order to select patients who will have the best outcomes long term. The aim of this study was to determine the prevalence of smoking among patients post lung Tx, as well as prior to inclusion on the Tx WL, and to offer treatment of tobacco dependence to smokers. The only lung Tx center in the CR is located at the University Hospital in Motol. The centre has performed about 20 lung Tx per year since 1997. To date, physicians in the CR have relied solely on self-reported smoking status. This study is the first to measure urinary cotinine levels prior to inclusion on the Tx-WL and post lung-Tx among patients in the Czech Republic.

METHODS

Between January 2009 and April 2012, we conducted a cross sectional survey of urinary cotinine levels to assess tobacco smoke exposure in 203 patients in the Lung Transplant Program. The purpose was to biochemically validate self-reported smoking status in these patients and determine if ongoing screening might be necessary. All patients had been diagnosed with end-stage lung disease and were cared for by the Department of Pneumology, 2nd Faculty of Medicine, Charles University in Prague, and the University Hospital in Motol, Czech Republic.

Urine samples were obtained from patients at routine visits. 163 patients were tested prior to inclusion on the lung transplant WL. 53 patients were tested post-Tx as bilateral lung recipients cared for by Lung Transplant Centre, 3rd Department of Surgery, 1st Faculty of Medicine, Charles University in Prague, and Motol University Hospital, Czech Republic. 13 patients were tested both prior to inclusion on the WL and post-Tx.

Prior to inclusion on the Tx-WL, patients had to meet the following criteria: the terminal state of pulmonary disease with expectancy survival of 12–18 months; the dependence of oxygen inhalation from oxygenator; and exhaustion of all other conservative treatment options. Patients had to meet standard criteria for specific diagnoses and avoid all absolute contraindications, including: malignant tumor, progressive neuromuscular disease, severe systemic disease or infection (HIV, hepatitis B or C), multi organ failure, ideal body weight < 70% or > 130%, long term corticoids treatment > 20mg Prednisone/ day, smoking or drug use during last six months, acute infection, psychosocial instability, or diabetes mellitus with organ complications. Other relative contraindications included: age > 65, the need for invasive ventilation, cardiac disease, or renal disease with creatinine clearance < 50mg/ml/min. Prior to inclusion on the WL, all patients in our sample met the inclusion criteria, but only had to prove they had been smoke-free during the last 6 months. All patients were advised to avoid active and passive smoking. This was validated by a negative urinary cotinine result, which was an obligatory parameter for the inclusion on the transplant WL. Among patients who had a positive or borderline result, passive smoking was discussed, and they were tested again at subsequent visits. All patients were asked about the use of nicotine replacement therapy or nicotine in other forms (none reported). Two patients reported using electronic cigarettes.

Between January 2009 and April 2012, all lung Tx recipients and patients prior to inclusion on the Tx-WL were eligible to be included in the study. All post-Tx patients were tested for urinary cotinine as a part of annual Tx follow up. The data including demographic characteristics and diagnosis was obtained from patients' charts (see Table 1). This study was approved by the ethics committee at University Hospital in Motol, Czech Republic.

Urinary cotinine (COT) was measured as a marker of smoking. Urinary cotinine levels (COT) were assessed by semiquantitatively urine enzyme immunoassay (DRI® Cotinine Assay, Microgenics Corporation, Fremont, CA, USA) (West, 2004; Wilcox *et al.*, 1979). Based on urinary cotinine levels, patients were categorized as positive (\geq 500 ng/ml), negative (< 50 ng/ml), or borderline (50-499 ng/ml), according to their level of tobacco exposure. In the case of a positive or borderline result, the measure

was confirmed by LCMS/MS (Applied Biosystems, 3200 Q Trap®, Singapore, Singapore) (Wilcox *et al.*, 1979; Jones-Burton *et al.*, 2007; Chambers *et al.*, 2001; Urakawa *et al.*, 1994; Chadwick and Keevil 2007; Zielińska-Danch *et al.*, 2007). Patients with a borderline or positive result were tested again at subsequent visits. Previously established urinary cotinine cut-off points were used to categorize patients as negative, borderline or positive for tobacco smoke exposure (Zielińska-Danch *et al.*, 2007). These cutoffs were established by Zielińska-Danch *et al.* to distinguish non-smokers, passive and active smokers. A brief cessation intervention (up to 10 minutes) was conducted with all smokers, as well as the recommendation to visit the Centre for Tobacco-Dependence.

