Practice Patterns and Perceptions of Chest Health Care Providers on Electronic Cigarette Use: An In-Depth Discussion and Report of Survey Results

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Abstract

Introduction—The emergence of electronic cigarettes (ECs) has become a growing phenomenon that has sharply split opinion among the public health community, physicians, and lawmakers.

Aims—We sought to determine chest physician perceptions regarding ECs.

Methods—We conducted a web-based survey of 18,000 American College of Chest Physician (CHEST) members to determine healthcare provider experiences with EC users and to characterize provider perceptions regarding ECs.

Results/Findings—There were 994 respondents. 88% reported that patients had asked their opinion of ECs, and 31% reported EC use among at least 10% of their patients. More disagreed than agreed (41% vs. 21%) that patients could improve their health by switching from tobacco smoking to daily EC use. Respondents were split on whether ECs promote tobacco cessation (32% agree vs. 33% disagree).

Conclusions—Current perceptions of ECs are variable among providers. More than 1/3 of respondents felt that EC’s could be used for smoking cessation for smokers who failed prior quit attempts with approved therapies. However, many respondents were not convinced that ECs will...
reduce harms from tobacco use. There is an urgent need to generate additional high quality scientific data regarding ECs to inform chest physicians, health professionals and the general public.

INTRODUCTION

Tobacco dependence is one of the most important problems facing chest physicians in clinical practice. Although optimal management of conditions such as chronic obstructive pulmonary disease depends heavily on the cessation of tobacco smoking, those individuals with smoking-related diseases tend to be more highly addicted and have a more difficult time ceasing tobacco consumption than a healthy individual in the general population. (Jimenez-Ruiz et al., 2001) Prior work has shown that physicians tend to view tobacco treatment as highly relevant to a patient’s health, but with a low probability of success with smoking cessation. (F. T. Leone, Evers-Casey, Graden, & Schnoll, 2015) Multiple studies have shown low rates of physician engagement in aggressively treating tobacco dependence in the clinical setting. (Ferketich, Khan, & Wewers, 2006; Goldstein et al., 1998; Jamal et al., 2012) A more recent large survey conducted among oncology providers found that while physicians caring for cancer patients recognize the importance of tobacco cessation, many still do not routinely provide assistance to their patients. (Warren et al., 2013)

While tobacco use and its health implications have long been on the radar of chest physicians, the emergence of electronic cigarettes (ECs) or electronic nicotine delivery systems (ENDS) has become a growing phenomenon that has sharply split opinion among the public health community, physicians, and lawmakers. (Avdalovic & Murin, 2015; Drummond & Upson, 2014; Gornall, 2015; “House bill aims for less e-cigarette regulation,” 2015; Frank T. Leone & Douglas, 2014; Middlekauff, 2015; Torjesen, 2015) Organizations including the Forum of International Respiratory Societies, World Health Organization, and Centers for Disease Control have taken the position that ECs should be generally viewed with caution and that they threaten to reverse the progress made in tobacco control over the past half century. (Health, 2015; Organization, 2014; Schraufnagel et al., 2014) Similarly, the American Society of Clinical Oncology and the American Association for Cancer Research released a joint statement concluding that safety and efficacy data were insufficient to allow for recommending ECs for smoking cessation and that additional research into ECs is warranted. (Brandon et al., 2015) More recently, however, the Royal College of Physicians (RCP) broadly recommended the use of EC’s in the United Kingdom as a means to reduce harms from tobacco smoking. (Britton, Arnott, McNeill, & Hopkinson, 2016) This recommendation was based in large part on the analysis of a group of tobacco experts who compared harms of various tobacco products and estimated that ECs are likely to significantly reduce harm among active tobacco smokers. (Nutt et al., 2014)

Given the rapid rise of ECs over the past several years, physicians are becoming more likely to encounter EC users in clinical practice. Consequently, determining health provider knowledge, perceptions, and behaviors regarding these products is important. The American College of Chest Physicians (CHEST) is an international organization with over 18,000 members representing more than 100 countries worldwide (Membership location: 76% USA, 24% international). We conducted a survey of CHEST members to gain more insight
into healthcare provider experiences with EC users in the clinical setting, to better characterize provider perceptions and practice patterns regarding ECs and tobacco.

