

E-cigarette, or Vaping, product use  
Associated Lung Injury (EVALI)  
Information for Health Care Providers



Current as of  
Dec 06, 2019

# Table of Contents

EVALI: Information for Health Care Providers .....	1
Background .....	1
Clinical Signs & Symptoms .....	1
Physical Examination .....	1
Laboratory Testing .....	1
Imaging.....	2
Pulmonology Consultation.....	2
Treatment .....	2
Special Considerations .....	2
Reporting .....	3
Product & Specimen Testing.....	3
Patient History: Guidelines .....	4
Additional Resources .....	4
November 8, 2019 MMWR Update Summary (Vitamin E Acetate) .....	5
November 19, 2019 MMWR Update Interim Guidance Summary .....	6
November 19, 2019 MMWR Update: Interim Guidance for HCP: Full Article.....	9
MMWR Bronchoalveolar Lavage Fluid Evaluation: Full Article .....	15
October 11, 2019 MMWR EVALI Interim Guidance for HCP .....	17
Out-of-Hospital Death Case Definition .....	26
Specimen Collection & Shipping - DSHS Guidelines .....	28
<a href="#">EVALI ICD-10-CM Official Coding Guidelines .....</a>	<a href="#">32</a>
Free Quit Tobacco Class .....	35
Vaping Poster - Hospital Use .....	36

Note:

December 06, 2019 updates are in [blue](#).

# EVALI: Information for Health Care Providers

## Background

Lung injury cases associated with the use of e-cigarette, or vaping, products have been reported to CDC from 49 states (all except Alaska), the District of Columbia, and 1 U.S. territory. All patients have reported a history of using e-cigarette or vaping products. THC has been present in most samples tested by the FDA and most patients reporting using THC-containing products. Notably, THC products obtained off the street or from other informal sources (e.g. friends, family members, illicit dealers), are linked to most of the cases and play a major role in the outbreak.

## Clinical Signs & Symptoms

95% of individuals experienced respiratory symptoms including cough, chest pain, and shortness of breath. 77% experienced abdominal pain, nausea, vomiting, and diarrhea. 85% experienced constitutional symptoms such as, fever, chills, and weight loss. Symptoms worsened over a period of days or weeks before admission to the hospital.

On imaging, chest radiographs have demonstrated bilateral opacification, and CT imaging has demonstrated diffuse ground glass opacification.

## Physical Examination

Ask all patients who report e-cigarette, or vaping, product use within the last 90 days about respiratory, gastrointestinal, and constitutional symptoms. Include vital signs and pulse oximetry. Among reported patients: 55% had tachycardia, 45% had tachypnea, and 57% had O<sub>2</sub> saturation <95% at rest on room air. Pulmonary findings on auscultation exam have been unremarkable, even among patients with severe lung injury.

A spectrum of pathologic findings associated with acute lung injury have been seen, including diffuse alveolar damage, acute fibrinous pneumonitis or bronchiolitis, or organizing pneumonia often with vacuolated or foamy macrophages and/or pneumocytes.

## Laboratory Testing

Laboratory testing should be guided by clinical findings and should consider all possible causes of illness in patients reporting respiratory and gastrointestinal symptoms. Respiratory viral panel should be strongly considered, including influenza during flu season. Consider consultation with specialists (pulmonary, infectious disease, critical care, medical toxicology, psychology, psychiatry, addiction medicine) as appropriate.

Evaluate and treat for other possible causes of illness (e.g., infectious, cardiac, rheumatologic, neoplastic) as clinically indicated.

With informed consent, consider urine toxicology testing (including THC). See [page 28](#) for more details.

## Imaging

A chest x-ray (CXR) should be obtained on all patients with a history of e-cigarette use, or vaping, and who have respiratory or gastrointestinal symptoms, particularly when accompanied by decreased O<sub>2</sub> saturation (<95%). Individuals with EVALI commonly have pulmonary infiltrates on CXR and opacities on chest computed tomography (CT) scan.

## Pulmonology Consultation

In consultation with pulmonology, determine whether bronchoscopy would be appropriate. Decision to perform bronchoscopy and bronchoalveolar lavage (BAL) should be made on a case-by-case basis, see [page 28](#) for more details.

Lung biopsies have been performed on some patients. If a lung biopsy is obtained, lipid staining may be considered during pathologic examination, and is best performed on fresh tissue, see [page 28](#) for more details. Routine pathology tissue processing involves the application of alcohols, which remove lipids, to formalin-fixed tissues. Conducting routine tissue processing and histopathologic evaluation is still important. Consider consultation with specialists in pulmonary medicine and pathology to help inform any evaluation plan.

## Treatment

Healthcare providers should consider empiric use of a combination of antibiotics, antivirals, or steroids, based upon clinical context. Clinical improvement has been reported with the use of corticosteroids. Early initiation of antibiotic treatment for community-acquired pneumonia in accordance with established guidelines should be strongly considered. During influenza season, health care providers should consider influenza in all patients with suspected of having EVALI. Antivirals should be considered in patients suspected of having influenza in accordance with established guidelines. The decision to use corticosteroids and dosing regimen should be made on a case-by-case basis based on risks and benefits and the likelihood of other etiologies, and should be made in consultation with a pulmonologist when possible.

## Special Considerations

Older individuals and individuals with a history of cardiac or lung disease are at greater risk for complications. Older individuals were more frequently intubated and had longer hospital stays. Individuals with a history of cardiac disease had longer hospital stays compared to those without no past cardiac disease.

Health care providers should emphasize the importance of annual vaccination against influenza for all persons >6 months of age, including patients with a history of EVALI. In addition, administration of pneumococcal vaccine should be considered according to current guidelines.

During flu season, health care providers should consider flu in all patients with suspected EVALI. Antivirals should be considered in accordance with established guidelines.

### Reporting

Report cases of lung injury of unclear etiology and a history of e-cigarette, or vaping, product use within the past 90 days to Wichita Falls – Wichita County Public Health District via fax 940-761-7659 using the [EVALI Reporting Form](#).

### Product & Specimen Testing

If you are interested in submitting clinical (bronchoalveolar lavage, serum, urine, or lung biopsy tissues) or vaping product samples for testing, please contact DSHS (512-442-0925 or [epitox@dshs.texas.gov](mailto:epitox@dshs.texas.gov)) for further instructions. See [page 28-31](#) for further guidelines.

## Patient History: Guidelines

Ask about use of e-cigarette or vaping products and types of substances used:

- THC/cannabis (oil, dabs) or nicotine
- Modified products
- Addition of substances not intended by the manufacturer

Suggested history items:

- Product source
- Specific product brand and name
- Duration and frequency of use
- Time of last use
- Product delivery system
- Method of use (aerosolization, dabbing, or dripping)

Continue to ask questions during hospitalization and follow-up visits.

## Additional Resources

For more detailed information and guidance for caring for patients with possible EVALI, please visit the following websites:

[https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/healthcare-providers/index.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/index.html)

<https://www.dshs.state.tx.us/tobacco/E-Cigarettes/>

Please find the detailed MMWR: Interim Guidance for Health Care Providers on [page 17](#) and the updated MMWR: Updated Interim Guidance for Health Care Providers on [page 9](#).

If you have any questions about EVALI, please contact the Wichita Falls – Wichita County Public Health District's Epidemiologist, Jisue Lee at 940-761-7803.

For updates on, this document, "E-cigarette, or Vaping, product use Associated Lung Injury (EVALI) Information for Health Care Providers", visit the [Wichita Falls Health District Website](#).

## November 8, 2019 CDC MMWR Update

- 29 bronchoalveolar lavage (BAL) fluid specimens from 29 patients across 10 states have been evaluated.
- CDC found vitamin E acetate in all 29 BAL samples.
- THC or its metabolites were detected in 23 of 28 BAL samples.
- Nicotine metabolites were detected in 16 of 26 BAL samples.
- Based on these data from 29 patients, it appears that vitamin E acetate is associated with EVALI
  - However, it is possible that more than one compound or ingredient could be a cause of lung injury, and evidence is not yet sufficient to rule out contribution of other toxicants to EVALI.
- The detailed MMWR can be found on [page 15](#).

## Nov 19, 2019 MMWR Update Interim Guidance Summary

- Ask patients with respiratory, gastrointestinal, or constitutional symptoms about the use of e-cigarette, or vaping, products using empathetic, nonjudgmental, and private questioning methods
- Evaluate those suspected to have EVALI with pulse oximetry and obtaining chest imaging, as clinically indicated
  - Tachycardia, tachypnea, and hypoxemia have been commonly reported among cases
  - A chest radiograph (CXR) should be considered for patients with a recent history of e-cigarette, or vaping, product use, who have respiratory or gastrointestinal symptoms, particularly when chest pain, dyspnea, or decreased oxygen saturation (<95% while breathing room air) are present
- Consider outpatient management for clinically stable EVALI patients who:
  - Have normal oxygen saturation ( $\geq 95\%$  while breathing room air), no respiratory distress, no comorbidities that might compromise pulmonary reserve, reliable access to care, strong social support systems, and should be able to ensure follow-up within 24–48 hours of initial evaluation and to seek medical care promptly if respiratory symptoms worsen
- Test patients for influenza, particularly during influenza season, and administer antimicrobials, including antivirals, in accordance with established guidelines and local microbiology and resistance patterns for bacterial pneumonia
  - Persons with suspected influenza who are at high risk for influenza complications, those with severe or progressive illness, and hospitalized patients are recommended for prompt administration of antiviral treatment
- Use caution when considering prescribing corticosteroids for outpatients, because this treatment modality has not been well studied among outpatients, and corticosteroids could worsen respiratory infections
  - Consultation with pulmonary, infectious disease, psychology, psychiatry, and addiction medicine specialists should be considered
- Recommend evidence-based treatment strategies, including behavioral counseling, to help patients discontinue using e-cigarette, or vaping, products
  - Health care providers should offer or connect patients to services to stop using e-cigarette, or vaping, products
  - See [page 32](#) for Wichita Falls – Wichita County Public Health District’s free class
- Emphasize the importance of annual influenza vaccination for all persons aged  $\geq 6$  months, including patients who use e-cigarette, or vaping products
  - In addition, administration of pneumococcal vaccine should be considered for patients with a history of EVALI, according to [current guidelines](#)
- Long-term effects and the risk for recurrence of EVALI are not known.
  - Clinicians report that some patients have relapsed during corticosteroid tapers or with resumption of e-cigarette, or vaping, product use after hospitalization
  - Health care providers should also advise patients with a history of EVALI to return as soon as possible if they develop new or worsening respiratory symptoms
- The detailed MMWR can be found on the [next page, 9](#).

## Update: Interim Guidance for Health Care Providers for Managing Patients with Suspected E-cigarette, or Vaping, Product Use–Associated Lung Injury — United States, November 2019

Tara C. Jatlouji, MD<sup>1</sup>; Jennifer L. Wiltz, MD<sup>1</sup>; Sarah Kabbani MD<sup>2</sup>; David A. Siegel<sup>1</sup>, MD; Ram Koppaka, MD, PhD<sup>3</sup>; Michele Montandon, MD<sup>4</sup>; Susan Hocevar Adkins, MD<sup>5</sup>; David N. Weissman, MD<sup>6</sup>; Emily H. Koumans, MD<sup>1</sup>; Michelle O’Hegarty, PhD<sup>1</sup>; Megan C. O’Sullivan, MPH<sup>2</sup>; Matthew D. Ritchey, DPT<sup>1</sup>; Kevin Chatham-Stephens, MD<sup>7</sup>; Emily A. Kiernan, DO<sup>8,9</sup>; Mark Layer, MD<sup>9,10</sup>; Sarah Reagan-Steiner, MD<sup>2</sup>; Jaswinder K. Legha, MD<sup>11</sup>; Katherine Shealy, MPH<sup>1</sup>; Brian A. King, PhD<sup>1</sup>; Christopher M. Jones, PharmD, DrPH<sup>11</sup>; Grant T. Baldwin, PhD<sup>11</sup>; Dale A. Rose, PhD<sup>2</sup>; Lisa J. Delaney, MS<sup>6</sup>; Peter Briss, MD<sup>1</sup>; Mary E. Evans, MD<sup>11</sup>; Lung Injury Response Clinical Working Group

CDC, the Food and Drug Administration (FDA), state and local health departments, and public health and clinical stakeholders are investigating a nationwide outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI) (1). CDC has published recommendations for health care providers regarding EVALI (2–4). Recently, researchers from Utah and New York published proposed diagnosis and treatment algorithms for EVALI (5,6). EVALI remains a diagnosis of exclusion because, at present, no specific test or marker exists for its diagnosis, and evaluation should be guided by clinical judgment. Because patients with EVALI can experience symptoms similar to those associated with influenza or other respiratory infections (e.g., fever, cough, headache, myalgias, or fatigue), it might be difficult to differentiate EVALI from influenza or community-acquired pneumonia on initial assessment; EVALI might also co-occur with respiratory infections. This report summarizes recommendations for health care providers managing patients with suspected or known EVALI when respiratory infections such as influenza are more prevalent in the community than they have been in recent months (7). Recommendations include 1) asking patients with respiratory, gastrointestinal, or constitutional symptoms about the use of e-cigarette, or vaping, products; 2) evaluating those suspected to have EVALI with pulse oximetry and obtaining chest imaging, as clinically indicated; 3) considering outpatient management for clinically stable EVALI patients who meet certain criteria; 4) testing patients for influenza, particularly during influenza season, and administering antimicrobials, including antivirals, in accordance with established guidelines;

5) using caution when considering prescribing corticosteroids for outpatients, because this treatment modality has not been well studied among outpatients, and corticosteroids could worsen respiratory infections; 6) recommending evidence-based treatment strategies, including behavioral counseling to help patients discontinue using e-cigarette, or vaping, products; and 7) emphasizing the importance of annual influenza vaccination for all persons aged  $\geq 6$  months, including patients who use e-cigarette, or vaping products.

