Original Investigation

Cigarette Smoking Knowledge and Perceptions Among Students in Four Italian Medical Schools

Maria Caterina Grassi, M.D.,[1] *Christian Chiamulera, Ph.D.,*[2] *Massimo Baraldo, M.D.,*[3] *Franco Culasso, Ph.D.,*[4]
Amy K. Ferketich, Ph.D.,[5] *Tobias Raupach, M.D.,*[6,7] *Carlo Patrono, M.D.,*[8] *& Paolo Nencini, M.D.*[1]

[1] *Department of Physiology and Pharmacology, School of Medicine, Sapienza University of Rome, Rome, Italy*

[2] *Department of Public Health and Community Medicine, University of Verona, Verona, Italy*

[3] *Department of Experimental and Clinical Medicine, School of Medicine, University of Udine, Udine, Italy*

[4] *Department of Public Health and Infectious Diseases, School of Medicine, Sapienza University of Rome, Rome, Italy*

[5] *Division of Epidemiology, The Ohio State University College of Public Health, Columbus, OH*

[6] *Department of Cardiology and Pneumology, University Hospital Göttingen, Göttingen, Germany*

[7] *Department of Epidemiology and Public Health, Health Behaviour Research Centre, University College London, London, United Kingdom*

[8] *Department of Pharmacology, School of Medicine, Catholic University, Rome, Italy*

Corresponding Author: Maria Caterina Grassi, M.D., *Department of Physiology and Pharmacology "V. Erspamer," Sapienza University of Rome, 5, Piazzale Aldo Moro, 00161 Rome, Italy. Telephone: +39-06-445-0618; Fax: +39-06-445-0618; E-mail: caterina.grassi@uniroma1.it*

Abstract

Introduction: Tobacco smoking is the leading cause of premature death in the developed world. Advice and assistance by physicians help smokers quit, but little attention has been paid to the topic of tobacco dependence in the curricula of Italian medical schools. Consequently, few physicians follow the clinical practice guidelines for treating dependence.

Methods: This study was conducted on 439 students at 4 Italian medical schools in 2010. Students were asked to complete a 60-item questionnaire. Two scores were computed: Score 1 assessed knowledge of the epidemiology of smoking, risks associated with smoking, and benefits of cessation. Score 2 assessed knowledge of tobacco dependence treatment guidelines and the effectiveness of treatments. A score of less than 60% indicated insufficient knowledge.

Results: Medical students had limited knowledge of the epidemiology of smoking, attributable morbidity and mortality, and the benefits of cessation. This limited knowledge was reflected by the finding that 70% of students had a total Score 1 less than 60% of available points. Knowledge of clinical guidelines, perceived competence in counseling smokers, and treatment of addiction was also insufficient, as 76% of students achieved a total Score 2 of less than 60%.

Conclusions: Our data demonstrate that Italian medical students have limited knowledge about tobacco dependence, how to treat it, and the critical role of the physician in promoting cessation. Taken together with research from other countries, these findings suggest that medical schools do not offer adequate training in tobacco dependence and provide a rationale for modifying the core curriculum to include more information on tobacco dependence treatment.

Introduction

Tobacco smoking is the leading cause of preventable death in developing countries [World Health Organization (WHO), 2008]. In Italy, the introduction of smoke-free legislation in 2005 and the resultant change in "public opinion" may have contributed to the reduction in smoking prevalence observed in recent years (Cesaroni et al., 2008; Gallus et al., 2006; Grassi, Enea, Ferketich, Lu, & Nencini, 2009). Nevertheless, over 11 million adults are still current smokers (21.7% of the entire adult population), and only 27% of these smokers report that they have tried stopping at least once in their lifetime (Osservatorio Fumo, Alcol e Droga (OssFAD), 2010).

Because many smoking-related conditions improve upon cessation (U.S. Department of Health and Human Services, 2010), strategies have been developed to help smokers to quit. The U.S. Public Health Service's Clinical Practice Guideline, *Treating Tobacco Dependence* (Fiore et al., 2008), as well as the guideline issued by the Italian Institute of Health (OssFAD, 2008), recommend the use of pharmacotherapy and counseling for cessation. In previous studies, we found that group counseling combined with pharmacotherapy improved the rate of continuous smoking abstinence at 1 year among smokers who wanted to quit (odds ratio: 4.3, 95% *CI* = 2.1–8.9; Cavuto, Bravi, Grassi, & Apolone, 2006; Grassi, Enea, Marchetti, Caricati, & Nencini, 2006; Grassi et al., 2009, 2011).

