HHS Public Access

Author manuscript

Acad Med. Author manuscript; available in PMC 2016 December 01.

Published in final edited form as:

Acad Med. 2015 December ; 90(12): 1713–1719. doi:10.1097/ACM.0000000000000873.

A Study of the Use, Knowledge, and Beliefs About Cigarettes and Alternative Tobacco Products Among Students at One U.S. Medical School

Sherry Zhou, MD, MS [a first-year internal medicine resident],
University of Michigan Health System, Ann Arbor, Michigan

Nancy Van Devanter, DrPH, RN, EdM [associate professor],
New York University College of Nursing, New York, New York

Michael Fenstermaker, MD, MS [a first-year urology resident],
University of Michigan Health System, Ann Arbor, Michigan

Philip Cawkwell [a third-year medical student],
New York University School of Medicine, New York, New York

Scott Sherman, MD, MPH [associate professor of population health, medicine, and psychiatry], and
New York University School of Medicine, New York, New York

Michael Weitzman, MD [professor, Departments of Pediatrics and Environmental Medicine, and Global Institute of Public Health]
New York University School of Medicine, New York, New York

Abstract

Purpose—In the United States, the prevalence of the use of alternative tobacco products (ATPs) (e.g., hookahs, e-cigarettes, cigars/cigarillos) has increased sharply. As future health care providers, medical students will play a critical role in health promotion and disease prevention. This study investigated medical students' use, knowledge, and beliefs about cigarettes and ATPs.

Method—In 2014, the authors surveyed all students enrolled at one medical school in New York City. The survey included questions about personal use of tobacco products, perceptions about the harms of ATPs and their role in disease causation, education about ATPs, and cessation training and practices related to ATPs and cigarettes. The authors compared results across medical school classes.

Results—Of 720 students, 431 (59.9%) completed the survey. Of those, 64 (14.7%) were current users of tobacco or smoking products, including cigarettes (17, 3.9%), ATPs (21, 4.8%), or marijuana (39, 8.9%). Many believed that ATPs contributed less than cigarettes to various diseases. Respondents received less cessation intervention training regarding ATPs than cigarettes

Correspondence should be addressed to Sherry Zhou, University of Michigan Health System, Department of Internal Medicine, 3116 Taubman Center, 1500 E. Medical Center Drive, SPC 5368, Ann Arbor, MI 48109-5368; szh@med.umich.edu..

Other disclosures: None reported.

Ethical approval: The New York University School of Medicine institutional review board deemed this study exempt.

(*P* < .0001). They felt less confident providing ATP cessation counseling than cigarette cessation counseling (*P* < .0001) and were less likely to report counseling patients on ATP cessation than cigarette cessation (46, 10.7% vs. 280, 64.8%, *P* < .0001).

Conclusions—A concerning percentage of surveyed medical students use tobacco products, including ATPs, and lack the knowledge, education, and cessation counseling skills to provide accurate information about them to patients. ATP education should be added to medical school curricula to address this gap.

Tobacco use is the leading preventable cause of death in the United States and globally.[1] In addition to traditional cigarettes, a number of alternative tobacco products (ATPs) now are available. These include hookahs or waterpipes, in which tobacco mixed with molasses is smoldered in the bowel of the hookah then drawn through water and inhaled; chewing tobacco or snus, which is a smokeless tobacco product that comes in loose-leaf strips of shredded tobacco leaves; electronic cigarettes or e-cigarettes, which are battery-powered, provide nicotine through a cartridge, and allow the user to exhale nicotine vapor from the end of the e-cigarette; kreteks, which are clove cigarettes that contains 60%-90% tobacco; and cigars, which are large bundles of tobacco tightly rolled in leaf tobacco then smoked.[2] Although the total consumption of cigarettes in the United States decreased by 33% between 2000 and 2011, the consumption of ATPs and nicotine delivery systems (e.g., e-cigarettes) increased by more than 100% over the same time period.[3] A 2012 Centers for Disease Control and Prevention (CDC) report indicated that a staggering 21.3% of U.S. adults used a tobacco product (including cigarettes, cigars/cigarillos, regular pipes, hookahs/waterpipes, smokeless tobacco, and e-cigarettes) every day or some days. By region, prevalence was highest in the Midwest (23.9%), followed by the South (22.9%), Northeast (19.7%), and West (19.0%). However, the use of hookahs was most prevalent in the Northeast (0.7%) compared to other regions.[4] Because of these findings, the CDC warned that the decrease in cigarette consumption is being "offset by increases in [the use of] other forms of tobacco."[5]

