ACMT Position Statement: Limiting Harms of Vaping and E-cigarette Use

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The use of vaping products, such as electronic cigarettes (e-cigarettes), has increased rapidly in recent years. Vaping products have historically exposed users, including adolescents, to the risks of nicotine use and dependence. Inadvertent nicotine liquid exposure in children has caused death. Adding to these previously known risks, there has been a recent outbreak of severe respiratory illness associated with the use of THC vaping products or e-cigarettes. It is the position of ACMT that stakeholders take steps enumerated below to address the increase in vaping and the recent outbreak of e-cigarette associated lung injury.

Background

Vaping is the practice of inhaling vaporized liquid using an electronic device, typically for the self-administration of nicotine or cannabis products. These devices include electronic cigarettes (e-cigarettes), vape pens, cartridge ("pod") vapes, and wax pens. Vaping is performed recreationally and as a smoking cessation aid. Although the majority of vaping products deliver nicotine solutions, some are used for delivery of cannabis-derived oils containing THC and CBD.[1,2] Vaping has gained significant popularity in recent years. In 2017, an estimated 2.8% of American adults used e-cigarettes.[2] From 2011 to 2018 e-cigarette use increased from 1.5% to 20.8% among high school students and 0.6% to 4.9% among middle school students.[3]

The majority of vaporization devices have three major components: a battery, a heating element, and a container to hold the liquid. Vaporization devices may or may not resemble a traditional cigarette and are available in both rechargeable and disposable forms.[4] The heating element heats the liquid into a vapor, which is inhaled by the user.[1,4]

In addition to the pharmacologically active ingredient, the liquid can contain a variety of additives, flavoring agents, and diluents such as glycerin or propylene glycol.[5] Many THC-containing products are sold as disposable, pre-packaged cartridges that the user inserts into a vaporization device. Vaporization devices have been promoted as a safer alternative to traditional smoking, and there may be a role for these for patients who have
failed other methods of smoking cessation.[6,7]

Hazards of Vaping

Vaping appears to be a safer method of nicotine use than cigarettes, but the inhalation of vaporized liquid still poses a health hazard. Although vaporization devices do not produce combustion products, vaping liquids still pose a health hazard. Concentrations of carbonyls, including the carcinogen formaldehyde, correlate with device power.[5] Some flavoring chemicals in vaporization liquids have been identified as potentially harmful. Diacetyl, a chemical implicated in the development of bronchiolitis obliterans, has been detected in some flavored vape
liquids.[5]

Nicotine is an addictive chemical and can have adverse effects on the developing brain.[5] Inadvertent pediatric exposures to concentrated nicotine solutions have also resulted in significant toxicity, including death.[9] Synthetic cannabinoids in liquids labeled to contain cannabidiol have resulted in seizures and delirium.[10] In rare cases, the explosion of vaping devices has caused severe burns.[11] Unfortunately long-term safety data are not available for many of the chemicals found in vaping products.[5]

E-cigarette or Vaping Product Use Associated Lung Injury (EVALI)

A recent epidemic has added to known concerns associated with vaping. The Centers for Disease Control (CDC) has received thousands of reported cases of lung injury associated with vaping. This entity, called “E-cigarette or vaping product use associated lung injury” (EVALI) has not been specifically attributed to any one type of vaporization device or liquid.[7,12] However, a large majority of patients report using THC-containing products, in isolation or in conjunction with nicotine products, and most report the use of THC-containing vape cartridges obtained from informal sources such as friends, online suppliers, or illicit dealers.12,13

Patients with EVALI primarily present with respiratory complaints, including shortness of breath, cough, and chest pain. Constitutional symptoms and gastrointestinal symptoms

(abdominal pain, nausea, vomiting, and diarrhea) are also reported in a majority of patients.[7] Gastrointestinal symptoms may precede respiratory symptoms.[7,14] Hypoxia, tachypnea, and tachycardia may be found on examination. Leukocytosis, elevated inflammatory markers (C-reactive protein, erythrocyte sedimentation rate [ESR]), and elevated liver transaminases have been commonly reported.[14] Chest radiographs or computed tomography reveal bilateral infiltrates in the absence of an infectious cause, often demonstrating ground glass opacities with areas of lobular or subpleural sparing.[14,15] Lipid-laden alveolar macrophages have been detected on bronchoalveolar lavage in some patients.[13]

To meet CDC-defined case criteria, patients with confirmed EVALI must have: reported use of vaping products within 90 days, pulmonary infiltrates on chest imaging, a negative workup for pulmonary infections, and no other alternative plausible diagnosis.[12]

The majority of patients reported thus far have been hospitalized, although many patients with minor symptoms are likely undiagnosed or unreported.[7,14] Some have required mechanical ventilation or extracorporeal membrane oxygenation (ECMO). One patient has successfully undergone a bilateral lung transplant.[16] Corticosteroids appear to be beneficial, but the optimal dose and duration have have yet to be determined.[14,17]