As of November 13, 2019, 49 states, the District of Columbia, and two U.S. territories (Puerto Rico and U.S. Virgin Islands) have reported 2,172 EVALI cases to CDC, including 42 (1.9%) EVALI-associated deaths. Based on established definitions,\* patients with EVALI require reported use of e-cigarette, or vaping, products within 3 months of symptom onset, positive imaging findings, and an evaluation to rule out infectious causes.

In anticipation of increasing incidence of influenza and other respiratory infections during the winter, CDC, the Council of State and Territorial Epidemiologists, state health departments, and clinical partners assessed the need for additional clinical guidance. CDC obtained individual clinical perspectives on the management of patients with suspected EVALI from nine national experts (Lung Injury Response Clinical Working Group) involved in previously published clinical guidance for EVALI patients (4).

\* [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf).



## Clinical Guidance

**Patient interview.** Health care providers should ask about the use of e-cigarette, or vaping, products in a confidential and nonjudgmental manner when evaluating patients with respiratory symptoms (e.g., cough, chest pain, and shortness of breath), gastrointestinal symptoms (e.g., abdominal pain, nausea, vomiting, and diarrhea), or constitutional symptoms (e.g., fever, chills, and weight loss) (Figure). Confidentiality is essential when assessing sensitive information, including all forms of substance use, especially among adolescents and young adults.<sup>†</sup> Empathetic, nonjudgmental, and private questioning of patients should be employed to encourage truthful disclosure (8). The most critical step in assessing EVALI is to ask patients about recent use of e-cigarette, or vaping, products. If confirmed, the types of substances used (e.g., [tetrahydrocannabinol] THC and nicotine) and where they were obtained should be ascertained. Evidence to date implicates products containing THC, particularly those obtained from informal sources like friends, family members, or in-person or online dealers (1,9). Therefore, clinicians might seek additional information to inform the ongoing investigation (Box).

**Physical examination.** The physical exam should include assessment of vital signs and pulse oximetry; tachycardia, tachypnea, and hypoxemia have been commonly reported among cases (4,9,10).

**Laboratory testing and imaging studies.** Laboratory testing should be guided by clinical findings to evaluate multiple etiologies, including the possibility of EVALI and concomitant infection (4–6). A chest radiograph (CXR) should be considered for patients with a recent history of e-cigarette, or vaping, product use, who have respiratory or gastrointestinal symptoms, particularly when chest pain, dyspnea, or decreased oxygen saturation (<95% while breathing room air) are present. Measured oxygen saturation should be interpreted with consideration of factors such as altitude. A chest computed tomography scan might be considered if EVALI is in the differential diagnosis and the CXR is normal. Radiographic findings have varied and abnormalities are not present in all patients upon initial assessment (11). Health care providers should evaluate for causes of community-acquired pneumonia according to established guidelines as indicated by imaging findings (12,13).

**Consideration of outpatient management.** Some patients with recent history of e-cigarette, or vaping, product use who are evaluated for respiratory, gastrointestinal, or constitutional symptoms might be candidates for outpatient management. Hospital admission should be strongly considered for patients

with concurrent illness such as influenza and suspected EVALI, especially if respiratory distress, comorbidities that compromise pulmonary reserve, or decreased oxygen saturation (<95% while breathing room air) are present. Candidates for outpatient management should have normal oxygen saturation (≥95%), no respiratory distress, no comorbidities that might compromise pulmonary reserve, reliable access to care, strong social support systems, and should be able to ensure follow up within 24–48 hours of initial evaluation and to seek medical care promptly if respiratory symptoms worsen; in some cases, patients who initially had mild symptoms experienced a rapid worsening of symptoms within 48 hours (4,10). Additional follow-up might be indicated, based on clinical findings.

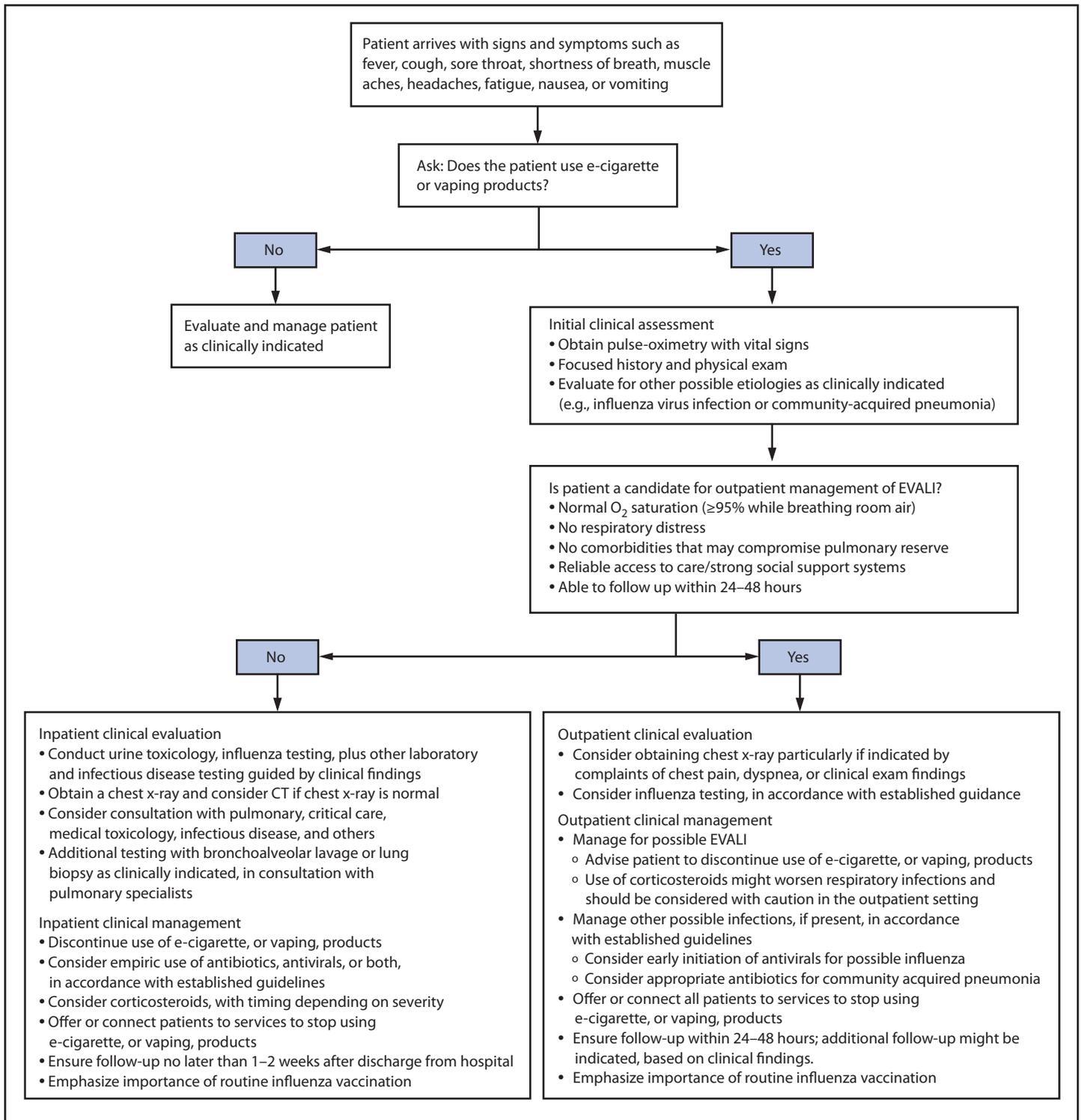
**Influenza testing and empiric antimicrobial treatment.** Influenza testing should be strongly considered, particularly during influenza season.<sup>§</sup> It might be difficult to differentiate EVALI, a diagnosis of exclusion, from influenza or community-acquired pneumonia on initial assessment, and EVALI might co-occur with respiratory infections. Treatment with empiric antimicrobials, including antivirals, should be considered in accordance with established guidelines and local microbiology and resistance patterns for bacterial pneumonia (12–14). Persons with suspected influenza who are at high risk for influenza complications, those with severe or progressive illness, and hospitalized patients are recommended for prompt administration of antiviral treatment. Antiviral treatment also can be considered for any previously healthy, symptomatic outpatient not at high risk for influenza complications, who is diagnosed with confirmed or suspected influenza, on the basis of clinical judgment, if treatment can be initiated within 48 hours of illness onset (14).

**Corticosteroids and treatment of EVALI.** Corticosteroids might be helpful in treating EVALI (4). In published reports primarily including hospitalized patients, most patients with EVALI who received corticosteroids had rapid improvement; dosages have been previously described (4–6,10,15). In some circumstances, it would be advisable to withhold corticosteroids while evaluating patients for infectious etiologies that might worsen with corticosteroid treatment. Use of corticosteroids for the treatment of EVALI in the outpatient setting has not been well studied and should be considered with caution. Corticosteroids might worsen respiratory infections commonly seen in the outpatient setting (13,14). Some patients who have not received corticosteroids have also had clinical improvement with cessation of e-cigarette, or vaping, products (4–6,10,15), and comparative studies have not been conducted. Consultation with pulmonary, infectious disease, psychology, psychiatry, and

<sup>†</sup> <https://depts.washington.edu/dbpeds/Screening%20Tools/HEADSS.pdf>.

<sup>§</sup> <https://www.cdc.gov/flu/professionals/diagnosis/index.htm>.

**FIGURE. Algorithm for management of patients<sup>\*,†,§,¶</sup> with respiratory, gastrointestinal, or constitutional symptoms and e-cigarette, or vaping, product use**



**Abbreviations:** CT = computed tomography; EVALI = e-cigarette, or vaping, product use–associated lung injury.

\* <https://www.cdc.gov/flu/professionals/diagnosis/consider-influenza-testing.htm>.

† <https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm>.

§ <https://www.atsjournals.org/doi/full/10.1164/rccm.201908-1581ST#readcube-epdf>.

¶ <https://academic.oup.com/cid/article/68/6/e1/5251935>.

**BOX. Assessment of recent history of use of e-cigarette, or vaping products**

The most critical step in assessing e-cigarette, or vaping, product use–associated lung injury (EVALI) is to ask patients about recent use of e-cigarette, or vaping, products. Health care providers evaluating patients with respiratory symptoms (e.g., cough, chest pain, or shortness of breath), gastrointestinal symptoms (e.g., abdominal pain, nausea, vomiting, or diarrhea), or constitutional symptoms (e.g., fever, chills, or weight loss) should ask about the use of e-cigarette, or vaping, products.

- Confidentiality is essential when assessing sensitive information, including all forms of substance use, especially for young adults and adolescents.
- Empathetic, nonjudgmental, and private questioning of patients to encourage truthful disclosure should be employed.\*,†
- Repeat questioning might elicit additional information about exposures, as trust is established.

The strongest evidence to date implicates products containing tetrahydrocannabinol (THC), particularly those obtained from informal sources like friends, family members, or in-person or online dealers. Therefore, it is important to ascertain the following information:

- What types of substances were used (see details below for examples)
- Where they were obtained

To assist with the ongoing investigation, the following details might provide additional necessary information:

- Types of substances used
  - THC or cannabis [specify if oil or dabs]
  - Nicotine
  - Modified products or the addition of substances (e.g., addition of vitamin E acetate)
- Product source
- Product brand and name
- Duration and frequency of use
- Time of last use
- Product delivery system
- Method of use (aerosolization, dabbing, or dripping)

\*<https://www.aafp.org/afp/2017/0101/p29.pdf>.

†<https://depts.washington.edu/dbpeds/Screening%20Tools/HEADSS.pdf>.

addiction medicine specialists should be considered, as indicated, to optimize patient management.

Special consideration should be given to patients who might be at increased risk for severe outcomes with EVALI, including those who are older or have a history of cardiac or lung disease, or those who are pregnant. Among reported cases, those who were older or had past cardiac disease had more severe EVALI-associated outcomes (e.g., higher percentage requiring endotracheal intubation and mechanical ventilation and longer duration of hospitalization) (4).

**Discontinuation of e-cigarette, or vaping, product use.**

Advising patients to discontinue use of e-cigarette, or vaping, products should be integral to the care approach. Health care

providers should offer or connect patients to services to stop using e-cigarette, or vaping, products. Resuming use of these products has the potential to cause slowed recovery, recurrence of symptoms, or further lung injury (5). Adult patients who are using e-cigarette, or vaping, products for smoking cessation should be advised not to return to smoking cigarettes. They should be provided with evidence-based interventions, including behavioral counseling and FDA-approved cessation medications.¶ Adolescents and young adults might benefit from specialized services, such as addiction treatment services and providers who have experience with counseling and

¶ <https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html>.

behavioral health follow-up. Persons with ongoing marijuana use that causes significant impairment or distress might have a cannabis use disorder. Persons with cannabis use disorder should receive evidence-based interventions such as cognitive-behavioral therapy, contingency management, motivational enhancement therapy, and multidimensional family therapy. Consultation with addiction medicine services should be considered (16–18).

**Influenza vaccination.** Health care providers should emphasize the importance of annual influenza vaccination for all persons aged  $\geq 6$  months, including their patients who use e-cigarette, or vaping products. It is not known whether patients with EVALI are at higher risk for severe complications of influenza or other respiratory infections. In addition, administration of pneumococcal vaccine should be considered for patients with a history of EVALI, according to current guidelines.\*\*

**Postdischarge follow-up.** Patients discharged from the hospital after inpatient treatment for EVALI should have a follow-up visit within 1–2 weeks. The follow-up evaluation should include pulse-oximetry and consideration of a repeat CXR. Additional follow-up testing 1–2 months after discharge might include spirometry, diffusion capacity for carbon monoxide, and CXR.