In contrast to our extensive knowledge of the effects of cigarette use, there is a marked paucity of information about the epidemiology and health effects of ATP use. Existing studies have shown that certain ATPs, such as hookahs, deliver tar, nicotine, and carbon monoxide in higher doses than cigarettes and are likely associated with adverse health effects that are comparable to or more severe than cigarettes.[6-8]

Physicians play a critical role in disease prevention and healthy lifestyle promotion. They have the potential to influence patients' behaviors as well as the responsibility to help further reduce all tobacco use. Medical students' use, knowledge, and beliefs about ATPs are of vital importance because the willingness of physicians to provide prevention counseling is heavily influenced by their own habits, knowledge, and beliefs.[9,10] In fact, physicians who personally use tobacco are less likely to provide cessation counseling to patients.[11] Recent studies in a number of countries have found that as many as 20% of medical students use ATPs,[12,13] although no such studies have been conducted in the United States.

To fill this gap in the literature, we surveyed medical students at a large medical school in New York City to assess their use, knowledge, and self-reported level of education and

cessation training regarding ATPs. In addition, we assessed their beliefs about the importance and impact of health care professionals in tobacco cessation efforts.

Method

The institutional review board at New York University School of Medicine deemed this study exempt, as the research involved the use of a survey instrument for educational purposes and the information obtained was not recorded in such a manner that individual participants could be identified.

Recruitment

We sent an anonymous Internet survey to all 720 medical students enrolled at New York University School of Medicine; the survey remained open for seven weeks from February to March of 2014. We used class email lists to contact students and sent a total of four reminder emails. To encourage participation, one of the reminders was sent by the dean of medical education. In addition, students were informed that they would have the opportunity to enter a raffle for an iPad Mini upon completion of the survey. E-mail addresses entered for the raffle were uncoupled from the survey data to maintain anonymity.

Survey development

The survey consisted of 33 questions adapted from previously validated surveys, including the National Youth Tobacco Survey[14] and the Global Health Professionals Student Survey,[15] and from a survey of the hookah habits of medical students at one Canadian medical school.[16] It also contained newly created questions that were developed and reviewed by survey specialists to ensure clarity. The final survey questions fell into five major categories: (1) demographics; (2) personal use of various tobacco products and nicotine delivery systems; (3) perceptions about the harms of ATPs and their role in disease causation; (4) self-reported level of education about ATPs; and (5) self-reported cessation training and practices related to ATPs and cigarettes. The survey instrument had an estimated completion time of ten minutes. It was piloted with the author's Master of Science in Clinical Investigation seminar class, and the wording of several questions was edited for clarity.

Measures

Demographics—Students were asked to provide their age, sex, medical school class, race/ethnicity, and clinical experience.

Personal use of tobacco products and nicotine delivery systems—Students were asked to indicate the frequency of their use of cigarettes, e-cigarettes, cigars/cigarillos, hookahs, smokeless tobacco, and marijuana. Responses included: "once or more in my life" which indicated lifetime use, "past year" which indicated use in the past year, and "past 30 days" which indicated current use.

Perceptions about the harms of ATPs and their role in disease causation—Students were asked, "Compared to cigarettes, what is the potential for harm for each of the

following products?" Responses included: "more harmful," "equally harmful," "less harmful," "I don't know," and "currently the answer is not known." Students then were asked to indicate the degree to which ATPs and cigarettes are responsible for various diseases on a five-point scale (1 = not at all responsible, 2 = a little responsible, 3 = somewhat responsible, 4 = moderately responsible, 5 = largely responsible).

Self-reported level of education about ATPs—Students were asked to indicate the level of education about ATPs and cigarettes they received on a five-point scale (1 = no education, 2 = a little education, 3 = some education, 4 = a lot of education, 5 = excessive education). To explore their general knowledge of tobacco products, students were asked the following questions: (1) What percentage of U.S. high school students have used a tobacco product in the last 30 days?; (2) Which of the following are found in electronic cigarettes?; and (3) How much tobacco does one cigar contain compared to conventional cigarettes?

Self-reported cessation training and practices related to ATPs and cigarettes —Students were asked to indicate their agreement with the statement "I have received enough training on ATP cessation intervention" using a five-point scale (1 = strongly disagree through 5 = completely agree). They then were asked the same question about cigarettes. To assess their confidence in cessation counseling, students were asked to answer "How confident are you that you can counsel smokers of ATPs to give up smoking?" on a five-point scale (1 = very confident through 5 = not at all confident). Again, they were asked the same question for cigarettes. To assess their counseling practices, students were asked to respond with "yes" or "no" to the question "Have you ever counseled anybody on cessation of ATPs?" Once more, they were asked the same question for cigarettes. Finally, students were asked to indicate their agreement with the statements "Advising patients to quit smoking is a priority to me" and "Counseling patients on smoking cessation increases the chance they will quit" using a five-point scale (1 = strongly disagree through 5 = completely agree).