Statistical analyses were performed using MedCalc for Windows, version 12.4.0 (MedCalc Software, Mariakerke, Belgium). For post-Tx patients and patients prior to inclusion on the WL, means and standard deviations were calculated for continuous variables, whilst frequencies and percentages were calculated for the categorical variables.

RESULTS

The majority of patients in both observed groups suffered from chronic obstructive pulmonary disease (COPD) or idiopathic pulmonary fibrosis. Patients with Cystic Fibrosis were on average 25.6 years younger than patients with other diagnoses (Table 8).

Among patients prior to the inclusion on the Tx waiting list, 4.9% (8/163) had at least one positive urinary cotinine test corresponding to active smoking (Table 9). Two patients reported using electronic cigarettes. Another 6.1% of patients (10/163) had borderline results, and the test was repeated. In the case of positive or repeated borderline tests, patients were not included to the WL until they had been smoke-free (negative test for urinary cotinine) for at least 6 months. Prior to inclusion on the Tx-WL, all patients were tested for cotinine in urine.

The prevalence of positive urinary cotinine among patients post-Tx was 15.1% (8/53). An additional 3.8% of post-Tx patients (2/53) had borderline results. One year post-Tx, 80% of all patients were tested for urinary cotinine during the observed period at a median of 1.4 (0.95 – 2.64) years. There was no known selection bias.

Regarding patients' positive and borderline urinary cotinine levels, corresponding to active smoking, the prevalence of cotinine was consistently higher among patients with COPD at both time points, compared to patients with other diagnoses (Table 10). All patients who tested positive for urinary cotinine levels were offered smoking cessation support, but only one Tx patient sought treatment for tobacco dependence at the Centre for Tobacco Dependent. That patient did not quit smoking.

Post-Tx, the prevalence of smoking resumption was 15% (8/53), based on positive urinary cotinine levels. The highest prevalence post-Tx was among patients with COPD, with 38.5% (10/26) having positive or borderline urinary cotinine levels corresponding with active smoking. All patients who tested positive for urinary cotinine levels were offered smoking cessation support.

The odds of smoking resumption was not different for men or women. There was a trend towards women tending to be more likely to have a positive or borderline urinary cotinine result prior to the inclusion on the Tx WL, but the difference was not significant.

The odds of smoking resumption were higher among patients with COPD, compared to patients with other diagnoses, at both time points. Prior to inclusion on the WL, the odds of smoking resumption was 4.13 times higher among patients with COPD (Table 9), and 35 times higher post-Tx, compared to patients with other diagnoses.

DISCUSSION

Our most remarkable finding was the high prevalence of smoking resumption post-Tx, particularly among patients with COPD. Despite the fragility of their condition, 15% of all tested lung Tx recipients had urinary cotinine levels corresponding to

active smoking; a further 3.8% had borderline results. Compared to patients with other diagnoses, patients with COPD were 35 times more likely to resume smoking post-Tx.

Our findings are similar to those of Vos *et al.* who found that 11% of lung Tx recipients self-reported smoking resumption post transplantation (Vos *et al.*, 2010). Similarly, the prevalence was higher (23%) among patients with emphysema due to COPD (Vos *et al.*, 2010). Risk factors, including shorter cessation period prior to transplantation, lower socioeconomic status, exposure to second-hand smoke, emphysema, and death of a spouse were all associated with a higher likelihood of smoking resumption post-Tx (Vos *et al.*, 2010). In a group of 331 lung Tx patients, Ruttens *et al.* found that the prevalence of post-Tx smoking was 12%, and they identified peer group smoking as an important risk factor for smoking resumption (Ruttens *et al.*, 2014).