Long-term effects and the risk for recurrence of EVALI are not known. Whereas many patients' symptoms resolved, clinicians report that some patients have relapsed during corticosteroid tapers or with resumption of e-cigarette, or vaping, product use after hospitalization, underscoring the need for cessation and close follow-up (personal communication, Lung Injury Response Clinical Working Group, October 2019). Some patients have had persistent hypoxemia requiring home oxygen at discharge and might require ongoing pulmonary follow-up. Patients treated with high-dose corticosteroids might require care from an endocrinologist to monitor adrenal function.

Health care providers should also advise patients with a history of EVALI to return as soon as possible if they develop new or worsening respiratory symptoms, with or without fever, for early evaluation with influenza testing and early initiation of antiviral (14)<sup>††</sup> or antibiotic treatment (12,13), as indicated.

## Public Health Recommendations

Recent testing has detected vitamin E acetate in bronchoalveolar lavage fluid samples from a convenience sample of 29 patients with EVALI (19); however, evidence is not yet sufficient to rule out contributions of other chemicals of potential concern contributing to EVALI. Many different substances and product sources are still under investigation, and it might be

### Summary

#### What is already known about this topic?

A total of 2,172 U.S. e-cigarette, or vaping, product use-associated lung injury (EVALI) cases have been reported to CDC. Vitamin E acetate and tetrahydrocannabinol appear to be associated with the outbreak; however, no single causative agent has been identified.

#### What is added by this report?

As rates of influenza increase, providers evaluating patients with respiratory illnesses should ask them about e-cigarette, or vaping, product use; evaluate whether patients require hospital admission; and consider empiric use of antimicrobials, including antivirals, as well as possible corticosteroids.

#### What are the implications for public health practice?

EVALI is a diagnosis of exclusion; rapid recognition of EVALI patients by health care providers is critical to reduce severe outcomes.

that there is more than one cause of this outbreak. Because most patients with EVALI report using THC-containing products before the onset of symptoms, CDC recommends that persons not use e-cigarette, or vaping, products that contain THC. Persons should not buy any type of e-cigarette, or vaping products, particularly those containing THC, from informal sources, like friends, family members, or in-person or online dealers.<sup>§§</sup> Persons should not modify or add any substances to e-cigarette, or vaping, products that are not intended by the manufacturer; these include but are not limited to vitamin E acetate and other cutting agents and additives obtained from informal sources or purchased through retail establishments. Because the specific cause or causes of EVALI are not yet known, the only way for persons to assure that they are not at risk is to consider refraining from use of all e-cigarette, or vaping, products while the investigation continues. Irrespective of the investigation, e-cigarette, or vaping, products should never be used by youths, young adults, or pregnant women (20). Moreover, persons who do not currently use tobacco products should not start using e-cigarette, or vaping products. Adults using e-cigarette, or vaping, products to aid with smoking cessation should not return to smoking cigarettes; they should weigh all risks and benefits and consider using FDA-approved cessation medications<sup>¶¶</sup>. Adults who continue to use e-cigarette, or vaping, products should carefully monitor themselves for symptoms and see a health care provider immediately if they develop symptoms like those reported in this outbreak.

<sup>§§</sup> [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease.html#latest-outbreak-information](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html#latest-outbreak-information).

<sup>¶¶</sup> [https://www.aafp.org/dam/AAFP/documents/patient\\_care/tobacco/pharmacologic-guide.pdf](https://www.aafp.org/dam/AAFP/documents/patient_care/tobacco/pharmacologic-guide.pdf).

\*\* <https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/pneumo.html>.

†† <https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm>.

## Lung Injury Response Clinical Working Group

Scott Aberegg, University of Utah Health; Carolyn S. Calfee, Pulmonary and Critical Care Medicine, University of California, San Francisco; Sean J. Callahan, University of Utah; Annette Esper, Emory University; Anne Griffiths, Pediatric Pulmonary Medicine, Children's Minnesota; Dixie Harris, Intermountain Healthcare; Don Hayes, Jr., Nationwide Children's Hospital, Ohio State University; Devika R. Rao, Department of Pediatrics, Division of Respiratory Medicine, University of Texas Southwestern Medical Center; Lincoln S. Smith, University of Washington, Seattle Children's Hospital.

<sup>1</sup>National Center for Chronic Disease Prevention and Health Promotion, CDC; <sup>2</sup>National Center For Emerging and Zoonotic Infectious Diseases, CDC; <sup>3</sup>National Center For Immunization And Respiratory Diseases, CDC; <sup>4</sup>Center For Global Health, CDC; <sup>5</sup>National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC; <sup>6</sup>National Institute for Occupational Safety and Health, CDC; <sup>7</sup>National Center on Birth Defects and Developmental Disabilities, CDC; <sup>8</sup>Agency for Toxic Substances and Disease Registry, CDC; <sup>9</sup>Emory University School of Medicine, Atlanta, Georgia; <sup>10</sup>National Center for Environmental Health, CDC; <sup>11</sup>National Center for Injury Prevention and Control, CDC.

Corresponding author: Tara C. Jatlaoui, eoevent32@cdc.gov.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

## References

- Moritz ED, Zapata LB, Lekhiachvili A, et al.; Lung Injury Response Epidemiology/Surveillance Group; Lung Injury Response Epidemiology/Surveillance Task Force. Update: characteristics of patients in a national outbreak of e-cigarette, or vaping, product use-associated lung injuries—United States, October 2019. *MMWR Morb Mortal Wkly Rep* 2019;68:985–9. <https://doi.org/10.15585/mmwr.mm6843e1>
- Schier JG, Meiman JG, Layden J, et al.; CDC 2019 Lung Injury Response Group. Severe pulmonary disease associated with electronic-cigarette—product use—interim guidance. *MMWR Morb Mortal Wkly Rep* 2019;68:787–90. <https://doi.org/10.15585/mmwr.mm6836e2>
- CDC. Severe pulmonary disease associated with using e-cigarette products. HAN alert no. 421. Atlanta, GA: US Department of Health and Human Services, CDC, Health Alert Network; 2019. <https://emergency.cdc.gov/han/han00421.asp>
- Siegel DA, Jatlaoui TC, Koumans EH, et al.; Lung Injury Response Clinical Working Group; Lung Injury Response Epidemiology/Surveillance Group. 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. *MMWR Morb Mortal Wkly Rep* 2019;68:919–27. <https://doi.org/10.15585/mmwr.mm6841e3>
- Blagev DP, Harris D, Dunn AC, Guidry DW, Grissom CK, Lanspa MJ. Clinical presentation, treatment, and short-term outcomes of lung injury associated with e-cigarettes or vaping: a prospective observational cohort study. *Lancet* 2019;19:32679–0. [https://doi.org/10.1016/S0140-6736\(19\)32679-0](https://doi.org/10.1016/S0140-6736(19)32679-0)
- Kalininskiy A, Bach CT, Nacca NE, et al. E-cigarette, or vaping, product use associated lung injury (EVALI): case series and diagnostic approach. *Lancet Respir Med* 2019;19:30415–1. [https://doi.org/10.1016/S2213-2600\(19\)30415-1](https://doi.org/10.1016/S2213-2600(19)30415-1)
- CDC. Estimated influenza illnesses, medical visits, hospitalization, and deaths in the United States—2017–2018 influenza season. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. <https://www.cdc.gov/flu/about/burden/2017-2018.htm>
- Hashim MJ. Patient-centered communication: basic skills. *Am Fam Physician* 2017;95:29–34.
- Lewis N, McCaffrey K, Sage K, et al. E-cigarette use, or vaping, practices and characteristics among persons with associated lung injury—Utah, April–October 2019. *MMWR Morb Mortal Wkly Rep* 2019;68:953–6. <https://doi.org/10.15585/mmwr.mm6842e1>
- Layden JE, Ghinai I, Pray I, et al. Pulmonary illness related to e-cigarette use in Illinois and Wisconsin—preliminary report. *N Engl J Med* 2019. Epub September 6, 2019. <https://doi.org/10.1056/NEJMoa1911614>
- Chatham-Stephens K, Roguski K, Jang Y, et al. Characteristics of hospitalized and nonhospitalized patients in a nationwide outbreak of e-cigarette, or vaping, product use-associated lung injury—United States, November 2019. *MMWR Morb Mortal Wkly Rep* 2019;68(46).
- Bradley JS, Byington CL, Shah SS, et al.; Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. The management of community-acquired pneumonia in infants and children older than 3 months of age: clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. *Clin Infect Dis* 2011;53:e25–76. <https://doi.org/10.1093/cid/cir531>
- Metlay JP, Waterer GW, Long AC, et al. Diagnosis and treatment of adults with community-acquired pneumonia. An official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. *Am J Respir Crit Care Med* 2019;200:e45–67. <https://doi.org/10.1164/rccm.201908-1581ST>
- Uyeki TM, Bernstein HH, Bradley JS, et al. Clinical practice guidelines by the Infectious Diseases Society of America: 2018 update on diagnosis, treatment, chemoprophylaxis, and institutional outbreak management of season influenza. *Clin Infect Dis* 2019;68:e1–47. <https://doi.org/10.1093/cid/ciy866>
- 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;68:784–6. <https://doi.org/10.15585/mmwr.mm6836e1>
- Budney AJ, Moore BA, Rocha HL, Higgins ST. Clinical trial of abstinence-based vouchers and cognitive-behavioral therapy for cannabis dependence. *J Consult Clin Psychol* 2006;74:307–16. <https://doi.org/10.1037/0022-006X.74.2.307>
- Diamond G, Panichelli-Mindel SM, Shera D, Dennis M, Tims F, Ungemack J. Psychiatric syndromes in adolescents with marijuana abuse and dependency in outpatient treatment. *J Child Adolesc Subst Abuse* 2006;15:37–54. [https://doi.org/10.1300/J029v15n04\\_02](https://doi.org/10.1300/J029v15n04_02)
- Fiore MC, Jaen CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update. Rockville, MD: US Department of Health and Human Services, Public Health Service, Agency for Healthcare Research and Quality; 2008. <https://www.ahrq.gov/prevention/guidelines/tobacco/clinicians/update/index.html>
- 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;68:1040–1. <https://doi.org/10.15585/mmwr.mm6845e2>
- US Department of Health and Human Services. Surgeon General's advisory on e-cigarette use among youth. Washington, DC: US Department of Health and Human Services; 2019. <https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf>

Readers who have difficulty accessing this PDF file may access the HTML file at [https://www.cdc.gov/mmwr/volumes/68/wr/mm6846e2.htm?s\\_cid=mm6846e2\\_w](https://www.cdc.gov/mmwr/volumes/68/wr/mm6846e2.htm?s_cid=mm6846e2_w). Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30329-4027 or to [mmwrq@cdc.gov](mailto:mmwrq@cdc.gov).

## 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

Benjamin C. Blount, PhD<sup>1,\*</sup>; Mateusz P. Karwowski, MD<sup>1,\*</sup>; Maria Morel-Espinosa, PhD<sup>1</sup>; Jon Rees, PhD<sup>1</sup>; Connie Sosnoff, MA<sup>1</sup>; Elizabeth Cowan, PhD<sup>1</sup>; Michael Gardner, MS<sup>1</sup>; Lanqing Wang, PhD<sup>1</sup>; Liza Valentin-Blasini, PhD<sup>1</sup>; Lalith Silva, PhD<sup>1</sup>; Victor R. De Jesús, PhD<sup>1</sup>; Zsuzsanna Kuklennyik, PhD<sup>1</sup>; Cliff Watson, PhD<sup>1</sup>; Tiffany Seyler, PhD<sup>1</sup>; Baoyun Xia, PhD<sup>1</sup>; David Chambers, PhD<sup>1</sup>; Peter Briss, MD<sup>2</sup>; Brian A. King, PhD<sup>3</sup>; Lisa Delaney, MS<sup>4</sup>; Christopher M. Jones, PharmD, DrPH<sup>5</sup>; Grant T. Baldwin, PhD<sup>6</sup>; John R. Barr, PhD<sup>1</sup>; Jerry Thomas, MD<sup>1</sup>; James L. Pirkle, MD, PhD<sup>1</sup>

CDC, the Food and Drug Administration (FDA), state and local health departments, and multiple public health and clinical partners are investigating a national outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI). Based on data collected as of October 15, 2019, 86% of 867 EVALI patients reported using tetrahydrocannabinol (THC)-containing products in the 3 months preceding symptom onset (1). Analyses of THC-containing product samples by FDA and state public health laboratories have identified potentially harmful constituents in these products, such as vitamin E acetate, medium chain triglyceride oil (MCT oil), and other lipids (2,3) (personal communication, D.T. Heitkemper, FDA Forensic Chemistry Center, November 2019). Vitamin E acetate, in particular, might be used as an additive in the production of e-cigarette, or vaping, products; it also can be used as a thickening agent in THC products (4). Inhalation of vitamin E acetate might impair lung function (5–7).

Bronchoscopy and bronchoalveolar lavage<sup>†</sup> (BAL) can be part of the clinical and diagnostic workup of EVALI patients. The decision to perform this procedure is made by the clinical team on a case-by-case basis (8). During August–October 2019, BAL fluid specimens were collected by clinical teams caring for hospitalized EVALI patients. Public health laboratories and health departments from 10 states (California, Connecticut, Hawaii, Illinois, Maryland, Michigan, Minnesota, Texas, Utah,

and Wisconsin) coordinated the submission of residual BAL fluid specimens from 29 patients to CDC.