Analyses

We examined respondents' demographic characteristics and performed Student's t-tests to compare differences between self-reported level of education, degree of disease causation, counseling confidence, and level of cessation training on ATPs versus cigarettes. To compare differences in scaled responses between multiple medical school classes of students, we used bivariate one-way analyses of variance and post-hoc pairwise comparisons with Šidák correction. For binary responses, such as the percentage of respondents who reported conducting cessation counseling, we used Pearson's chi-square and Fisher's exact test. Because most respondents completed the entire survey, we excluded incomplete responses from our analyses in a casewise manner. We determined statistical significance using a two-sided $\alpha = 0.05$ and performed all analyses using Stata 12 SE (StataCorp, College Station, TX).

Results

Of the 720 students to whom the survey was sent, 431 submitted complete surveys, for a complete response rate of 59.9%. An additional 103 students submitted partially completed surveys, for an overall response rate of 74.2%. Compared to those who submitted complete surveys, the partial respondents did not differ by age, race, gender, medical school class, or completion of at least one month of clinical experience. Complete respondents also did not differ from the entire medical school population in terms of age, race, or gender.

Demographics

Of the 431 complete respondents, the average age was 25 with a range from 21 to 32 years; 221 (49.7%) were female and 226 (50.3%) male; 241 (53.4%) were White, 122 (27.8%) Asian or South Asian, 31 (7.0%) reported multiple races, 28 (6.3%) Hispanic or Latino, and 11 (2.3%) Black. By medical school class, 109 (24.6%) were first-year students, 89 (20.2%) second-year students, 91 (20.2%) third-year students, 124 (27.6%) fourth-year students, 23 (5.1%) in the MD/PhD program, and 10 (2.1%) in a gap year pursuing research or a dual degree. The majority of respondents (311, 69.4%) reported having some prior clinical experience while in medical school (via clerkships or volunteer activities).

Personal use of tobacco products and nicotine delivery systems

When asked about their personal use of tobacco or smoking products, 263 (60.2%) respondents reported ever using and 64 (14.7%) reported currently using any of the six products we studied. With regards to ATPs, 226 (51.7%) respondents reported ever using and 21 (4.8%) reported currently using them. Overall, current use was most prevalent for marijuana (39, 8.9%), followed by cigarettes (17, 3.9%), cigars (9, 2.1%), e-cigarettes (7, 1.6%), hookahs (5, 1.1%), and smokeless tobacco (4, 0.9%). Even though use of hookahs in the past month was less prevalent then use of other ATPs, they were the most commonly used product over the past year (71, 16.3%) and over respondents' lifetime (188, 43.0%) (see Table 1).

Perceptions about the harms of ATPs and their role in disease causation

Only a small percentage of respondents correctly reported that the potential harm for each ATP compared to cigarettes is currently unknown: 94 (21%) chose the correct response for cigars, 13 (2.9%) for hookahs, 8 (1.8%) for smokeless tobacco and cigars each, and 4 (1.2%) for cigars. In addition, respondents reported that cigarettes were more responsible than ATPs for causing each of the following diseases: gastrointestinal, lung, liver, and bladder cancers; chronic obstructive pulmonary disease; and coronary artery disease (all $P < .001$) (see Table 2).

Self-reported level of education about ATPs

Compared to education about cigarettes, respondents reported receiving significantly less education about the epidemiology, health effects, and secondhand smoke effects of ATPs (all $P < .0001$). When comparing respondents' answers among medical school classes, second-, third-, and fourth-year respondents reported receiving significantly more education about the epidemiology of cigarettes than did first-year respondents ($P = .001$, $P = .0001$, P

= .0001, respectively); on the topic of the epidemiology of ATPs, third- and fourth-year respondents reported receiving significantly more education than did first-year respondents (*P* = .003, *P* = .002, respectively). On the topic of the health effects of cigarettes, second-, third-, and fourth-year respondents reported receiving significantly more education than did first-year respondents (all *P* = .0001); on the topic of the health effects of ATPs, only third- and fourth-year respondents reported receiving significantly more education than did first-year respondents (*P* = .001, *P* = .006, respectively). On the topic of the secondhand smoke effects of cigarettes, second-, third-, and fourth-year respondents reported receiving significantly more education than did first-year respondents (*P* = .003, *P* = .001, *P* = .0001, respectively) and third-year respondents significantly more than second-year respondents (*P* = .002); on the topic of the secondhand smoke effects of ATPs, third- and fourth-year respondents reported receiving significantly more education than did first-year respondents (*P* = .002, *P* = .024, respectively) (see Table 3).