The culprit substance causing EVALI has been under investigation by numerous national and regional agencies. Several potentially harmful compounds have been identified, but vitamin E acetate emerged as a leading suspect when it was found in many THC-containing samples associated with EVALI cases.[18] In November 2019, the CDC reported detecting the chemical in bronchoalveolar lavage fluid in all 29 cases from a convenience sample of EVALI patients.[19] Vitamin E acetate, added to THC oil as an adulterant and thickening agent in illicit vape cartridges, appears to cause lung epithelial damage induce an inflammatory response.[1,20]

Further investigation will be needed to confirm if this substance is causative, or if other toxicants are contributing. Some jurisdictions have already banned the use of vitamin E acetate[21] and some manufacturers have announced voluntarily discontinuing use of the chemical.[22]

CDC provides case definitions and testing guidance for healthcare professionals on surveillance efforts so that a causative agent may be identified.[6,11,16]

Methodology

Our initial recommendations were based on the opinion and clinical experience of a task force of our members. In addition, the authors performed a literature search when drafting this position statement. A PubMed and Medline search was performed using the terms “electronic-cigarettes” and “electronic-cigarettes lung injury” and “vaping”. Only articles written in English were reviewed. All relevant articles were reviewed as well as any applicable references in the bibliography. Given the rapidly evolving nature of the current outbreak of respiratory illness and lag time to publication, we also evaluated relevant public health websites such as the Centers for Disease Control and Prevention and the U.S. Food and Drug Administration.

This document was reviewed and approved by the ACMT Position Statement and Guidelines Committee, was sent to the ACMT Board of Directors, and then sent to the entire College membership for review. After revision by the task force, final approval was made by the ACMT Board of Directors.

Recommendations

Government/Governmental Agencies

- Continue and expand upon current surveillance efforts to identify the causative agent of the current outbreak of respiratory illness.
- Review reports of EVALI to gain additional information about clinical course and to guide treatment recommendations.
- Provide timely updates and guidance for healthcare providers and the public.
- Institute the necessary regulatory and manufacturing changes if a causative agent is identified.
- Update warning label requirements on e-cigarettes to reflect this evolving health concern.
- Impose the same advertising restrictions already in place for tobacco and cannabis to limit the growing market for vaping in nicotine-naive adolescents.
- Limit the sale of flavored vape products which are likely to target adolescents and young adults.
- Promote continued research and surveillance to describe the long-term health effects of vaping.

Electronic-Cigarette Manufacturers/Distributors

- Comply with governmental standards with regard to labeling and use of approved ingredients.
- Use child-resistant packaging for vaping solutions.
- Avoid advertisements and packaging that target teens and young adults.
- Remove vaping products containing vitamin E acetate from the market.

Health Care Providers

- When evaluating patients with respiratory or gastrointestinal complaints, inquire about smoking and vaping practices.
- Be aware of the clinical presentation and current treatment strategies for patients with vaping-associated respiratory illness. Incorporate clinical practice algorithms into management.[23]
- Report suspected cases of EVALI to the local and state health department, or to the regional Poison Control Center.
- Consider chest radiography, computed tomography, and evaluation for infectious etiology to identify or exclude other causes of severe lung injury in management of EVALI.
- Consider corticosteroids in the management of EVALI.
- For suspected respiratory illness, obtain information on the product used (contents, brand name, where obtained) and submit any remaining product to the local health department when possible.
- For patients being discharged after recovery from acute respiratory illness, consider 24-48 hour follow-up.
- Counsel all patients including adolescents, young adults, and pregnant women to avoid vaping.
- Monitor patients who use electronic-cigarettes for long-term health effects.
- Counsel caregivers to store e-cigarettes and vaping solutions away from children.
- Encourage patients to use behavioral methods and FDA-approved pharmacotherapies to stop smoking. There may be a role for nicotine vaping in patients where these methods fail, but encourage patients to stop nicotine vaping when you and the patient are confident they will not relapse to cigarette use.

General Public

- Adolescents, young adults, and pregnant women should not use e-cigarettes
- Avoid unregulated THC-containing vape oil.
- Use behavioral techniques and FDA-approved therapies to stop cigarette smoking. If these methods fail, only use vaping as a smoking cessation aid under medical supervision.

- If you currently vape and develop respiratory or gastrointestinal symptoms, seek medical attention.

Disclaimer

While individual practitioners may differ, these are the positions of the American College of Medical Toxicology (ACMT) at the time written, after a review of the issue and pertinent literature.

References:

1. Cao, DJ, Aldy K, Hsu S, McGetrick M, Verbeck G, De Silva I, Feng S. Review of health consequences of electronic cigarettes and outbreak of electronic cigarette, or vaping, product use-associated lung injury. J Med Toxicol 2020. Online ahead of print
2. Wang T, Asman K, Gentzke AS, et al. Tobacco product use among adults-United States, 2017. MMWR Morb Mortal Wkly Rep 2018;67:1225-32.
3. Cullen KA, Ambrose BK, Gentzke AS, Apelberg BJ, Jamal A, King BA.