To better characterize exposure among EVALI patients, CDC developed and validated isotope dilution mass spectrometry methods to analyze specific toxicants of concern and active compounds in case-associated BAL fluid.<sup>§</sup> These CDC analytic methods can identify vitamin E acetate, MCT oil (medium chain triglycerides), plant oils (long chain triglycerides), petroleum distillates (including mineral oil), diluent terpenes, cannabinoids, and nicotine in BAL fluid. The quality of case-associated BAL specimens was assessed by measuring dipalmitoylphosphatidylcholine (DPPC), the principal phospholipid in naturally-occurring lung surfactant: the presence of acceptable levels of DPPC confirms that the lavage procedure recovered adequate pulmonary epithelial fluid. When specimen volume was insufficient to perform all planned analyses, analysis of vitamin E acetate and cannabinoids was prioritized. Among the 27 BAL fluid specimens with sufficient volume for testing, all had measurable levels of DPPC. Overall, 21 (72%) patients with available specimens were male, and their median age was 23 years (range = 16–67 years), which is consistent with the sex and age patterns of EVALI patients reported to CDC to date (1). Two of the patients died.

Vitamin E acetate was detected in all 29 patient BAL samples. Among 23 patients for whom self-reported THC use information was available, 20 reported using THC-containing products. THC or its metabolites were detected in 23 of 28 patient

\*These two authors contributed equally.

<sup>†</sup> Bronchoalveolar lavage, performed in the evaluation of lung disease, involves instillation of sterile saline into a subsegment of the lung, followed by suction and collection of the fluid for analysis.

<sup>§</sup> CDC has not yet published these validated isotope dilution mass spectrometry methods.



Corresponding author: Benjamin C. Blount, [bkb3@cdc.gov](mailto:bkb3@cdc.gov), 770-488-7894.

<sup>1</sup>Division of Laboratory Sciences, National Center for Environmental Health, CDC; <sup>2</sup>Office of the Director, National Center for Chronic Disease Prevention and Health Promotion, CDC; <sup>3</sup>Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; <sup>4</sup>Office of the Director, National Institute for Occupational Safety and Health, CDC; <sup>5</sup>Office of Strategy and Innovation, National Center for Injury Prevention and Control, CDC; <sup>6</sup>Division of Overdose Prevention, National Center for Injury Prevention and Control, CDC.

BAL samples, including in those of three patients who said they did not use THC products. Nicotine metabolites were detected in 16 of 26 patient BAL specimens. Results for plant oils, MCT oil, petroleum distillates, and diluent terpenes were all below analyte-specific levels of detection (typically in the low ng/mL range).

This is the first reported identification of a potential toxicant of concern (vitamin E acetate) in biologic specimens obtained from EVALI patients. These findings provide direct evidence of vitamin E acetate at the primary site of injury among EVALI patients and are consistent with FDA product testing and media reports of state public health laboratory testing documenting vitamin E acetate in product samples used by EVALI patients (2,3) (Personal communication, D.T. Heitkemper, FDA Forensic Chemistry Center, November 2019). Other diluents and additives of concern (e.g., plant oils, MCT oil, petroleum distillates, and diluent terpenes) were notably not detected in BAL fluid specimens from EVALI patients.

Although vitamin E acetate was detected in all specimens in this analysis of a convenience sample of 29 EVALI case-associated BAL specimens, additional studies are needed, including comparison with BAL fluid specimens from healthy volunteers and animal studies using controlled exposures to establish whether a causal link exists between this exposure and EVALI. Based on these data from 29 patients, it appears that vitamin E acetate is associated with EVALI; however, it is possible that more than one compound or ingredient could be a cause of lung injury, and evidence is not yet sufficient to rule out contribution of other toxicants to EVALI.

These findings reinforce CDC's recommendation that persons should not use e-cigarette, or vaping, products containing THC, especially those obtained from informal sources such as friends or family, or those from the illicit market, where product ingredients are unknown or can be highly variable (9). Until the relationship of vitamin E acetate and lung health is better characterized, it is important that vitamin E acetate not be added to e-cigarette, or vaping, products. CDC will continue to update guidance, as appropriate, as new data become available from this outbreak investigation.

## References

- Moritz ED, Zapata LB, Lekiaxvili A, et al.; Lung Injury Response Epidemiology/Surveillance Group; Lung Injury Response Epidemiology/Surveillance Task Force. Update: characteristics of patients in a national outbreak of e-cigarette, or vaping, product use associated lung injuries. *MMWR Morb Mortal Wkly Rep* 2019;68:985–9. <https://doi.org/10.15585/mmwr.mm6843e1>
- Ritchel M. New York State suspects vitamin E may have played a role in vaping illnesses. *New York Times*. September 5, 2019. <https://www.nytimes.com/2019/09/05/health/vaping-illness-lung-vitamin-e.html?smid=nytcore-ios-share>
- Ritchel M, Grady D. What you need to know about vaping-related lung illness. *New York Times*. September 11, 2019. <https://www.nytimes.com/2019/09/07/health/vaping-lung-illness.html?smid=nytcore-ios-share>
- Downs D. Amid vape pen lung disease deaths: what exactly is vitamin E oil? Seattle, WA: Leafly; 2019. <https://www.leafly.com/news/health/vape-pen-lung-disease-vitamin-e-oil-explained>
- Kamal MA, Raghunathan VA. Modulated phases of phospholipid bilayers induced by tocopherols. *Biochim Biophys Acta* 2012;1818:2486–93. <https://doi.org/10.1016/j.bbmem.2012.06.016>
- Massey JB, She HS, Pownall HJ. Interaction of vitamin E with saturated phospholipid bilayers. *Biochem Biophys Res Commun* 1982;106:842–7. [https://doi.org/10.1016/0006-291X\(82\)91787-9](https://doi.org/10.1016/0006-291X(82)91787-9)
- Casals C, Cañadas O. Role of lipid ordered/disordered phase coexistence in pulmonary surfactant function. *Biochim Biophys Acta* 2012;1818:2550–62. <https://doi.org/10.1016/j.bbmem.2012.05.024>
- Siegel DA, Jatlaoui TC, Koumans EH, et al.; Lung Injury Response Clinical Working Group; Lung Injury Response Epidemiology/Surveillance Group. 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. *MMWR Morb Mortal Wkly Rep* 2019;68:919–27. <https://doi.org/10.15585/mmwr.mm6841e3>
- CDC. Outbreak of lung injury associated with the use of e-cigarette, or vaping, products. Atlanta, GA: US Department of Health and Human Services, CDC; 2019. [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease.html#what-cdc-recommends](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html#what-cdc-recommends)

Readers who have difficulty accessing this PDF file may access the HTML file at [https://www.cdc.gov/mmwr/volumes/68/wr/mm6845e2.htm?s\\_cid=mm6845e2\\_w](https://www.cdc.gov/mmwr/volumes/68/wr/mm6845e2.htm?s_cid=mm6845e2_w). Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30329-4027 or to [mmwrq@cdc.gov](mailto:mmwrq@cdc.gov).

## 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

David A. Siegel, MD<sup>1</sup>; Tara C. Jatlaoui, MD<sup>1</sup>; Emily H. Koumans, MD<sup>1</sup>; Emily A. Kiernan, DO<sup>2,3</sup>; Mark Layer, MD,<sup>3,4</sup>; Jordan E. Cates, PhD<sup>5,6</sup>; Anne Kimball, MD<sup>6,7</sup>; David N. Weissman, MD<sup>8</sup>; Emily E. Petersen, MD<sup>1</sup>; Sarah Reagan-Steiner, MD<sup>9</sup>; Shana Godfred-Cato, DO<sup>10</sup>; Danielle Moulia, MPH<sup>5,11</sup>; Erin Moritz, PhD<sup>4</sup>; Jonathan D. Lehnert, MPH<sup>9</sup>; Jane Mitchko, MEd<sup>1</sup>; Joel London, MPH<sup>1</sup>; Sherif R. Zaki, MD<sup>9</sup>; Brian A. King, PhD<sup>1</sup>; Christopher M. Jones, PharmD, DrPH<sup>12</sup>; Anita Patel, PharmD<sup>5</sup>; Dana Meaney Delman, MD<sup>10</sup>; Ram Koppaka, MD, PhD<sup>5</sup>; Lung Injury Response Clinical Working Group; Lung Injury Response Epidemiology/Surveillance Group

*On October 11, 2019, this report was posted as an MMWR Early Release on the MMWR website (<https://www.cdc.gov/mmwr>).*

CDC, the Food and Drug Administration (FDA), state and local health departments, and public health and clinical partners are investigating a multistate outbreak of lung injury associated with the use of electronic cigarette (e-cigarette), or vaping, products. In late August, CDC released recommendations for health care providers regarding e-cigarette, or vaping, product use associated lung injury (EVALI) based on limited data from the first reported cases (1,2). This report summarizes national surveillance data describing clinical features of more recently reported cases and interim recommendations based on these data for U.S. health care providers caring for patients with suspected or known EVALI. It provides interim guidance for 1) initial clinical evaluation; 2) suggested criteria for hospital admission and treatment; 3) patient follow-up; 4) special considerations for groups at high risk; and 5) clinical and public health recommendations. Health care providers evaluating patients suspected to have EVALI should ask about the use of e-cigarette, or vaping, products in a nonjudgmental and thorough manner. Patients suspected to have EVALI should have a chest radiograph (CXR), and hospital admission is recommended for patients who have decreased blood oxygen (O<sub>2</sub>) saturation (<95%) on room air or who are in respiratory distress. Health care providers should consider empiric use of a combination of antibiotics, antivirals, or steroids based upon clinical context. Evidence-based tobacco product cessation strategies, including behavioral counseling, are recommended to help patients discontinue use of e-cigarette, or vaping, products. To reduce the risk of recurrence, patients who have been treated for EVALI should not use e-cigarette, or vaping, products. CDC recommends that persons should not use e-cigarette, or vaping, products that contain tetrahydrocannabinol (THC). At present, CDC recommends persons consider refraining from using e-cigarette, or vaping, products that contain nicotine. Irrespective of the ongoing investigation, e-cigarette, or vaping, products should never be used by youths, young adults, or women who are pregnant. Persons

who do not currently use tobacco products should not start using e-cigarette, or vaping, products.

As of October 8, 2019, 49 states, the District of Columbia, and one territorial health department have reported 1,299 cases of EVALI to CDC, with 26 deaths reported from 21 states (median age of death = 49 years, range = 17–75 years). Among 1,043 patients with available data on age and sex, 70% were male, and the median age was 24 years (range = 13–75 years); 80% were aged <35 years, and 15% were aged <18 years. Among 573 patients who reported information on substances used in e-cigarette, or vaping, products in the 90 days preceding symptom onset, 76% reported using THC-containing products, and 58% reported using nicotine-containing products; 32% reported exclusive use of THC-containing products, and 13% reported exclusive use of nicotine-containing products.\* No single compound or ingredient has emerged as the cause of these injuries to date, and there might be more than one cause. Available data suggest THC-containing products play a role in this outbreak, but the specific chemical or chemicals responsible for EVALI have not yet been identified, and nicotine-containing products have not been excluded as a possible cause.

Ongoing federal and state investigations have provided information about the clinical characteristics of cases and a surveillance case definition for confirmed and probable cases has been developed (1); this case definition<sup>†</sup> is not intended to guide clinical care. To inform CDC's updated interim clinical guidance, on October 2, 2019, CDC obtained individual expert perspectives on the evaluation and treatment of patients with suspected EVALI. Discussions occurred with nine national experts in adult and pediatric pulmonary medicine and critical care who were designated by professional medical societies to participate (Lung Injury Response Clinical Working Group). Evidence supporting CDC's recommendations include data from medical abstractions reported to CDC, previously published case series (3–5), and the aforementioned individual expert opinions.

\* <https://www.cdc.gov/lunginjury>.

† [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf).

## Clinical Evaluation for Patients with Suspected EVALI

EVALI is considered a diagnosis of exclusion because, at present, no specific test or marker exists for its diagnosis (Box 1). Health care providers should consider multiple etiologies, including the possibility of EVALI and concomitant infection. In addition, health care providers should evaluate alternative diagnoses as suggested by clinical findings and medical history (e.g., cardiac, gastrointestinal, rheumatologic, and neoplastic processes; environmental or occupational exposures; or causes of acute respiratory distress syndrome) (6).

**Patient history.** Based upon medical chart abstraction data submitted to CDC, 95% (323/339) of patients diagnosed with EVALI initially experienced respiratory symptoms (e.g., cough, chest pain, and shortness of breath), and 77% (262/339) had gastrointestinal symptoms (e.g., abdominal pain, nausea, vomiting, and diarrhea). Gastrointestinal symptoms preceded respiratory symptoms in some patients (1–3). Respiratory or gastrointestinal symptoms were accompanied by constitutional symptoms such as fever, chills, and weight loss among 85% (289/339) of patients (Table).

All health care providers evaluating patients for EVALI should ask about the use of e-cigarette, or vaping, products and ideally should ask about types of substances used (e.g., THC, cannabis [oil, dabs], nicotine, modified products or the addition of substances not intended by the manufacturer); product source, specific product brand and name; duration and frequency of use, time of last use; product delivery system, and method of use (aerosolization, dabbing, or dripping). Empathetic, nonjudgmental, and private questioning of patients regarding sensitive information to assure confidentiality should be employed. Standardized approaches should be used for interviewing adolescents. Resources exist to guide patient interviews, including those of adolescents.<sup>§</sup> In some situations, asking questions over the course of the hospitalization or during follow-up visits might elicit additional information about exposures, especially as trust is established between the patient and clinicians.

