

Full Length Research Paper

Internal medicine resident knowledge and perceptions regarding electronic cigarettes

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Electronic cigarettes are an important public health concern. Smoking remains the leading cause of preventable death and morbidity worldwide and is a risk factor for six of the eight leading global causes of death. E-cigarettes have been proposed as an enticing prospect to reduce the harms of conventional tobacco use. However, they are increasingly used by middle-school and high-school students and threaten important barriers that have slowly protected the public against tobacco products including renormalization, price barriers, limitations on advertising and access, and bans on flavoring. Physicians have poor knowledge about the potential harms of e-cigarettes and limited data exists regarding potential long-term outcomes. We explored resident physician beliefs and practices regarding e-cigarettes. Several themes were identified: (1) Conversations regarding e-cigarettes are becoming more frequent in physician offices; (2) A lack of knowledge regarding potential harms and benefits of e-cigarettes exists among resident physicians; (3) Physicians falsely believe that e-cigarettes are safer alternatives to conventional smoking products; (4) More education is needed regarding evidence based smoking cessation techniques.

Key words: Electronic cigarettes, public health, nicotine, smoking.

INTRODUCTION

Electronic cigarettes are an important public health concern. Although tobacco use has decreased by more than half since 1965, it remains the leading cause of preventable death and morbidity worldwide. Smoking is a risk factor for six of the eight leading global causes of death including heart disease, cerebrovascular disease, lower respiratory infections, tuberculosis, chronic obstructive lung disease, and lung cancer (Crowley, 2015). E-cigarettes have been proposed as an enticing

prospect to reduce the harms of conventional tobacco use. They are also increasingly used by middle-school and high-school students.

Electronic cigarettes have only been available within the past fifteen years. They were originally marketed without evaluation of safety or health impact. Only recently has there been a societal interest in investigating related health outcomes and regulating safety measures. Electronic cigarettes do not contain tobacco. They are

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Table 1. Survey questions regarding electronic cigarettes.

1. Do you typically ask patients about their tobacco use?
2. Do you counsel patients to quit?
3. Have you ever asked patients about their e-cigarette use?
4. Have any of your patients ever asked you about e-cigarettes?
5. Do you recommend e-cigarettes to patients?
6. Do you believe e-cigarettes are less harmful to patients than conventional cigarettes?
7. Do e-cigarettes have a role in harm reduction?
8. Are e-cigarettes FDA approved for smoking cessation?
9. Do e-cigarettes have any significantly documented adverse effects?
10. Has e-cigarette use exceeded that of nicotine replacement therapy?

devices that produce an aerosol by heating a liquid that contains a solvent, one or more flavorings, and/or nicotine (Noel et al., 2011). The evaporation of the liquid at the heating element is followed by rapid cooling to form an aerosol. The user directly inhales it through a mouthpiece. There is no smoke, no carbon monoxide, and no odor. Only the e-cigarette user inhales the vapor. This mechanism is what has made e-cigarettes to be considered safe by many individuals and has contributed to the rapid acceptance and use by the public.

Though advances have been made in the fight against conventional cigarettes, the principal route of tobacco-related disease, e-cigarettes threaten important barriers that have slowly protected the public against tobacco products. Recent studies have shown that experimentation, use, and promotion of e-cigarettes via conventional as well as online marketing have grown exponentially (Noel et al. 2011). Though most users have used tobacco at some time, a third of current e-cigarette users have never smoked tobacco or were former tobacco users. Of particular concern regarding public health is the increased experimentation with and use of e-cigarettes among persons younger than 18 years of age. Other ties worrisome to public health include renormalization, price barriers, limitations on advertising and access, and bans on flavoring (Crowley, 2015). Of utmost concern is the risk that e-cigarette use will romanticize smoking, rescinding decades of efforts by public health and medical communities.

Despite growing e-cigarette use, how physicians perceive them is not fully understood (Brandon, 2015). Since current tobacco use counseling guidelines taught in medical school do not address e-cigarettes, understanding what guides physicians' practice when asked about e-cigarette is important. The manner in which resident physicians approach e-cigarette discussions, and the factors, which contribute, to their beliefs, perceptions, and decisions to recommend e-cigarettes are largely unknown. The purpose of this study was to explore resident beliefs and practices regarding e-cigarette use.