Over a period of 13 years, Botha *et al.* covertly assessed smoking habits among cardiac transplant patients (2008). They found that 27% tested positive for urinary cotinine levels corresponding to active smoking at least once post transplant; 15% tested positive repeatedly (Botha *et al.*, 2008). Post cardiac transplantation, smoking shortened median survival and was the most significant determinant of overall mortality (Botha *et al.*, 2008). Among liver transplant recipients, Lee *et al.* found that 12% self-reported smoking resumption post surgery (Lee *et al.*, 2009). Bright *et al.* similarly found that 17% of liver transplant recipients' self-reported ongoing tobacco use (Bright *et al.*, 2010). They also found that self-reported smoking behaviour was not the most reliable measure, as 11% of liver transplant recipients who denied tobacco use, had serum cotinine levels that corresponded to active smoking (Bright *et al.*, 2010). Among renal transplant recipients, Nguyen *et al.* found that 34% of patients with serum cotinine levels corresponding to active smoking, claimed to be non-smokers (Nguyen *et al.*, 2007).

Ensuring that candidates are abstinent prior to transplantation is important, but this is only half of the equation. Few centres actively screen patients for tobacco exposure or offer cessation support to patients, particularly post transplantation (Vos *et al.*, 2010). Until 2008, the Pneumology Clinic and the Lung Transplant Centre in Prague relied

solely on patients' self-reported smoking status. No further validation was deemed necessary, as those patients were considered to be too ill to continue smoking. We found that 4.9% of transplant candidates prior to inclusion on the WL tested positive for urinary cotinine levels corresponding to active smoking; a further 6.1% had borderline results. Those findings clearly speak to the degree of nicotine dependence among some patients, the need for active screening, and the importance of offering an ongoing smoking cessation support to patients both pre- and post-Tx.

Despite the fact that patient compliance with cessation measures is often poor, this problem may be perpetuated by a number of factors. Beyond self-reported smoking status, few centers actively screen for tobacco use, or collect a comprehensive smoking history on their patients. Factors, such as the duration of abstinence period, quit attempts, the age of initiation, demographics, behavioural and psychosociological factors have all been shown to influence cessation (Caponnetto *et al.*, 2008; Dobbels *et al.*, 2006). The implementation of a more rigorous screening program will help centres identify patients who may benefit from an ongoing cessation support, and those patients who may be the most promising candidates for Tx.

To date, pharmacological treatment for nicotine withdrawal symptoms combined with intensive counseling have been shown to improve quit rates (Dornelas *et al.*, 2000; Jorenby *et al.*, 1999; Gonzales *et al.*, 2006). Our findings underscore the need for physicians to proactively address smoking behaviour and screen patients for smoking at each visit. Unfortunately, many physicians are ill prepared to talk to their patients about smoking and, therefore, do not intervene (Roddy *et al.*, 2004). While physicians need support, information and training to effectively intervene, there is also the need for a reliable system of tobacco treatment centres, where patients can be referred to in order to receive the specialized cessation support they need.

Limitations of the current study include: a small sample size (dictated by the number of lung Tx in the Czech Republic, which is around 20 per year) and the availability of sociodemographic characteristic (e.g. socioeconomic status, marital status, stress/anxiety, depression, etc.), as well as more detailed information about patients' smoking histories (e.g. quit attempts, the duration of abstinence, the age of initiation,

smoking frequency, the degree of nicotine dependence, etc.). Without proper screen protocols in place, the medical staff cannot proactively identify patients who may have relapsed, or refer them to appropriate cessation supports. Another limitation is that only 80% of all patients were tested one year post-TX in the observed period. Despite results of a pilot study that showed the importance of an ongoing screening, testing may not have been perceived as a priority by staff, and, in some cases, samples were never collected. In some cases, patients did not show up for follow-up visits, or there were issues relating to handling and processing samples.

All biochemical tests can trigger false results. In the case of urinary cotinine, the use of nicotine replacement therapy or ingestion of nicotine in any form will result in a positive test, even though the patient may have quit smoking. In the case of a false positive result, the patient should be questioned about any tobacco smoke exposure in more detail, and another test should be conducted at a subsequent visit. All patients in the study were asked about the use of nicotine replacement therapy or the use of nicotine in any form; none was reported. Two patients reported using electronic cigarettes. The biological cut offs used included a range that would account for even higher levels of exposure to environmental tobacco smoke, so there is little likelihood of a false positive result due to passive smoking. A false negative result is also possible in the case where enough time has passed for cotinine to be eliminated from the patient's system prior to the test, but this result is not likely in heavy smokers.

