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Original Investigation

Medical students lack basic knowledge about smoking: Findings from two European medical schools

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Abstract

Introduction: Prevention of smoking-related disease is a major challenge to medicine. Although interventions delivered by clinicians can reduce smoking rates, the teaching of smoking cessation methods is not a top priority in most medical curricula.

Methods: Medical students from Göttingen, Germany (n = 1,435), and London (n = 656) were asked to complete a questionnaire on smoking-related mortality and the effectiveness of different approaches to smoking cessation. In addition, students' perceived competence to counsel smokers was assessed.

Results: Smoking-related mortality was underestimated by students from both study sites. The data suggest that smoking medical students greatly overestimated the chances of reaching old age as a smoker. A substantial number of students falsely assumed that nicotine causes coronary artery disease. Overall knowledge of the long-term effectiveness of smoking cessation methods was poor. For example, medical students from Göttingen considered "willpower alone" more effective than comprehensive group cessation programs. Less than a third of medical students from both study sites felt competent to counsel smoking patients. This finding was constant across different stages of medical education.

Discussion: Students in both countries lacked relevant information about smoking and health and the effectiveness of cessation methods. Given the importance of smoking in practically all aspects of medicine and the role of clinicians in advising patients on and aiding cessation, this problem urgently needs to be addressed.

Introduction

Smoking is the leading cause of preventable death and morbidity in the developed world (U.S. Department of Health and Human Services, 2004) due to its causative role in the development of cardiovascular diseases, cancerous lesions, respiratory disorders, impaired fertility, osteoporosis, and endocrine disorders (Rimm, Chan, Stampfer, Colditz, & Willett, 1995). Stopping smoking reduces overall mortality (Doll, Peto, Boreham, & Sutherland, 2004). In addition, it improves the prognosis for patients with coronary artery disease (Wilson, Gibson, Willan, & Cook, 2000) or lung cancer (Tammemagi, Neslund-Dudas, Simoff, & Kvale, 2004; Toh et al., 2004) and the survival rates and quality of life in patients with chronic obstructive pulmonary disease (COPD; Anthonisen et al., 2005). Health professionals have a crucial role in advising and helping smoking patients to stop (Emmons, 1999), but the provision of expert advice and support to smokers has been found to be lacking (Twardella & Brenner, 2005). At the same time, provision of a 2-hr physician group training in smoking cessation methods has been shown to have a significant impact on patients' long-term success rates (Twardella & Brenner, 2007).

Teaching students about tobacco-related issues did not rank highly in the curricula of most medical schools 10 years ago (Richmond, Debono, Larcos, & Kehoe, 1998). Although medical schools have started to put greater emphasis on preventive medicine in teaching curricula, a study from Japan found that 80% of medical students did not consider counseling on smoking cessation necessary as long as patients did not have smoking-related disease (Kawakami, 2000). The European Respiratory Society task force on guidelines for smoking cessation in patients with respiratory diseases recently issued a comprehensive

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report that expressed the need to update knowledge about smoking dependence and cessation among physicians (Tonnesen et al., 2007). The report called for smoking-related issues to be "part of the core curriculum of the undergraduate and postgraduate education and training of physicians."

Surprisingly, we could find no recent studies assessing the extent of knowledge about smoking cessation methods and perceived counseling competence among medical students. The present study represents a first attempt to fill this gap by assessing knowledge of smoking-related mortality and smoking cessation methods in medical students from two European cities: London (UK) and Göttingen (Germany). It also examined smoking prevalence and medical students' perceived competence to help smokers. We chose students from an English and a German medical school since the two countries differ in terms of smoking prevalence, public opinion, and tobacco control policies, providing an interesting background against which to evaluate students' knowledge and attitudes.

Methods

Medical students from London and Göttingen were invited to take part in the present study. In 2006, a total of 2,199 medical students were enrolled at Göttingen University. A modular curriculum for medical education was introduced in 2004. Because the curriculum has no specific teaching module on tobacco, related issues are referred to in organ-specific modules (e.g., the cardiovascular module). For the same period, 1,802 students were enrolled at University College London to study medicine. This course also has a modular curriculum and includes an intercalated science degree. As for Göttingen, teaching on tobacco occurs within relevant topic-specific courses but no dedicated module exists.