Smoking cessation advice and assistance by physicians play an important role in helping smokers quit (Emmons, 1999; Fiore et al., 2008), as suggested by the observation that smokers cite physician's advice to quit as an important motivator to stop smoking (Bao, Duan, & Fox, 2006). Several studies have investigated

1

the role that medical schools can play in providing students with basic knowledge about smoking and how to assist their patients who smoke with cessation (Chatkin & Chatkin, 2009; Ferry, Grissino, & Runfola, 1999; Fiore, Epps, & Manley, 1994; Geller et al., 2005, 2008; Powers et al., 2004; Raupach et al., 2009; Schkrohowsky, Kalesan, & Alberg, 2007; Springer et al., 2008). A recent report of the European Respiratory Task Force on guidelines for smoking cessation in patients with respiratory diseases concluded that smoking-related issues should be "part of the core curriculum of the undergraduate and post-graduate education and training of physicians" (Tønnessen et al., 2007). Unfortunately, until now, the core curriculum of Italian medical schools has devoted little attention to treating tobacco dependence (La Torre, Sandström, et al., 2009; La Torre, Thuemmler, et al., 2009). Accordingly, Italian physicians neither do regularly advise smokers to quit nor do prescribe pharmacotherapy for tobacco dependence at recommended levels (Ferketich et al., 2008, 2009).

The present study was conducted among medical students at four Italian medical schools to investigate their smoking behavior and to assess their knowledge about smoking-related mortality, the harmful effects of cigarette smoking, and the efficacy of counseling techniques and pharmacotherapy for tobacco dependence.

Methods

Questionnaire Development

A questionnaire was developed for this study. It contained 46 close-ended questions and 1 open-ended question (for a total of 60 items since some questions had more than 1 item included). The majority of the questions were derived from previous studies on this topic (Raupach et al., 2009; Springer et al., 2008). With the approval of the authors of these studies, the questionnaire was translated into Italian and, after linguistic inconsistencies were corrected, a draft version was validated by administration to 30 students for comprehension of questionnaire items. The questionnaire is available upon request.

There were four main sections to the questionnaire: demographics and personal smoking history, knowledge of smoking-related epidemiology, knowledge of clinical guidelines, and smoking and life expectancy. The demographic questions included items on gender and age. The personal smoking history questions included items on age at initiation, cessation history, intention to quit, and nicotine dependence using the Fagerström questionnaire (Heatherton, Kozlowski, Frecker, & Fagerström, 1991).

The section on knowledge of smoking-related epidemiology included items on knowledge of smoking-attributable mortality, tobacco toxins, health risks associated with smoking, and knowledge of the benefits of smoking cessation. For most of these questions, 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 chronic obstructive pulmonary disease (COPD) using an 11-point scale (0%–100%).

The third section contained items related to knowledge of clinical guidelines on tobacco dependence treatment. Eight questions were about knowledge of clinical guidelines, including a dichotomous question in which students were asked whether

they felt "competent to counsel a smoker who is seeking help in order to give up smoking." One question asked about perceived effectiveness of several smoking cessation methods (willpower alone, advice from a general practitioner, nicotine replacement therapy [NRT], tobacco dependence treatment program, self-help material, and acupuncture); this question was assessed on a 4-point scale with the highest item "very effective" corresponding to a continuous abstinence rate of 30% after 1 year. One question asked students about their knowledge of NRT contraindications. One question asked about knowledge of tobacco dependence treatment programs and one asked whether students knew of a tobacco dependence treatment program at their university.

The last section included questions on perception of smoking and life expectancy. Students were asked whether they personally knew smokers and nonsmokers who had lived to the age of 90 (two questions).

One final question asked students "Would you like a smoke-free medical school?" Response options were yes or no.

Study Participants

Four Italian medical schools were involved in the study. Two were located in Rome (Sapienza University of Rome, Catholic University Medical School), while the other two were located in Northern Italy (University of Udine and University of Verona). We considered these medical schools representative of undergraduate medical training in Italy because they offer a standard core curriculum similar to all other Italian medical schools. The core curriculum fulfills the requirements for medical practice in the European Union. In Italy, undergraduate medical education lasts 6 years, with the first 3 years being devoted to basic sciences. Preclinical courses address general and specific health risks including cigarette smoking; thus, students at this stage should be familiar with the epidemiology of smoking-related diseases. Knowledge of treatment options and practical experience is expected to be somewhat lower.

The study included students taking the course of Pharmacology and Toxicology that is offered to fourth-year students at all participating medical schools.

Between April and May 2010, students attending the course were invited to complete self-administered questionnaires; participation was voluntary and anonymous. The questionnaire was explained and distributed by the pharmacology lecturer, and students were allowed 30 min to complete it. Lecturers remained in the classroom but kept at a distance from participating students in order to maintain anonymity of the responses.

Data Analysis

Questionnaire answers were entered manually into an electronic database. Statistical analyses were performed using SPSS version 16.0 for Mac. Statistical comparisons between groups for continuous variables were performed using two-sample t tests, while categorical variables were analyzed using Pearson's chi-square test.