CONCLUSION

Despite the fragility of their condition, smoking continues to be an issue for many patients with end stage lung disease. The prevalence of smoking among patients post lung Tx, as well as prior to the inclusion on the Tx-WL, provides evidence that an ongoing screening is necessary to detect smoking resumption. The implementation of routine screening protocols may help centers identify those candidates who are likely to have the best outcomes post transplantation.

7.0 Translating research into practice

There is strong evidence supporting the use of brief intervention with smokers at each clinical contact (success rate of 5-10 %). Intensive treatment (success rate >30%) should be available to those who need it. Tobacco related comorbidities and treatment of dependence are relevant to clinicians of all disciplines, yet brief intervention is still not part of standard clinical practice in the CR.

In order to translate the latest evidence into practice clinical practice, medical professionals from all disciplines must recognise tobacco dependence as a disease (code F17), and incorporate tobacco dependence treatment into clinical practice guidelines (CPG). In order to highlight this critical gap practice, we conducted a review of all CPG documents relating to cardiovascular and respiratory diseases, as well as cancer from 20 selected medical professional societies within the CR. We searched each document for keywords "smoking", "tobacco" and "nicotine addiction". Our findings provide evidence that despite the clinical significance of smoking, the majority of CPG did not adequately address tobacco dependence and its treatment, representing a major gap in translating research findings into clinical practice.

7.1 Treatment of Tobacco Dependence: A critical gap in Czech Clinical Practice Guidelines.

Smoking is the leading cause of preventable death globally (WHO, 2008). Cardiovascular diseases (CVD) are the most common cause of death among smokers. In the CR, about 2,000 more people die annually due to CVD than to lung cancer, the most common form of cancer caused by smoking (Peto R, *et al.*, 2015). Overall mortality in the CR due to smoking is about 14,000 people a year (Peto R, *et al.*, 2015). Compared to developed Western countries of the EU, the prevalence of smoking in the CR is high – 29% (33% men, 24% women) (Cifkova, 2006; Sovinová *et al.*, 2012). The prevalence of smoking in the CR undoubtedly contributes to the country's high cardiovascular mortality rate, which in 2001 was almost two times greater than that of other European countries (15 European Union member states before 2004) (Molarius, *et al.*, 2001).

Tobacco dependence is a chronic disease characterized by relapse and remission, which can be reported according to the International Classification of Diseases 10 (ICD-10) code F17 (Hughes *et al.*, 2004; WHO, 2011). The quit rate among smokers who stop without help or using methods with placebo effect is about 2–5% after one year (Hughes *et al.*, 2004; Royal College of Physicians of London, 2000). According to the WHO, all physicians should provide a brief intervention for tobacco use to a patient at each clinical contact. The success rate of brief intervention is 5–10% (Fiore *et al.*, 2008). A brief intervention consists of 5 points known as the “5 A’s”. The intervention involves asking the patient about tobacco use, advising the patient to quit, assessing readiness to quit, assisting the patient in quitting, and arranging for follow up (Fiore *et al.*, 2008). People unable to quit should be recommended to receive intensive specialized treatment. The success rate with intensive treatment (psychobehavioural therapy and pharmacotherapy) provided by specialized Centres for Tobacco-Dependent (CTD) in the CR is over 30% after one year (Králíková *et al.*, 2013; WHO, 2014).

Brief intervention with patients who smoke is still not standard clinical practice in the CR. Eighty percent of Czech physicians ask about tobacco use and advise patients to quit. Beyond this, subsequent parts of the brief intervention are delivered to smokers

i.e. assessing readiness to quit, assisting the patient to quit, and arranging for follow up (Králíková *et al.*, 2011).

According to the National Institute of Health, clinical practice guidelines (CPG) are systematically developed statements to assist practitioners and patients in making appropriate decisions about health care for specific clinical circumstances (Field and Lohr, 1992). CPG help support the transfer of research knowledge into clinical practice. Tobacco related comorbidities and treatment of tobacco dependence are relevant to clinicians of all disciplines. According to the WHO there should be a systematic approach for incorporating brief tobacco interventions into primary health care services (WHO, 2014).

Our aim was to determine whether or not tobacco dependence treatment recommendations were included in selected CPG documents for cardiovascular and respiratory diseases, cancer and related comorbidities from various medical disciplines.

