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Readiness for smoking cessation in coronary heart disease patients across Europe: results from the EUROASPIRE III survey --Manuscript Draft--

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Abstract:	Background: Readiness for smoking cessation is an important predictor of quit attempts and cessation success. We aimed to investigate the prevalence and correlates of readiness for smoking cessation in coronary heart disease (CHD) patients. Design: The EUROASPIRE III survey is a cross-sectional study conducted in 2006-2007 among CHD patients <80 years of age from 22 European regions. Methods: Patients were interviewed on average 15 months after hospital admission for an acute coronary event or procedure. Readiness for smoking cessation was assessed using the smoking stages of change (SSC) short form questionnaire. Breath carbon monoxide was measured to validate self-reported non-smoking.

	Results: Among 2,585 patients who were smoking prior to hospital admission, 25.6%, 16.8%, 8.1%, 5.6% and 44.0% were in the precontemplation (no intention to quit), contemplation (thinking of quitting), preparation (planning to quit), action (having quit within 6 months) and maintenance (having quit more than 6 months ago) stage, respectively. Significant multivariable correlates of advancement in SSC showed positive associations of older age and attended cardiac rehabilitation and negative associations of severe depressive symptoms, longer smoking duration and environmental tobacco smoke (ETS) exposure. Conclusions: One quarter of CHD patients across Europe who were smoking prior to hospitalisation have no intention to quit, and an additional quarter is thinking of quitting or planning to quit. Patients who are younger, do not attend cardiac rehabilitation, have severe depressive symptoms, have been smoking for longer periods of time and are exposed to ETS may need to be specifically targeted in cessation interventions.
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Diederick E. Grobbee, MD, PhD, FESC
Editor-in-Chief
European Journal of Preventive Cardiology

Paris, November 12, 2014

Revised Manuscript EJPC-D-14-00370

Dear Prof. Grobbee,

On behalf of my co-authors I would like to submit the revised version of our manuscript entitled “Readiness for smoking cessation in coronary heart disease patients across Europe: results from the EUROASPIRE III survey” for further consideration by *European Journal of Preventive Cardiology*.

Our study is set against the background that readiness for smoking cessation is a strong predictor of quit attempts and cessation success and that about half of coronary heart disease patients across Europe continue smoking after hospitalisation for an acute coronary event or procedure.

The valuable comments and suggestions of the reviewers have enabled us to improve the readability of the manuscript and to complement the reported results. Briefly, we have (a) described smoking stages of change (SSC) in table format, (b) added a table on SSC with stratification by sex, (c) provided a supplementary table on SSC by geographical regions and (d) added descriptive data in a total of three tables.

In our view, the revised manuscript underlines the low readiness for smoking cessation in coronary patients who were smoking prior to hospitalisation across Europe and emphasises patient groups that may need to be specifically targeted in cessation interventions.

We hope you will find our work suitable for publication and are looking forward to hearing from you.

Thank you for considering our work.

Yours sincerely,

Christof Prugger, MD, MSc

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Response to the editor and reviewers

We thank the editor for his efforts in handling the manuscript and the reviewers for their valuable comments and suggestions. An itemised response to the reviewers is provided below indicating the changes made in the manuscript. These were implemented using the ‘track-changes’ option in the text and highlighted in yellow within the tables. As one further relevant paper that was recently published in the journal, the work by Perk et al. Eur J Prev Cardiol 2012; 19:585-667 was included in the reference list.

The revision comprises, among others, the inclusion of two additional tables reducing the maximum number of word to 3,750. This was accommodated by editing and shortening the text, the references in particular. The final word count is 3,871 and thus exceeds the limit by 121 words. We feel that further text shortening would adversely affect the quality of the paper. Nevertheless, we are ready to abridge the manuscript, should this prove necessary.

Reviewer #1:

This article addresses a very important issue by not only showing the context of smoking cessation challenges but also providing a number of simple and straightforward solutions to help patients increase their success rate of quitting.

1.1 What I missed was a break down per country or even region. I would be interested to know if there were differences that need to be dealt with differently in those geographical areas.

Following the reviewer’s comment, an additional table (Supplementary Table 1) was included showing the smoking stages of change by geographical regions. Please note that the rather

small number of patients by region precluded us from conducting statistical analyses in these sub-samples.

1.2 The readability of the paper could be improved by adding some more structured information like bullet points, graphs, and boxes with major conclusions as well as simple advice for clinicians with simple steps to follow in order to improve smoking cessation rates.

