

THE ANESTHETIC IMPLICATIONS FOR THE PATIENT WHO VAPES, A REVIEW OF THE LATEST EVIDENCE

Lindsey Bell MSN, BSN, APRN, AGACNP-BC, FNP-BC; Charles Buscemi PhD, APRN, FNP-BC, CWCN; Karina Grubbs DNP, CRNA, APRN; Yasmine Campbell DNP, CRNA, APRN, CNE, CHSE

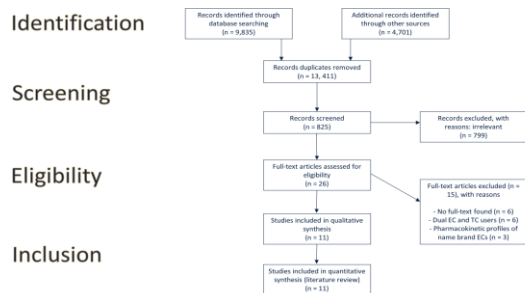
Background

- According to the National Center for Health Statistics and the CDC, about 8.1 million adults and 2.55 million adolescents in the U.S. use ECs.
- The number of vaping individuals in the US is increasing and with the pulmonary damage done by ECs is so hazardous that in 2020 the CDC was forced to declare an outbreak of EVALI.
- EC users, who consider themselves distinct from traditional cigarette smokers, identify as vapers.
- This may present challenges for anesthesia providers in assessing smoking status before surgery, potentially leading to complications during the perioperative period.

Clinical Significance

The health risks of electronic cigarettes (ECs) impact multiple organ systems in both humans and animals. Despite growing evidence of these risks, usage among surgical patients continues to be high.

Methodology



Literature Review

Author	Design Sample	Major Findings
Alasmari et al.	Quasi experimental	Chronic daily inhalation of nicotine containing EC alters concentrations of neurotransmitters within mesocorticolimbic brain regions
Heldt et al.	Quasi experimental	Long term use of ECs may negatively affect neurovascular health and contribute to cognitive dysfunction, regardless of nicotine content
Ma Ise et al.	Cross sectional single visit pilot study	When compared with nonsmokers, vapers experience moderate to severe eye dryness and their tear film function is significantly disturbed
Munamy et al.	Quasi-experimental	Clinical increases were noted which may be amplified with puff number and repeated vaping throughout the day
Schwarzmeir et al.	Quasi experimental	There are significant findings of cytotoxicity and genotoxicity in the oral mucosa cells in both the EC and smoking groups
Tommasi et al.	Blinded quasi experimental	Whole transcriptome analysis of oral cells from exclusive EC users and smokers shows that vapers, similarly to smokers, have deregulation of key genes, the majority of which converge on cancer related pathways and functions
Coppeta et al.	Quasi experimental	The active use of EC by healthy subjects leads to worsening of the main parameters of ventilatory function after 5 minutes of exposure
Song et al.	Randomized Controlled Trial	Small changes in inflammation correlated with change in propylene glycol exposure, but no difference between the intervention and control groups in expression
Biondi-Zoccai et al.	Independent randomized cross over study	Use of DBB, EC, or traditional cigarettes, with equivalent nicotine consumption in a group of healthy adults was associated with acute multidimensional adverse effects on a range of biological and physiological markers
Gonzalez JE et al.	Randomized cross sectional design	Acute inhalation of nicotine from the JUUL EC increases MAP and HR and inhibits peripheral MSNA. Inhalation of an EC that does not contain nicotine does not elicit sympathoadrenergic responses and does not influence peripheral sympathetic outflow
Chaumont M et al.	Randomized cross over study	Short term EC cessation in regular users decreases baseline HR and increases CC16 and FEF-25%, suggesting slight improvement of airway status. 5 days of cessation modified urine metabolomic signature, acute nicotine vaping increases hemodynamic parameters

Results and Clinical Recommendations

Neurological Effects

- ↑ PONV, ↑ requirements for anxiolytics or sedatives, impact the effectiveness of anesthetic agents, delay emergence, and ↑ the risk for emergence agitation.
- Impairment of cerebral autoregulation, ↓ cerebral reserve, ↑ inflammation and oxidative stress, BBB disruption, and hemodynamic instability

Ocular Effects

- ↑ Risk for corneal abrasions, overproduction of tears may prove troublesome maintaining proper eye protection and make entry into phase II of anesthesia difficult to identify

- Issues with regional anesthesia due to anatomical changes

- ↑ IOP, ↑ risk of nystagmus, and risk for injury due to vasoconstrictive effects of nicotine

Oropharyngeal Effects

- Impaired healing, ↑ infection risk, ↑ plaque, ↑ tooth decay or loss, and ↑ bleeding in the oral cavity
- ↑ Risk for oropharyngeal cancer
- Gentle airway management recommended with potential need for pretreatment with topical medications and use of video laryngoscopy
- Regional anesthetics may be inappropriate
- Administration of corticosteroids may be warranted prior to extubation to prevent post-extubation swelling

Pulmonary Effects

- ↑ Airway resistance, ↓ O2 saturations, and ↓ fractional exhaled NO
- Interruption in pulmonary gas exchange, impairment of pulmonary immune function, and worsening ventilatory function that mimics an obstructive process
- ↑ Risk for reactive airway processes, consider regional anesthesia
- Determine if preoperative treatment for reactive airway is necessary
- Passive exposure may lead to complications intraop
- Consider advanced monitoring prior to extubation (ABGs)

Cardiovascular Effects

- ↑ Risk for MI, cardiac arrhythmias, and unstable hemodynamics due to impaired baroreceptor response
- Advanced hemodynamic monitoring may be necessary
- Careful fluid management
- ↑ Risk for thrombosis due to ↑ platelet activation, consider a hematology consult with derangements in laboratory values
- Nicotine withdrawal may occur and cause unstable hemodynamics
- ↑ Risk for vasospasm due to endothelial dysfunction cause by ↑ oxidative stress and ↓ antioxidant status
- Consider avoiding N2O due to its association with worsening of endothelial status

PICO Question

Will an educational intervention regarding the anesthetic perioperative consequences of EC use improve the knowledge among anesthesia providers?

Conclusion

- The neurological effects of ECs can impact the effectiveness of medications administered during induction, increase the risk for postoperative nausea and vomiting, and delay emergence.
- The ocular effects of ECs can affect an anesthesia provider's ability to administer anticholinergics and opioids, increase the risk for corneal abrasions, and lead to negative postoperative outcomes due to anatomical changes in the eye.
- The oropharyngeal effects of ECs can influence the anesthesia provider's airway management techniques and put the patient at increased risk for infection and unanticipated trauma.
- The pulmonary effects of ECs can prove challenging when managing ventilation during the perioperative period. Pulmonary inflammatory processes, prolonged emergence, and delayed return of airway reflexes can occur, further complicating emergence.
- Patients who vape are at increased risk for cardiac complications similar to cigarette smokers and warrant close hemodynamic monitoring especially with nicotine use.

References

Available upon request, contact lbell083@fiu.edu