



## E-cigarette, or vaping, product use–associated lung injury (EVALI)

### Key Articles

- 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;

### Background

- Electronic cigarettes, or e-cigarettes, include a diverse group of battery-powered devices that allow users to inhale aerosolized substances.
- E-cigarettes are commonly used to inhale nicotine, THC, CBD, and butane hash oils, but are believed to contain fewer toxic chemicals than traditional cigarettes.
- Since 2014 e-cigarettes have been the most commonly used tobacco product among youths in the United States
- Since 2017, vaping has increased from 11.7% to 20.8% among U.S. high school students
- > 70% of hospitalized patients were initially seen in ED, urgent care, or outpatient clinics
- Made news, because over a 4-month period, the number of suspected cases had quadrupled between July 2019 and September 2019.
- The last report on September 20, 2019 in NEJM, a total of 908 cases of vaping-associated severe pulmonary disease across 45 states and the U.S. Virgin Islands — 495 confirmed cases and 413 suspected cases.

### Presentation

- Patients are young
  - Median age of initial reported cohort 19 years old (all < 55 years old)
  - 32% were under 18 years old
- Minimal co-morbidities, except for asthma (30%)
- Critical to ask about history of e-cigarette use
  - 94% of patients report vaping within a week of onset
  - Most (88%) reported daily e-cigarette use (nicotine and THC products)
  - Note: One case series report use of THC containing products in 84% of patients (brand noted: “Dank Vape” (59%)
- Symptoms
  - Fever (81%)
  - Respiratory symptoms: Shortness of breath, cough, chest pain
    - Upper respiratory sx: Rhinorrhea, sneezing, or congestion NOT common
  - GI symptoms: Nausea, vomiting, diarrhea, abdominal pain
- Physical exam
  - Tachycardia, tachypnea

- Moderate Hypoxemia: 38% had an SpO<sub>2</sub> 89-94% on RA
- Severe Hypoxemia: 31% with an SpO<sub>2</sub> < 89% on RA

### Diagnostic testing

- Radiographic findings
  - CXR: bilateral, patchy infiltrates
  - CT Chest: Basilar ground glass opacities & consolidations that spare the periphery
- Lab testing: Leukocytosis with neutrophil predominance (neutrophil % > 80%)
- **Clinical picture:** Range from multifocal pneumonia to severe ARDS or chemical pneumonitis

### Diagnosis

- Will probably be made *after* extensive inpatient testing, this is a diagnosis of exclusion as there is no directed therapy at this time
- Use of an e-cigarette within 90 days of symptom onset
- **Confirmed case**
  - Must include (+) imaging (CXR with pulmonary infiltrates or ground glass opacities on CT chest) with negative infectious work-up including respiratory viral panel, influenza PCR, *S. pneumoniae* and *legionella* urine antigen, blood culture, sputum culture, BAL, HIV
  - No evidence of alternative cause (cardiac, rheumatologic, or neoplastic process)
  - Can send ESR/CRP (high in some cases of EVALI)
- **Probable case:** (+) infection, but clinical team believes that this is not a sole cause for acute illness.
- **Interestingly,** Vitamin E acetate (oil) was detected in 94% in BAL of patients in one 51 patient case series

### Treatment and ED care

- Important to note, symptoms can be rapidly progressive
- ICU admission rates are reported as between 40-70% due to respiratory requirements
- Majority is supportive care, early antibiotic therapy
- Mechanical ventilation if failing initial treatments
- Steroids appear to be helpful (prednisone 40-60mg daily)
- The use of VV-ECMO has been described in severe cases

The CDC also recommends that clinicians report cases of VAPI to their state or local health department, as well as the FDA at <https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=cc7873df-0590-49ec-9d71-ecbf742d34e3> and collect the following information:

- Type of device(s) used (e.g. bottles, cartridges or pods)
- Specific type(s) of liquid used (e.g. nicotine, THC products, flavored fluids)
- Were devices, liquids, refill pods and/or cartridges shared with other people?

- Were old cartridges or pods reused with other homemade or commercial products?
- Were devices used to inhale drugs that were concentrated by heating prior to vaping (i.e., “dabbing”)
- Details of vaping behavior (e.g. cloud volume, frequency of puffs, ‘zero’ or ‘stealth’ vaping, valsalva at end inhalation).