**MATERIALS AND METHODS**

A brief online questionnaire was adapted from Warren, et.al (Warren et al., 2013) and modified to assess health care provider practice patterns and perceptions regarding electronic cigarette and burned tobacco cigarette use among patients. The online survey included questions asking about: (1) demographics (i.e. medical degree, area of clinical practice, amount of time in practice, time devoted to patient care, location of practice, etc.); (2) estimated frequency of patients’ reported use of ECs and relationship to tobacco smoking; (3) perception of EC harms and benefits; (4) clinical practice behaviors with respect to tobacco treatment; and (5) perceived barriers to tobacco treatment.

The survey was distributed to the membership of CHEST using an online survey. The survey was resent 6 times between May 2015 and 2016. A $500 cash prize awarded by lottery was provided as an incentive to increase participation. Of approximately 18,000 members invited to participate, 994 (5.5%) responded to the survey. The results presented were primarily based upon descriptive analyses.

**RESULTS**

Most of the respondents (77%) were from the United States, and the vast majority (92%) had a medical degree. US and international respondents were equally represented based on baseline membership rates. Most respondents were trained in Pulmonology (78%), and significant proportions practiced Critical Care (39%) and Sleep Medicine (12%). Forty-eight percent of respondents worked in an academic setting, and most (82%) spent at least half their time devoted to patient care. A majority of respondents (61%) were at least 10 years past completion of their degree.

Most (88%) reported that patients had asked their opinion of ECs, and 31% reported EC use among at least 10% of their patients. Less than half (44%) reported asking patients about EC use either most of the time or always.

Most reported believing that ECs are harmful (69%) and that daily EC use is not safe (72%). However, respondents were evenly split on whether ECs promote tobacco cessation (33% agree/strongly agree and 32% disagree/strongly disagree) and whether ECs should be used for smoking cessation in those who have not been successful using Food and Drug Administration (FDA)-approved treatments (35% agree/strongly agree and 36% disagree/strongly disagree). Few believed ECs were at least as effective as FDA-approved treatments to promote smoking cessation (13% agree/strongly agree vs. 53% disagree/strongly disagree), and 11% reported that ECs should be used in an initial quit attempt. While 6% thought ECs were more harmful than smoking, only 21% thought switching from daily tobacco smoking to daily EC use would improve a patient’s health. A slight majority (55%) reported feeling comfortable discussing health effects of ECs with patients. US and international respondents answered similarly on the key questions of whether ECs promote tobacco cessation (32% vs. 33% agree/strongly agree), whether ECs should be used for
smoking cessation in those not successful using FDA approved treatments (36% vs. 36% agree/strongly agree), and whether ECs were at least as effective as FDA-approved treatments to promote smoking cessation (13% vs. 15% agree/strongly agree).

**DISCUSSION**

We conducted the largest chest physician survey regarding perceptions and practice patterns related specifically to ECs reported to date by querying all members of CHEST through an e-mail survey. Despite a low response rate, we were still able to ascertain opinions of nearly 1,000 clinicians in practice. We attempted to maximize the response rate by offering a cash incentive, keeping the survey length brief, and sending out the survey many times over the course of a year. Despite these interventions, the response rate remained low. We suspect that the primary reason for this is that compared to other groups in the general population, physicians have greater time constraints, a high paperwork and electronic messaging burden, and less need for the financial incentives offered. There may also be variability in physician interest in addressing tobacco dependence in the clinical setting, and survey respondents may represent the most motivated individuals in this regard. Although not the primary focus of this investigation, we included questions related to practice patterns with respect to traditional tobacco cigarettes and note similarity in reported patterns with respect to frequency of asking, advising, and treating tobacco dependence between our respondents and providers recently surveyed from the International Association for the Study of Lung Cancer. (Warren et al., 2013) This increases the likelihood that our respondent population is representative of prior physician survey groups despite the limited response rate.

We found that among respondents, healthcare provider perceptions regarding potential harms and benefits of ECs varied substantially. While most believed that regular EC use is not inherently safe, there was an even split as to whether these products are effective in promoting cessation from burned tobacco consumption. Our findings were similar to a recent national physician survey that found 30% of the respondents would recommend ECs for smoking cessation and 37% would recommend them for smoking reduction. (Nickels, Warner, Jenkins, Tilburt, & Hays, 2016) Similarly, an earlier survey done among physicians of North Carolina found similar perceptions among physicians regarding EC use for smoking cessation (67% believing ECs are helpful for this purpose and 35% recommending them to patients) (Kandra, Ranney, Lee, & Goldstein, 2014).