**Physical examination.** For patients who report the use of e-cigarette, or vaping, products, physical examination should include vital signs and pulse-oximetry. Tachycardia was reported in 55% (169/310) of patients and tachypnea in 45% (77/172); O<sub>2</sub> saturation <95% at rest on room air was present for 57% (143/253) of patients reported to CDC (Table), underscoring the need for routine pulse-oximetry. Among patients identified to date, pulmonary findings on auscultation exam have often been unremarkable, even among patients with severe lung injury (personal communication, Lung Injury Response Clinical Working Group, October 2, 2019).

<sup>§</sup> <https://www.aafp.org/afp/2017/0101/p29.pdf>; <https://depts.washington.edu/dbpeds/Screening%20Tools/HEADSS.pdf>.

### BOX 1. Clinical evaluation for patients with recent history of use of e-cigarette, or vaping, products and suspected lung injury

#### History

- Ask about respiratory, gastrointestinal, and constitutional symptoms (e.g., cough, chest pain, shortness of breath, abdominal pain, nausea, vomiting, diarrhea, and fever) for patients who report a history of use of e-cigarette, or vaping, products.
- Ask all patients about recent use of e-cigarette, or vaping, products.
  - Types of substances used (e.g., tetrahydrocannabinol [THC], cannabis [oil, dabs], nicotine, modified products or the addition of substances not intended by the manufacturer); product source, specific product brand and name; duration and frequency of use, time of last use; product delivery system, and method of use (aerosolization, dabbing, or dripping).

#### Physical exam

- Assess vital signs and oxygen saturation via pulse-oximetry.

#### Laboratory testing

- Infectious disease evaluation might include
  - Respiratory viral panel including influenza testing during flu season, *Streptococcus pneumoniae*, *Legionella pneumophila*, *Mycoplasma pneumoniae*, endemic mycoses, and opportunistic infections.
- Initial laboratory evaluation
  - Consider complete blood count with differential, liver transaminases, and inflammatory markers (e.g., erythrocyte sedimentation rate and C-reactive protein).
  - In all patients, consider conducting urine toxicology testing, with informed consent, including testing for THC.

#### Imaging

- Chest radiograph.
- Consider chest computed tomography for evaluation of severe or worsening disease, complications, other illnesses, or when chest x-ray result does not correlate with clinical findings.

#### Other considerations

- Further evaluation of patients meeting inpatient admission criteria might include
  - Consultation with pulmonary, critical care, medical toxicology, infectious disease, psychology, psychiatry, and addiction medicine specialists.
  - Additional testing with bronchoalveolar lavage or lung biopsy as clinically indicated, in consultation with pulmonary specialists.

**TABLE. Characteristics of patients (N = 342) with e-cigarette use, or vaping, product use associated lung injury (EVALI),\* from national EVALI surveillance reports to CDC — United States, 2019†**

Characteristic	EVALI patients	
	No. (%)	Total no. used in calculation <sup>§</sup>
Age, median (range) (yrs)	22 (13–71)	338
<b>Symptoms reported</b>		
Any respiratory	323 (95)	339
Any gastrointestinal	262 (77)	339
Any constitutional <sup>¶</sup>	289 (85)	339
<b>Vital signs</b>		
Oxygen saturation <95% while breathing room air	143 (57)	253
Tachycardia (heart rate >100 beats/min)	169 (55)	310
Tachypnea (respiratory rate >20 breaths/min)	77 (45)	172
<b>Clinical course</b>		
<b>Admission to intensive care unit</b>	159 (47)	342
Age group (yrs)		
13–17	45 (56)	80
18–24	49 (38)	130
25–50	54 (47)	115
≥51	9 (69)	13
Past cardiac disease**	8 (50)	16
No past cardiac disease	151 (46)	326
<b>Intubation and mechanical ventilation</b>	<b>74 (22)</b>	<b>338</b>
Age group (yrs)		
13–17	23 (29)	80
18–24	21 (16)	130
25–50	23 (20)	115
≥51	7 (54)	13
Past cardiac disease**	5 (31)	16
No past cardiac disease	70 (21)	326
<b>Corticosteroids</b>	252 (88)	287
<b>Improved after corticosteroids</b>	114 (82)	140
<b>Duration of hospitalization (days)</b>	<b>Mean (median)</b>	<b>Range</b>
Age group (yrs)		
13–17	6.9 (6)	0–23
18–24	6.2 (5)	0–38
25–50	6.6 (6)	0–40
≥51	14.8 (12)	3–31
Past cardiac disease	8.9 (4)	3–31
No past cardiac disease	6.6 (5)	0–40
Average hospital stay	6.7 (5)	0–40

**Abbreviation:** E-cigarette = electronic cigarette.

\* For cases that had full medical chart abstraction data available.

† Surveillance data through October 3, 2019, from the following 29 U.S. states: Alabama, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Minnesota, Mississippi, Missouri, Montana, Nevada, New Jersey, New Mexico, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Texas, Vermont, Washington, West Virginia, and Wisconsin.

§ Patients with missing data were excluded from denominators for selected characteristics.

¶ Self-reported fever, chills, and unexpected weight loss.

\*\* Heart failure, heart attack, or other heart conditions.

**Laboratory testing.** Laboratory testing should be guided by clinical findings. A respiratory virus panel, including influenza testing during influenza season, should be strongly considered. Additional testing should be based on published guidelines for

evaluation of community-acquired pneumonia.<sup>¶</sup> Infectious diseases to consider include *Streptococcus pneumoniae*, *Legionella pneumophila*, *Mycoplasma pneumoniae*, endemic mycoses, and opportunistic infections; the likelihood of infection by any of these varies by geographic prevalence and patient medical history. Other abnormal laboratory tests reported in patients with EVALI include elevated white blood cell (WBC) count, serum inflammatory markers (C-reactive protein, erythrocyte sedimentation rate [ESR]), and liver transaminases. In a report of initial patients from Illinois and Wisconsin, 87% had a WBC >11,000/mm<sup>3</sup> and 93% had an ESR >30mm/hr; 50% of patients had elevated liver transaminases (aspartate aminotransferase or alanine aminotransferase >35 U/L) (3). However, at this time, these tests cannot be used to distinguish EVALI from infectious etiologies. In all patients, providers should consider conducting, with informed consent, urine toxicology testing, including testing for THC.

**Imaging.** Radiographic findings consistent with EVALI include pulmonary infiltrates on CXR and opacities on chest computed tomography (CT) scan (1,7). A CXR should be obtained on all patients with a history of e-cigarette, or vaping, product use, who have respiratory or gastrointestinal symptoms, particularly when accompanied by decreased O<sub>2</sub> saturation (<95%). Chest CT might be useful when the CXR result does not correlate with clinical findings or to evaluate severe or worsening disease, complications such as pneumothorax or pneumomediastinum, or other illnesses in the differential diagnosis, such as pneumonia or pulmonary embolism. In some cases, chest CT has demonstrated findings such as bilateral ground glass opacities despite a normal or nondiagnostic CXR (3). Among patients with abnormal CXR findings and a clinical picture consistent with EVALI, a chest CT scan might not be necessary for diagnosis. The decision to obtain a chest CT should be made on a case-by-case basis depending on the clinical circumstances.

**Consultation with specialists.** Consultation with several specialists might be necessary to optimize patient management. For patients being evaluated for possible EVALI, consideration should be given to consultation with a pulmonologist, who can help guide further evaluation, recommend empiric treatment, and review the indications for bronchoscopy. The decision to perform bronchoscopy and bronchoalveolar lavage (BAL) to rule out alternative diagnoses such as pulmonary infection should be made on a case-by-case basis. The value of staining BAL cells or fresh lung biopsy tissue for lipid-laden macrophages (e.g., using oil red O or Sudan Black) in the evaluation of EVALI remains unknown. In addition, there should be

¶ <https://www.atsjournals.org/doi/full/10.1164/rccm.201908-1581ST#readcube-pdf>; <http://academic.oup.com/cid/article/53/7/e25/424286/>.

a low threshold for consulting with critical care physicians, because, based upon data submitted to CDC, 47% (159/342) of patients were admitted to an intensive care unit and 22% (74/338) required endotracheal intubation and mechanical ventilation (Table); critical care physicians should be consulted to determine optimal management of respiratory failure. Consultation with medical toxicology, infectious disease, psychology, psychiatry, addiction medicine, and other specialists should be considered as warranted by patient circumstances.

## Management of Patients with Suspected EVALI

**Admission criteria and outpatient management.** Several factors should be considered when deciding whether to admit a patient with potential EVALI to the hospital (Box 2). Among 1,002 cases reported to CDC with available data as of October 8, 96% of patients were hospitalized. Patients with suspected EVALI should be admitted if they have decreased O<sub>2</sub> saturation (<95%) on room air, are in respiratory distress, or have comorbidities that compromise pulmonary reserve. Consider

modifying factors such as altitude to guide interpretation of measured O<sub>2</sub> saturation.

Outpatient management of suspected EVALI might be considered on a case-by-case basis for patients who are clinically stable, have less severe injury, and for whom follow-up within 24–48 hours of initial evaluation can be assured. Candidates for outpatient management should have normal O<sub>2</sub> saturation (≥95%), reliable access to care, and strong social support systems. For these patients, empiric use of antimicrobials, including antivirals, if indicated, should be considered. Some patients who initially had mild symptoms experienced a rapid worsening of symptoms within 48 hours. In Illinois and Wisconsin, 72% of patients had either an outpatient or emergency department visit before seeking additional medical care that resulted in hospital admission (3). Health care providers should instruct all patients to seek medical care promptly if respiratory symptoms worsen.

**Medical treatment.** Corticosteroids might be helpful in treating this injury. Several case reports describe improvement with corticosteroids, likely because of a blunting of

### BOX 2. Management of patients with suspected e-cigarette, or vaping, product use associated lung injury (EVALI)

#### Admission criteria and outpatient management

- Strongly consider admitting patients with potential lung injury, especially if respiratory distress present, have comorbidities that compromise pulmonary reserve, or decreased (<95%) O<sub>2</sub> saturation (consider modifying factors such as altitude to guide interpretation).
- Outpatient management for patients with suspected lung injury who have less severe injury might be considered on a case-by-case basis.

#### Medical treatment

- Consider initiation of corticosteroids.
- Early initiation of antimicrobial coverage for community-acquired pneumonia should be strongly considered in accordance with established guidelines.\*
- Consider influenza antivirals in accordance with established guidelines.†

#### Patients not admitted to hospital

- Recommend follow-up within 24–48 hours to assess and manage possible worsening lung injury.
- Outpatients should have normal oxygen saturation, reliable access to care and social support systems, and be

instructed to promptly seek medical care if respiratory symptoms worsen.

- Consider empiric use of antimicrobials and antivirals.

#### Post-hospital discharge follow-up

- Schedule follow-up visit no later than 1–2 weeks after discharge that includes pulse-oximetry testing. Consider repeating chest radiograph.
- Consider additional follow-up testing including spirometry and diffusion capacity testing, and consider repeat chest radiograph in 1–2 months.
- Consider endocrinology consultation for patients treated with high-dose corticosteroids.

#### Cessation services and preventive care

- Strongly advise patients to discontinue use of e-cigarette, or vaping, products.
- Provide education and cessation assistance for patients to aid nicotine addiction and treatment or referral for patients with marijuana-use-disorder.§
- Emphasize importance of routine influenza vaccination.¶
- Consider pneumococcal vaccine.\*\*

\* <https://www.atsjournals.org/doi/full/10.1164/rccm.201908-1581ST#readcube-epdf>; <http://academic.oup.com/cid/article/53/7/e251424286/>.

† <https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm>; <https://www.idsociety.org/practice-guideline/influenza/>.

§ Substance Abuse and Mental Health Services Administrations treatment locator (<https://www.samhsa.gov/find-treatment>) to find treatment in your area or call 1–800–662–HELP (4357).

¶ <https://www.cdc.gov/flu/prevent/vaccinations.htm>.

\*\* [https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm?s\\_cid](https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm?s_cid).

the inflammatory response (3–5). In a series of patients in Illinois and Wisconsin, 92% of 50 patients received corticosteroids; the medical team documented in 65% of 46 patient notes that “respiratory improvement was due to the use of glucocorticoids” (3). Among 140 cases reported nationally to CDC that received corticosteroids, 82% of patients improved (Table). However, the natural progression of this injury is not known, and it is possible that patients might recover without corticosteroids or by avoiding use of e-cigarette, or vaping, products. In some circumstances, it would be advisable to withhold corticosteroids while evaluating patients for infectious etiologies, such as fungal pneumonia, that might worsen with corticosteroid treatment. Nevertheless, because the diagnosis remains one of exclusion, aggressive empiric therapy with corticosteroids, antimicrobial, and antiviral therapy might be warranted for patients with severe illness. A range of corticosteroid doses, durations, and taper plans might be considered on a case-by-case basis. Whenever possible, decisions on the use of corticosteroids and dosing regimen should be made in consultation with a pulmonologist.

Early initiation of antimicrobial treatment for community-acquired pneumonia in accordance with established guidelines\*\* should be strongly considered given the overlapping of signs and symptoms in these conditions. During influenza season, health care providers should consider influenza in all patients with suspected EVALI. Antivirals should be considered in accordance with established guidelines.†† Decisions on initiation or discontinuation of treatment should be based on specific clinical features and, when appropriate, in consultation with specialists.

**Follow-up from hospital admission.** Patients discharged from the hospital after inpatient treatment for EVALI should have a follow-up visit no later than 1–2 weeks after discharge that includes pulse-oximetry, and clinicians should consider repeating the CXR. Additional follow-up testing 1–2 months after discharge that might include spirometry, diffusion capacity testing, and CXR should be considered. Long-term effects and the risk of recurrence of EVALI are not known. Whereas many patients’ symptoms resolved, clinicians report that some patients have relapsed during corticosteroid tapers after hospitalization, underscoring the need for close follow-up (personal communication, Lung Injury Response Clinical Working Group, October 2, 2019). Some patients have had persistent hypoxemia (O<sub>2</sub> saturation <95%), requiring home oxygen

at discharge and might need ongoing pulmonary follow-up. Patients treated with high-dose corticosteroids might require care from an endocrinologist to monitor adrenal function.