The percentages of respondents who correctly answered the general tobacco knowledge questions ranged from 2.7% to 21.5% as listed in Table 4. The percentage of correct responses was not significantly different among respondents across medical school classes for any of the questions (see Table 4).

Self-reported cessation training and practices related to ATPs and cigarettes

Respondents reported receiving less cessation intervention training regarding ATPs than regarding cigarettes (*P* < .0001) and feeling less confident providing ATP cessation counseling than in providing cigarette cessation counseling (*P* < .0001). In fact, 386 (89.4%) had never counseled anyone concerning ATP cessation, compared to only 152 (35.2%) who had not done so for cigarettes (*P* < .0001) (see Table 5).

When compared across medical school classes, second-, third-, and fourth-year respondents all reported receiving significantly more training regarding cigarette cessation interventions than did first-year respondents (all *P* = .0001) and feeling more confident in counseling cigarette smokers to quit (all *P* = .0001). In addition, third- and fourth-year respondents reported receiving significantly more training regarding cigarette cessation interventions than did second-year respondents (*P* = .001, *P* = .011, respectively). When asked about training regarding ATP cessation interventions, third- and fourth-year respondents reported receiving significantly more training than did first-year respondents (*P* = .0001, *P* = .002, respectively) and feeling more confident counseling ATP users to quit (all *P* = .0001).

Respondents' beliefs about whether smoking cessation counseling was a priority to them and whether smoking cessation counseling provided by physicians increased the chances that patients would quit were not significantly different across medical school classes (see Table 5).

Discussion

In this study, we explored medical students' use, knowledge, and beliefs about ATPs. To our knowledge, ours is the first to explore these characteristics in U.S. medical students. Our findings indicate that a notable percentage of medical students use tobacco products and lack

the knowledge, education, and skills needed to provide accurate information about ATPs to patients as well as to protect their own health. The growing use of ATPs among Americans combined with the lack of knowledge of their danger among future physicians support the introduction of ATP education into the medical school curriculum.

In contrast to the 18% of adults and 14% of high school students in the United States who currently smoke cigarettes,[17,18] only about 1% of physicians do.[19] We found that four times as many students at the studied medical school as physicians currently smoke cigarettes. Whether those who smoke cigarettes as medical students will continue as physicians is unclear. In all, 15% of the students in our study currently use a smoking or tobacco product, including cigarettes, e-cigarettes, hookahs, cigars, chewing tobacco, and marijuana. While we are unaware of data regarding physicians' ATP use, the prevalence of current hookah and cigar use, 1% and 2% respectively, among the medical students in our study, is comparable to that found in the study of Canadian medical students (6% were current hookah users and 6% were current cigar users).[16]

Given the public's relatively regular contact with physicians--three times per year for the average American adult[19]--and the role that physicians play in providing authoritative health information to patients, the public likely will turn to physicians for accurate information regarding new tobacco products, such as ATPs. However, our data suggest that medical students do not learn as much about ATPs as they do about cigarettes. Thus, training future physicians in effective smoking cessation counseling has the potential to improve public health.[14,20] It is crucial then to inform and alert future physicians about new tobacco products so they can better contribute to tobacco control efforts.

The 2014 report from the Surgeon General, entitled "The Heath Consequences of Smoking: 50 Years of Progress," noted a causal link between cigarette smoking and the number of newly diagnosed cases of diseases, such as liver cancer and diabetes.[21] Our study demonstrated that the majority of students at the studied medical school recognized that cigarettes are largely or moderately responsible for causing debilitating or mortal diseases, such as lung cancer and coronary artery disease. These students, however, were not as certain about the causal relationship between cigarettes and the diseases recently linked to cigarette smoking, such as liver and bladder cancer.[21] The authors of the study of Canadian medical students[16] observed a similar pattern, suggesting that this may be a common issue in medical education in North America.

The medical students in our study, on average, reported that ATPs were less likely than cigarettes to cause various chronic diseases and cancers. However, while these questions were intended to ask students to estimate the proportion of disease incidence in a population that is due to ATP or cigarette use, a number of other interpretations were also possible. For example, some might have interpreted the question as asking for the contribution of ATPs or cigarettes to the initiation and development of the diseases, and others might have assumed that cigarettes are more likely to cause disease than ATPs because more people smoke cigarettes than use ATPs. Although research on the long-term health consequences of ATP use is in its infancy, meta-analyses have linked hookah use to lung cancer and low birth-weight.[22] Other studies have linked hookah use to esophageal cancer,[23,24] stomach cancer,[23]

poor birth outcomes,[25-27] and endothelial dysfunction.[28] Educating medical students about these potentially fatal outcomes associated with ATP use is necessary to address this knowledge gap and to correct the popular misconception that ATPs are safe alternatives to cigarettes.