Although only 6% of our respondents thought ECs were more harmful than tobacco smoking, less than a quarter thought that a switch from regular tobacco smoking to daily EC use could improve their patients’ health. This was an apparent contradiction in the respondent perceptions, and we can only speculate as to why this difference in responses was observed. The results could indicate a belief that while a switch from tobacco to ECs could reduce harm in the short-term, the reduction might be too little to have clinical significance on patients’ long-term health. There may also have been concern regarding unknown health risks with long-term EC use. Furthermore, nearly half of respondents (48%) expressed concern that ECs could increase the risk of relapsing into tobacco use. This suggests a view that even if ECs could reduce harm temporarily, it is possible that they will not lead to long-term smoking abstinence and would therefore not meaningfully impact...
long-term patient outcomes. Respondent comments did not routinely indicate a concern about high dose aerosol exposure from ECs as a potential mechanism preventing harm reduction among users switching from tobacco to EC use, but rather a general discomfort with unknown or unforeseen health risks intrinsic to ECs. In light of the fact that the long-term health risks of ECs remain unknown, we were surprised to find that more than half of respondents reported feeling comfortable discussing health effects of ECs. This proportion was higher than we expected given the current state of the scientific evidence.

Survey respondents indicated that they frequently encounter EC users in the clinical setting, and that users are likely to ask clinicians for advice with regard to these products. However, only 19% of respondents reported always asking about EC use, compared to 84% who always asked about smoking. We suspect that this discrepancy is related primarily to the fact that harms of tobacco smoking are well known and understood, while the nature and magnitude of long-term harms of EC use are still unclear. Although FDA recently deemed regulation of EC products, at present and in the near future much remains unknown regarding EC toxicity and efficacy in promoting cessation from combustible tobacco. Furthermore, because there is significant variation within EC products themselves (i.e. “cig-alike” versus “personal vaporizers” or “tank systems”, different nicotine strengths, additives, and flavoring chemicals), it may be difficult to determine relative harms or benefits among products. Physicians might also be less likely to ask about EC use since there is no clear evidence or treatment guidelines for EC cessation. Since the products are still relatively new, physicians might be hesitant to address the topic or may view them as secondary in importance as compared to smoking.

Despite the overall lack of scientific evidence, previous surveys of smokers and EC users to date reveal that the majority of respondents generally viewed ECs as less harmful compared to tobacco smoking and in some cases perceiving some positive impact with regard to reducing or stopping tobacco smoking. (Brose, Brown, Hitchman, & McNeill, 2015; Eastwood et al., 2015; Mark, Farquhar, Chisolm, Coleman-Cowger, & Terplan, 2015; Martinez-Sanchez et al., 2015; Wackowski, Bover Manderski, & Delnevo, 2016) We note the discrepancy in the perception of ECs between the majority of survey respondents and the RCP position, which generally looked more favorably upon ECs for their potential role for tobacco harm reduction.

This discrepancy underscores the importance of generating more high quality scientific data regarding potential harms and benefits of ECs in order to inform both health professionals and the general public. As previously noted, the EC debate remains complex, but the aggregate evidence is lacking. From a regulatory standpoint, an important question surrounding ECs is how the potential benefits to some groups (i.e. tobacco smokers who might use them to quit smoking) compare to potential harms to other groups (i.e. adolescents, non-smokers, current tobacco smokers who might become dual users, and former smokers who become EC users or relapse onto tobacco smoking who would not have otherwise). FDA recently considered these factors, and released its regulations of ECs on May 5, 2016, which took a generally cautious approach to these products and required EC vendors to provide evidence that the products are safer than regular cigarettes. From a clinician’s point of view, several unanswered questions regarding ECs are:
(1) Will EC’s assist in cessation from smoked tobacco, and if so, will this definitively lead to harm reduction?