A self-administered questionnaire assessing smoking status, knowledge regarding smoking-related mortality, and the effectiveness of various smoking cessation methods was developed and piloted in the winter term of 2005–2006. To ensure comparability, questions on smoking status were derived from earlier country-specific studies (Latza et al., 2005; Prior, Deverill, Malbut, & Primatesta, 2003). Two open response questions were used: "Please estimate how many people die of smoking-related diseases in England each year" and "In your opinion, what component of tobacco smoke is mainly responsible for the increased risk of coronary artery disease among smokers?"

Students were asked to indicate smoking-attributable fractions (i.e., the percentages of all cases of a specific disease caused by smoking) for lung cancer and COPD using a 11-point Likert scale (0%–100%). In a question related to the British Doctors' Study (Doll et al., 2004), students were asked whether they personally knew smokers and nonsmokers who had lived to the age of 90 years. Perceived effectiveness of several smoking cessation methods (willpower alone, advice from a general practitioner, nicotine replacement therapy [NRT], cessation program, self-help material, and acupuncture) was assessed on a 4-point scale with the highest item ("very effective") corresponding to a continuous abstinence rate of 30% after 1 year. In a final dichotomous question, students were asked whether they felt "competent to counsel a smoker who is seeking help in order to give up smoking."

The questionnaire was translated from its original German into English and back into German, and linguistic inconsistencies were corrected. Questionnaires were distributed to medical students at Georg-August University in Göttingen in April and May 2006 and to medical students at University College London in October and November 2006 during plenary sessions at the beginning of the term. Attendance at lectures is generally high in Göttingen (around 80% of the student population) and somewhat lower in London (around 50%). Completed questionnaires were collected during the same sessions to achieve the highest possible response rates and ensure the representativeness of the sample included. Absolute response rates of Göttingen students in preclinical and clinical years were 58.3% (n = 625) and 71.6% (n = 800), respectively. In London, these rates were lower (41.2%, n = 427, and 25.2%, n = 193) due to restriction of the survey to selected plenary sessions. However, effective response rates in individual lecture halls were between 80% and 90% at both study sites. According to the medical schools' curricula, the term *preclinical* refers to the first 2 years in Göttingen and the first 3 years in London. The full course of medical education lasts 5 years at both institutions.

Production of questionnaires and capture of completed forms was performed using an online production system (EvaSys, Electric Paper, Lueneburg, Germany). Full text answers were entered manually by two of the authors. The software we used allowed for correct reassignment of manually entered data to the corresponding questionnaire. A total of 83 cases were deleted due to missing data or inconsistencies between responses to different questions. Results did not change significantly when these questionnaires were included. Incomplete questionnaires were accepted if data on smoking status were available. Analysis of students' perceptions of the effectiveness of different smoking cessation methods was performed using all available data. Data analysis was performed using SPSS version 12.0.1. Results are presented as median (range) and proportions with 95% *CI*s as appropriate. Chi-square tests were carried out to investigate between-group differences.

Approval by the local ethics committee was obtained at one study site and, owing to the nature of data collected (anonymous, noninvasive, or sensitive), not required at the other.

Results

Demographics and smoking characteristics

A total of 2,174 completed questionnaires were returned, 2,091 of which were valid. Demographic data and smoking prevalence of medical students are summarized in Table 1.

In Göttingen, 25.1% of male and 20.6% of female students considered themselves regular smokers; the corresponding figures for London were significantly lower, at 10.9% and 9.1%, respectively. Of all smokers from both study sites (n = 397), the majority (68.2%) smoked 1–10 cigarettes/day. More than 60% of smokers stated that they wished to give up smoking, and a similar proportion had already tried to quit.

Table 1. Subject characteristics and smoking status according to study site

	Total sample	London (n = 656)	Göttingen (n = 1,435)	p value (London vs. Göttingen)[a]
Demographics				
Median age (range), years	22.0 (18–47)	21.0 (18–47)	23.0 (18–44)	<.001
Percent (n) female	57.0 (1,192)	55.2 (362)	57.8 (830)	.579
Year in medical school				
Students in Year 1 (n)	566	204	362	
Students in Year 2 (n)	380	117	263	
Students in Year 3 (n)	417	106	311	
Students in Year 4 (n)	363	143	220	
Students in Year 5 (n)	319	50	269	
Smoking characteristics				
Percent (n) ever-smokers	31.0 (649)	19.7 (129)	36.2 (520)	<.001
Percent (n) current smokers	19.0 (397)	10.2 (67)	23.0 (330)	<.001
Percent (n) of current smokers wanting to quit smoking	63.2 (251)	70.1 (47)	61.8 (204)	.346
Percent (n) of current smokers having had a relapse before	64.5 (256)	64.2 (43)	64.5 (213)	.584

[a]The p values refer to the Kruskal–Wallis test for continuous variables and to the chi-square test for categorical and dichotomous variables.

