ORIGINAL ARTICLE

The role of a center for tobacco-dependent in cardiovascular prevention. A retrospective study

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Abstract

OBJECTIVES: Smoking cessation is an essential part of cardiovascular disease (CVD) prevention. At the Center for Tobacco-Dependent (CTD), clients are screened to identify and reduce cardiovascular (CV) risk factors. In our study we have focused on the role of the CTD in reducing global CV risk.

METHODS: 1,334 CTD patients aged 25–64 years (52.2% men, mean age 44±12 years, Fagerström Test for Cigarette Dependence 6±2) were included in a retrospective cross-sectional survey. Medical history, blood samples and physical examination were analysed. Blood pressure, weight and exhaled CO were measured at each visit (12-months-follow-up). Patients' CV risk was scored. CO-verified abstinence according to CV risk and prevalence of detected CV risk factors were examined.

RESULTS: Among patients who had attended at least their first visit and a visit after one year, 37.9% (506/1,334) had stopped smoking. Among patients with a SCORE of <5%, the success rate was 44.3% (254/574) and 41.2% for patients at high CV risk (105/255, p=0.41). There was a trend towards a lower success rate among patients with CVD, but this difference was not significant. The smoking cessation rate among low and high CV risk patients at the baseline visit was identical (46.2%, resp. 47.3%, p=0.81). 3.1% (42/1,334) of patients were referred to a specialist for hypertension. 62.5% (223/357), without a prior history, were found to have dyslipidemia.

CONCLUSIONS: High CV risk patients have the same chance to stop smoking as low risk patients.

Abbreviations:

BP	- blood pressure
BMI	- body mass index
CHD	- coronary heart disease
COPD	- chronic obstructive pulmonary disease
CTD	- Center for Tobacco-Dependent
CV	- cardiovascular risk
CVD	- cardiovascular disease
FTCD	- Fagerström Test for Cigarette Dependence
HDL	- high-density lipoprotein
LDL	- low-density lipoprotein
MS	- multiple sclerosis
SCORE	- Systemic Coronary Risk Estimation
TC	- total cholesterol
TG	- triglycerides

INTRODUCTION

Treatment of tobacco dependence is essential for both primary and secondary cardiovascular disease (CVD) prevention. The most effective and least expensive way to reduce mortality and morbidity from CVD include controlling dyslipidemia, hypertension, diabetes, smoking cessation and obesity prevention (Graham *et al.* 2007).

Smoking is associated with increased risk of CVD (Lakier, 1992; Hawkins *et al.* 2002; Willigendael *et al.* 2004), arterial hypertension (Dochi *et al.* 2009), dyslipidemia (Humphries *et al.* 2001), metabolic syndrome (Tonstad & Svendsen, 2005) and increased risk of type 2 diabetes (Wannamethee *et al.* 2001).

Smoking cessation is the most important CVD intervention (Gaemperli *et al.* 2010). However, many smokers do not quit, even after being diagnosed with CHD (Critchley & Capewell, 2003) or following a cardiovascular (CV) event (Kotseva *et al.* 2009).

After smoking cessation the risk of CVD decreases immediately by about a third and the risk for recurrent myocardial infarction declines to that equal to nonsmokers with coronary heart disease within 2–3 years (Doll *et al.* 2004).

In the Czech Republic (CR), trained doctors provide treatment for tobacco dependence in centers for tobacco-dependent (CTD). These CTD are based on collaboration with the Nicotine Dependence Centre at Mayo Clinic, Rochester, Minnesota, USA. The network of CTD in the CR has grown systematically since 2005 (Kralikova *et al.* 2012).

The purpose of this study was to assess the effectiveness of the CTD in reducing global CV risk and screening for other CV risk factors among smokers who are trying to quit.