There have been very few randomized trials studying EC efficacy for tobacco cessation. (Bullen et al., 2013; Caponnetto et al., 2013) The largest trial conducted enrolled 657 smokers and randomized them to nicotine EC (16 mg/ml), non-nicotine EC, and nicotine patch.(Bullen et al., 2013) 6 month follow-up quit rates were unexpectedly low in all groups and not statistically different (7.3%, 5.8%, and 4.1% in the nicotine e-cigarette, nicotine patch, and placebo e-cigarette groups, respectively). There was a noted difference in the proportion of smokers who reduced cigarette consumption by 50% or more between the e-cigarette and patch users. The study findings were limited by low statistical power and the use of an early generation EC that may not have had reliable nicotine delivery. Smaller studies have suggested that ECs can assist in smoking reduction among those not willing to stop smoking.(Adriaens, Van Gucht, Declerck, & Baeyens, 2014; Polosa, Caponnetto, Maglia, Morjaria, & Russo, 2014; Polosa et al., 2011; Tseng et al., 2016) Larger studies with more technologically advanced nicotine delivery systems would be helpful evidence for the field.

The most recent data suggest that puff-for-puff, ECs are less toxic compared to smoked tobacco.(Goniewicz et al., 2014; Hecht et al., 2015) Still, toxicity from any inhaled substances is likely to be dose-dependent. If an individual stops smoking tobacco but begins vaping with a much higher rate of aerosol delivery, toxin inhalation could remain high and harm reduction may not occur. Furthermore, production of toxins (i.e. volatile carbonyl compounds) has been shown to increase significantly with higher temperature and electrical power applied to the e-liquid.(Bekki et al., 2014; Geiss, Bianchi, & Barrero-Moreno, 2016; Kosmider et al., 2014; Talih, Balhas, Salman, Karaoghlanian, & Shihadeh, 2015) Consequently, since ECs and EC use patterns vary significantly with respect to product characteristics, it is inappropriate to think of ECs as a single entity with a given level of risk, and it would be more appropriate to view this as a class of products with a continuum of risk.

(2) Will EC’s hinder cessation from smoked tobacco by providing behavioral cues that reinforce smoking without serving as a sufficient tobacco substitute?

There is no evidence to date that ECs prevent cessation among motivated smokers seeking abstinence, but long-term studies have not yet been conducted. One reasonable concern is the possibility that ECs may deter smokers from seeking less harmful alternatives first (such as the nicotine patch or varenicline). Such a phenomenon could potentially reduce the degree of harm reduction achieved by a smoker.

(3) Will long-term EC use lead to unforeseen health consequences in the future?

Although these questions will take many years to answer, it is hopeful that large controlled clinical trials and long term observational cohort studies of EC and tobacco users will provide much-needed data to more accurately inform opinions both publically and within the medical community.
We note that our study has several limitations. First, our response rate was low, which limits the degree to which we can generalize our findings to account for the perceptions of all chest physicians. Second, we surveyed providers only within CHEST, and opinions and experiences of physicians outside of the organization and in other specialties may vary. More than three quarters of respondents were from the US, and opinions from physician organizations in other parts of the world may differ. In particular, we had very few respondents from the UK, where public health officials have taken a much more positive view of ECs for tobacco treatment as compared to their US counterparts. Third, since knowledge regarding ECs is rapidly evolving, the perceptions and opinions here are likely subject to change over the next few years as more becomes known. As noted above, the RCP endorsed the use of ECs for tobacco users in the UK. (Britton et al., 2016) Shortly thereafter, FDA issued several regulatory actions on ECs. Both of these events occurred after the administration of our survey, and it is unclear whether this would have affected our results if it occurred during the study period. Nevertheless, this study represents the largest survey of chest physicians’ knowledge, perceptions, and behaviors regarding ECs conducted to date.

CONCLUSIONS

Our findings suggest that chest physicians are likely to encounter electronic cigarette (EC) users in clinical practice, and chest healthcare provider survey respondent perceptions of EC harms and benefits varied substantially. Over two-thirds of respondents perceived ECs are harmful, and the perceived efficacy of ECs in promoting cessation of tobacco smoking was evenly split. Most respondents reported that their patients requested a professional opinion regarding ECs, but many providers reported that they do not yet feel comfortable discussing health effects of these products. More than 1/3 of respondents felt that ECs could be used for smoking cessation for smokers who were not successful in prior quit attempts with approved therapies. Nevertheless, many providers are not convinced that ECs will reduce harms from tobacco use. There is an urgent need to generate additional high quality scientific data regarding potentials harms and benefits of ECs in order to inform both health professionals and the general public.

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Conflicts of interest

Dr. Toll received a grant from Pfizer for medicine only for a research study, and he receives funding as an expert witness in litigation filed against the tobacco industry.

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