Tobacco toxins

Substances mentioned by at least 5% of medical students when asked about tobacco components causing coronary artery disease were nicotine, tar, carbon monoxide, and a mixture of different components. The proportion of students blaming only nicotine for coronary artery disease was significantly greater in Göttingen (30.0%) than in London (20.4%), $\chi^2(1) = 22.4$ ($p < .001$), whereas the proportion of students blaming tar was significantly lower in Göttingen (34.0%) than in London (51.4%), $\chi^2(1) = 61.5$ ($p < .001$).

Smoking-attributable morbidity and mortality

Figure 1 shows students' estimates of smoking-attributable fractions of lung cancer and COPD. According to Parrott, Godfrey, Raw, West, and McNeill (1998), the smoking-attributable fraction of both diseases is 85%. Thus, smoking-attributable fraction estimates of 80% or 90% were considered reasonable. Although overall students' estimates were favorable in the two study samples, around one-fifth of Göttingen medical students believed that the fraction of lung cancer and COPD cases

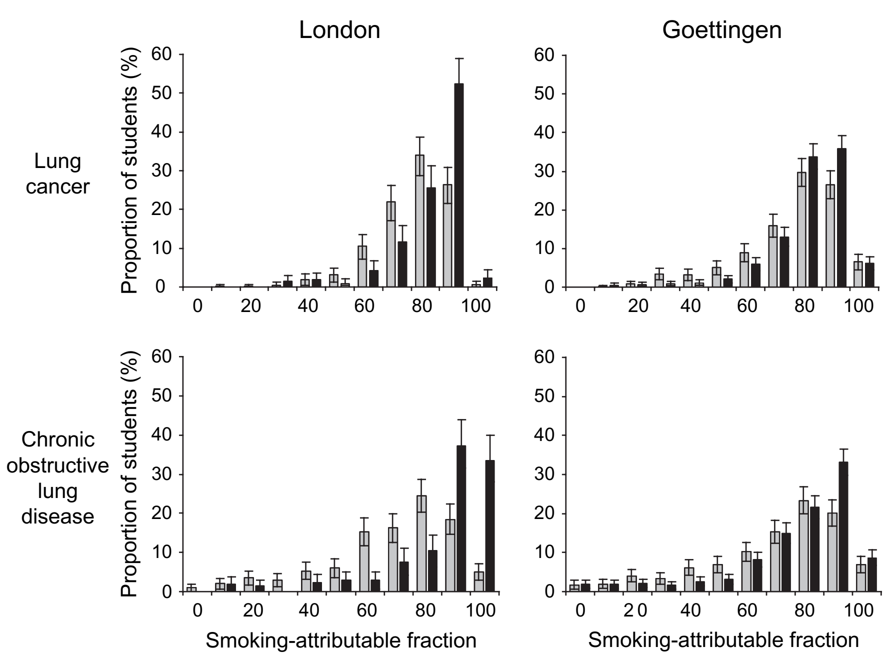

Figure 1. Smoking-attributable fractions of lung cancer and chronic obstructive pulmonary disease as estimated by medical students in preclinical (gray) and clinical (black) years of medical education. Error bars indicate 95% confidence intervals.

attributable to smoking was below 70%. Smoking-attributable fraction estimates of smokers and nonsmokers were similar at both sites. When comparing estimates of students in preclinical years to estimates of more advanced students, we found significant differences in the percentage of students giving a reasonable estimate (i.e., 80%–90%) for lung cancer in both London (60.5% vs. 76.9%), $\chi^2(1) = 14.97$ ($p < .001$), and Göttingen (56.1% vs. 69.6%), $\chi^2(1) = 26.5$ ($p < .001$). We found a significant difference regarding smoking-attributable fraction estimates for COPD in Göttingen (43.5% vs. 54.9%) $\chi^2(1) = 16.74$ ($p < .001$) but not in London (42.9% vs. 46.7%) $\chi^2(1) = 0.718$ ($p = .397$).