In order to improve the readability of the paper, we implemented the following changes. First, the description of smoking stages of change was included in a structured table format (Table 1), which was also suggested by reviewer #2. Second, regarding simple advices for clinicians, the heading ‘*Current evidence on smoking cessation interventions*’ was inserted to emphasize more clearly the discussion section on page 15 and 16 dealing with this issue. Further, in this section, the interventions and results of one recent randomised controlled trial among high risk smokers were outlined in more detail. Third, with regard to major conclusions, we would like to draw the attention of the reviewer to the section at the end of the discussion section on page 19. To highlight these conclusions, we now introduce this section by the statement: ‘As major conclusions of our study we would like to note the following.’

Reviewer #2:

The study assessed the level of readiness for smoking cessation among a sample of 2585 smoking coronary heart disease (CHD) patients in 76 clinical centers representing 22 European regions (Euroaspire III survey). Readiness for smoking cessation was assessed by using the smoking stages of change (SSC) questionnaire. The aims of the study were: (1) to describe the distribution of SSC, and (2) to investigate correlates of advancement in SSC among CHD patients who were smoking prior to hospital admission for a coronary event or

procedure. Smoking is one of the main risk factors for CHD, and cessation of smoking is particularly important for people having high level of other cardiovascular risk factors or existing cardiovascular disease. Therefore, the study questions are both scientifically and clinically important. The study is conducted by using appropriate methodology and the report is well written. However, the reviewer would like to suggest the following minor changes:

2.1 Page 8: Kindly provide the description of different SSC levels in table format instead of verbal description in the text.

The description was provided as requested in the added Table 1.

2.2 Even though sex was not associated with advancement in SSC it would be useful to provide some background information by sex. Descriptive data on page 12 could be provided in a table stratified by sex (men, women, total).

The requested data were provided in the added Table 2. In order to avoid duplicate information, SSC by sex was deleted from the Figure and Supplementary Table 2.

2.3 Add to table 1 and 2 the number of patients in each category.

These numbers were included in the tables (now Table 3 and 4).

2.4 If possible, the supplementary table could be included to the main text.

Unfortunately, no supplementary table could be included in the main text because of the limited word count (please see above). In line with the comment on table 1 and 2, numbers were added in each category to supplementary table 2 (now Supplementary Table 3).

2.5 *Supplementary data on SSC distribution by different regions would be interesting even though the number of patients in some regions may be too small for statistical analysis.*

Data on SSC distribution by geographical regions were provided as Supplementary Table 1.

READINESS FOR SMOKING CESSATION IN CORONARY HEART DISEASE PATIENTS ACROSS EUROPE: RESULTS FROM THE EUROASPIRE III SURVEY

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legends and references): 3,871

Abstract

Background: Readiness for smoking cessation is an important predictor of quit attempts and cessation success. We aimed to investigate the prevalence and correlates of readiness for smoking cessation in coronary heart disease (CHD) patients.

Design: The EUROASPIRE III survey is a cross-sectional study conducted in 2006–2007 among CHD patients <80 years of age from 22 European regions.

Methods: Patients were interviewed on average 15 months after hospital admission for an acute coronary event or procedure. Readiness for smoking cessation was assessed using the smoking stages of change (SSC) short form questionnaire. Breath carbon monoxide was measured to validate self-reported non-smoking.

Results: Among 2,585 patients who were smoking prior to hospital admission, 25.6%, 16.8%, 8.1%, 5.6% and 44.0% were in the precontemplation (no intention to quit), contemplation (thinking of quitting), preparation (planning to quit), action (having quit within 6 months) and maintenance (having quit more than 6 months ago) stage, respectively. Significant multivariable correlates of advancement in SSC showed positive associations of older age and attended cardiac rehabilitation and negative associations of severe depressive symptoms, longer smoking duration and environmental tobacco smoke (ETS) exposure.

Conclusions: One quarter of CHD patients across Europe who were smoking prior to hospitalisation have no intention to quit, and an additional quarter is thinking of quitting

or planning to quit. Patients who are younger, do not attend cardiac rehabilitation, have severe depressive symptoms, have been smoking for longer periods of time and are exposed to ETS may need to be specifically targeted in cessation interventions.

Abstract word count: 250

Keywords

stages of change; smoking cessation; coronary artery disease; epidemiology

Introduction

Smoking cessation is the most effective measure of secondary prevention in patients with coronary heart disease (CHD) substantially reducing cardiovascular morbidity and mortality.^{1,2} Current data, however, show that about half of smokers who suffer an acute coronary event or undergo coronary revascularisation across Europe continue smoking after hospitalisation.³

Existing evidence for the treatment of tobacco use suggests that patients who are ready to change their problem behaviour achieve higher smoking abstinence rates.⁴ Readiness for smoking cessation is most commonly assessed using the smoking stages of change (SSC) of the transtheoretical model (TTM). The SSC comprise the precontemplation (no intention to quit), contemplation (thinking of quitting), preparation (planning to quit), action (having quit within 6 months) and maintenance (having quit more than 6 months ago) stage.⁵ According to the TTM, smokers advance through these stages of self-change before they quit successfully, whilst relapse to lower stages is possible.^{6,7}