As many as 70% of cigarette smokers visit a physician each year,[29] and a counseling intervention as short as three minutes can significantly increase cessation rates in cigarette smokers who want to quit.[19,30] Yet only about 66% of primary care physicians, and even fewer specialists, discuss smoking cessation with patients who smoke cigarettes.[19] Reasons why so few physicians provide such highly effective counseling include lack of information about smoking cessation,[31] lack of confidence in counseling skills,[32] lack of support services,[33] and time constraints.[31,33] Given the widespread belief that ATPs are safer and healthier than cigarettes, physicians must learn about the existing evidence regarding ATPs and initiate the discussion about ATP cessation with their patients.

Findings from our study indicate that medical students receive significantly less training on ATP cessation interventions than on cigarette cessation interventions. Consequently, more students reported being “not so confident” advising ATP users to quit, and almost 90% had never counseled anyone on ATP cessation. Interestingly, the medical education curricula on tobacco cessation in New York City has not been assessed since 2004.[34] Ideally, ATP education will be added to existing tobacco modules, but before this can happen, a system-wide assessment of all forms of tobacco education should be performed. This comprehensive evaluation should be repeated every year or two to identify gaps in tobacco education and areas for improvement after the introduction of ATPs to the curriculum. Medical students should learn about the available cessation techniques that are tailored towards ATP use. To date, only one study of ATP cessation interventions, specifically hookah use, has been conducted; the authors found that behavioral counseling sessions plus bupropion therapy were more effective in facilitating hookah use cessation than cigarette smoking cessation.[35] Thus, the responses in our study that students received poor ATP cessation education, though of concern, probably reflect the general paucity of information about effective ATP cessation counseling.

Our study has at least two noteworthy limitations. First, we surveyed a sample of medical students at only one U.S. medical school, and we cannot generalize our findings to other schools. Second, while we did achieve a 60% complete response rate (and a 74% overall response rate), which is higher than that in other published studies concerning medical students,[16,34,36] we cannot know if respondents’ reported use, knowledge, and beliefs differ from those of non-respondents.

In summary, our findings indicate that a surprising number of medical students at one U.S. medical school use tobacco products, including ATPs, and that they lack the knowledge, education, and cessation counseling skills needed to provide accurate information about ATPs to their future patients. We recommend that medical schools incorporate ATP education into the curriculum and encourage similar studies at other medical schools across the United States to better understand students’ use, knowledge, and beliefs. We hope that

doing so will inform future physicians about the dangers of all tobacco use and reduce its prevalence among physicians and the public.

Acknowledgements

The authors thank the medical students who participated in this study, Dean Buckvar-Keltz, and Dr. Victoria Harnik, for their support.

Funding/Support: This study was partially funded by grants from the National Institutes of Health (NIH/NIEHS 5 P30 ES000260-49 and NIH/NCI 3 P30 CA016087-33S1).