METHODS

We performed a retrospective cross-sectional survey of 1,334 patients (52.2% men) aged 25–64 (mean age 44±12 years) who attended the CTD of the 3rd Department of Medicine, First Faculty of Medicine and General University Hospital in Prague, CR between January 2007 and December 2009, and returned for at least one follow-up visit one year after their quit date. At their first visit, all patients signed an informed consent according to the principles of the Declaration of Helsinki of 1975, as revised in 1983 according to procedures which apply at our institution (Ethics Committee of the General University Hospital in Prague), ensuring anonymity of data used for statistical analysis.

Patients come to the CTD on the recommendation of a physician or by self referral. The average number of visits per patient is 6–7 per year. Blood pressure (BP) is measured at each visit. In the case of BP ≥140/90, it is measured again during the same visit. Patients at high CV risk with BP ≥140/90 or those with BP ≥140/90 at multiple visits, are referred to their general practitioner. Blood samples are taken only from patients whose lipid profile has never been determined, or was determined long ago (Reiner *et al.* 2011). The remaining patients are asked to bring a recent blood tests from their physicians to the CTD. Patients are assessed for depression using the Beck Depression Inventory II scale (Beck 2006) and for fear of weight gain using the Weight Concerns Scale (Killen *et al.* 1994).

86.4% patients (1,152/1,334) completed a baseline visit (the second visit). During the baseline visit patients receive recommendations regarding therapy, general information about prevention of weight gain and recommendations regarding regular physical activity. Tobacco dependence is treated according current guidelines including psychobehavioral intervention and pharmacotherapy (Fiore *et al.* 2008).

Retrospectively, we assessed the level of CV risk using the SCORE (Systemic Coronary Risk Estimation) method in patients without automatically high CV risk. For definition of terms, see Table 1. We used a table specific for the Czech Republic (Conroy *et al.* 2003). The new nomenclature in the 2007 guidelines indicates

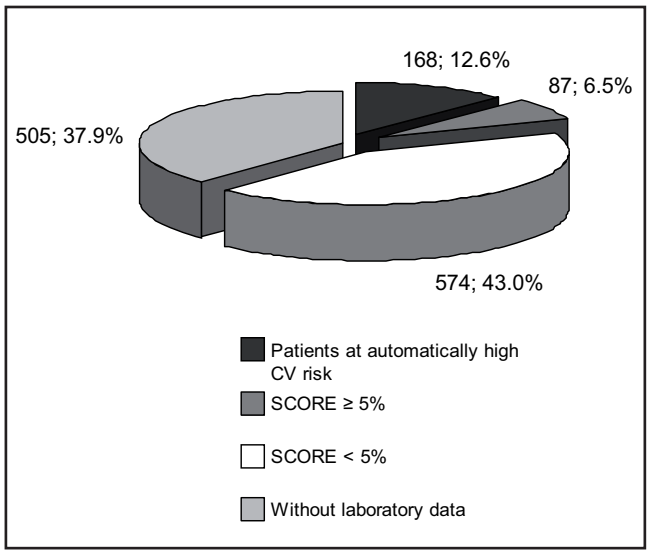

Figure 1: Distribution of patients according to CV risk

that everyone with a SCORE ≥5% is at increased risk (Graham *et al.* 2007).

12.6% of patients (168/1,334) were at automatically high CV risk (Figure 1). Laboratory data was available for 56.7% of patients without automatically high CV risk (661/1,166). Remaining patients (505/1,166) did not go for blood sampling or provide last/recent results of their laboratory tests.

Self-reported abstinence was validated by measuring breath CO at each visit (expired carbon monoxide <10 parts per million). One year CO validated abstinence was evaluated in all patients and stratified according to CV risk.

We also evaluated detection of hypertension, dyslipidemia and obesity. We excluded isolated HDL cholesterol reduction from the analysis for dyslipidemia, as it is not an indication for lipid-lowering drug therapy or referral to a specialist.

Tab. 1. Definitions of terms.

