

A Survey Assessing the Vaping Habits of Patients Undergoing Surgery

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Introduction

The prevalence of vaping is increasing dramatically in the United States.¹ From 2017–2018, e-cigarette use (a form of vaping) by high school students nearly doubled to 1 in 5 students.² It has been estimated that 2.3% of adults in the United States self-identify as active users of vaping products, where men are more likely than women to use vaping products.³ An estimated 39.1% of adults who use vaping products in the United States are current cigarette smokers; 37.9% are former smokers, and 23.1% have never smoked.³ On the backdrop of rising vaping prevalence is the recent outbreak of e-cigarette or vaping product use–associated lung injury (EVALI).⁴ As of February 2020, a total of 2,807 people had been hospitalized and 68 deaths had occurred due to EVALI.⁵ E-cigarette and vaping products have been associated with damage to cellular metabolism and DNA resulting in clinically important lung diseases.⁶

Given the emerging relationships between vaping and lung injury, it is possible that vaping status may be a clinically relevant aspect of patient history of which surgeons and anesthesiologists should be aware in the perioperative period. This may be especially relevant in the setting of the COVID-19 pandemic.^{6,7} Likewise, given that many people perceive smoking and vaping to be fundamentally different,⁸ patients may not disclose a vaping history unless explicitly asked.

The present prospective, survey-based study was conducted to assess vaping habits of surgical patients at a single academic teaching center in the United States. We

hypothesized that vaping is prevalent among surgical patients. We additionally hypothesized that vaping is generally not discussed in preoperative conversations with surgical team providers. Finally, an exploratory multivariate logistic regression was created to assess the association between independent survey variables and the dependent outcome (ie, vaping status).

Methods

The study protocol was approved by the institutional review board of Icahn School of Medicine at Mount Sinai. An anonymous, paper questionnaire based on previous work by Khelemsky et al⁹ was used to collect data on respondent demographics, use of vaping products, history of illicit drug use, and tobacco use. Specifically, participants were asked if they have ever “used e-cigarettes or vaped”; and if so, the following questions were asked with answers in multiple-choice format: Last time e-cigarette/vaping product was used; frequency; whether cartridges include nicotine, THC, or flavor; and a free-form answer for brand name. These questionnaires were distributed by research staff (authors IS and SI), not clinical staff. The information was asked separately from other preoperative information, utilized strictly for research and not included in respondents’ medical records. Whereas the study was deemed exempt, participants were, nevertheless, provided with an information sheet describing the study as voluntary and anonymous. Contact information for Mount Sinai Hospital’s Program for the Protection of Human Subjects Office was also provided to participants. The questionnaire was administered to a convenience sample of patients in the preoperative registration area prior to elective surgery at Mount Sinai Hospital, New York, from July 2020–November 2020. All patients in the registration area were eligible candidates and were approached in a random manner. A total of 200 respondents were surveyed, as seen in existing survey-based research on surgical patients.¹⁰

Given the exploratory nature of the study, no formal power analysis was performed. Descriptive information for the sample study measures included frequency distributions. A

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univariate analysis for each independent variable was conducted using chi-square test to assess for independence with the dependent variable vaping status. A multivariate logistic regression model was created using independent variables with a univariate analysis $P < .20$ or those having a known association with vaping status (age, gender, education level, income level).³

Results

Two hundred questionnaires were distributed and collected. Respondent demographics are shown in Table 1. Responses were missing for 108 of the total 3,788 questions (2.85%) asked across all surveys; only items with responses were included in the statistical analysis.

Thirty six of 199 respondents (18.1%) reported having ever vaped. Of those who had ever vaped, 12 of 36 (34.3%) had vaped in the last year, 5 of 36 (13.9%) in the last week, and 4 of 36 (11.4%) had vaped within 24 h prior to surgery. One hundred and nineteen of 197 respondents (60.4%) reported having been asked about smoking habits by the surgical team during a preoperative encounter prior to the day of surgery. Of the 119 respondents who were asked about smoking habits, 49 (41.2%) did not assume that being asked about smoking also meant vaping. Fourteen of 195 respondents (7.2%) reported having been asked specifically about vaping by the surgical team.

The logistic regression results are shown in Table 2. A P of $< .05$ was used to determine statistical significance. The only independent variable that predicted vaping status was age 60–75 y old, which is associated with a significantly decreased likelihood of vaping (odds ratio 0.047 [95% CI 0.006–0.342], $P = .003$).