References

1. Centers for Disease Control and Prevention. Current tobacco use among middle and high school students--United States, 2011. MMWR Morb Mortal Wkly Rep. 2012; 61:581–585. [PubMed: 22874835]
2. Prignot JJ, Sasco AJ, Poulet E, Gupta PC, Aditama TY. Alternative forms of tobacco use. Int J Tuberc Lung Dis. 2008; 12:718–727. [PubMed: 18544194]
3. Centers for Disease Control and Prevention. Consumption of cigarettes and combustible tobacco--United States, 2000-2011. MMWR Morb Mortal Wkly Rep. 2012; 61:565–569. [PubMed: 22854624]
4. Agaku IT, King BA, Husten CG, et al. Tobacco product use among adults--United States, 2012-2013. MMWR Morb Mortal Wkly Rep. 2014; 63:542–547. [PubMed: 24964880]
5. Centers for Disease Control and Prevention. Drop in cigarette consumption offset by increases in other forms of smoked tobacco. Press release. Aug.2012 :2.
6. Knishkowy B, Amitai Y. Water-pipe (narghile) smoking: An emerging health risk behavior. Pediatrics. 2005; 116:e113–e119. [PubMed: 15995011]
7. Shihadeh A. Investigation of mainstream smoke aerosol of the argileh water pipe. Food Chem Toxicol. 2003; 41:143–152. [PubMed: 12453738]
8. Eissenberg T, Shihadeh A. Waterpipe tobacco and cigarette smoking: Direct comparison of toxicant exposure. Am J Prev Med. 2009; 37:518–523. [PubMed: 19944918]
9. Yentz S, Klein RJ, Oliverio AL, et al. The impact of tobacco cessation training of medical students on their attitude towards smoking. Med Teach. 2012; 34:1000. [PubMed: 22931146]
10. Frank E, Segura C, Shen H, Oberg E. Predictors of Canadian physicians' prevention counseling practices. Can J Public Health. 2010; 101:390–395. [PubMed: 21214054]
11. Frank E, Elon L, Spencer E. Personal and clinical tobacco-related practices and attitudes of U.S. medical students. Prev Med. 2009; 49:233–239. [PubMed: 19576926]
12. Senkubuge F, Ayo-Yusuf OA, Louwagie GM, Okuyemi KS. Water pipe and smokeless tobacco use among medical students in South Africa. Nicotine Tob Res. 2012; 14:755–760. [PubMed: 22039073]
13. Imam SZ, Nawaz H, Sepah YJ, Pabaney AH, Ilyas M, Ghaffar S. Use of smokeless tobacco among groups of Pakistani medical students - A cross sectional study. BMC Public Health. 2007; 7:231. [PubMed: 17767719]
14. GTSS Collaborative Group. Tobacco use and cessation counselling: Global Health Professionals Survey Pilot Study, 10 countries, 2005. Tob Control. 2006; 2(15 Suppl):ii31–34.
15. Starr, G.; Rogers, T.; Schooley, M.; Porter, S.; Wiesen, E.; Jamison, N. Key Outcome Indicators for Evaluating Comprehensive Tobacco Control Programs. Centers for Disease Control and Prevention; Atlanta, GA: 2005.
16. Vanderhoek AJ, Hammal F, Chappell A, Wild TC, Raupach T, Finegan BA. Future physicians and tobacco: An online survey of the habits, beliefs and knowledge base of medical students at a Canadian university. Tob Induc Dis. 2013; 11:9. [PubMed: 23557392]
17. Agaku IT, King BA, Dube SR. Current cigarette smoking among adults - United States, 2005-2012. MMWR Morb Mortal Wkly Rep. 2014; 63:29–34. [PubMed: 24430098]

18. Centers for Disease Control and Prevention. Tobacco product use among middle and high school students--United States, 2011 and 2012. MMWR Morb Mortal Wkly Rep. 2013; 62:893–897. [PubMed: 24226625]
19. Association of American Medical Colleges. Physician Behavior and Practice Patterns Related to Smoking Cessation: A Report Prepared for the American Legacy Foundation. Association of American Medical Colleges; Washington, DC: 2007. http://www.legacyforhealth.org/content/download/566/6812/file/Physicians_Study.pdf. Accessed June 24, 2015
20. Pati S. Putting tobacco cessation and prevention into undergraduate medical education. Int J Prev Med. 2014; 5:69–75. [PubMed: 24554994]
21. U.S. Department of Health and Human Services. A Report of the Surgeon General. Atlanta, GA: 2014. The Health Consequences of Smoking: 50 Years of Progress. 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
22. Akl EA, Gaddam S, Gunukula SK, Honeine R, Jaoude PA, Irani J. The effects of waterpipe tobacco smoking on health outcomes: A systematic review. Int J Epidemiol. 2010; 39:834–857. [PubMed: 20207606]
23. Gunaid AA, Sumairi AA, Shidrawi RG, et al. Oesophageal and gastric carcinoma in the Republic of Yemen. Br J Cancer. 1995; 71:409–410. [PubMed: 7841062]
24. Nasrollahzadeh D, Kamangar F, Aghcheli K, et al. Opium, tobacco, and alcohol use in relation to oesophageal squamous cell carcinoma in a high-risk area of Iran. Br J Cancer. 2008; 98:1857–1863. [PubMed: 18475303]
25. Tamim H, Yunis KA, Chemaitelly H, Alameh M, Nassar AH. Effect of narghile and cigarette smoking on newborn birthweight. BJOG. 2008; 115:91–97. [PubMed: 18053105]
26. Nuwayhid IA, Yamout B, Azar G, Kambris MA. Narghile (hubble-bubble) smoking, low birth weight, and other pregnancy outcomes. Am J Epidemiol. 1998; 148:375–383. [PubMed: 9717882]
27. Mirahmadizadeh A, Nakhaee N. Prevalence of waterpipe smoking among rural pregnant women in Southern Iran. Med Princ Pract. 2008; 17:435–439. [PubMed: 18836270]
28. Rammah M, Dandachi F, Salman R, Shihadeh A, El-Sabban M. In vitro effects of waterpipe smoke condensate on endothelial cell function: A potential risk factor for vascular disease. Toxicol Lett. 2013; 219:133–142. [PubMed: 23454654]
29. Centers for Disease Control and Prevention. Physician and other health-care professional counseling of smokers to quit--United States, 1991. MMWR Morb Mortal Wkly Rep. 1993; 42:854–857. [PubMed: 8232167]
30. Clinical Practice Guideline Treating Tobacco Use and Dependence 2008 Update Panel, Liasisons, and Staff. A clinical practice guideline for treating tobacco use and dependence: 2008 update. A U.S. Public Health Service report. Am J Prev Med. 2008; 35:158–176. [PubMed: 18617085]
31. Ferry LH, Grissino LM, Runfola PS. Tobacco dependence curricula in US undergraduate medical education. JAMA. 1999; 282:825–829. [PubMed: 10478687]
32. Conroy MB, Majchrzak NE, Regan S, Silverman CB, Schneider LI, Rigotti NA. The association between patient-reported receipt of tobacco intervention at a primary care visit and smokers' satisfaction with their health care. Nicotine Tob Res. 2005; 1(7 Suppl):S29–S34. [PubMed: 16036267]
33. Rigotti NA, Thorndike AN. Reducing the health burden of tobacco use: What's the doctor's role? Mayo Clin Proc. 2001; 76:121–123. [PubMed: 11213298]
34. Springer CM, Tannert Niang KM, Matte TD, Miller N, Bassett MT, Frieden TR. 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. Acad Med. 2008; 83:982–989. [PubMed: 18820533]
35. Dogar O, Jawad M, Shah SK, et al. Effect of cessation interventions on hookah smoking: Post-hoc analysis of a cluster-randomized controlled trial. Nicotine Tob Res. 2014; 16:682–688. [PubMed: 24376277]
36. Minen MT, Duquaine D, Marx MA, Weiss D. A survey of knowledge, attitudes, and beliefs of medical students concerning antimicrobial use and resistance. Microb Drug Resist. 2010; 16:285–289. [PubMed: 20624097]