Similarly to Springer et al. (2008), we grouped the questions by relevance to knowledge of smoking epidemiology, benefits of cessation, treatment of nicotine addiction, and practice of cessation. Using 10 questions (14 items), a derived score (Score 1)

was computed, assigning a value of 0–2 to each answer (range 0–28). A value of 2 implied the student answered correctly or in an acceptable range (depending on the question), a value of 1 implied it was not far from the correct answer, and a value of 0 implied a totally incorrect answer. The items for Score 1 included (a) smoking epidemiology, (b) risks associated with smoking, and (c) benefits of cessation. A score of 60% was selected to represent a sufficient level of knowledge. Using 9 additional questions (14 items), another score (Score 2) was computed, assigning a value of 0–2 to each answer (same mechanism for assigning values as in the Score 1 system), to assess students by their knowledge of (a) clinical guidelines on smoking cessation and (b) effectiveness of smoking cessation methods. For both scores 1 and 2, means and SDs were computed for the groups of students of different schools, gender, and current smoking status. Means were compared with a t test or analysis of variance, and missing data were counted as incorrect answers. Approval of the study was obtained by the Sapienza University of Rome Ethics Committee and, owing to the nature of data collected (anonymous, noninvasive, or sensitive), by the Deans of the other participating medical schools.

Results

The questionnaire was completed by 439 students (61% female, mean age 23.3 ± 3.0 years, range 20–55), of whom 197 (44.9%) were from Rome Sapienza and 95 (21.6%), 96 (21.9%), and 51 (11.6%) from Rome Catholic, Udine, and Verona Medical Schools, respectively. Although participation rates in individual lecture rooms approached 100%, only 40% of eligible students were attending the class on the day of data collection. These figures were similar for all participating Medical Schools. Students' compliance was satisfactory, as missing items were limited to less than 10%.

Demographic Characteristics, Personal History of Tobacco Use, and Intention to Quit

Since no statistically significant differences were observed between students by study site with respect to either demographic characteristics or smoking history, data were pooled for all analyses.

As shown in Table 1, current daily smokers represented a minority, accounting for 15% of the students surveyed (20.5% of males vs. 11.6% of females; $p = .009$). Moreover, they rated low on the Fagerström scale of nicotine dependence, the majority of them (78%) smoking less than 10 cigarettes per day and approximately 60% reporting that they wished to stop smoking. Health professionals contributed little to this intention to quit since only a minority of students (16%) stated they had been advised to stop smoking by a general practitioner during the past year.

Knowledge of Smoking Epidemiology, Smoking Attributable Mortality, Tobacco Toxins and Health Risks Associated With Smoking, and Benefits of Smoking Cessation

As reported in Table 2, only 26% of students correctly estimated the prevalence of smoking in Italy. Almost three quarters (72%)

Table 1. Smoking Habits, Medical Advice to Quit, and Intention to Quit Among Medical Students

	n (%) or $M \pm SD$
Smoking habits ($n = 439$)	
Never smokers	330 (75.2)
Current smokers	67 (15.3)
Former smokers	42 (9.6)
Mean age at onset of smoking among ever smokers: years (range 12–24)	16.5 ± 2.4
Mean age of smoking cessation among former smokers: years (range 15–24)	20.1 ± 2.4
Characteristics of current smokers ($n = 67$)	
Fagerström score (range 0–6)	1.3 ± 1.7
Tried to quit and relapsed in the past	30 (44.8)
Tried to stop smoking during medical school	29 (43.3)
Tried in the last year to stop smoking and succeeded for 1 day or longer	36 (53.7)
Medical advise to quit (answered yes)	
"In the last year, did a doctor advise you to stop smoking?"	11 (16.4)
Intention to quit (answered yes)	
"Would you like to give up smoking altogether?"	40 (59.7)
"Which of the following statements best describes your current intentions with regard to smoking …"	
"I want to quit, but I'm not ready to try now"	26 (38.8)
"I will continue to smoke for now"	13 (19.4)

of students overestimated the prevalence of smoking in Italy, whereas 43% underestimated the number of Italians who die each year because of smoking (data not shown). A similarly low proportion of students (39%) correctly estimated the annual smoking-attributable percentage of mortality in other developed countries (Peto, Lopez, Boreham, Thun, & Heath, 2006).

According to Parrot, Godfrey, Raw, West, and McNeill (1998), the smoking-attributable fraction of lung cancer and COPD is approximately 80%–90%. Just about two thirds of students (67%) provided estimates within this range, with no statistically significant differences between smokers and nonsmokers. Students appeared less knowledgeable about the cardiovascular risks of smoking, as very few of them (3%) correctly indicated the rate of coronary artery disease caused by smoking (Teo et al., 2006). Moreover, a minority of them (41%) blamed carbon monoxide as the tobacco component causing this disease, whereas many of them blamed tar (31%) or nicotine (27%). Surprisingly, a majority of students (89%) knew that passive smoking represents a risk factor for coronary artery disease. Medical students surveyed in this study were also aware of the risks associated with smoking during pregnancy, but about half of them (52%) incorrectly thought that it also increases gestational diabetes (data not shown).

A majority of students (54%) thought that stopping smoking at any age reduces the risk of premature death, and only a minority (31%) were aware that lung cancer risk never returned to that of a nonsmoker after quitting.