Investigating the distribution and correlates of SSC in CHD patients may provide important insights into the motivational readiness for smoking cessation and enable identifying patient groups that need to be specifically targeted in cessation interventions. However, data on SSC in CHD patients are currently scarce, and no prior multicentre study has reported on SSC in this high risk group. EUROASPIRE

(EUROpean Action on Secondary and Primary Prevention through Intervention to Reduce Events) comprises a series of multicentre studies across Europe to evaluate primary and secondary prevention of cardiovascular disease, offering the opportunity to address these outstanding issues in a sample of European CHD patients.

The objectives of the present study were, firstly, to describe the distribution of SSC and, secondly, to investigate correlates of advancement in SSC among CHD patients who were smoking prior to hospital admission for a coronary event or procedure.

Methods

Study participants

The EUROASPIRE III survey among CHD patients is a cross-sectional study conducted in 2006–2007. ~~Details of the study design and participant recruitment have been described elsewhere.⁷⁸~~ Patients hospitalised for coronary artery bypass graft (CABG), percutaneous coronary intervention (PCI), acute myocardial infarction (AMI) and myocardial ischemia were retrospectively identified from hospital records at 76 centres in 22 European regions. Trained research staff reviewed 13,935 medical records and interviewed 8,966 patients up to 80 years of age at least 6 months after hospitalisation for the index event or procedure. Among these patients, a total of 2,723 (30.4%) reported at interview that they were smoking in the month prior to their hospital admission.

Information on study centres and organisations is provided as Supplementary Material. The study complies with the Declaration of Helsinki and was approved by; local ethics committees ~~have approved the research protocol, and i~~ Informed consent ~~has been~~was obtained from study participants.

Smoking stages of change

SSC were assessed in a face-to-face interview using the short form questionnaire: ‘Do you smoke now?’ and if not smoking, ‘Did you quit within the last 6 months/more than 6 months ago?’, whereas if smoking ‘In the last year, how many times have you quit smoking for at least 24 hours?’ and ‘Are you seriously thinking of quitting smoking?’ Possible answers to the latter question were: ‘Yes, within the next 30 days’, ‘Yes, within the next 6 months’, ‘No, not thinking of quitting’ and ‘Don’t know/Unsure’. ~~SSC were defined as described in Table 1. According to the TTM, the maintenance stage and action stage were defined as having quit more than 6 months ago and within the last 6 months, respectively; the preparation stage was defined as thinking of quitting within the next 30 days and having at least one 24-hour quit attempt in the past year; the contemplation stage was defined as thinking of quitting within the next 6 months or within the next 30 days without a 24-hour quit attempt in the past year; the precontemplation stage was defined as not thinking/being unsure of quitting.~~

Carbon monoxide in breath

Carbon monoxide (CO) in breath was measured for biochemical validation of self-reported non-smoking at interview. The concentration of breath CO was recorded in parts per million (ppm) using calibrated instruments ~~and following the manufacturer's specifications (Bedfont Scientific, Model Micro 4 Smokerlyser, Bedfont Scientific, Kent, UK).~~ After a 15-second breath hold, participants were asked to breathe out steadily and gently through a disposable mouthpiece connected to the monitor, emptying the lungs as much as possible. Following each CO measurement, the system was cleared for the next procedure exposing the sensor to room air. Self-reported non-smoking was validated using 10 ppm CO in breath as cut-off value.

Covariates

We investigated age at event, sex ~~and the following other patient characteristics: educational level, diagnostic group, time since hospital admission, recurrent CHD, cardiac rehabilitation, Hospital Anxiety and Depression Scale (HADS), smoking duration and environmental tobacco smoke (ETS)~~ as covariates of SSC. ~~Four~~ Educational levels ~~were~~ considered were: primary, secondary, intermediate and higher education. ~~DPatients were categorised into~~ diagnostic groups were defined according to ~~their patients'~~ index event or procedure. Recurrent CHD events were self-reported CABG, PCI, AMI or myocardial ischemia since hospital discharge. Information on cardiac rehabilitation was assessed at interview using the following questions: 'Were you advised to follow a cardiac prevention/rehabilitation programme within 3 months of