MATERIALS AND METHODS

Study participants

Participants were internal medicine residents at a university training program in New Brunswick, NJ. Residents represented individuals from heterogeneous training medical schools, geographic backgrounds, and levels of training. In December 2015, we emailed all residents within our institution (n=69) to participate in the study. To be eligible for participation, residents had to be categorical residents who participated in a continuity outpatient clinic and discussed tobacco use with at least one patient. Participants did not receive compensation for participation. All subjects gave informed consent for voluntary participation. The study was approved and exempt from IRB as the use of survey procedures was performed only to observe resident beliefs and behaviors. There was no abstraction of patient specific material or chart abstraction.

Data collection

A descriptive pilot study utilized survey instruments to measure e-cigarette knowledge, perceptions and awareness among internal medicine residents. The authors developed the survey. The survey collected demographic (age, gender, race, future career interests, year of training) from each participant. Prior training in smoking cessation, whether patients had asked about e-cigarettes, whether the physician recommended e-cigarettes, and attitudes toward harm reduction were also assessed. For analysis, data was focused on responses to questions in Table 1. Data were analyzed using descriptive analysis using SPSS 21.0 software was used.

RESULTS

57 residents participated in the study Table 2. The mean age was 27 (range 25 to 37). Residents were distributed across varied levels of training (21 pgy-1, 18 pgy-2 and 18 pgy-3). Respondents were evenly distributed by gender (that is, 51% male and 49% female). Nearly 46 of 57 (80%) of resident physicians reported being asked about e-cigarettes by their patients. When probed as to whether those conversations resulted in any specific recommendations, 49% reported they have recommended e-cigarette use to at least one of their patients (Table 3).

In addition, more than two thirds believed in a harm-

Table 2. Demographics of surveyed residents (n=57).

Median age (range)	27 (24 - 37)
Level of training	
Pgy-1	21
Pgy-2	18
Pgy-3	18
Male gender	29 of 57
Personal smoking history	3 of 57
Parental smoking history	18 of 57
Prior smoking cessation training	26 of 57
Prior education on E-cigarettes	3 of 57

Table 3. Resident survey responses (n=57).

Responses	Yes	Percentage
1. Do you typically ask patients about their tobacco use?	56	98
2. Do you counsel patients to quit?	54	95
3. Have you ever asked patients about their e-cigarette use?	15	26
4. Have any of your patients ever asked you about e-cigarettes?	46	80
5. Do you recommend e-cigarettes to patients?	28	49
6. Do you believe e-cigarettes are less harmful to patients than conventional cigarettes?	40	70
7. Do e-cigarettes have a role in harm reduction?	38	66
8. Are e-cigarettes FDA approved for smoking cessation?	40	70
9. Do e-cigarettes have any significantly documented adverse effects?	29	51
10. Has e-cigarette use exceeded that of nicotine replacement therapy?	0	0

reduction approach and nearly half believed that there were no documented adverse side effects. Most (75%) believed that the FDA approved its use for smoking cessation. No resident identified e-cigarette use as exceeding that of nicotine replacement therapy. Male and female physicians were just as likely to recommend e-cigarettes and endorse a harm reduction approach. Responses were not significantly different based on age, gender, level of training, personal smoking history, if their parents were smokers, or prior experience to smoking cessation counseling.

DISCUSSION

To date, no study has investigated resident physician perspectives on e-cigarette use. Our data suggests that young physicians lack professional education of e-cigarettes. Societally, interest in e-cigarettes appears high, despite the absence of evidence regarding its long-term health impact. E-cigarettes continue to be one of the most polarizing products to ever reach the market and raise many public health concerns for which there are few answers.

Short and long term health impact

Increasing evidence is being gathered concerning the short-term side effects of e-cigarettes. Depending upon concentration, liquid nicotine is known to be toxic and can cause harm when inhaled and ingested. In higher levels, a tablespoon can kill an adult and a teaspoon can kill a child. There is no regulation of the amount of liquid nicotine in e-cigarettes and studies have shown a wide variance in nicotine levels that often exceed that of tobacco cigarettes (Kim and Baum, 2015). In the US, telephone calls to the CDC poison control line, regarding e-cigarettes, have increased from one/month in 2010 to 125/month in 2014. In all poison control emergency calls, 51% of calls involved poisoning of children aged 5 and under (Center for Disease Control, 2015).