Table 2. Distribution of Correct Answers[a] to Questions About the Epidemiology of Smoking and Smoking-Attributable Mortality, Tobacco Toxins and Health Risks of Smoking, and Knowledge of the Benefits of Smoking Cessation (Score 1)		
	Total sample (*n* = 439)	Nonsmokers (*n* = 372)	Smokers (*n* = 67)
Questionnaire items (answered correctly)	% (*n*)	% (*n*)	% (*n*)
Epidemiology of smoking and smoking-attributable mortality			
Percent of Italian adults who smoke: answered in acceptable range (20%–25%)	26.2 (115)	24.7 (92)	29.9 (20)
Estimate of the smoking-attributable deaths/year in Italy: answered in acceptable range (70,000–83,000)	35.5 (156)	34.9 (130)	38.8 (26)
Percent of mortality/year in developed countries: answered in acceptable range (10%–30%)	39.4 (173)	37.9 (141)	47.8 (32)
Tobacco toxins and health risks of smoking			
Carbon monoxide contributes to coronary artery disease: answered correctly (yes)	40.8 (179)	41.1 (153)	38.8 (26)
Health risks of smoking: answered in acceptable range			
Lung cancer (80%–90%)	67.0 (294)	66.7 (248)	68.7 (46)
Chronic obstructive pulmonary disease (80%–90%)	57.6 (253)	57.5 (214)	58.2 (39)
Coronary artery disease (20%–30%)	3.4 (15)	3.8 (14)	1.5 (1)
Health risks during pregnancy: answered correctly			
Gestational diabetes (no increase)	15.5 (68)	15.6 (58)	14.9 (10)
Sudden Infant Death syndrome (large increase)	43.3 (190)	43.3 (161)	43.3 (29)
Premature birth (large increase)	57.2 (251)	56.7 (211)	59.7 (40)
Coronary artery disease is a health risk of second-hand smoke: answered correctly (yes)	89.1 (391)	90.1 (335)	83.6 (56)
Knowledge of the benefits of smoking cessation			
Time for risk of heart disease to return to normal: answered in acceptable range (0–15 years)	63.8 (280)	64.0 (238)	62.7 (42)
Time for risk of lung cancer to return to normal: answered correctly (never)	31.4 (138)	32.3 (120)	26.9 (18)
Quit smoking at any age reduces risk of premature death: answered correctly (true)	53.8 (236)	54.0 (201)	52.2 (35)

Note. [a]The correct answer is in parentheses.

Knowledge of Clinical Guidelines on Tobacco Dependence Treatment, Perceived Competence to Counsel Smokers, Knowledge of Treatments for Tobacco Dependence, and Nicotine Contraindications

As shown in Table 3, both smokers and nonsmokers agreed that smokers should be advised to quit, but only one third of them (32%) felt competent in providing counseling. Moreover, more nonsmokers than smokers (85% vs. 75%, respectively; *p* < .01) were aware that nicotine is a substance of abuse that causes dependence like heroin and cocaine, and, accordingly, a greater percentage of nonsmokers than smokers (84% vs. 66%, respectively; *p* < .01) reported that during their medical training, they advised smokers to quit. However, more smokers than nonsmokers knew that the chance of quitting doubles when help is provided (45% and 28%, respectively; *p* < .05). There were no statistically significant differences between the two groups in the rate of correct answers to questions concerning the treatment of tobacco dependence. Finally, only one tenth of the sample (12%) was aware of the existence of tobacco treatment centers in the city of his/her university.

Comparison Among Students

Proficiency scoring in the epidemiology of smoking, risks associated with smoking, and benefits of cessation is reported in Table 4 (Score 1). Seventy percent scored below the threshold of 60 without statistically significant differences by gender and smoking status. However, there were significant differences by university site in that the score was higher among students in Verona compared with students at Rome Sapienza.

The results were similar for the proficiency on nicotine dependence treatment items (Score 2 of Table 4). Three of four students (76%) scored below the sufficiency threshold of 60. No statistically significant differences between the groupings of students were detected.

Smoking and Life Expectancy: Wishing for a Smoke-Free Medical School

The percentage of smokers claiming they personally knew a smoker who had lived to the age of 90 was significantly higher than among nonsmokers (52% vs. 39%, respectively; *p* < .05), whereas the percentage of students answering they personally knew a nonsmoker who had reached the age of 90 was similar in the two groups (85% vs. 81%, respectively). Fi-

Table 3. Distribution of Correct Answers[a] to Questions About the Knowledge of Clinical Guidelines, Perceived Competence in Counseling Smokers, Knowledge of Treatments for Tobacco Dependence, and Nicotine Replacement Therapies (NRT) Contraindications, by Smoking Status (Score 2)