METHODS

In the Czech Republic, there are approximately 120 medical professional societies. Most of these societies are part of the Czech Medical Association of Jan Evangelista Purkyně (CzMA) (CMA JEP 2014). We selected 20 societies (Table 11) in the fields of internal and general medicine or oncology that had published CPG on their websites. These documents were freely accessible online as of December 2, 2013. We then selected current CPG from each society that addressed education, treatment or prevention of diseases related to smoking as a risk factor. We excluded CPG that addressed acute conditions, diagnostics only, laboratory methods, or administration. We searched for keywords “smoking”, “tobacco” and “nicotine addiction” in the full text of 94 selected CPG documents. Documents were reviewed to determine if smoking was mentioned as a risk factor (RF) or if they included any recommendations relating to intervention or treatment.

According to the results of the keyword search, we classified the CPG documents into four groups: CPG with no mention of smoking; CPG that reported smoking as a RF; CPG that included two word recommendation to stop or minimize smoking; CPG with a comprehensive approach that included recommendation to use a brief intervention, a link to the Centres for tobacco-de-pendent, or guidelines for tobacco dependence treatment (Králíková *et al.*, 2015; Society for Tobacco Dependence Treatment, 2014).

RESULTS

Among all CPG documents related to cardiovascular and respiratory diseases as well as cancer, 27.7% (26/94) did not mention smoking. 16% (15/94) of documents listed smoking among risk factors. 42.5% (40/94) of CPG included some recommendation to stop or minimize smoking (e.g. “smoking ban”). 13.8% (13/94) of CPG recommended a comprehensive approach to treatment or prevention of tobacco use.

CPG documents which included no mention of smoking in the diagnosis and treatment included venous thromboembolism, diabetic retinopathy, atrial fibrillation, chronic pulmonary hypertension, obesity, cystic fibrosis, interstitial lung disease, tuberculosis, malignant pleural mesothelioma, chronic pancreatitis, colorectal cancer, malignant lymphoma, hepatocellular cancer, and dyslipidemia.

Many CPG documents mentioned smoking only as a RF in the introduction, and rarely mentioned tobacco use in terms of primary and secondary prevention. Smoking related recommendations were often included in the non-pharmacological treatment section of CPG. The most frequently mentioned smoking related recommendations, in descending order, included; smoking ban, cessation, abstinence, elimination, and quit smoking/stop smoking. The terms smoking minimization, avoiding smoking, warning against smoking, smoking omission, give-up smoking, and restriction on smoking were each mentioned only once in the 94 CPG documents we reviewed. Only two professional societies had a link to the Guidelines for Tobacco Dependence Treatment on their website (Czech Society of Cardiology and Czech

Society for Oncology). The Prevention of Cardiovascular Diseases in Adults – Joint Guidelines of Czech Professional Societies (2005) is the only CPG document that fully addressed tobacco dependence treatment (Cífková *et al.*, 2005)

DISCUSSION

Despite the clinical significance of smoking, few medical professional societies in the CR adequately addressed tobacco dependence and treatment in their CPG documents. One quarter of the selected CPG documents did not include any mention of smoking. Only 16% of CPG named smoking as a risk factor for cardiovascular and respiratory diseases, cancer, and related comorbidities.

Forty two percent of CPG documents contained a recommendation to quit smoking, most often using the phrase “smoking ban”. Some documents used terms such as “minimize” or “restrict smoking”. It would be appropriate to replace these terms with a clear recommendation for patients to stop smoking. This means zero exposure to tobacco smoke, including secondhand smoke. The ultimate goal for patients is smoking cessation, not reduction because there is no safe level of tobacco exposure (U.S. Department of Health and Human Services, 2014). If we recommend that tobacco-dependent patients reduce the number of cigarettes without medication, the patient smokes the reduced number of cigarettes more intensively. This is known as compensatory smoking as it allows the patient to obtain the required dose of nicotine with fewer cigarettes and reduces withdrawal symptoms (Shahab, 2012; NICE, 2013).