Table 1

Medical Students' Use of Alternative Tobacco Products (ATPs) and Cigarettes[a]

	No. (% of 431)		
Product	**Used ever**	**Used in the past year**	**Used in the past 30 days**
Hookahs	188 (43.0)	71 (16.3)	5 (1.1)
Marijuana	136 (31.1)	53 (12.1)	39 (8.9)
Cigars/Cigarillos	123 (28.2)	29 (6.6)	9 (2.1)
Cigarettes	122 (27.9)	29 (6.6)	17 (3.9)
Smokeless tobacco	32 (7.3)	5 (1.1)	4 (0.9)
E-cigarettes	18 (4.1)	14 (3.2)	7 (1.6)
Any product[b]	263 (60.2)	130 (29.8)	64 (14.7)
Any ATP[c]	226 (51.7)	96 (22.0)	21 (4.8)

[a] An anonymous online survey was completed by 431 medical students at one medical school in New York City in 2014. Students were asked to indicate the frequency of their use of various tobacco and smoking products.

[b] Includes cigarettes, e-cigarettes, cigars/cigarillos, hookahs, smokeless tobacco, and marijuana.

[c] Includes e-cigarettes, cigars/cigarillos, hookahs, and smokeless tobacco.

Table 2

Medical Students' Perceptions about the Roles of Alternative Tobacco Products (ATPs) and Cigarettes in Disease Causation[a]

Disease	ATPs, mean (SD)	Cigarettes, mean (SD)	*P* value[b]
GI cancer	3.9 (1.0)	4.3 (0.8)	< .001
Lung cancer	3.6 (1.0)	4.9 (0.4)	< .001
Liver cancer	2.6 (1.0)	2.8 (1.1)	< .001
Bladder cancer	3.0 (1.1)	3.7 (1.2)	< .001
COPD	3.6 (1.0)	4.9 (0.3)	< .001
CAD	3.5 (1.0)	4.4 (0.7)	< .001

Abbreviations: SD indicates standard deviation; GI, gastrointestinal; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease.

[a] An anonymous online survey was completed by 431 medical students at one medical school in New York City in 2014. Students were asked to indicate the degree to which ATPs and cigarettes are responsible for various diseases on a five-point scale (1 = not at all responsible; 2 = a little responsible; 3 = somewhat responsible; 4 = moderately responsible; 5 = largely responsible).