Questionnaire items (answered correctly)	Total sample ($n = 439$) % (n)	Nonsmokers ($n = 372$) % (n)	Smokers ($n = 67$) % (n)
Knowledge of clinical guidelines			
A doctor should ask if patient is a smoker at every visit (yes)	86.7 (381)	86.8 (323)	86.6 (58)
All smokers should be advised to quit (yes)	99.0 (435)	98.9 (368)	100 (67)
In practice (e.g., during a consultation) do you advise every smoker to quit (yes)	81.1 (356)	83.9 (312)	65.7 (44)**
Perceived competence in counseling smokers			
I feel prepared to help smokers seeking help (yes)	31.9 (140)	32.5 (121)	28.4 (19)
A smoker's chance of quitting doubles with health provider's help (yes)	30.8 (135)	28.2 (105)	44.8 (30)*
Nicotine is as addictive as heroin or cocaine (yes)	83.6 (367)	85.2 (317)	74.6 (50)**
Knowledge of treatments for tobacco dependence			
Which of the following smoking cessation methods has high efficacy in quitting smoking at 1-year follow-up (4-point scale with the highest item "very effective")			
Willpower alone (hardly effective)	17.5 (77)	16.7 (62)	22.4 (15)
Advice from a general practitioner (effective)	23.5 (103)	22.8 (85)	26.9 (18)
NRT without any further support (effective)	48.3 (212)	50.5 (188)	35.8 (24)
Group counseling plus NRT (very effective)	27.6 (121)	28.0 (104)	25.4 (17)
Self-help material (hardly effective)	24.1 (106)	23.9 (89)	25.4 (17)
Acupuncture (hardly effective)	42.1 (185)	42.5 (158)	40.3 (27)
Knowledge of antismoking centers (yes)	11.6 (51)	10.5 (39)	17.9 (12)
NRT contraindications			
NRT is contraindicated for people with heart diseases (no)	24.1 (106)	25.5 (95)	16.4 (11)**

Notes. [a]The correct answer is in parentheses.
*$p < .05$ and **$p < .01$ versus nonsmokers (Pearson's chi square).

nally, an overwhelming majority of nonsmokers (86%) but only 46% of smokers ($p < .01$) indicated that they would like to study in a smoke-free medical school.

Discussion

Perceived competence among medical students in assisting and counseling smokers to quit has been evaluated previously in North America and several European countries (Fiore et al., 1994; Geller et al., 2008; Raupach et al., 2009; Springer et al., 2008) but, to the best of our knowledge, not in Italy. While La Torre and colleagues reported that the Italian medical school core curriculum is lacking formal training in tobacco counseling (La Torre, Sandström, et al., 2009; La Torre, Thuemmler, et al., 2009), our study goes beyond that by demonstrating that Italian medical students have a limited knowledge of a wide array of topics including the health hazards of tobacco smoking and benefits of smoking cessation.

Student Knowledge of the Epidemiology and Health Hazards of Smoking

According to the results obtained for Score 1, students' knowledge of the epidemiological aspects of tobacco use was relatively limited, with large numbers overestimating the percentage of Italians who smoke. Most importantly, a high percentage of

students underestimated smoking-attributable mortality per year, showing that they were largely unaware of the fact that smoking is the leading cause of disease and death in the world (WHO, 2008). Furthermore, they indicated a rather pessimistic attitude toward the benefits of smoking cessation, with about 20% of the students believing that the risk of heart disease never returned to a never-smoker's level following cessation. Hence, a picture emerged of inadequate and/or distorted information potentially responsible for a fatalistic attitude toward tobacco dependence. These findings are remarkable in that fourth-year medical students would be expected to have learned about tobacco-related diseases through their basic science curriculum.

Student Knowledge of Treatment Options for Smokers

Score 2 was designed to capture student knowledge of effective methods to stop smoking and help smokers quit. As expected, a large proportion of medical students did not know how to counsel smokers or, more generally, how to manage tobacco dependence. Consistently with a lack of information about stopping methods, many students were unaware of the existence of outpatient clinics for smoking cessation. Interestingly, by examining each item individually, differences between nonsmokers and smokers emerged. Specifically, more nonsmokers than smokers knew that NRT is not contraindicated for patients

	n	*M* ± *SD*	Range (0–100)	*p* Value
Table 4. Mean Scores for Two Sets of 14 Grouped Items				
Knowledge of smoking epidemiology, risks associated with smoking, and benefits of cessation (Score 1)				
Total sample	393	49.3 ± 10.8	17–87	
Gender				.944[a]
Female	241	49.2 ± 10.6	17–87	
Male	147	49.3 ± 11.4	27–80	
Smoking status				.693[a]
Smokers	58	48.8 ± 12.5	17–73	
Nonsmokers	335	49.4 ± 10.6	17–87	
University				.029[b]
Rome Sapienza	173	48.4 ± 11.1	17–87	
Rome Catholic	92	48.8 ± 10.3	17–73	
Udine	83	49.3 ± 10.7	33–80	
Verona	45	53.8 ± 10.6	33–80	
Knowledge of clinical guidelines on tobacco dependence treatment and effectiveness of methods (Score 2)				
Total sample	391	47.8 ± 10.4	7–87	
Gender				.082[a]
Female	237	47.0 ± 10.5	7–83	
Male	149	49.0 ± 10.2	27–87	
Smoking status				.098[a]
Smokers	60	45.7 ± 12.3	7–83	
Nonsmokers	331	48.1 ± 10.0	23–87	
University				.078[b]
Rome Sapienza	165	46.9 ± 10.3	23–87	
Rome Catholic	88	46.9 ± 10.2	7–73	
Udine	92	50.2 ± 10.0	23–83	
Verona	46	47.8 ± 11.6	23–83	

Notes. *n* = number of subjects observed.

[a]Student's *t* test.

