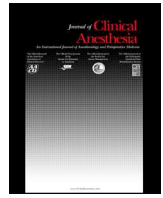




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## Correspondence

## Implementation of a preoperative screening tool to identify patients at risk for adverse perioperative pulmonary outcomes secondary to E-cigarette vaping: A pilot study



## ARTICLE INFO

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## To the Editor

The use of electronic cigarettes (e-cigarettes) and vaping devices in the United States has escalated during the past decade with an increasing number of exposed patients presenting for elective and emergent procedures [1]. Neither the number of e-cigarette users undergoing surgical procedures under anesthesia nor the prevalence of E-cigarette or vaping products use-associated lung injury (EVALI) during the perioperative period is known [2]. Vaping is not benign, as EVALI has been reported following anesthesia for bronchoscopy [3]. In light of the COVID-19 pandemic, potential adverse pulmonary effects of vaping is especially concerning [4]. Anesthesiologists have an important role in addressing perioperative morbidity associated with vaping since these patients are seen preoperatively and can be flagged in the electronic health record (EHR) for follow-up. This report describes the deployment and implementation of a preoperative screening tool within our EHR to identify patients who are vaping and the extent of their exposure. Such information is critical to the development of recommendations for the preoperative management of such patients.

In November 2019, we implemented a pilot, paper-based screening tool for all patients seen in our preoperative clinic that asked about the use vaping. The Institutional Review Board of University of Miami approved the study with a waiver of written informed consent. Patient screening was performed either in person or over the phone by Advanced Registered Nurse Practitioners and Registered Nurses working under the direction of the anesthesiologist medical director of the preoperative clinic (SE).

Of the initial 347 patients screened using the paper-based process, 13 reported actively using e-cigarettes or vaping (prevalence of 3.7%). The median age of these patients was 43 years old (interquartile range 27 to 59.5 years). Among those screened, 69% were male, 50% used e-cigarettes “few times a week,” and the median duration of use was 6.5 months (interquartile range 2 to 12 months). Many of the vaping patients reported using THC-containing marijuana products (8 of 13). It is particularly important to identify those patients consuming THC-containing e-cigarettes, since the majority of cases of EVALI have been associated with such use [5].

Following the pilot screening, the hospital's information systems department incorporated the screening questions into the EHR (PowerChart® Cerner Corporation, North Kansas City, MO). Screening

for e-cigarette use became a mandatory part of the pre-operative clinic evaluation. The relevant questions appear in preoperative anesthesia evaluation under social history (Fig. 1). These data will allow us to assess the relative risk of vaping on adverse perioperative pulmonary outcomes (hypoxemia, increased airway reactivity, coughing, inability to extubate, unanticipated intensive care unit admission).

In our pilot study, we found a clinically important incidence of e-cigarettes use and vaping in patients evaluated by our preoperative clinic that corresponded to the general population prevalence of such use. Based on this, we felt it was warranted to formalize the screening process into our EHR and make it a mandatory part of the preoperative evaluation. Adding the screening questions to PowerChart was straightforward and should be easily accomplished in other EHRs such as Epic (Epic Systems, Verona, WI).

Identifying patterns of use and type of vaping products being used represents the first step to assess the perioperative risks of these patients and to develop triage criteria for preoperative referral to a pulmonologist. Prospective collection of pulmonary outcomes data in patients who are vaping is needed to assess the risks involved and provide more informed decision-making as to the timing of elective surgery and the need for preoperative evaluation by a pulmonologist in the context of such use. We are currently engaged in such a process.

### Declaration of competing interest

The authors declare no competing interests.

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### Author's contributions

Roman Dudaryk: This author helped in conceptualization of the study, original draft manuscript writing, editing and final review.

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Family Procedure Social Pregnancy Implants

Electronic Cigarette/Vaping

**\*Use**

Never  
 Use, within last 90 days  
 Former use, quit more than 90 days ago  
 Refused e-cigarette screen  
 Unknown/not obtained  
 Other:

**Type**

Cannabinoid infused  
 Flavored-only  
 Nicotine infused  
 Other:

**Use per Day**

1-25 Inhalations/Day  1 Cartridge/Day  
 26-50 Inhalations/Day  2 Cartridges/Day  
 51+ Inhalations/Day  Other:  
 1/2 Cartridge/Day

Number of Years

Started at Age  Year(s)

Stopped at Age  Year(s)

Previous Treatment

None  
 Counseling  
 Hypnosis  
 Nicotine replacement  
 Self initiate treatment  
 Other:

Ready to Change  Yes  No

Passive Exposure  Yes  No

Comment

Comment:

**Fig. 1.** Screenshot of preoperative evaluation of e-cigarette use or vaping. This form is presented in Cerner PowerChart under the social history tab, and is now a mandatory component of the preoperative clinic evaluation of patients presenting for surgery.

Jose R. Navas-Blanco: This author helped in original draft manuscript writing, editing and final review.

Scott Eber: This author helped screening the patients in the preoperative clinic, design of the assessment tool, data gathering and manuscript review.

Richard H. Epstein: This author helped in conceptualization of the study, manuscript writing, editing and final review.

## References

- [1] Perrine CG, Pickens CM, Boehmer TK, et al. Characteristics of a multistate outbreak of lung injury associated with E-cigarette use, or vaping - United States, 2019. *MMWR Morb Mortal Wkly Rep* 2019;68(39):860–4.
- [2] A patient with E-cigarette vaping associated lung injury (EVALI)—coming to an operating room near you!. <https://www.apsf.org/article/a-patient-with-e-cigarette-vaping-associated-lung-injury-evali-coming-to-an-operating-room-near-you>, Accessed date: 5 March 2020.
- [3] Diaz CD, Carroll BJ, Hemyari A. Pulmonary illness related to E-cigarette use. *N Engl J Med* 2020;382(4):384–5.
- [4] Brake SJ, Barnsley K, Lu Wenying, McAliden KD, et al. Smoking upregulates angiotensin-converting enzyme-2 receptor: a potential adhesion site for novel coronavirus SARS-CoV-2 (Covid-19). *J Clin Med* 2020;9(3):841.
- [5] Blount BC, Karwowski MP, Morel-Espinosa M, et al. Evaluation of bronchoalveolar lavage fluid from patients in an outbreak of E-cigarette, or vaping, product use-associated lung injury - 10 states, August–October 2019. *MMWR Morb Mortal Wkly Rep* 2019;68(45):1040–1.

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