A total of 14.9% (London) and 4.7% (Göttingen) of students correctly estimated the number of annual smoking-related deaths to be between 80,000 and 100,000 in UK (Office for National Statistics, 2006) and between 130,000 and 150,000 in Germany (John & Hanke, 2001), respectively. The median of students' estimates of the number of annual smoking-related deaths was 100,000 at both sites (Table 2). Thus, smoking-related mortality was underestimated by German medical students. Results from the British Doctors' Study (Doll et al., 2004) indicate that between half and two-thirds of smokers of at least 20 cigarettes/day will eventually die of a smoking-related disease. Less than 30% of medical students at both study sites provided a number from within this range when asked about mortality from smoking-related diseases among smokers.

Smoking and life expectancy

In a set of questions related to the British Doctors' Study, students were asked whether they knew lifelong smokers and nonsmokers who had lived to the age of 90 years. The proportion of smoking students from both sites claiming they personally knew a smoker who had lived to the age of 90 years was considerably greater than among nonsmoking students, $\chi^2(1) = 82.7$ ($p < .001$), whereas the percentage of students claiming they personally knew a nonsmoker who had reached the age of 90 years was comparable in the two groups, $\chi^2(1) = 0.0002$ ($p = .988$; Figure 2).

Cessation method effectiveness

Regarding methods to achieve sustained abstinence from smoking, students from Göttingen assigned the highest effectiveness to "willpower alone," rating it above a behavioral support program plus NRT or NRT alone. The latter were considered effective or highly effective by London medical students, whereas willpower alone scored similarly to advice from a general practitioner in this study sample (Figure 3).

Perceived competence to counsel smokers

Although 91.9% (95% *CI* = 90.5%–93.3%) of Göttingen students and 92.3% (95% *CI* = 90.3%–94.4%) of London students thought that smoking patients should be advised to quit, only 24.7% (95% *CI* 22.5%–27.0%) of Göttingen students and 33.2% (95% *CI* = 29.6%–36.8%) of London students reported that they felt competent to counsel smokers. Comparing Göttingen students in preclinical and clinical years, we found no differences in perceived competency. In London, a significantly higher proportion of clinical than preclinical medical students felt competent to counsel smokers (Figure 4). Perceived competence among more advanced students was significantly higher in London (44.6%) than in Göttingen (28.6%; $p < .001$).

Table 2. Students' estimates of the number of smoking-attributable deaths per year in Germany and England

	London ($n = 656$)	Göttingen ($n = 1,435$)
Estimate	n (%)	n (%)
0–100,000	336 (51.2)	687 (47.9)
100,001–200,000	51 (7.8)	191 (13.3)
200,001–300,000	40 (6.1)	113 (7.9)
300,001–400,000	12 (1.8)	45 (3.1)
400,001–500,000	76 (11.6)	114 (7.9)
>500,000	95 (14.5)	158 (11.0)
Missing values	46 (7.0)	127 (8.9)

Discussion

Few studies have so far examined the extent to which medical students feel prepared to counsel smokers. Although the Global Health Professionals Survey (Costa de Silva et al., 2005) will help fill this gap, the present survey adds three aspects to the discussion: medical students' knowledge of the smoking-attributable fractions of lung cancer and COPD, perceived effectiveness of several smoking cessation methods, and perceived competence to counsel smokers in two European medical schools. Despite differences between knowledge and attitudes of medical students from London and Göttingen as well as considerable differences in tobacco control policies in England and Germany, the basic similarity of results demonstrates that medical education has failed to address this issue adequately at both sites.

The majority of students from both medical schools surveyed in the present study did not feel competent to counsel smokers. Although this was not a follow-up study, we found a significant difference in perceived competence between the preclinical and clinical years of medical education that was limited to London students. Even in this group, though, fewer than half of the students felt competent to counsel smokers at the end of medical training. Taken together with the low level of perceived competence at all stages of medical education among Göttingen students, this finding indicates that, during medical education, skills related to smoking cessation are acquired to only a very limited degree, if at all. Knowledge of the role of different tobacco smoke constituents in coronary artery disease and overall

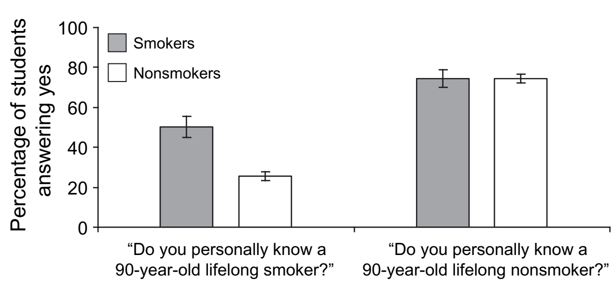

Figure 2. Students' answers to questions regarding the chances of reaching old age depending on smoking status. Gray bars, smokers ($n = 360$); white bars, nonsmokers ($n = 1,501$). Error bars indicate 95% *CI*s.