[b] Student's t-test

Table 3

Medical Students' Self-Reported Level of Education about Alternative Tobacco Products (ATPs) and Cigarettes[a]

Topic	Overall (n = 432)	*P* value (overall cigarettes vs. ATPs)[b]	First-year students (n = 106)	Second-year students (n = 87)	Third-year students (n = 87)	Fourth-year students (n = 120)	*P* value (by class)[c]
Epidemiology							
ATPs	1.5	< .0001	1.3	1.4	1.6	1.6	.0004
Cigarettes	3.1		2.7	3.2	3.4	3.2	< .0001
Health effects							
ATPs	1.6	< .0001	1.3	1.5	1.7	1.7	.0005
Cigarettes	3.6		3.2	3.7	3.9	3.8	< .0001
Secondhand smoke effects							
ATPs	1.5	< .0001	1.3	1.4	1.6	1.6	.0013
Cigarettes	2.8		2.2	2.7	3.2	3.0	< .0001

[a] An anonymous online survey was completed by 431 medical students at one medical school in New York City in 2014. Students were asked to indicate the level of education on ATPs and cigarettes they received in the areas of epidemiology, health effects, and secondhand smoke effects on a five-point scale (1 = no education; 2 = a little education; 3 = some education; 4 = a lot of education; 5 = excessive education).

[b] Student's t-test

[c] One-way analysis of variance

Table 4

Medical Students' General Knowledge of Tobacco Products[a]

Question	No. (%) responded correctly					*P* value (by class)[b]
	Overall (n = 447)	First-year students (n = 109)	Second-year students (n = 89)	Third-year students (n = 91)	Fourth-year students (n = 124)	
What percentage of U.S. high school students have used a tobacco product in the last 30 days?	96 (21.5)	20 (18.4)	18 (20.2)	21 (23.1)	29 (23.4)	.421
Which of the following are found in electronic cigarettes?	28 (6.3)	7 (6.4)	7 (7.9)	4 (4.4)	8 (6.5)	1.000
How much tobacco does one cigar contain compared to conventional cigarettes?	12 (2.7)	1 (0.9)	4 (4.5)	2 (2.2)	4 (3.2)	.375

[a] An anonymous online survey was completed by 431 medical students at one medical school in New York City in 2014. Students' general knowledge of tobacco products was tested using the questions listed above. The correct answers are: (1) 15%-20%; (2) nicotine, humectants, tobacco specific nitrosamines, diethylene glycol; and (3) more than a pack (20 cigarettes).

[b] Fisher's exact test

Table 5

Medical Students' Self-Reported Cessation Training and Practices Related to Alternative Tobacco Products (ATPs) and Cigarettes

Item	Overall (n = 432)	*P* value (overall cigarettes vs. ATPs)	First-year students (n = 106)	Second-year students (n = 87)	Third-year students (n = 87)	Fourth-year students (n = 120)	*P* value (by class)
Mean level of agreement: Enough training on ATP cessation interventions	1.9	< .0001[b]	1.6	1.7	2.1	2.0	< .0001[c]
Mean level of agreement: Enough training on cigarette cessation interventions	3.4	--	2.5	3.3	3.9	3.8	< .0001[c]
Mean level of confidence to counsel ATP users to quit	2.2	< .0001[b]	1.8	2.2	2.4	2.4	< .0001[c]
Mean level of confidence to counsel cigarette smokers to quit	3.1	--	2.5	3.1	3.5	3.4	< .0001[c]
No. (%) who ever counseled anyone on ATP cessation	46 (10.7)	< .0001[b]	4 (3.8)	10 (11.5)	17 (19.5)	12 (10.0)	.005[d]
No. (%) who ever counseled anyone on cigarette cessation	280 (64.8)	--	20 (18.9)	52 (59.8)	84 (96.6)	114 (95.0)	< .0001[d]
Mean level of agreement: Advising patients to quit smoking is a priority for me	4.2	N/A	4.3	4.1	4.3	4.2	.2808[c]
Mean level of agreement: Counseling patients on smoking cessation increases the chance they will quit	4.3	N/A	4.2	4.3	4.4	4.2	.338[c]

[a] An anonymous online survey was completed by 431 medical students at one medical school in New York City in 2014. Students were asked a series of questions about ATP and cigarette cessation training and related practices. Students were asked to respond to the following statements: How much do you agree that "I have received enough training on ATP/cigarette cessation intervention?" (1 = strongly disagree to 5 = completely agree); How confident are you that you can counsel smokers of ATPs/cigarettes to give up smoking? (1 = not at all confident to 5 = very confident); Have you ever counseled anybody on cessation of ATPs/cigarettes? (yes or no); Advising patients to quit smoking is a priority to me. (1 = strongly disagree to 5 = completely agree); Counseling patients on smoking cessation increases the chance they will quit. (1 = strongly disagree to 5 = completely agree).

[b] Student's t-test

[c] One-way analysis of variance

[d] Chi-square test