Automatically high total CV risk	known CVD, type 2 diabetes or type 1 diabetes with microalbuminuria, very high levels of individual risk factors (TC ≥8 mmol/l, LDL-cholesterol ≥6 mmol/l, BP ≥180/110 mmHg), chronic kidney disease (Reiner et al. 2011)
Cardiovascular diseases	coronary heart disease, myocardial infarction, ischemic stroke, peripheral artery disease
Hypertension	systolic BP ≥140 or diastolic BP ≥90 mm Hg
Dyslipidemia	total cholesterol ≥5 mmol/l and/or LDL-cholesterol ≥3 mmol/l and/or triglycerides ≥1.7 mmol/l
Obesity Central obesity	body mass index ≥30 waistline >102 cm in men, >88 cm in women
Selected diseases	chronic obstructive pulmonary disease (COPD), asthma bronchiale, multiple sclerosis (MS), carcinomas

To summarize continuous parameters, we used basic descriptive statistics: mean, median, and percentiles. Discrete variables were characterized by the number of observations and its percentage. For comparison of basic characteristics among defined groups, we used the Kruskall-Wallis test, if needed followed by multiple comparisons of mean ranks method to determine the difference between individual groups. Discrete characteristics were compared using the Pearson Chi-square test. The success rate between high risk groups and patients with SCORE less than 5% was compared using the Fisher-exact test.

An univariate and multivariate logistic regression model was used to quantify the predictive strength of the studied factors in relation to the defined endpoint (one year abstinence). Potential predictors were coded as binary factors according to their risk value. The predictive strength of these factors is then given by the OR (odds ratio) supplemented by a 95% confidence interval and the determined level of significance.

RESULTS

The success rate after one year from the quit date according to CV risk categories is presented in Table 2. Patients at high CV risk tended to have lower success rate, but this did not reach statistical significance. The success rate in patients with CVD was: 36.5% (35/96) in all patients (p=0.181), resp. 44.3% (35/79) in patients with completed baseline visit (p=0.807) compared to patients with SCORE <5%.

Compared to their low risk counterparts, patients at high CV risk smoked significantly more cigarettes per day, were significantly more likely to have other related diseases, and only a primary education (Table 3). Patients without laboratory data had significantly lower number of follow-up visits and duration of recommended medication compared to patients with low CV risk.

Multivariate logistic regression showed that CV risk was not a predictor of successful abstinence after one year (Table 4). In contrast, male sex, number of follow-up visits greater than 6, and following the rec-

Tab. 2. Success rate after one year from the quit day according to CV risk categories.

Group of patients	Success rate (%)		Fisher-exact test p-value[1]
	All patients	Patients with completed baseline visit	
Total	37.9 (506/1,334)	42.5 (490/1,152)	–
SCORE <5%	44.3 (254/574)	46.2 (248/537)	reference
With high CV risk	41.2 (105/255)	47.3 (104/220)	0.410 (0.810)
Automatically high CV risk	39.9 (67/168)	47.5 (67/141)	0.331 (0.777)
SCORE ≥5%	43.7 (38/87)	46.8 (37/79)	0.999 (0.999)
Without laboratory data	29.1 (147/505)	34.9 (138/395)	<0.001 (0.001)

[1] Fisher-exact test p-value for given category in contrast to patients with SCORE < 5%; all patients (patients with at least 3 visits).

Tab. 3. Basic characteristics according to CV risk.