It is unknown if patients with a history of EVALI are at higher risk for severe complications of influenza or other respiratory viral infections if they are infected simultaneously or after recovering from lung injury. Health care providers should emphasize the importance of annual vaccination against influenza for all persons >6 months of age, including patients with a history of EVALI. In addition, administration of pneumococcal vaccine should be considered according to current guidelines.§§

**Addressing exposures.** Advising patients to discontinue use of e-cigarette, or vaping, products should be an integral part of the care approach during an inpatient admission and should be re-emphasized during outpatient follow-up. Cessation of e-cigarette, or vaping, products might speed recovery from this injury; resuming use of e-cigarette, or vaping, products has the potential to cause recurrence of symptoms or lung injury. Evidence-based tobacco product cessation strategies include behavioral counseling and FDA-approved cessation medications.¶¶ For patients who have addiction to THC-containing or nicotine-containing products, cognitive-behavioral therapy, contingency management, motivational enhancement therapy, and multidimensional family therapy have been shown to help, and consultation with addiction medicine services should be considered (8–10).

**Special considerations for groups at high risk.** Patients with certain characteristics or comorbidities, including older age, history of cardiac or lung disease, or pregnancy, might be at higher risk for more severe outcomes. Among reported cases (Table), patients aged >50 years experienced the highest percentage of endotracheal intubation and mechanical ventilation (54%) and the longest mean inpatient stays (15 days). The mean first recorded O<sub>2</sub> saturations among those who did and did not require intubation were 87% and 92%, respectively (data not shown). Among those with and without past cardiac disease, 31% and 21%, respectively, required intubation (Table). Special consideration might need to be given to patients aged >50 years, because these patients might require longer duration of hospitalization and have a higher risk of intubation (Figure). Rapid identification of exposure, a high index of suspicion of EVALI, initiation of corticosteroids, and specialist consultations might be lifesaving in this patient population.

Additional data might identify other groups at high risk, provide important information about disparities in outcomes,

\*\* <https://www.atsjournals.org/doi/full/10.1164/rccm.201908-1581ST#readcube-pdf>; <http://academic.oup.com/cid/article/53/7/e25/424286/>.

†† <https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm>; <https://www.idsociety.org/practice-guideline/influenza/>.

§§ [https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm?s\\_cid](https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm?s_cid).

¶¶ [https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html?s\\_cid](https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html?s_cid).

and help guide clinical care. Certain patients, such as adolescents and young adults, might benefit from specialized services, such as addiction treatment services and providers who have experience with counseling and behavioral health follow-up.

### Clinical Care and Public Health Recommendations

Reporting cases to state, local, territorial, or tribal health departments is critical for accurate surveillance of EVALI. Reporting cases and obtaining and sending products, devices, and clinical and pathologic specimens for testing, can help health departments and CDC determine the cause or causes of these lung injuries.<sup>\*\*\*</sup> CDC is developing *International Classification of Diseases, Tenth Edition, Clinical Modification* coding guidance for health care encounters related to EVALI. Updates, when available, can be found at <https://www.cdc.gov/lunginjury> (Box 3).

**Public health recommendations.** At this time, FDA and CDC have not identified the cause or causes of the lung injuries among EVALI cases, and the only commonality among all cases is that patients report the use of e-cigarette, or vaping, products. This outbreak might have more than one cause, and many different substances and product sources are still under investigation. To date, national and state data suggest that products containing THC, particularly those obtained off the street or from other informal sources (e.g., friends, family

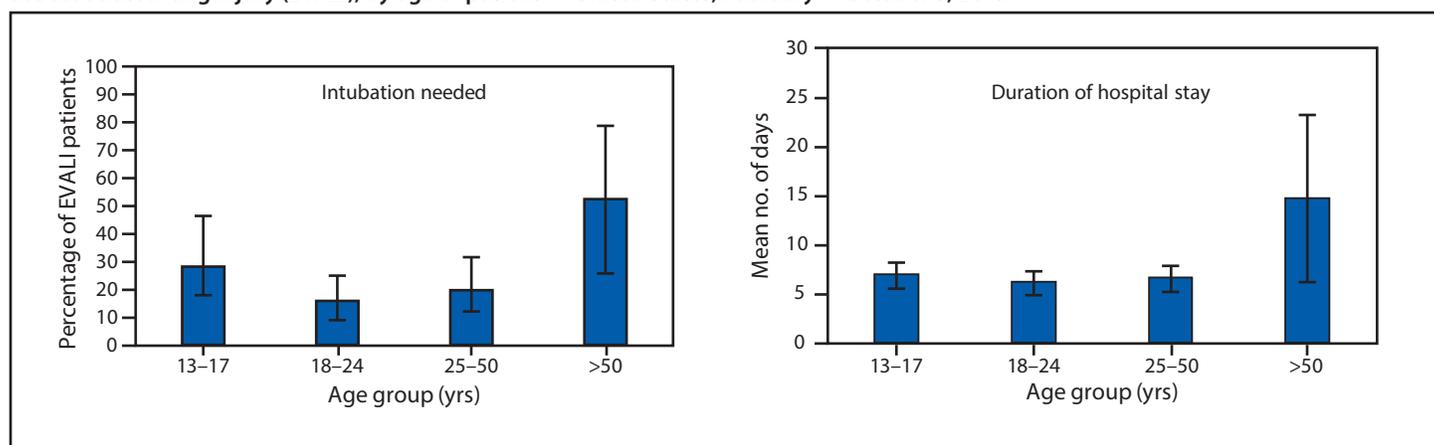
members, or illicit dealers), are linked to most of the cases and play a major role in the outbreak (11,12). Therefore, CDC recommends that persons should not use e-cigarette, or vaping, products that contain THC. Persons should not buy any type of e-cigarette, or vaping, products, particularly those containing THC, off the street. Persons should not modify or add any substances to e-cigarette, or vaping, products that are not intended by the manufacturer, including products purchased through retail establishments.

Given that the exclusive use of nicotine-containing products has been reported by a small percentage of persons with EVALI, and that many persons with EVALI report combined use of THC- and nicotine-containing products, the possibility that nicotine-containing products play a role in this outbreak cannot be excluded. Therefore, at present, CDC continues to recommend that persons consider refraining from using e-cigarette, or vaping, products that contain nicotine. If adults are using e-cigarette, or vaping, products to quit cigarette smoking, they should not return to smoking cigarettes; they should use evidence-based treatments, including health care provider counseling and FDA-approved medications.<sup>†††</sup> If persons continue to use these products, they should carefully monitor themselves for symptoms and see a health care provider immediately if symptoms develop. Irrespective of the ongoing investigation, e-cigarette, or vaping, products should never be used by youths, young adults, or women who are pregnant.

<sup>\*\*\*</sup> [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/health-departments/index.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/health-departments/index.html).

<sup>†††</sup> [https://www.aafp.org/dam/AAFP/documents/patient\\_care/tobacco/pharmacologic-guide.pdf](https://www.aafp.org/dam/AAFP/documents/patient_care/tobacco/pharmacologic-guide.pdf).

**FIGURE.** Percentage of persons needing intubation (N = 338) and hospitalization (N = 242) among patients with e-cigarette, or vaping, product use associated lung injury (EVALI), by age of patient — United States, February 1–October 3, 2019<sup>\*,†</sup>



**Abbreviation:** E-cigarette = electronic cigarette.

\* Data reported through October 3, 2019, from the following 29 states: Alabama, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Minnesota, Mississippi, Missouri, Montana, Nevada, New Jersey, New Mexico, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Texas, Vermont, Washington, West Virginia, and Wisconsin.

<sup>†</sup> 95% confidence intervals indicated by error bars.

**BOX 3. Clinical Care and Public Health Reporting of e-cigarette, or vaping, product use associated lung injury (EVALI)****Considerations at points of care**

- Examples include emergency departments, urgent care, doctors' offices, etc.
- Consider posting reminders or signage to encourage conversation between patients and providers about use of e-cigarette, or vaping, products.\*
- Report cases of lung injury associated with use of e-cigarette, or vaping, products within the past 90 days to state or local health department.
- Determine whether any remaining product, including devices and liquids, is available for testing. Testing can be coordinated with health departments.
- CDC is developing *International Classification of Diseases, Tenth Edition, Clinical Modification* (ICD-10-CM) coding guidance for healthcare encounters related to EVALI. Updates, when available, will be at <https://www.cdc.gov/lunginjury>.

**Clinical specimen testing by CDC†**

- Consider submission of any collected specimens, including bronchoalveolar lavage, blood, or urine, to CDC for evaluation.

**Testing of pathologic specimens by CDC§**

- If a lung biopsy or autopsy is performed on a patient suspected of lung injury related to e-cigarette, or vaping, product use, consider submission of fixed lung biopsy tissues or autopsy tissues to CDC for evaluation.
- Testing can include evaluation for lipids on formalin-fixed (wet) lung tissues that have not undergone routine processing.
- Routine microscopic examination will be performed, as well as infectious disease testing, if indicated, on formalin-fixed (wet) tissues, or formalin-fixed, paraffin-embedded tissue specimens.

\* [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/healthcare-providers/index.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/index.html).

† [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/health-departments/index.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/health-departments/index.html).

§ [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/health-departments/index.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/health-departments/index.html).

**Summary****What is already known about this topic?**

Forty-nine states, the District of Columbia, and one U.S. territory have reported 1,299 cases of lung injury associated with the use of electronic cigarette (e-cigarette), or vaping, products. Twenty-six deaths have been reported from 21 states.

**What is added by this report?**

Based on the most current data, CDC's updated interim guidance provides a framework for health care providers in their initial assessment, evaluation, management, and follow-up of persons with symptoms of e-cigarette, or vaping, product use associated lung injury (EVALI).

**What are the implications for public health practice?**

Rapid recognition by health care providers of patients with EVALI and an increased understanding of treatment considerations could reduce morbidity and mortality associated with this injury.

There is no safe tobacco product, and the use of any tobacco products, including e-cigarettes, carries a risk. Therefore, persons who do not currently use tobacco products should not start using e-cigarette, or vaping, products.

This investigation is ongoing. CDC will continue to work in collaboration with FDA and state and local partners to investigate cases and to update guidance, as appropriate, as new data emerges from this complex outbreak.

**Acknowledgments**

State and local health department staff members.

Corresponding author: David A. Siegel, [dsiegel@cdc.gov](mailto:dsiegel@cdc.gov), 770-488-4426.

<sup>1</sup>National Center for Chronic Disease Prevention and Health Promotion, CDC; <sup>2</sup>Agency for Toxic Substances and Disease Registry, CDC; <sup>3</sup>Emory University School of Medicine, Atlanta, Georgia; <sup>4</sup>National Center for Environmental Health, CDC; <sup>5</sup>National Center for Immunization and Respiratory Diseases, CDC; <sup>6</sup>Epidemic Intelligence Service, CDC; <sup>7</sup>National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC; <sup>8</sup>National Institute for Occupational Safety and Health, CDC; <sup>9</sup>National Center for Emerging and Zoonotic Infectious Diseases, CDC; <sup>10</sup>National Center on Birth Defects and Developmental Disabilities, CDC; <sup>11</sup>General Dynamics Information Technology; <sup>12</sup>National Center for Injury Prevention and Control, CDC.

### Conflict of Interest

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed. All members of the Lung Injury Response Clinical Working Group have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Carolyn S. Calfee reports a grant from the FDA/NIH (Tobacco Center of Regulatory Science [TCORS]) for a project entitled Impact of Different E-cigarette Characteristics on Acute Lung Injury; a grant from GlaxoSmithKline for an observational study on sepsis and ARDS biomarkers; a grant and personal fees from Bayer for an observational study on pulmonary hypertension in ARDS and for medical consultation; and personal fees from Roche/Genentech for consultation on potential therapies for ARDS, and personal fees from Prometic, CSL Behring, and Quark for serving on medical advisory boards for ARDS. No other potential conflicts of interest were disclosed.