discharge following the index event or procedure?’ and ‘If yes, did you attend the cardiac rehabilitation programme offered?’ We categorised patients who were not advised, patients who were advised, but did not attend, and patients who attended cardiac rehabilitation. The Hospital Anxiety and Depression Scale (HADS), a 4-point Likert scale (range 0–3) with 7 items being related to anxiety and 7 items to depression, was administered at interview. Item scores are added to obtain the summary scores on anxiety and depression separately. A score <8 is considered to be in the normal range, scores from 8 to 10 indicate a presence of moderate anxiety and depressive symptoms and a score ≥ 11 a presence of severe symptoms. Smoking duration was assessed by asking the question ‘For how many years in total have you smoked?’ and categorized into quartiles. Exposure to environmental tobacco smoke (ETS) was assessed by asking the following question at interview: ‘In the daytime or at night, do you frequently stay in rooms where people smoke at home, at work and at other locations?’ Participants were asked to respond to this question providing separate answers for each location (yes/no). We ~~evaluated exposure to ETS at any place by~~ constructing a composite variable ~~that combin~~ing information on exposure at home, at work and at other locations.

Statistical analysis

Descriptive statistics present patient characteristics and SSC. Associations of patient characteristics with advancement in SSC were estimated using a continuation ratio

model with geographical region modelled as a random effect. The continuation ratio model is a logit analysis of variables with ordered categories, appropriate when study units need to advance through ~~stages~~~~lower categories before higher categories can be reached~~⁸⁹. A continuation ratio model for an outcome variable with k ordered categories can be thought of as a combination of k-1 separate logistic regression models. For the s^{th} stage, one considers only data from those participants who have reached stage s or higher on the SSC scale, in our application, and formulates a logistic regression model for achieving stage s+1 or higher, $s=1,\dots,k-1$. A simple continuation ratio model considers these k-1 models jointly, leading to homogeneous estimates for the effects of explanatory variables on the odds of advancement on the SSC scale. This is our primary analysis of the SSC outcome, whereby a multivariable model was fitted using stepwise backward selection among significant covariates identified in separate analyses plus the variable age ~~at event~~~~group~~. In an ‘unconstrained’ model, the effects of the explanatory variables may change from stage to stage. This flexibility is formally achieved by incorporating appropriate interaction terms into the model⁷, and has been performed as secondary analysis in the current study.

All patients for whom data were available on the variables concerned were considered in the descriptive and separate analyses, and only patients with data on all covariates entered the multivariable analysis. Statistical tests were two-tailed, and an

alpha level of 0.05 was chosen to indicate statistical significance. The statistical analysis was carried out using SAS software version 9.4 (SAS Institute Inc., Cary, NC).^{9,10}

Results

Study population

In the present study, we included 2,585 patients who were smoking in the month prior to hospital admission and who were interviewed a median of 15.2 (interquartile range 11.2-21.6) months later. We excluded 60 (2.2%) patients due to missing information on SSC and 78 (2.8%) patients who reported non-smoking at interview, but who had CO in breath >10 ppm. Patients included were older (mean [SD] 56.5 [9.0] years vs. 53.7 [8.7] years, $p=0.005$) and more educated (higher education 16.4% vs. 15.3%, $p=0.008$) than those excluded, but similar with regard to sex and diagnostic group.

Frequency distribution of smoking stages of change

Overall, 25.6%, 16.8%, 8.1%, 5.6% and 44.0% of patients were in the precontemplation, contemplation, preparation, action and maintenance stage, respectively ([Table 2](#)). [No significant difference in SSC was observed between sexes \(\$p=0.431\$ \)](#). Among the 1,305 patients who were smoking at interview, 50.7%, 33.2% and 16.1% respectively were in precontemplation, contemplation and preparation stage. [SSC by geographical regions are shown in Supplementary Table 1.](#)

The Figure presents mosaic plots showing the frequency distribution of SSC by patient characteristics (please see also Supplementary Table [24](#)). The frequency of precontemplation, [contemplation, preparation, action and maintenance](#) stage by patient characteristics ranged from 18.0% to 38.8%, ~~the frequency of contemplation stage from 11.7% to 19.8%, the frequency of preparation stage from 5.9% to 12.6%, the frequency of action stage from 3.6% to 8.2%, and the frequency of maintenance stage from 32.5% to 54.6%, respectively.~~

Correlates of advancement in smoking stages of change

Separate associations of patient characteristics with advancement in SSC are shown in Table [34](#). Significant associations with SSC advancement were observed for all investigated covariates, except for age at event, sex, time since hospital admission and recurrent CHD. Table [42](#) presents multivariable associations of patient characteristics with advancement in SSC after backward selection. Age at event ~~(70-79 vs. <50 years, OR 1.92, 95% confidence interval [CI] 1.38-2.66)~~, attended cardiac rehabilitation ~~(OR 1.37, 95% CI 1.16-1.63)~~, severe depressive symptoms ~~(OR 0.60, 95% CI 0.48-0.76)~~, smoking duration ~~(>40 vs. ≤26 years, OR 0.45, 95% CI 0.35-0.56)~~ and ETS exposure ~~(OR 0.51, 95% CI 0.44-0.58)~~, but not educational level, diagnostic group and HADS anxiety, were significantly associated with advancement in SSC.