Parameters	All patients	SCORE <5%	Higher CV risk[1]	Without laboratory data	*p*-value[4]
N	1,334	574	255	505	
Age (yrs)					
median (mean)	44 (44)	38 (40)[a]	57 (56)[b]	41 (42)[a]	<0.001
range (5–95%)	27–62	26–59	41–64	27–61	
Men, n (%)	697 (52.2)	270 (47.0)	174 (68.2)	253 (50.1)	<0.001
Cigarettes per day, n (%)					
median (mean)	20 (25)	20 (25)[a]	25 (27)[b]	20 (24)[a]	0.005
1–10	89 (6.8)	33 (5.8)	17 (6.7)	39 (7.8)	0.009
11–20	634 (48.1)	295 (52.1)	104 (41.1)	235 (47.1)	
21–30	348 (26.4)	139 (24.6)	66 (26.1)	143 (28.7)	
≥31	247 (18.7)	99 (17.5)	66 (26.1)	82 (16.4)	
FTCD[2] Score, n (%)					
median (mean)	6 (6)	6 (6)	6 (6)	6 (6)	0.65
0–1	52 (4.9)	17 (3.8)	6 (2.9)	29 (7.2)	0.10
2–5	398 (37.7)	166 (37.2)	81 (39.3)	151 (37.5)	
≥6	605 (57.3)	263 (59.0)	119 (57.8)	223 (55.3)	
Follow-up visits, n (%)					
2–5	711 (53.3)	243 (42.3)	130 (51.0)	338 (66.9)	<0.001
6 and more	623 (46.7)	331 (57.7)	125 (49.0)	167 (33.1)	
Education, n (%)					
Elementary school	137 (10.3)	44 (7.7)	38 (14.9)	55 (10.9)	0.005
High school	819 (61.4)	348 (60.6)	159 (62.4)	312 (61.8)	
University	378 (28.3)	182 (31.7)	58 (22.7)	138 (27.3)	
Other related diseases[3], n (%)					
Yes	233 (17.5)	92 (16.0)	66 (25.9)	75 (14.9)	<0.001
Medication duration, n (%)					
at least 3 months	537 (40.7)	278 (49.1)	101 (39.9)	158 (31.7)	<0.001

[1] SCORE ≥ 5% and automatically high CV risk; [2] FTCD–Fagerström Test for Cigarette Dependence; [3] COPD, Asthma bronchiale, MS or carcinomas; [4] Continuous parameters were compared using the Kruskall-Wallis test. If a result was significant, multiple comparisons of mean ranks was used to determine the difference between individual groups. Homogenous groups are assigned with the same letter. Discrete characteristics were compared using the Pearson Chi-square test.

ommended medication for at least 3 month were all associated with abstinence after one year.

With regard to other CV risk factors detected at the CTD, 3.1% patients (42/1,334) were referred to their doctors because of high BP measured at the CTD. 64.3% of these (27/42) were patients without a prior history of hypertension and 16.6% (7/42) had SCORE ≥5%.

Of the 357 individuals without a history of dyslipidemia who underwent blood sampling, 62.5% (223/357) were found to have dyslipidemia (for definition see Table 1). Dyslipidemia was detected in 86.3% patients at high CV risk without a prior history of dyslipidemia (44/51) – in 88.6% patients with SCORE ≥5% (31/35). 16.9% patients with SCORE <5% (97/574) and 15.7% patients at high CV risk (40/255) were referred to a specialist following the detection of dyslipidemia. Of these, 71.5% (98/137) did not have a prior history of dyslipidemia.

4.2% patients (56/1,334) agreed to be referred to a specialist in obesitology, among which 3.8% of patients with SCORE <5% (22/574). Of the 50 successful patients at high CV risk without central obesity at the first visit, 18% patients (9/50) had central obesity after one year from the quit date and 46% (23/50) did not.

Tab. 4. Univariate and multivariate logistic regression evaluating the characteristics associated with successful abstinence after one year–only patients with assessed CV risk.