Discussion

Our prospective survey study of 200 adult surgical subjects found that 18.1% (36/199) of respondents had ever used vaping products, and 5 of 36 (13.9%) respondents who have ever used vaping products had done so within the week prior to surgery. Prior research on pre-surgical subjects found that 13 of 347 study participants (3.7%) reported being active users of vaping products (the study did not define active, and attempts were made to clarify this definition with authors; however, no response was received).⁷ An estimated 2.3% of adults in the United States actively use vaping products, where an active user of vaping products was defined as “ever use of an e-cigarette and now vaping every day or some days.”³

Our study demonstrated that vaping habits are not explicitly asked about in the preoperative conversations between respondents and their surgical team. Additionally, respondents did not necessarily believe the term smoking includes

Table 1. Demographic Characteristics of Study Subjects

Age, y	
18–24	14 (7)
25–39	31 (15.6)
30–44	31 (15.6)
45–59	61 (30.7)
60–75	47 (23.6)
> 75	15 (7.5)
Sex	
Male	99 (49.5)
Female	101 (50.5)
Race	
White non-Hispanic	105 (54.4)
Hispanic/Latino	44 (22.8)
Black non-Hispanic	28 (14.5)
Asian/Pacific Islander	11 (5.7)
Other	5 (2.6)
Highest education level completed	
< High school	7 (3.6)
High school	58 (29.6)
Bachelor’s/associate’s degree	82 (41.8)
Master’s degree	39 (19.9)
Doctorate degree	10 (5.1)
Income level, annual	
< \$25,000	46 (24.1)
\$25,000–\$49,999	36 (18.8)
\$50,000–\$99,999	54 (28.3)
> \$100,000	55 (28.8)
Any e-cigarette/vape use, ever	
No	163 (81.9)
Yes	36 (18.1)
Most recent e-cigarette/vape use (out of 36 respondents)	
Within last 24 h	4 (11.4)
Within last wk	1 (2.9)
Within last mo	3 (8.6)
Within last y	4 (11.4)
> 1 y ago	23 (65.7)
Current cigarette smoker	
No	179 (89.5)
Yes	21 (10.5)
Prior illicit substance* use	
No	156 (80.8)
Yes	37 (19.2)

Data are shown as n (%).

* Illicit substances included cocaine, crack, amphetamine, heroin, phencyclidine (PCP), methamphetamine, ecstasy.

vaping products. In our exploratory analysis, vaping status was only predicted by age.

Given the reported and mechanistically plausible associations between vaping and deleterious physiological changes,⁶ we recommend that inquiry about vaping habits be incorporated as part of a standard pre-surgical questionnaire. At this time, there are not robust data demonstrating an association between vaping and worse surgical outcomes

Table 2. Logistic Regression for Predictors of Vaping Status

	OR	95% CI	P
Age, y			
18–24	[reference]		
25–39	0.42	0.07–2.47	.335
30–44	0.28	0.04–1.88	.189
45–59	0.20	0.03–1.20	.078
60–75	0.05	0.01–0.34	.003
> 75	0	0	.988
Sex			
Male	[reference]		
Female	0.45	0.16–1.26	.127
Race			
White non-Hispanic	[reference]		
Hispanic/Latino	0.48	0.13–1.80	.273
Black non-Hispanic	0.36	0.07–1.70	.196
Asian/Pacific Islander	0.55	0.05–6.70	.643
Other	1.42	0.11–18.26	.786
Highest education level completed			
< High school	[reference]		
High school	0.49	0.03–6.97	.598
Bachelor's/associate's degree	0.55	0.04–8.39	.671
Master's degree	0.25	0.01–5.02	.365
Doctorate degree	0.75	0.02–31.30	.881
Income level, annual			
< \$25,000	[reference]		
\$25,000–\$49,999	2.92	0.67–12.70	.152
\$50,000–\$99,999	1.26	0.28–5.63	.766
> \$100,000	0.97	0.17–5.55	.97
History of marijuana use			
No	[reference]		
Yes	2.04	0.73–5.72	.176
History of tobacco use			
No	[reference]		
Yes	2.95	0.66–13.22	.158
History of illicit substance use			
No	[reference]		
Yes	2.95	0.93–9.34	.065

OR = odds ratio

in particular. However, collecting information pertaining to vaping may facilitate future study in this area. Additionally, we recommend that clinicians and researchers explicitly use the terms vaping and e-cigarettes when asking patients

about related use, as the term smoking does not necessarily capture these electronic forms of substance delivery.

This study is limited by the exclusion of patients < 18 y old, which decreases generalizability. Additionally, this study did not provide quantifiable data regarding the number of vaping products used, as there is not a standardized unit to measure vaping intake. Finally, this study is limited by the sample of convenience as well as dependence on veracity of self-reported patient data. Future research can focus on the content of the preoperative interview conducted by anesthesiologists, which was not included in this study.

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