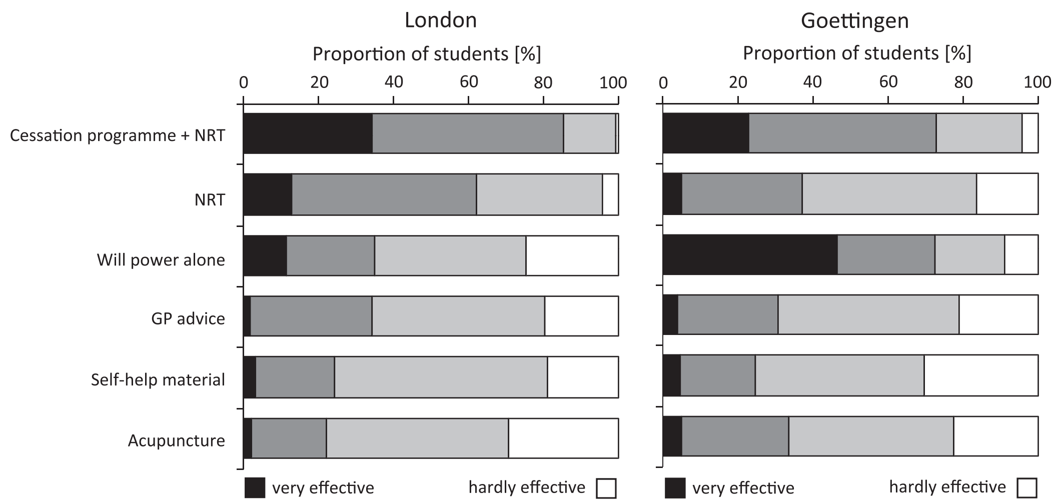

Figure 3. Students' perceptions of the long-term effectiveness of different approaches to smoking cessation. Students rated effectiveness on a 4-point Likert scale with high effectiveness defined as a continuous abstinence rate of 30% after 1 year. Black bars, high effectiveness; gray bars, intermediate effectiveness; white bars, low effectiveness. GP, general practitioner.

effect of smoking on mortality was poor in both study samples. In addition, we found considerable misperceptions regarding the effectiveness of various cessation methods, especially in the Göttingen sample. This finding might be due in part to the absence of specific teaching modules on tobacco and smoking cessation at either site.

Smoking prevalence was twice as high among medical students enrolled in Göttingen as among medical students from London. The London figures are in line with a study by Roddy, Rubin, and Britton (2004), which reported a smoking rate of 8% among British preregistration house officers.

Although students' estimates of annual smoking-attributable deaths tended to be too low, knowledge of smoking-attributable fractions of two major respiratory diseases was favorable among medical students. However, in addition to scientific knowledge, a physician's own smoking status is likely to modify attitudes toward and management of smoking patients (Kawakami, Nakamura, Fumimoto, Takizawa, & Baba, 1997). In our study population, medical students' perceptions of the chances of reaching old age as a smoker or a nonsmoker differed with respect to their own smoking status. According to the results of the British Doctors' Study (Doll et al., 2004), chances of living to the age of 90 years are six times higher for nonsmokers (24%) than for smokers (4%). The two questionnaire items related to this study did not assess students' knowledge about smokers' and nonsmokers' life expectancies but were merely directed at the students' personal experience. Our data indicate that smokers know a large number of smokers who have lived to old age (see Figure 2). This finding might be explained in part by the likelihood that many smoking medical students come from families or communities with higher smoking prevalence, thus increasing their chances of personally knowing a 90-year-old lifelong smoker. However, it also may reflect an overly optimistic view adopted by smoking medical students, which might eventually undermine their own commitment to counseling smoking patients.