   Notes from the Field: Use of Electronic Cigarettes and Any Tobacco Product Among Middle and High School Students — United States, 2011–2018. MMWR Morb Mortal Wkly Rep 2018;67:1276–1277.
4. CDC. About electronic cigarettes (e-cigarettes). https://www.cdc.gov/tobacco/basic_information/e-cigarettes/about-e-cigarettes.html. Accessed October 5, 2019.
5. El-Hellani A, Salman R, El-Hage R, et al. Nicotine and carbonyl emissions from popular electronic cigarette products: Correlation to liquid composition and design characteristics. Nicotine Tob Res. 2018; 20:215-223.
6. Ratajczak A, Feleszko W, Smith DM, Goniewicz M. How close are we to definitively identifying the respiratory health effects of e-cigarettes? Expert Rev Respir Med. 2018 Jul;12(7):549-556. doi: 10.1080/17476348.2018.1483724. Epub 2018 Jun 8.
7. Siegel DA, Jatlaoui TC, Koumans EH, et al. Update: Interim Guidance for Health Care Providers Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use Associated Lung Injury — United States, October 2019.
8. Allen JG1 , Flanigan S S, LeBlanc M, et al. Flavoring Chemicals in E-Cigarettes: Diacetyl, 2,3-Pentanedione, and Acetoin in a Sample of 51 Products, Including Fruit-, Candy-, and Cocktail-Flavored E-Cigarettes. Environ Health Perspect. 2016 Jun;124(6):733-9.
9. Kamboj A, Spiller HA, Casavant MJ, et al. Pediatric exposure to e-cigarettes, nicotine, and tobacco products in the United States. Pediatrics. 2016;137:pii: e20160041. doi: 10.1542/peds.2016-0041.

10. Horth RZ, Crouch B, Horowitz BZ, et al. Notes from the Field: Acute Poisonings from a Synthetic Cannabinoid Sold as Cannabidiol — Utah, 2017–2018. MMWR Morb Mortal Wkly Rep 2018;67:587–588.
11. Jones CD, Ho W, Gunn E, et al. E-cigarette burn injuries: Comprehensive review and management guidelines proposal. Burns. 2019;45:763-71.
12. CDC. Outbreak of lung injury associated with e-cigarette use or vaping. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html. Accessed November 22, 2019.
13. Davidson K, Brancato A, Heetderks P, et al. Outbreak of Electronic-Cigarette–Associated Acute Lipoid Pneumonia — North Carolina, July–August 2019. MMWR Morb Mortal Wkly Rep 2019;68:784–786.
14. Layden JE, Ghinai I, Pray I, et al. Pulmonary illness related to e-cigarette use in Illinois and Wisconsin-Final report. N Eng J Med 2020;382:903-16.
15. Henry TS, Kanne JP, Kligerman SJ. Imaging of Vaping-AssociatedLung Disease. N Engl J Med. 2019 Oct 10;381(15):1486-1487.
16. Henry Ford Health System Performs First Double Lung Transplant for Patient Injured by Vaping. https://www.henryford.com/news/2019/11/vaping-lung-transplant. Accessed November 12, 2019.
17. Schier JG, Meiman JG, Layden J, et al. Severe pulmonary disease associated with electronic cigarette product use-interim guidance. MMWR. Morb Mortal Wkly Rep. 2019;68:787-90
18. New York State Department of Health Announces Update on Investigation into Vaping-Associated Pulmonary Illnesses. September 5, 2019. https://www.health.ny.gov/press/releases/2019/2019-09-05_vaping.htm.
19. 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. MMWR Morb Mortal Wkly Rep 2019; 68:1-2.
20. Bhat TA, Kalathil SG, Bogner PN, et al. An animal model of inhaled Vitamin E acetate and EVALI-like lung injury. NEJM 2020; 382:1175-1177. il-explained. Accessed November 22, 2019.
21. Fields, Asia. "Washington state bans vape products containing vitamin E acetate, thought to be linked to illness". Seattle Times; November 18, 2019. https://www.seattletimes.com/seattle-news/washington-state-bans-vape-products-containing-vitamin-e-acetate-thought-to-be-linked-to-illness/. Accessed November 22, 2019.
22. Peel, Sophie. Leading Oregon cannabis extractor pulls line of vape products off its website as health questions swirl. Willamette Week, September 9. 2019. https://www.wweek.com/news/state/2019/09/09/leading-oregon-cannabisextractor-pulls-line-of-vape-products-off-its-website-as-health-questions-s wirl/

Accessed November 27, 2019.
23. Kalininskiy A, Bach CT, Nacca NE, Ginsberg G, Marraffa J, Navarette KA, McGraw MD, Croft DP. E-cigarette, or vaping, product use associated lung injury (EVALI): case series and diagnostic approach. Lancet Respir Med 2019; 12: 1017-1026.