Secondary analysis

When further evaluating whether these effects were similar at each of the SSC, significant interactions of stage were observed with age at event and exposure to ETS ($P=0.002$ for both): older age and ETS exposure were significantly associated with advancement from the precontemplation through the action stage, but not from the action to the maintenance stage (Supplementary Table [32](#)).

Discussion

Here, we report on the prevalence and correlates of the readiness for smoking cessation among CHD patients from 22 European regions.

Prevalence of readiness for smoking cessation

On average 15 months after hospitalisation, only about half of patients had stopped smoking within the last 6 months (action stage) or more than 6 months ago (maintenance stage), whereas one quarter of patients were not thinking of quitting (precontemplation stage) and thinking of quitting/planning to quit within the next 6 months or 30 days (contemplation and preparation stage), respectively. Among persistent smokers at interview, more than half of patients were in precontemplation stage, one third was in contemplation stage and one sixth was in preparation stage.

Conceptualised in the early eighties in the context of studies on substance abuse and dependence, the stages of change of the TTM have gained considerable recognition in medical research. According to the model theory, smokers should be targeted by

smoking cessation interventions matched to their level of readiness to quit.¹⁰⁴

Prospective evaluation of the TTM showed that individuals in the precontemplation and contemplation stage are less frequently inclined to attempt and less likely to achieve quitting.¹¹² A cross-validation study of the TTM supports the applicability of the SSC to the group of cardiac patients.¹²³

The frequency distribution of SSC in general population samples varies between studies and settings,¹⁴⁻¹⁹ but also rather similar pattern of stage distributions have been reported across study samples.^{20,21} Interestingly, a positive association has been observed between the population prevalence of smoking and the proportion of smokers in the precontemplation stage.¹³²² We are not aware of any prior multicentre study that investigated the readiness for smoking cessation among CHD patients. The frequency distribution of SSC observed in our study gives rise to concern, particularly in light of the high cardiovascular risk of CHD patients. Smokers hospitalized for CHD across Europe thus need to be targeted more specifically by cessation strategies that may include behavioural counselling in conjunction with pharmacotherapy.^{23,24}

Current evidence on smoking cessation interventions

~~Among CHD patients, A randomized controlled trials (RCTs) among smokers at high cardiovascular risk that compared have shown that case management and a nurse-led preventive cardiology programmes based on (offering behavioural interventions intensive cessation counselling and optional pharmacological support) with usual care in~~

general practice showed a substantially increased smoking cessation-abstinence over 16 weeks^{25,1426} Clinical practice guidelines for treating tobacco use currently recommend to offer treatment and counselling to patients willing to quit and to promote motivation in unwilling patients.⁴ A meta-analysis of RCTs on stage-based interventions based on the TTM for smoking cessation showed no additional benefit of tailoring self-help measures and individual counselling to SSC.¹⁰¹ By contrast, a recent cluster randomized trial in basic care units (family physician and nurse who care of the same group of patients) in primary care centres comparing a stepped smoking cessation intervention with standard cessation advice showed a 50% increased likelihood of smoking abstinence in the intervention group after 2 years of follow-up.¹⁵²⁷ However, the efficacy of such smoking cessation intervention needs to be evaluated among CHD patients before its application in clinical practice can be advocated.

Correlates of readiness for smoking cessation

The continuation ratio model proved well-suited to the TTM of behaviour change for the purpose of investigating correlates of the readiness for smoking cessation. In multivariable analysis, ~~We~~ identified positive associations of older age and attended cardiac rehabilitation and negative associations of severe depressive symptoms, longer smoking duration and ETS exposure with advancement in SSC. Significant associations of educational level, diagnostic group and HADS anxiety with

~~advancement in SSC in separate analyses were attenuated to non-significance in the multivariable analysis.~~