[b]Analysis of variance.

with cardiovascular disease and were aware of the addictive properties of nicotine. Yet, more current smokers believed that providing assistance was effective. These findings are important as doctors who smoke have been shown to treat smokers differently than doctors who do not (Pipe, Sorensen, & Reid, 2009).

Differences Between Smokers and Nonsmokers

One interesting finding of the present study relates to differences in perception between smokers and nonsmokers: compared with the latter, students who smoked tended to overestimate the life expectancy of smokers. This result might be explained, at least in part, by the likelihood that many medical students who smoke come from families or communities with higher smoking prevalence. This, in turn, might increase their chances of personally knowing a 90-year-old lifelong smoker and underestimating the long-term risks associated with cigarette smoking.

A different smoking prevalence might also have contributed to the observed difference in Score 1 between the students at the medical schools in Verona and Rome Sapienza. Current estimates of smoking prevalence are higher in southern as compared with northern Italy (OssFAD, 2010). It might, therefore, be speculated that regional differences in the social acceptance of cigarette smoking contributed to these findings. In addition, unmeasured differences between curricula could account for differences in student perception.

Relation to Other Studies

While some encouraging data have recently been reported from a medical school in New York City (Springer et al., 2008), a comprehensive survey of 665 medical school deans (Richmond, Zwar, Taylor, Hunnisett, & Hyslop, 2009) suggests that the shortcomings detected in Italian medical curricula are likely to represent a global phenomenon. According to that survey, teaching in most schools focuses on smoking-related diseases rather than interventions to support smokers willing to quit. Consistently, results of the Global Health Professionals Survey (GHPS) showed that less than 40% of third year students had ever received formal training in how to conduct smoking cessation counseling (Warren, Jones, Chauvin, Peruga, & GTSS Collaborative Group, 2008). In summary, these studies demonstrate a fairly uniform level of knowledge gaps regarding smoking and its treatment among medical students from different countries worldwide.

Limitations

There are several limitations in our study that must be addressed. First, there may be some bias in the limited student sample. We did our best to limit this bias by involving four different medical schools, two located in Rome and the other two in middle-sized towns in the more affluent northeast of Italy. Since course content and format are very similar across Italian medical schools, our results are likely to be applicable to other medical schools in the country, though further studies are needed to test this hypothesis. The proportion of current smokers in our sample was lower than that reported by the GHPS (Gualano et al., 2011) which had shown that about one third of Italian medical students and physicians were current smokers. Different survey tools as well as the small sample size of our study might have accounted for these differences.

Furthermore, although virtually all the students attending the lectures during which the questionnaire was presented accepted completing it, they only represented 40% of the fourth-year class. Thus, there could be unmeasured differences between the students who attended the lecture and completed the survey and those who did not attend the lecture on the day of the survey. A more important limitation is that we did not collect any information about the actual proficiency level of our students in their medical training. Moreover, we cannot exclude the possibility that their limited knowledge about nicotine addiction was due to the fact that they were in their fourth year (of six) of medical school and had experienced only limited exposure to clinical training. Yet, even fourth-year medical students should have been exposed to some teaching on a major health risk that can be easily prevented.

Practical Implications

A recent study among German hospital physicians suggests a low level of proficiency even among fully qualified doctors (Raupach, Merker, Hasenfuβ, Andreas, & Pipe, 2011). At the same time, the American experience of adapting medical curricula to these needs is encouraging. According to Geller et al. (2008), U.S. medical students now have "multiple opportunities to

learn tobacco counseling in case-based discussions, simulated patient encounters, and clinical skills courses." Given the high impact of summative examinations on student learning behavior, inclusion of smoking cessation skills as core objectives for practical examinations in undergraduate education seems advisable (Raupach et al., 2010).

Conclusions

Our study highlights the fact that, as previously observed in other European countries, Italian medical students do not receive adequate training in tobacco dependence. As a result, medical students underestimate their ability to help patients quit smoking and are not fully aware of the relevant role that a physician may have in this endeavor. The data presented here contribute to our understanding of missed teaching opportunities across Europe. Although tobacco control policies in Italy are different from those in Germany and the United Kingdom, findings in medical students from these countries are strikingly similar. There is clearly a need to devise uniform curricular requirements for factual knowledge and practical skills regarding smoking cessation in European medical schools.

Funding

Declaration of Interests

None declared.

Acknowledgments

References

Bao, Y., Duan, N., & Fox, S. A. (2006). Is some provider advice on smoking cessation better than no advice? An instrumental variable analysis of the 2001 National Health Interview Survey. *Health Services Research*, 41, 2114–2135. doi:10.1111/j.1475-6773.2006.00592.x

Cavuto, S., Bravi, F., Grassi, M. C., & Apolone, G. (2006). Propensity score for the analysis of observational data: An introduction and an illustrative example. *Drug Development Research*, 67, 208–216. doi:10.1002/ddr.20079

Cesaroni, G., Forastiere, F., Agabiti, N., Valente, P., Zuccaro, P., & Perucci, C. A. (2008). Effect of the Italian smoking ban on population rates of acute coronary events. *Circulation*, 117, 1183–1188. doi:10.1161/CIRCULATIONAHA.107.729889

Chatkin, J., & Chatkin, G. (2009). Learning about smoking during medical school: Are we still missing opportunities?