The high proportion of students from Göttingen who believe that nicotine causes coronary artery disease is of particular interest given that, in a considerable number of German medical textbooks, nicotine or "nicotine abuse" is listed instead of smoking as a cardiovascular risk factor (Raupach, Bätzing,

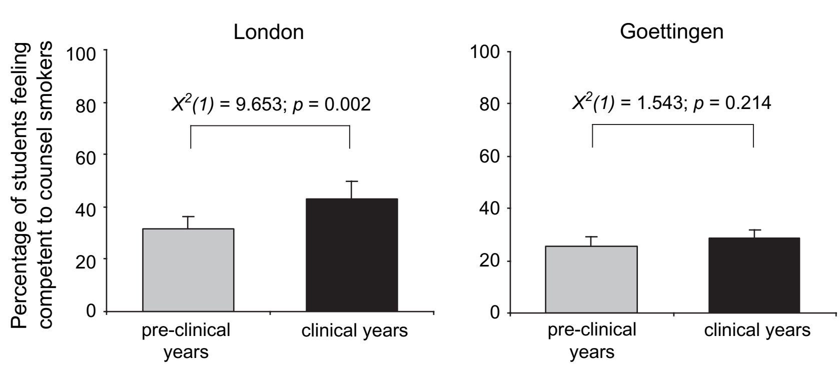

Figure 4. Perceived competence to counsel smokers among medical students from London and Göttingen. Error bars indicate 95% confidence intervals.

Wiebel, & Andreas, 2007). The misconception thus produced might account for German general practitioners' hesitancy to prescribe NRT. In that same context, the finding that students enrolled at Göttingen University ranked "willpower alone" as the most effective method to achieve continuous abstinence from smoking is disturbing given the conceivable consequences for clinical practice.

The perceived lack of ability to counsel smokers even among advanced medical students is a cause for concern. The proportion of young doctors feeling competent to counsel smokers seems not to have increased during the past 15 years (Cantor, Baker, & Hughes, 1993). Perceived competence affects clinical behavior. Thus, the lack of training might explain recent reports of only 20%–30% of patients receiving professional advice on smoking cessation after undergoing myocardial infarction, bypass grafting, or coronary angioplasty (Scholte op Reimer et al., 2006). In a British study sample, fewer than 50% of smoking patients recalled having received any advice on smoking cessation from their general practitioner during the preceding 12 months (Silagy et al., 1992). According to a survey in Germany, many general practitioners perceive their training regarding smoking cessation as unsatisfactory. (Twardella & Brenner, 2005). Indeed, our data show that medical students underestimate general practitioners' abilities to support smokers willing to quit, at least when comparing this kind of intervention to other forms of support. Cessation advice delivered by general practitioners was rated to be as effective as acupuncture (see Figure 3), although the latter has not been shown to be effective in a recent systematic review (White, Rampes, & Campbell, 2006). As a consequence, future physicians who do not ascribe high effectiveness to general practitioner advice are unlikely to put a lot of effort into counseling smokers once they have become general practitioners themselves (Vogt, Hall, & Marteau, 2006).

Although specific curricula on the consequences of smoking and smoking cessation methods have been devised, only 8% of medical schools in Europe offer teaching modules on this topic, and "tobacco" is not mentioned in the published curricula of 42% of U.K. medical schools (Roddy et al., 2004). To identify whether the different replies are based on the medical education received, it might be interesting to compare medical students' responses with those given by the general population.

As far as we know, this is the first study to report not only on smoking rates but also on knowledge about smoking cessation methods and perceived competence to counsel smokers in a large sample of medical students from two countries. Despite the large size of the population surveyed, selection bias cannot be ruled out as a source of bias in the present study. However, effective response rates compared favorably with data reported for similar studies (Patkar, Hill, Batra, Vergare, & Leone, 2003). Smoking status was assessed only by means of self-report in the present study, but given that self-report was anonymous and has been shown to reliably capture smoking status (Patrick et al., 1994), it is unlikely to have influenced the results. Differences in methodology have to be taken into account, however, when comparing data from this survey among medical students to data from large epidemiological trials such as the British Doctors' Study and when generalizing our results to the rest of Europe.

Training of medical students regarding smoking-related disease and smoking cessation seems inadequate in our study sample. Given that this cross-national finding, which might apply to other European medical schools, has serious consequences for the clinical management of smokers—owing to the role of clinicians in advising patients and aiding cessation (Emmons, 1999)—efforts must be made to improve medical education on this relevant health issue.

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Declaration of Interests

Tobias Raupach and Stefan Andreas were reimbursed for attendance at two workshops on smoking cessation funded by Pfizer from 2006 through 2008. Robert West undertakes consultancy and research for and receives travel funds and hospitality from manufacturers of medications for smoking cessation. He also undertakes training for smoking cessation advisors and has a share of a patent for a novel nicotine delivery device. Lion Shahab has received an honorarium for a talk and travel expenses from Pfizer. None of the other authors has any competing interest to declare.

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