### References

- Schier JG, Meiman JG, Layden J, et al.; CDC 2019 Lung Injury Response Group. Severe pulmonary disease associated with electronic-cigarette-product use—interim guidance. *MMWR Morb Mortal Wkly Rep* 2019;68:787–90. <https://doi.org/10.15585/mmwr.mm6836e2>
- CDC. Severe pulmonary disease associated with using e-cigarette products. HAN alert No. 421. Atlanta, GA: US Department of Health and Human Services, CDC, Health Alert Network; 2019. <https://emergency.cdc.gov/han/han00421.asp>
- Layden JE, Ghinai I, Pray I, et al. Pulmonary illness related to e-cigarette use in Illinois and Wisconsin—preliminary report. *N Engl J Med* 2019;NEJMoa1911614. <https://doi.org/10.1056/NEJMoa1911614>
- 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;68:784–6. <https://doi.org/10.15585/mmwr.mm6836e1>
- Maddock SD, Cirulis MM, Callahan SJ, et al. Pulmonary lipid-laden macrophages and vaping. *N Engl J Med* 2019;381:1488–9. <https://doi.org/10.1056/NEJMc1912038>
- Matthay MA, Zemans RL, Zimmerman GA, et al. Acute respiratory distress syndrome. *Nat Rev Dis Primers* 2019;5:18. <https://doi.org/10.1038/s41572-019-0069-0>
- Henry TS, Kanne JB, Kligerman SJ. Imaging of vaping-associated lung disease. *N Engl J Med* 2019;381:1486–7. <https://doi.org/10.1056/NEJMc1911995>
- Budney AJ, Moore BA, Rocha HL, Higgins ST. Clinical trial of abstinence-based vouchers and cognitive-behavioral therapy for cannabis dependence. *J Consult Clin Psychol* 2006;74:307–16. <https://doi.org/10.1037/0022-006X.74.2.307>
- Diamond G, Panichelli-Mindel SM, Shera D, Dennis M, Tims F, Ungemack J. Psychiatric syndromes in adolescents with marijuana abuse and dependency in outpatient treatment. *J Child Adolesc Subst Abuse* 2006;15:37–54. [https://doi.org/10.1300/J029v15n04\\_02](https://doi.org/10.1300/J029v15n04_02)
- Fiore MC, Jaén CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update. Rockville, MD: US Department of Health and Human Services, Public Health Service, Agency for Healthcare Research and Quality, 2008.
- Perrine CG, Pickens CM, Boehmer TK, et al.; Lung Injury Response Epidemiology/Surveillance Group. Characteristics of a multistate outbreak of lung injury associated with e-cigarette use, or vaping—United States, 2019. *MMWR Morb Mortal Wkly Rep* 2019;68:860–4. <https://doi.org/10.15585/mmwr.mm6839e1>
- Ghinai I, Pray IW, Navon L, et al. E-cigarette product use, or vaping, among persons with associated lung injury—Illinois and Wisconsin, April–September 2019. *MMWR Morb Mortal Wkly Rep* 2019;68:865–9. <https://doi.org/10.15585/mmwr.mm6839e2>

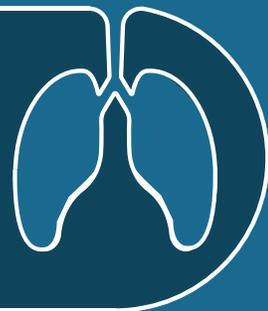
### **Lung Injury Response Clinical Working Group**

Anne Griffiths, MD, Pediatric Pulmonary Medicine, Children's Minnesota; Annette Esper, MD, Emory University; Carolyn S. Calfee, MD, Pulmonary and Critical Care Medicine, University of California, San Francisco; Don Hayes, Jr., MD, Nationwide Children's Hospital and The Ohio State University; Devika R. Rao, MD, Department of Pediatrics, Division of Respiratory Medicine, UT Southwestern Medical Center; Dixie Harris, MD, Intermountain Healthcare; Lincoln S. Smith, MD, University of Washington and Seattle Children's Hospital; Scott Aberegg, MD, Sean J. Callahan, MD, University of Utah

### **Lung Injury Response Epidemiology/Surveillance Group**

Rashid Njai, Office of the Director, Deputy Director for Non-Infectious Diseases, CDC; Jennifer Adjemian, Macarena Garcia, Kathleen Hartnett, Kristen Marshall, Aaron Kite Powell, Center for Surveillance, Epidemiology, and Laboratory Services, CDC; Adebola Adebayo, Minal Amin, Michelle Banks, Jordan Cates, National Center for Immunization and Respiratory Diseases, CDC; Maeh Al-Shawaf, Lauren Boyle-Estheimer, Peter Briss, Gyan Chandra, Karen Chang, Jennifer Chevinsky, Katelyn Chiang, Pyone Cho, Carla Lucia DeSisto, Lindsey Duca, Sumera Jiva, Charlotte Kaboré, John Kenemer, Akaki Lekiachvili, Maureen Miller, Yousra Mohamoud, Cria Perrine, Mays Shamout, Lauren Zapata, National Center for Chronic Disease Prevention and Health Promotion, CDC; Francis Annor, Vaughn Barry, Amy Board, Mary E. Evans, Allison Gately, Brooke Hoots, Cassandra Pickens, Tia Rogers, Alana Vivolo-Kantor, National Center for Injury Prevention and Control, CDC; Alissa Cyrus, Office of Minority Health and Health Equity, CDC; Tegan Boehmer, Emily Glidden, Arianna Hanchey, Angela Werner, Shideh Ebrahim Zadeh, National Center for Environmental Health, CDC; Donna Pickett, National Center for Health Statistics, CDC; Victoria Fields, Michelle Hughes, Varsha Neelam, Kevin Chatham-Stephens, National Center on Birth Defects and Developmental Disabilities, CDC; Kevin O'Laughlin, Mary Pomeroy, National Center for Emerging and Zoonotic Infectious Diseases, CDC; Sukhshant K. Atti, Agency for Toxic Substances and Disease Registry, CDC and Emory University School of Medicine; Jennifer Freed, Jona Johnson, Eva McLanahan, Agency for Toxic Substances and Disease Registry; Kate Varela, National Institute for Occupational Safety and Health; Jennifer Layden, Illinois Department of Public Health; Jonathan Meiman, Wisconsin Department of Health Services; Nicole M. Roth, Eagle Medical Services; Diane Browning, Northrop Grumman; Augustina Delaney, Samantha Olson, G2S Corporation; Dessica F. Hodges, Student Worksite Program volunteer; Raschelle Smalley, Student Worksite Experience Program volunteer; Council of State and Territorial Epidemiologists Vaping-Associated Pulmonary Injury (VAPI) Epidemiology Task Force.

# 2019 LUNG INJURY SURVEILLANCE CASE DEFINITION FOR OUT-OF-HOSPITAL DEATHS (CDC) – OCTOBER 4, 2019



- This case definition is **ONLY** meant to be used to determine case status for individuals who die outside of the hospital or prior to hospital admission (e.g., at home, in route to the hospital, or in the emergency department), for whom chest imaging and clinical evaluation outlined in the primary **2019 Lung Injury Surveillance Case Definition** have not been performed. This case definition is **NOT** intended to be used to classify case status for surviving individuals or for individuals who die in the hospital, for whom chest imaging and clinical evaluation were performed.
- This case definition integrates pathologic findings from the microscopic review of lung tissue specimens. As medicolegal jurisdiction allows, autopsies should be considered for deaths among persons with a history of e-cigarette product use, or vaping, who had antecedent respiratory or gastrointestinal symptoms, or are suspected of having possible lung injury associated with e-cigarette product use, or vaping.
- Fixed tissue specimens from autopsy can be sent to the CDC Infectious Disease Pathology Branch for histopathologic review and other testing. Guidelines for specimen submission are available on the Healthcare Provider page of CDC's Lung Injury response website: [www.cdc.gov/lunginjury](http://www.cdc.gov/lunginjury).
- This case definition is being used for public health surveillance purposes only and should not be used for clinical diagnostics or forensics. Persons meeting this case definition will not be counted separately; they will be included in the total count of confirmed and probable cases in conjunction with confirmed and probable cases that meet the primary **Lung Injury Surveillance Case Definition** (available on the State and Local Health Department page of CDC's Lung Injury response website).

## Confirmed Case:

History of e-cigarette product use, or vaping,\* in the 90 days prior to death

### **AND**

Pathologic evidence of acute lung injury (e.g., diffuse alveolar damage, acute fibrinous pneumonitis or bronchiolitis, or organizing pneumonia often with vacuolated or foamy macrophages and/or pneumocytes)

### **AND**

Absence of pulmonary infection\*\* (e.g. influenza, *S. pneumoniae*, *Legionella*, and other infectious diseases, including HIV-related infections as appropriate, as evidenced by microscopy, immunohistology, microbiology\*\*\*, or molecular testing)

### **AND**

No evidence of alternative plausible diagnoses for the lung injury in medical record or at autopsy



U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention

## **Probable Case:**

History of e-cigarette product use, or vaping,\* in the 90 days prior to death

### **AND**

Pathologic evidence of acute lung injury (i.e., diffuse alveolar damage, acute fibrinous pneumonitis or bronchiolitis, or organizing pneumonia often with vacuolated or foamy macrophages and/or pneumocytes)

### **AND**

A positive result on testing for pulmonary infection\*\* (e.g., influenza, *S. pneumoniae*, *Legionella*, and other infectious diseases, including HIV-related infections as appropriate, as evidenced by microscopy, immunohistology, microbiology\*\*\*, or molecular testing), however medical examiner or other forensic pathologist believes infection is not the sole cause of the underlying lung injury

### **AND**

No evidence of alternative plausible diagnoses for the lung injury in medical record or at autopsy

## **Footnotes**

\* Using an electronic device (e.g., electronic nicotine delivery system (ENDS), electronic cigarette, e-cigarette, vaporizer, vape(s), vape pen, dab pen, or other device) to inhale substances (e.g., nicotine, marijuana, THC, THC concentrates, CBD, synthetic cannabinoids, flavorings, or other substances). This definition also includes “dabbing,” which involves superheating substances that contain high concentrations of THC and other plant compounds (e.g., cannabidiol) with the intent of inhaling the aerosol.

\*\* Does not include positive results from postmortem microbiologic testing thought to represent normal viral or bacterial colonization of nasopharynx, or postmortem bacterial overgrowth of lung tissues or blood.

\*\*\*Recommended microbiology: Nasopharyngeal and/or lung swab testing for influenza, lung swab testing for respiratory viruses, postmortem cultures of lung tissue and blood. Interpretation of postmortem cultures may be complicated because of bacterial overgrowth resulting from tissue breakdown. Medical examiners and other forensic pathologists should contact their local or state health department for assistance if such testing is not readily available at their agency. Fixed autopsy tissue specimens can also be sent to the Infectious Diseases Pathology Branch at CDC for histopathologic evaluation, and infectious disease testing, including immunohistochemistry and molecular testing, as indicated ([https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/healthcare-providers/pdfs/specimen-submission-req.pdf](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/pdfs/specimen-submission-req.pdf)).



## Laboratory Clinical Specimen Collection and Storage Guidance for Lung Injury Associated with E-Cigarettes, or Vaping

The purpose of this document is to provide sample collection and storage guidance for clinicians in the care of patients who meet the probable or confirmed case definitions for lung injury associated with e-cigarettes, or vaping. CDC recommends that clinicians consult their local or state health department for the department's recommendations on collection and storage of clinical samples. This document supplements CDC's guidance by providing specific information for reporting in Texas.

Prior to submitting samples, complete [this form](https://www.dshs.state.tx.us/tobacco/pdf/TX-Vaping-Case-Report-Form.pdf) (<https://www.dshs.state.tx.us/tobacco/pdf/TX-Vaping-Case-Report-Form.pdf>) and call 512-442-0925 to discuss sample submission, then follow directions to submit the form to the DSHS Environmental Surveillance and Toxicology Branch. DSHS will confirm that the samples are eligible to be submitted the state public health laboratory and will provide State Case ID numbers and further instructions.

### SPECIMEN TYPES

CDC has indicated clinical specimens (e.g., plasma/serum, urine, bronchoalveolar lavage (BAL)) could be used for investigative testing. At this time CDC is prioritizing BAL fluid for testing. Plasma/serum and urine samples will only be accepted in conjunction with BAL samples from the same patient. See below for detailed guidance for collection, handling, and shipping of these samples. **PLEASE NOTE:** If specimens are tested by CDC, CDC will report results to the Texas Department of State Health Services (DSHS) and results will then be forwarded to the submitter.

### SPECIMEN COLLECTION AND HANDLING

#### Specimen Collection Time Point

- Clinical specimens (urine and plasma) are to be collected **ONLY** at the time when BAL fluid is to be collected or upon Patient Admission to Hospital

### Specimen Labeling and Handling

- All specimens must be labeled with at least two patient specific identifiers, but must include: the *State Case ID number* and the patient's *medical record number*.
- The identifiers must appear on all primary containers and the associated submission form.
- A manifest with the CDC Case ID, State Case ID, Patient Medical Record number, specimen type, and collection date must be included with the shipment.
- Specimens must be labeled as to type (e.g. serum, urine, etc.).

### Bronchoalveolar lavage fluid (BAL fluid) samples

- Due to the invasive nature of BAL sampling, the decision and timing for a patient to undergo BAL should be left to the judgement of the treating clinicians.
- **Optimal timing:** These specimens may be obtained at any time during the clinical course but may be most informative if obtained prior to initiation of antimicrobial or steroid therapy. If antibiotics or steroids have been initiated, course and duration should be noted on the back of the G-2A form.
- **Specimen collection:** Collect specimens in sterile containers. BAL fluid should undergo culture and routine centrifugation followed by cellular analyses and cytopathology, including lipid and other staining, as clinically indicated at the local institution.

### Guidance for retaining BAL fluid samples left over from routine clinical evaluation:

#### BAL Fluid for Further Cytopathologic Evaluation

- Remaining uncentrifuged BAL fluid and supernatant from centrifuged BAL fluid should be labeled as such and be retained.
- Up to 10 unstained cytology slides prepared from the cell pellet should be briefly fixed in formalin and retained for future evaluation.
- Excess cell pellet after cytopathologic evaluation can be divided in half, with half being fixed in formalin and stored at room temperature for further cytopathologic evaluation. The other half should be set aside for Chemical or Lipid Analysis (see below)

### BAL Fluid Submission for Chemical or Lipid Analysis

- Place remaining uncentrifuged fluid and centrifuged supernatant from centrifuged fluid into sterile vials with external caps and internal O-ring seals. If there is no internal O-ring seal, then seal tightly with the available cap and secure with Parafilm®.
- Label each specimen container with the patient's medical record number, state case ID number, the specimen type, subsection of lung lavaged, and the date the specimen was collected.
- FREEZE the BAL Fluid Sample for Chemical or Lipid Analysis at freezer temperatures of -20 °C or lower and store frozen.
- SEE BELOW FOR SHIPPING INSTRUCTIONS.