Various subject characteristics including socio-demographics (age, education, income), smoking history (duration, daily cigarettes) and medical conditions (health problems, disease symptoms) have been shown to be associated with SSC among study volunteers, different patient groups and general population samples.^{16-19,28-34} To the best of our knowledge, however, no prior study has evaluated correlates of SSC ~~in among the group of~~ CHD patients. The independent association of age at event, cardiac rehabilitation, HADS depression, smoking duration and ETS exposure suggest an influential role of these patient characteristics in the readiness for smoking cessation. From the current literature it is known that people at older age more frequently quit smoking, that ~~patients-smokers~~ who suffer from a depressive disorder are less likely to stop ~~smoking~~, that the longer a person smokes, the less probable he or she will refrain from tobacco use, and that people are more likely to stop smoking in smoke-free environments.³²⁻³⁵ A systematic review and meta-analysis of RCTs on the efficacy of exercise-based cardiac rehabilitation in CHD patients showed a 36% decreased likelihood of persistent smoking after at least 6 months of follow-up.^{20,36} Based on data from EUROASPIRE we have previously shown that age at event, cardiac rehabilitation, HADS depression, smoking duration and ETS exposure are, among others, associated with the likelihood of smoking cessation in CHD patients across Europe.^{21,22,37-39} Results

of the present study extend upon these findings by revealing an intermediary effect of these patient characteristics in the process of behaviour change via the readiness for smoking cessation. Our findings from the secondary analysis indicate a homogenous effect size of cardiac rehabilitation, HADS depression and smoking duration across SSC. However, the effect of age at event and ETS exposure was confined to the advancement from the precontemplation up to the action stage, suggesting that these characteristics become less relevant once CHD patients have become tobacco abstinent. By investigating correlates of the readiness for smoking cessation, we identified patient groups that are more likely to remain in lower SSC and who may thus need to be specifically targeted in routine clinical practice. These comprise younger patients, non-participants in cardiac rehabilitation, patients with severe depressive symptoms, long-term smokers and patients exposed to ETS. The development of future stage-based smoking cessation interventions may benefit from our findings when considering patient characteristics that are negatively correlated with advancement in SSC.

Limitations~~and strengths~~

There are some limitations to the present study. First, due to its cross-sectional nature, the dynamic process of the readiness for behaviour change over time could not be considered. Furthermore, correlates of SSC were assessed simultaneously with the readiness for smoking cessation. Thus, prospective studies of SSC should be conducted to confirm the observed associations. Second, the rather small study sample hampered

conducting analyses by geographical regions. However, pooled data analysis considered geographical region as a random effect using multilevel modelling. Third, we lacked information on the amount of tobacco smoked per day prior to hospitalisation that may have influenced the readiness for smoking cessation.

~~Among strengths of our study we would like to note the same study protocol and standardised procedures used for the assessment of SSC and investigated covariates in a multicentre study design.~~

Conclusions

As major conclusions of our study we would like to note the following. One quarter of CHD patients across Europe who were smoking prior to hospital admission for a coronary event or procedure have no intention to quit smoking, and an additional quarter is thinking of quitting or planning to quit. Patients who belong to younger age groups, do not take up cardiac rehabilitation, experience a severe level of depressive symptoms, have been smoking for a longer period of time and are exposed to ETS may need to be specifically targeted by appropriate smoking cessation interventions.

Acknowledgements

The EUROASPIRE Study Group is grateful to all the hospitals in which the study was carried out. Their administrative staff, physicians, nurses, and other personnel helped us in many ways and we very much appreciate this. We are particularly grateful to the patients who participated in the study.

Declaration of conflicting interests

Dr. Reiner reports personal fees from AstraZeneca, personal fees from Abbott, personal fees from Aegirion, and other from Sanofi, outside the submitted work; Dr. Kotseva reports grants from European Society of Cardiology, during the conduct of the study; grants from Hoffman La Roche, from Boehringer Ingelheim, outside the submitted work; Dr. Wood reports grants from Astra Zeneca, Bristol Myers Squibb, Glaxo SmithKline, Pfizer, Sanofi-Aventis, Servier Laboratories, Merck, Sharp and Dohme (MSD)/Schering-Plough, personal fees from Bristol Myers Squibb Merck, Sharp and Dohme/Schering Plough, Pfizer, Zentiva, during the conduct of the study; grants from Pfizer, grants from Hoffman La Roche, Merck Sharp and Dohme, Bristol-Myers Squibb Emea Sarl, AstraZeneca, GlaxoSmithKline, personal fees from Astra Zeneca, Merck Sharp and Dohme, Kowa Pharmaceuticals, Zentiva, Ranexa, Sanofi, Pfizer, personal fees from Merck Sharp and Dohme, outside the submitted work; Dr.

Keil reports grants from Pfizer, MSD and AstraZeneca, for projects generated within EUROASPIRE III. All other authors have nothing to disclose.

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Legend for figure

Figure: Mosaic plots showing the frequency distribution of smoking stages of change by patient characteristics (N=2,585)

SSC, smoking stages of change; PCS, precontemplation stage; CS, contemplation stage; PS, preparation stage; AS, action stage; MS, maintenance stage.

Int., intermediate; PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; AMI, acute myocardial infarction; CHD, coronary heart disease; HADS, Hospital Anxiety and Depression Scale; ETS, environmental tobacco smoke.