International Journal of Tuberculosis and Lung Disease, 13, 429–437. Retrieved from: http://www.ingentaconnect.com/content/iuatld/ijtld/2009/00000013/00000004/art00003?token=004d1902e7a31438a6e58654624317b42576b415d5878675f535e4e26634a492f2530332976f5#expand/collapse

Emmons, K. M. (1999). Smoking cessation and tobacco control: An overview. *Chest*, 116, 490S–492S. doi:10.1378/chest.116.suppl_3.490S

Ferketich, A. K., Gallus, S., Colombo, P., Apolone, G., Rossi, S., Zuccaro, P., et al. (2009). Use of pharmacotherapy while attempting cessation among Italian smokers. *European Journal of Cancer Prevention*, 18, 90–92. doi:0.1097/CEJ.0b013e328305a0d9

Ferketich, A. K., Gallus, S., Colombo, P., Fossati, R., Apolone, G., Zuccaro, P., et al. (2008). Physician-delivered advice to quit smoking among Italian smokers. *American Journal of Preventive Medicine*, 35, 60–63. doi:10.1016/j.amepre.2008.03.022

Ferry, L. H., Grissino, L. M., & Runfola, P. S. (1999). Tobacco dependence curricula in US under graduate medical education. *Journal of the American Medical Association*, 282, 825–829. doi:10.1001/jama.282.9.825

Fiore, M. C., Epps, R. P., & Manley, M. W. (1994). A missed opportunity: Teaching medical students to help their patients to successfully quit smoking. *Journal of the American Medical Association*, 271, 624–626. doi:10.1001/jama.1994.03510320064032

Fiore, M. C., Jaén, C. R., Baker, T. B., Bailey, W. C., Benowitz, N. L., Curry, S. J., et al. (2008). *Treating tobacco use and dependence: 2008 Update. Clinical practice guideline*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service. Retrieved from http://www.surgeongeneral.gov/tobacco/treating_tobacco_use08.pdf

Gallus, S., Zuccaro, P., Colombo, P., Apolone, G., Pacifici, R., Garattini, S., et al. (2006). Effects of new smoking regulations in Italy. *Annals of Oncology*, 17, 346–347. doi:10.1093/annonc/mdj070

Geller, A. C., Brooks, D. R., Powers, C. A., Brooks, K. R., Rigotti, N. A., Bognar, B., et al. (2008). Tobacco cessation and prevention practices reported by second and fourth year students at US medical schools. *Journal of General Internal Medicine*, 23, 1071–1076. doi:10.2105/AJPH.2004.057331

Geller, A. C., Zapkda, J., Brooks, K. R., Dube, C., Powers, C. A., Rigotti, N., et al. (2005). Tobacco competencies for US medical students. *American Journal of Public Health*, 95, 950–955. doi:10.2105/AJPH.2004.057331

Grassi, M. C., Enea, D., Ferketich, A. K., Lu, B., & Nencini, P. (2009). A smoking ban in public places increases the efficacy of bupropion and counseling on cessation outcomes at 1 year. *Nicotine & Tobacco Research*, 11, 1114–1121. doi:10.1093/ntr/ntp110

Grassi, M. C., Enea, D., Ferketich, A. K., Lu, B., Pasquariello, S., & Nencini, P. (2011). Effectiveness of varenicline for smoking cessation: A 1-year follow-up study. *Journal of Substance Abuse Treatment*, 4, 64–70. doi:10.1016/j.jsat.2011.01.014

Grassi, M. C., Enea, D., Marchetti, R., Caricati, A. M., & Nencini, P. (2006). Combined counseling and bupropion therapy for smoking cessation: Identification of outcome predictors. *Drug Development Research*, 67, 271–279. doi:10.1002/ddr.20085

Gualano, M. R., Siliquini, R., Manzoli, L., Firenze, A., Cattaruzza, M. S., Bert, F., et al. (2011). Tobacco use prevalence, knowledge and attitudes, and tobacco cessation training among medical students: Results of a pilot study of Global Health Professions Students Survey (GHPSS) in Italy. *Journal of Public Health*. doi:10.1007/s10389-011-0442-2. Retrieved from: http://www.springerlink.com/content/w1654778l2280152/

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K. O. (1991). The Fagerström Test for Nicotine Dependence: A revision of the Fagerström Tolerance Questionnaire. *British Journal of Addiction*, 86, 1119–1127. doi:10.1111/j.1360-0443.1991.tb01879.x

La Torre, G., Sandström, P., Falkenberg, M., Tanskanen, P., Patja, K., Kauhanen, J., et al. (2009). Smoking prevention and smoking cessation training in European medical schools. *European Journal of Public Health*, 19(Suppl. 1), 42. doi:10.1093/eurpub/ckp504

La Torre, G., Thuemmler, K., Bes-Rastrollo, M., Czaplicki, M., Siliquini, R., Firenze, A., et al. (2009). Tobacco smoking and medical students: Results of a multicentre Global Health Professions Survey in Europe. *European Journal of Public Health*, 19(Suppl. 1), 41–42. doi:10.1093/eurpub/ckp504