		Univariable analysis		Multivariable analysis (N=636)	
	N	OR (95% CI)[2]	*p*-value[2]	OR (95% CI)[2]	*p*-value[2]
CV risk					
SCORE <5%	574	reference	–	reference	–
Higher CV risk[1]	255	0.88 (0.65–1.19)	0.410	0.97 (0.56–1.70)	0.92
Sex					
Men	444	reference	–		
Women	385	0.82 (0.63–1.09)	0.172	0.65 (0.43–0.97)	0.03
Age at the first visit (years)					
≤39	304	reference	–	reference	–
40–49	166	0.84 (0.57–1.23)	0.371	0.72 (0.42–1.21)	0.21
50–59	240	1.05 (0.75–1.47)	0.786	1.23 (0.72–2.10)	0.46
≥60	119	1.12 (0.73–1.71)	0.603	1.02 (0.47–2.18)	0.96
Cigarettes per day					
1–10	50	reference	–	reference	–
11–20	399	0.50 (0.27–0.91)	0.024	0.53 (0.23–1.20)	0.16
21–30	205	0.47 (0.25–0.89)	0.020	0.37 (0.15–0.90)	0.03
≥31	165	0.31 (0.16–0.61)	0.001	0.25 (0.10–0.66)	0.005
FTCD Score					
0–1	23	reference	–	reference	–
2–5	247	0.82 (0.35–1.93)	0.650	1.07 (0.37–3.08)	0.89
≥6	382	0.72 (0.31–1.68)	0.447	1.17 (0.39–3.50)	0.77
Follow-up visits					
2–5	373	reference	–	reference	–
6 and more	456	7.29 (5.29–10.05)	<0.001	5.32 (3.43–8.23)	<0.001
Education					
Elementary school	82	reference	–	reference	–
High school	507	1.02 (0.64–1.64)	0.926	1.18 (0.63–2.21)	0.61
University	240	1.24 (0.74–2.05)	0.414	1.17 (0.59–2.34)	0.65
Other diseases					
No	671	reference	–	reference	–
Yes	158	0.93 (0.65–1.31)	0.666	0.74 (0.46–1.2)	0.23
Medication duration					
Without therapy or less than 3 months	440	reference	–	reference	–
At least 3 months	379	4.71 (3.5–6.35)	<0.001	2.39 (1.57–3.64)	<0.001

[1] SCORE ≥ 5 % and automatically high CV risk; [2] Odds ratio for success in smoking cessation with 95 % CI and Wald test p value. Odds ratios greater than 1.0 indicates increased odds of abstinence.

DISCUSSION

CV risk decreased in 37.9% of the study patients after one year merely because they had quit smoking. The main finding of our study is that patients at high CV risk have about the same chance to quit smoking as low risk patients. The success rate of patients with CVD was insignificantly lower than that of patients at low CV risk.

CV risk was not shown to be a predictive factor of abstinence after one year. Previous findings have suggested that high risk patients may be more motivated than low CV risk patients to quit for health reasons (Wilkes & Evans 1999). The CEASE trial, a European

multicenter study, showed that CVD decreased the probability of success (Monso *et al.* 2001).

The Framingham study (Gordon *et al.* 1975) and others (Greene *et al.* 1977 and 1995) did not show significant increases in BP in subjects after smoking cessation. However findings of the study by Lee *et al.* (2001) imply that smoking cessation itself may result in increasing BP.

We recommended regular physical activity for its positive effects on lipid profile (Stranska *et al.* 2011) and craving reduction. Bupropion, nicotine replacement therapy, and probably varenicline have all been shown to reduce weight gain during smoking cessation (Parsons *et al.* 2009).

There were several limitations of this study including only two categories assigned for the number of follow-up visits (2–5 and ≥ 6), and duration of the medication used. As a result, we were anable to distinguish the effect of no medication versus medication lasting less than 3 months. Severity or stage in the selected diagnoses were not investigated. Blood sampling was perfomed only once therefore, laboratory errors or biological variability cannot be excluded (Reiner *et al.* 2011).

The findings of this study underscore the important role of the CTD in preventive medicine. Physician lead tobacco dependence treatment in CR is a promising model that supports more comprehensive monitoring of health status. This model, provides patients with necessary smoking cessation support and proactive screening for CV risk factors.

In conclusion, if patients at high CV risk are referred to specialized center for tobacco-dependent, they have a high chance of successfully quitting.

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