### Plasma Samples

- For each patient, collect up to 8 mL of blood in two (2) 4-mL **PURPLE**-top (K2 -EDTA) plastic tubes. (Note: **DO NOT** use gel separators.)
- Mix contents of tubes by inverting them 8 -10 times.
- Label tubes in order of collection. Example: #1, #2.
- Centrifuge blood tubes for 15 minutes at 1000 to 1300 g-force to separate the plasma from whole blood cells within 6 hours of collection. Check with the centrifuge rotor manual (or RCF to RPM table) for the proper RPM (e.g. 2400 RPM) to use with your specific rotor.
- Aliquot plasma into cryotubes with corresponding collection sequence number (e.g. #1, #2)
- Label each specimen container with the patient's medical record number, state case ID number, the specimen type, and the date the specimen was collected.
- FREEZE these specimens at freezer temperatures of -20 °C or lower and store frozen.
- SEE BELOW FOR SHIPPING INSTRUCTIONS.

### Urine Samples

- For each patient, collect approximately 40 mL to 60 mL of urine in a screw-cap urine cup without preservative.
- Transfer 8 mL to 10 mL of urine to a urine collection tube(s) with no preservative. (Example: *BD 364991 Vacutainer® Urinalysis Transfer Straw Kit: 8.0 mL, 16 x 100 mm Plus Plastic Conical Tube, without preservative, or similar*)
- Indicate on the tube how the sample was collected if the method was other than "clean catch" (example: catheterization).

- Label each specimen container with the patient's medical record number, state case ID number, the specimen type, and the date the specimen was collected.
- FREEZE these specimens at freezer temperatures of -20 °C or lower and store frozen.
- SEE BELOW FOR SHIPPING INSTRUCTIONS.

## SPECIMEN SHIPPING

- Specimens should be shipped in a biohazard bag and stored on enough dry ice to keep specimens frozen. Please only ship the same specimen types together in a box (e.g., BAL fluids only in one box, plasma tubes only in one box, etc.)
- Do not ship on Fridays or before government holidays. Ship specimens Monday-Thursday by overnight delivery.
- Complete a DSHS G-2A Serology Specimen Submission Form (September 2017 revision):
  - A separate G-2A is required for each specimen (plasma, urine, etc.) submitted
  - A submitter ID is required to submit specimens. To request a submitter ID, please complete the *Submitter Identification (ID) Number Request Form* available at [www.dshs.texas.gov/lab/MRS\\_forms.shtm#Microbiological](http://www.dshs.texas.gov/lab/MRS_forms.shtm#Microbiological) and follow the instructions for submitting the form. Please include an email address in section 3 of the *Submitter ID Request Form* for a faster response.
  - **Tips for completing G2-A form:**
    - ✓ Section 2 – Patient Information: Place patient's State Case ID number in the "Last Name" field, leave "First Name" field blank, and place patient's medical record # in the "Medical Record #" field; complete date of collection field
    - ✓ Section 3 – Specimen Source or Type: check the "Other" box and write in specimen type
    - ✓ Section 9 – CDC Reference Tests: check the "Other" box and write in Vaping
- Ship to the physical address: TX DSHS Lab Services, ATTN: Walter Douglass 512-776-7569, 1100 W. 49th Street, Austin TX, 78756
- Record the shipping tracking number and notify your local health department that a specimen is being shipped.

**ICD-10-CM Official Coding Guidelines - Supplement**  
**Coding encounters related to E-cigarette, or Vaping, Product Use**  
Post Date: October 17, 2019

**Introduction**

The purpose of this document is to provide official diagnosis coding guidance for healthcare encounters related to the 2019 health care encounters and deaths related to e-cigarette, or vaping, product use associated lung injury (EVALI). This guidance is consistent with current clinical knowledge about e-cigarette, or vaping, related disorders.

As necessary, this guidance will be updated as new clinical information becomes available. The clinical scenarios described below are not exhaustive and may not represent all possible reasons for health care encounters that may be related to e-cigarette, or vaping, product use. Proposals for new codes that are intended to address additional detail regarding use of e-cigarette, or vaping, products will be presented at the March 2020 ICD-10 Coordination and Maintenance Committee Meeting.

This guidance is intended to be used in conjunction with current ICD-10-CM classification and the *ICD-10-CM Official Guidelines for Coding and Reporting* (effective October 1, 2019).

[https://www.cdc.gov/nchs/data/icd/10cmguidelines-FY2020\\_final.pdf](https://www.cdc.gov/nchs/data/icd/10cmguidelines-FY2020_final.pdf). The ICD-10-CM codes provided in the clinical scenarios below are intended to provide e-cigarette, or vaping, product use coding guidance only. Other codes for conditions unrelated to e-cigarette, or vaping products may be required to fully code these scenarios in accordance with the *ICD-10-CM Official Guidelines for Coding and Reporting*. A hyphen is used at the end of a code to indicate that additional characters are required.

**General Guidance**

**Lung-related complications**

For patients documented with electronic cigarette (e-cigarette), or vaping, product use associated lung injury (EVALI), assign the code for the specific condition, such as:

- J68.0, Bronchitis and pneumonitis due to chemicals, gases, fumes and vapors; includes chemical pneumonitis
- J69.1, Pneumonitis due to inhalation of oils and essences; includes lipoid pneumonia
- J80, Acute respiratory distress syndrome
- J82, Pulmonary eosinophilia, not elsewhere classified
- J84.114, Acute interstitial pneumonitis
- J84.89, Other specified interstitial pulmonary disease

For patients with acute lung injury but without further documentation identifying a specific condition (pneumonitis, bronchitis), assign code:

- J68.9, Unspecified respiratory condition due to chemicals, gases, fumes, and vapors

### **Poisoning and toxicity**

Acute nicotine exposure can be toxic. Children and adults have been poisoned by swallowing, breathing, or absorbing e-cigarette liquid through their skin or eyes. For these patients assign code:

- T65.291-, Toxic effect of other nicotine and tobacco, accidental (unintentional); includes Toxic effect of other tobacco and nicotine NOS.

For a patient with acute tetrahydrocannabinol (THC) toxicity, assign code:

- T40.7X1- Poisoning by cannabis (derivatives), accidental (unintentional).

### **Substance use, abuse, and dependence**

For patients with documented substance use/abuse/dependence, additional codes identifying the substance(s) used should be assigned.

When the provider documentation refers to use, abuse and dependence of the same substance (e.g. nicotine, cannabis, etc.), only one code should be assigned to identify the pattern of use based on the following hierarchy:

- If both use and abuse are documented, assign only the code for abuse
- If both abuse and dependence are documented, assign only the code for dependence
- If use, abuse and dependence are all documented, assign only the code for dependence
- If both use and dependence are documented, assign only the code for dependence.

Assign as many codes, as appropriate. Examples:

Cannabis related disorders: F12.---

Nicotine related disorders: F17.----

Specifically, for vaping of nicotine, assign code:

- F17.29-, Nicotine dependence, other tobacco products. Electronic nicotine delivery systems (ENDS) are non-combustible tobacco products.

### **Signs and symptoms**

For patients presenting with any signs/symptoms (such as fever, etc.) and where a definitive diagnosis has not been established, assign the appropriate code(s) for each of the presenting signs and symptoms such as:

- M79.10 Myalgia, unspecified site
- R06.00 Dyspnea, unspecified
- R06.02 Shortness of breath
- R06.2 Wheezing
- R06.82 Tachypnea, not elsewhere classified
- R07.9 Chest pain, unspecified

ICD-10-CM Coding Guidance  
Vaping related disorders (October 17, 2019)

- R09.02 Hypoxemia
- R09.89 Other specified symptoms and signs involving the circulatory and respiratory systems (includes chest congestion)
- R10.84 Generalized abdominal pain
- R10.9 Unspecified abdominal pain
- R11.10 Vomiting, unspecified
- R11.11 Vomiting without nausea
- R11.2 Nausea with vomiting, unspecified
- R19.7 Diarrhea, unspecified
- R50.- Fever of other and unknown origin
- R53.83 Other fatigue
- R61 Generalized hyperhidrosis (night sweats)
- R63.4 Abnormal weight loss
- R68.83 Chills (without fever)

This coding guidance has been approved by the four organizations that make up the Cooperating Parties: the National Center for Health Statistics, the American Health Information Management Association, the American Hospital Association, and the Centers for Medicare & Medicaid Services.

**References:**

Ghinai I, Pray IW, Navon L, et al. E-cigarette Product Use, or Vaping, Among Persons with Associated Lung Injury — Illinois and Wisconsin, April–September 2019. *MMWR Morb Mortal Wkly Rep* 2019;68:865–869.

DOI: <http://dx.doi.org/10.15585/mmwr.mm6839e2>

National Academies of Sciences, Engineering, and Medicine. 2018. *Public Health Consequences of E-Cigarettes*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/24952>.

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;68:860–864.

DOI: <http://dx.doi.org/10.15585/mmwr.mm6839e1>

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;68:787–790.

DOI: <http://dx.doi.org/10.15585/mmwr.mm6836e2>

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. *MMWR Morb Mortal Wkly Rep*. ePub: 11 October 2019. DOI:

<http://dx.doi.org/10.15585/mmwr.mm6841e3>

**BLUE SKIES, GOLDEN OPPORTUNITIES, AND A FRESHSTART!**

# QUIT TOBACCO CLASS

(Includes e-cigarettes and vapes)

Class will be held at the Public Health District on scheduled Tuesdays and Thursdays from noon to 1pm, and 5:30 – 6:30pm in the Health Empowerment Classroom (enter at the blue awning). Please contact us for dates or sign up via the website.

<http://www.wichitafallstx.gov/forms.aspx?FID=78>

**If quitting were easy, everyone would do it!**

A minimum of 4 participants is necessary for the course to be held; each participant must attend all 4 sessions to receive a certificate.

Supplies will be provided on day 1, please bring your supplies to every session.

For more information contact: Amanda Kennedy @ 940-761-7840

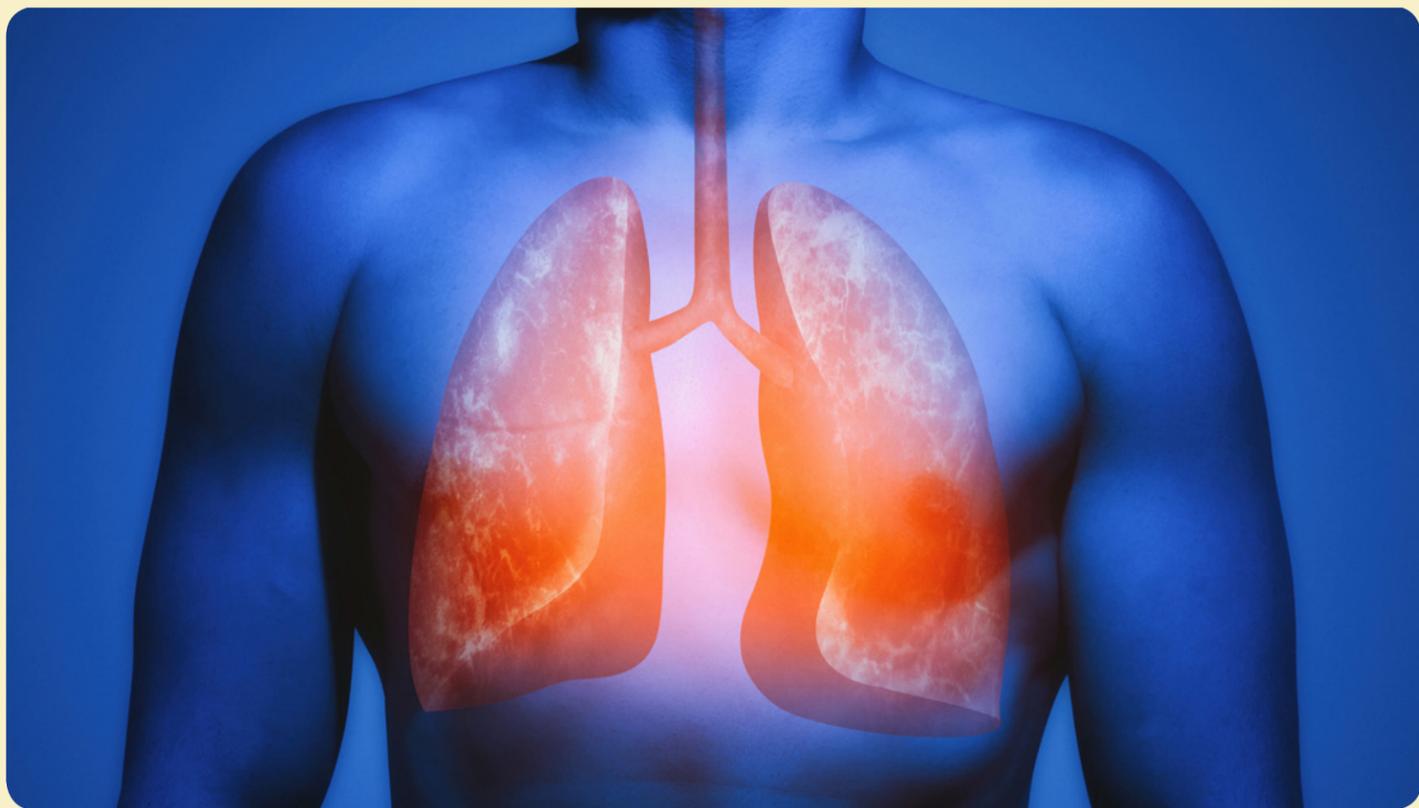


# Do You Have Any of These Symptoms?



- cough, shortness of breath, or chest pain
- nausea, vomiting, or diarrhea
- fatigue, fever, or abdominal pain

# Do you use e-cigarettes or vaping products?



**If you answered YES to either of these questions, be sure to tell your doctor that you use e-cigarettes, or vaping products, and to check for lung injury!**