Table 1: Description of smoking stages of change

<u>Smoking stage of change</u>	<u>Description</u>
<u>Maintenance stage</u>	<u>Having quit more than 6 months ago</u>
<u>Action stage</u>	<u>Having quit within the last 6 months</u>
<u>Preparation stage</u>	<u>Thinking of quitting within the next 30 days and having at least one 24-hour quit attempt in the past year</u>
<u>Contemplation stage</u>	<u>Thinking of quitting within the next 6 months or within the next 30 days without a 24-hour quit attempt in the past year</u>
<u>Precontemplation stage</u>	<u>Not thinking/being unsure of quitting</u>

Table 2: Smoking stages of change [n (%)], total and by sex

	<u>Smoking stage of change</u>				
	<u>Precontemplation</u>	<u>Contemplation</u>	<u>Preparation</u>	<u>Action</u>	<u>Maintenance</u>
<u>Men</u>	<u>551</u> <u>(25.4)</u>	<u>366</u> <u>(16.9)</u>	<u>179</u> <u>(8.3)</u>	<u>113</u> <u>(5.2)</u>	<u>957</u> <u>(44.2)</u>
<u>Women</u>	<u>111</u> <u>(26.5)</u>	<u>67</u> <u>(16.0)</u>	<u>31</u> <u>(7.4)</u>	<u>31</u> <u>(7.4)</u>	<u>179</u> <u>(42.7)</u>
<u>Total</u>	<u>662</u> <u>(25.6)</u>	<u>443</u> <u>(16.8)</u>	<u>210</u> <u>(8.1)</u>	<u>144</u> <u>(5.6)</u>	<u>1136</u> <u>(44.0)</u>

Table 31: Separate associations of patient characteristics with advancement in smoking stages of change (N=2,585)

		n	Advancement in SSC		
			Odds ratio	95% CI	p-value
Age at event	<50 years	601	1.00	Reference	0.280
	50-59 years	1077	1.10	0.94-1.28	
	60-69 years	736	1.13	0.96-1.34	
	70-79 years	171	1.27	0.97-1.66	
Sex	Men	2,166	1.00	Reference	0.725
	Women	419	0.97	0.82-1.15	
Educational level	Primary	619	1.00	Reference	0.004
	Secondary	1,065	1.00	0.84-1.19	
	Intermediate	466	1.15	0.93-1.41	
	Higher	423	1.42	1.14-1.77	
Diagnostic group	PCI	1,125	1.00	Reference	0.007
	CABG	367	1.30	1.07-1.58	
	AMI	654	1.08	0.92-1.27	
	Ischemia	439	0.88	0.73-1.06	
Time since hospital admission	per months		1.00	0.99-1.01	0.532

Recurrent CHD	No	2,141	1.00	Reference	0.325
	Yes	427	1.09	0.92-1.29	
Cardiac rehabilitation	Not advised	1,456	1.00	Reference	<0.001
	Advised	231	1.31	1.03-1.65	
	Attended	864	1.50	1.28-1.76	
HADS anxiety	<8	1,702	1.00	Reference	0.005
	8-10	403	0.92	0.77-1.09	
	≥11	364	0.74	0.62-0.88	
HADS depression	<8	1,884	1.00	Reference	<0.001
	8-10	394	0.84	0.71-1.00	
	≥11	206	0.61	0.49-0.76	
Smoking duration	≤26 years	641	1.00	Reference	<0.001
	27-34 years	642	0.79	0.69-0.98	
	35-40 years	677	0.60	0.51-0.72	
	>40 years	573	0.59	0.49-0.71	
ETS exposure	No	1,204	1.00	Reference	<0.001
	Yes	1,354	0.50	0.44-0.57	

SSC, smoking stages of change; CI, confidence interval; PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; AMI, acute myocardial ischemia;

CHD, coronary heart disease; HADS: Hospital Anxiety and Depression Scale; ETS, environmental tobacco smoke.

Odds ratios with 95% confidence intervals for the advancement in smoking stages of change from separate continuation ratio models with geographical region modelled as a random effect.