Osservatorio Fumo, Alcol e Droga (OssFAD). (2008). *Linee guida cliniche per promuovere la cessazione dell'abitudine al fumo [Clinical guidelines to promote smoking cessation]*. Roma: Istituto Superiore di Sanità. Retrieved from http://www.iss.it/fumo/publ/cont.php?id=146&lang=1&tipo=19

Osservatorio Fumo, Alcol e Droga (OssFAD). (2010). *Relazione annuale sul tabagismo. Indagine DOXA [Annual report on tobacco use. The DOXA study]*. Roma: Istituto Superiore di Sanità. Retrieved from http://www.iss.it/fumo/rann/cont.php?id=195&lang=1&tipo=3

Parrott, S., Godfrey, C., Raw, M., West, R., & McNeill, A. (1998). Guidance for commissioners on the cost effectiveness of smoking cessation interventions. Health Educational Authority. *Thorax*, 53(Suppl. 5), S1–S38. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1765918/

Peto, R., Lopez, A. D., Boreham, J., Thun, M., & Heath, C. (2006). *Mortality from smoking in developed countries 1950–2000* (2nd edn.). Oxford: Oxford University Press.

Pipe, A., Sorensen, M., & Reid, R. (2009). Physician smoking status, attitudes toward smoking, and cessation advice to patients: An international survey. *Patient Education and Counseling*, 74, 118–123. doi:10.1016/j.pec.2008.07.042

Powers, C., Zapka, J., Bognar, B., Dube, C., Hyder Ferry, L., Ferguson, K. J., et al. (2004). Evaluation of current tobacco curriculum at 12 US medical schools. *Journal of Cancer Education*, 19, 212–219. doi:10.1207/s15430154jce1904_7

Raupach, T., Hanneforth, N., Anders, S., Pukrop, T., Th J ten Cate, O., & Harendza, S. (2010). Impact of teaching and assessment format on electrocardiogram interpretation skills. *Medical Education*, 44, 731–740. doi:10.1111/j.1365-2923.2010.03687.x

Raupach, T., Merker, J., Hasenfuβ, G., Andreas, S., & Pipe, A. (2011). Knowledge gaps about smoking cessation in hospitalized patients and their doctors. *European Journal of Cardiovascular Prevention and Rehabilitation*, 18, 334–341. doi:10.1177/1741826710389370

Raupach, T., Shahab, L., Baetzing, S., Hoffmann, B., Hasenfuss, G., West, R., et al. (2009). Medical students lack basic knowledge about smoking: Findings from two European medical schools. *Nicotine & Tobacco Research*, 11, 92–98. doi:10.1093/ntr/ntn007

Richmond, R., Zwar, N., Taylor, R., Hunnisett, J., & Hyslop, F. (2009). Teaching about tobacco in medical schools: A worldwide study. *Drug and Alcohol Review*, 28, 484–487. doi:10.1111/j.1465-3362.2009.00105.x

Schkrohowsky, J. G., Kalesan, B., & Alberg, A. J. (2007). Tobacco awareness in three U.S. medical schools. *Journal of Addictive Diseases*, 26, 101–106. doi:10.1300/J069v26n03_11

Springer, C. M., Tannert Niang, K. M., Matte, T. D., Miller, N., Bassett, M. T., & Frieden, T. R. (2008). Do medical students know enough about smoking to help their future patients? Assessment of New York City fourth-year medical students' knowledge of tobacco cessation and treatment for nicotine addiction. *Academic Medicine*, 83, 982–989. doi:10.1097/ACM.0b013e3181850b68

Teo, K. K., Ounpuu, S., Hawken, S., Pandey, M. R., Valentin, V., Hunt, D. D., et al. (2006). Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study: A case-control study. *Lancet*, 368, 647–658. doi:10.1016/S0140-6736(06)69249-0

Tønnessen, P., Carrozzi, L., Fagerström, K. O., Gratziou, C., Jimenez–Ruiz, C., Nardini, S., et al. (2007). Smoking cessation in patients with respiratory disease: A high priority, integral component of therapy. *European Respiratory Journal*, 29, 390–417. doi:10.1183/09031936.00060806

U.S. Department of Health and Human Services. (2010). *How tobacco smoke causes disease: The biology and behavioral basis for smoking-attributable disease: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Retrieved from: http://www.cdc.gov/tobacco/data_statistics/sgr/2010/index.htm

Warren, C. W., Jones, N. R., Chauvin, J., Peruga, A., & GTSS Collaborative Group. (2008). Tobacco use and cessation counseling: Cross-country. Data from the Global Health Professions Student Survey (GHPSS), 2005–7. *Tobacco Control*, 17, 238–247. doi:10.1136/tc.2007.023895

World Health Organization (WHO). (2008). *The MPOWER: A policy package to reverse the tobacco epidemic*. Geneva, Switzerland: World Health Organization Press. Retrieved from www.who.int/tobacco/mpower/mpower_english.pdf.