The majority (80%) of smokers are physically addicted to nicotine and cannot stop smoking without help (Balfour, *et al.*, 2004; Stead *et al.*, 2008). It is therefore important to proactively offer smokers treatment and information on where they can seek help, when they are ready to quit. In this study, we focused on CPG because they are a key component of evidence-based medicine (Brownson *et al.*, 2011). CPG from the Czech Society of Cardiology state that “no drug can reduce cardiovascular mortality, by 25–50%, as effectively as smoking cessation” (Widimský, *et al.*, 2002). Only 14% of the selected CPG documents included the points of a brief intervention, a more detailed section on tobacco dependence treatment or a link to the Guidelines

for Tobacco Dependence Treatment. CPG from the UK's National Institute for Health and Care Excellence (NICE) may be a good example of how tobacco treatment guidelines can be incorporated into the Czech CPG. The NICE guidelines state that one of the points of care for the patient with a concrete diagnosis of nicotine dependence is to offer advice to quit smoking, and provides links to the guidelines for brief interventions and Smoking Cessation Services in the UK (NICE, 2009; 2006; 2008).

Limitations of this study may include the parameters of CPG documents selected, the changing number of medical professional societies, the availability of CPG freely online, as well as the number of CPG documents published by each society. We chose only CPG documents related to clinical practice of cardiovascular and respiratory diseases, and cancer. However, all physicians should intervene with smokers regardless of their area of specialization. A brief intervention for tobacco dependence is simple, quick (3–5 minutes), and effective (Fiore et al., 2008). It would be well justified to recommend that a brief intervention should be conducted with all smokers. Tobacco dependence treatment guidelines should be included in all CPG, including those that were not included in this survey.

The presence of a short description of the brief intervention or reference to the guidelines for tobacco dependence treatment in CPG documents may help remind physicians of the importance of routinely providing a brief intervention to patients who smoke. More recent research has shown a shorter form of the 5 A's model to be effective for busier clinics or providers. The Mayo Clinic, Rochester, MN, USA uses the 2 A's (Ask, Advice) and R (Refer) to the Nicotine Dependence Centre (Hurt *et al.*, 2009; Schroeder 2005; Campbell *et al.*, 2006). The treatment in specialized Centres for Tobacco-Dependent (CTD) (Society for Tobacco Dependence Treatment, 2014) in the CRIs carried out according to current evidence based guidelines (Fiore *et al.*, 2008; Králíková *et al.*, 2015). Since 2013, the Czech Society for Tobacco Dependence Treatment has begun to advocate that professional societies include more detailed information on tobacco dependence treatment in forthcoming updates of any CPG documents.

CONCLUSION

CPG documents from selected medical professional societies in the CR did not adequately address the importance of smoking cessation. Smoking cessation should not be viewed as a mere lifestyle change, but rather imperative to good health and a necessary part of treatment for many diseases. CPG are an important source of evidence-based information for clinicians. CPG should provide up to date information on tobacco dependence, treatment and highlight the importance of using brief intervention with patients who smoke at each clinical contact.

8.0 CONCLUSIONS

Tobacco related chronic diseases are an enormous and growing burden on the Czech health care system. Lessons learned and experiences of global TC leaders, such as Canada, may provide the Czech Republic with a roadmap to help guide decision makers in identify policy *best buys* moving forward. Despite the high social and economic costs of tobacco use, at a systems level few Czech organizations are involved in chronic disease prevention activities that address tobacco use. Among organizations involved, many are under resourced, lack core chronic disease prevention skills and face many barriers to moving the tobacco control agenda forward.

Brief intervention for treatment of tobacco dependence is still not part of routine care and treatment is not accessible for many tobacco users. Despite strong evidence that shows that nicotine replacement therapy increases cessation rates, pharmacotherapy is still not covered by health insurance plans in the Czech Republic.

Many tobacco users suffer from chronic health conditions and continue to smoke despite knowing that cessation would have many long-term health benefits. This speaks to the level of nicotine dependence, rather than a lack of motivation. Screening protocol and referral procedures to help patients who may benefit from treatment of nicotine dependence are inconsistent or unreliable. This represents an important gap in the Czech health care system.

Further to this, clinical practice guidelines do not adequately address tobacco use, or offer evidence based treatment guidelines that would help guide practitioners in how to help patients who smoke. This represents a major gap in knowledge translation.

Our findings provide empirical evidence that there are major gaps relating to treatment of tobacco dependence, as well as tobacco control more generally within the Czech Republic. In order to move the tobacco control agenda forward there is a need to build a comprehensive and sustainable national strategy for multi-sectoral tobacco control programs and policies within the Czech Republic.

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