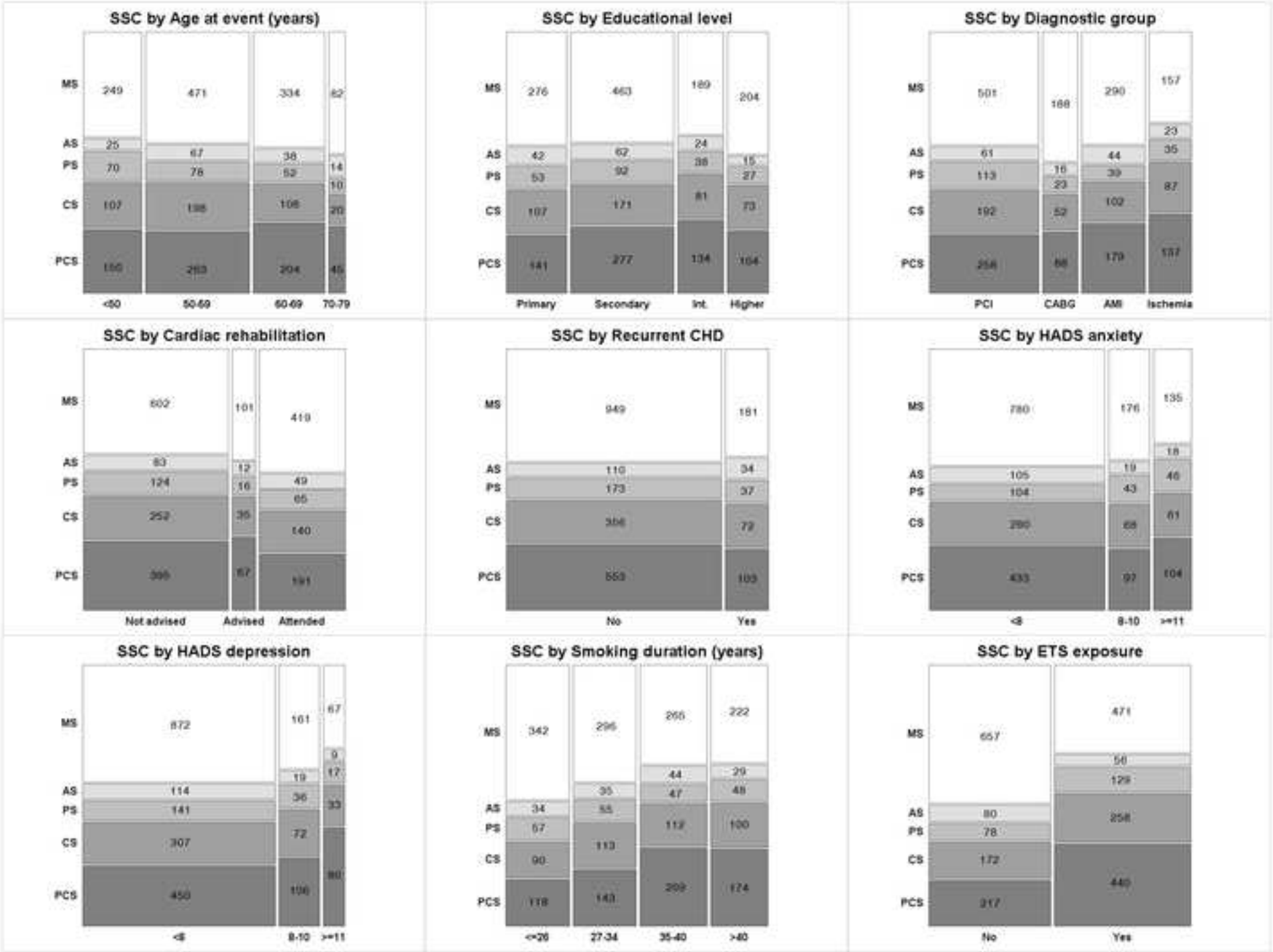
Table 42: Multivariable associations of patient characteristics with advancement in smoking stages of change (N=2,357)

		n	Advancement in SSC	
			Odds ratio	95% confidence interval
Age at event	<50 years	537	1.00	Reference
	50-59 years	1,004	1.39	1.16-1.67
	60-69 years	663	1.62	1.31-2.02
	70-79 years	153	1.92	1.38-2.66
Cardiac rehabilitation	Not advised	1,342	1.00	Reference
	Advised	218	1.22	0.95-1.56
	Attended	797	1.37	1.16-1.63
HADS depression	<8	1,791	1.00	Reference
	8-10	373	0.85	0.71-1.01
	≥11	193	0.60	0.48-0.76
Smoking duration	≤26 years	600	1.00	Reference
	27-34 years	600	0.70	0.58-0.85
	35-40 years	637	0.48	0.40-0.59
	>40 years	520	0.45	0.35-0.56
ETS exposure	No	1,119	1.00	Reference
	Yes	1,238	0.51	0.44-0.58

HADS, Hospital Anxiety and Depression Scale; ETS, environmental tobacco smoke.

Odds ratios with 95% confidence intervals for the advancement in smoking stages of change from a single continuation ratio model with geographical region modelled as a random effect and adjusted for age at event, cardiac rehabilitation, HADS depression, smoking duration and environmental tobacco smoke exposure.

Figure
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