If e-cigarettes carry any lifelong harm, the dangers will stem from the poor knowledge base of our physicians who are at the forefront of tackling nicotine addiction. Nicotine is not the primary cause of cigarette-related morbidity but is the addictive agent (Yamin, 2010). Youths are particularly marketed and advertising has been effective. A large majority of adolescents today are aware of e-cigarettes (Crowley, 2015) and surveys of e-

cigarette users have found that they perceive them as a less harmful, less addictive, and healthier alternative to conventional cigarettes (Pearson et al., 2012). In many ways, e-cigarettes represent the new gateway to cigarettes (Duke et al., 2014). As our survey study indicates, resident physicians too perceive e-cigarettes to be less harmful and a healthier alternative, though this belief is not supported by evidence.

Unethical and false marketing

Several societies have recommended that e-cigarettes be regulated and treated like cigarettes. The recent FDA regulation to restrict the marketing of these nicotine delivery devices seems appropriate given the lack of evidence regarding safety and potential harm. The absence of warnings can be seen as an endorsement of their safety. There have been limited consumer protection requirements or product quality standards.

To date, no study has demonstrated superiority of E-cigarettes over smoking cessation pharmacotherapy approved by the U.S. Food and Drug Administration for combustible cigarette cessation. In fact, a meta-analysis of 20 studies that included control groups showed that e-cigarettes were associated with significantly lower odds of quitting cigarettes than either nicotine-replacement therapy or no cessation aid (odds ratio, 0.72, 95% confidence interval [CI], 0.57 to 0.91) (Kalkhoran and Glantz, 2016).

Areas of further study

Although the health risks of e-cigarettes are still being elucidated, early findings suggest that nicotine addiction is a concern. In addition, e-cigarette nicotine solutions, carrier agents and flavoring, generate known toxins and carcinogens when vaporized, although in lower concentrations compared to cigarettes (Hecht et al., 2015). E-cigarette use has also been associated with respiratory symptoms in young adults whose airways were naïve and not yet irritated by cigarette smoke (Wang et al., 2016). Secondary and tertiary exposure risks of e-cigarettes are under study. Despite their reduced risk promise, many questions remain regarding efficacy for smoking cessation, the potential increased uptake by nontobacco users, discouragement of cessation promoted by dual use, or encouraged relapse to cigarette use among former smokers. It is unknown whether e-cigarettes have a role in risk modification.

Current shortcomings

As our study highlights, it is imperative that physicians stay current with evidence-based research on e-cigarettes and that medical education follows the growing

literature on electronic cigarettes. Without dissemination of clear, evidence-based research on e-cigarettes, it is likely these discrepancies will continue and patients could be given inaccurate information.

Many questions remain unanswered. Aside from addiction, are there other risks incurred from inhaling nicotine vapor? Are other harmful substances present? Can “second-hand vapor” cause harm? Until further studies are conclusive, physicians are left to weigh uncertainties with available data. Regulation by the Food and Drug Administration is a good first step to regulate marketing, youth access, and quality control. During the upcoming years and decades, more studies will demonstrate long-term safety or harm. Though a tremendous amount of ambiguity surrounds e-cigarettes, we must educate our young (and seasoned) physicians regarding the data behind electronic cigarettes in order to best counsel our patients.

Limitations

The results described should be interpreted in the context of several limitations. First, the study is collected relatively early in a rapidly evolving e-cigarette market. The applicability of the findings thus should be interpreted with caution as future trainees may be more exposed to the growing controversy. Second, residents interviewed were limited to one training institution in the northeast and thus, may not be generalizable. Third, there may be important themes and both physician and patient factors not identified by the survey questions that have not been validated. Nevertheless, the study offers important insight into resident beliefs and practices regarding e-cigarettes.

Conclusions

In conclusion, resident physicians lack knowledge about e-cigarette safety and efficacy in general and in smoking cessation in particular. When patients initiate discussions with physicians, some physicians recommend e-cigarettes to patients who smoke, both for smoking cessation and a harm reduction strategy. Such findings renew the importance of generating and rapidly disseminating evidence based guidelines regarding e-cigarette safety and efficacy for smoking cessation. Without continued efforts, physicians will continue to recommend their own beliefs that in the long run, will be difficult to change once established.

Conflicts of Interests

The authors have not declared any conflict of interests.

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