

# AMSER Case of the Month

## January 2023

22 year-old-female presenting with worsening SOB

Esther Kim, MS4  
Drexel University College of Medicine

Ajla Kadribegic, PGY 5

Dr. Layla Nasr, MD  
Dr. Matthew Hartman, MD  
Allegheny Health Network



# Patient Presentation

HPI: 22 year-old-female with a PMH of IBS, annular pancreas, and iron deficiency anemia presented to the ED with a five day history of fevers, generalized malaise, N/V, and new nonproductive cough. Experienced **acute worsening SOB over the past 24 hrs**. Denied hx of DVT/PE, hx of blood clotting disorders, recent travel, or any sick contacts. Pt became hypoxic to the low 80s and required 2L O2.

Social Hx: **Vaping THC and nicotine every day since 2018**

Vitals: Afebrile, HR **118**, RR **22**, BP 121/72

PE: Not in acute distress; Equal breath sounds bilaterally without wheezing or rales; **Abdominal tenderness to palpation in RLQ**

# Pertinent Labs

CBC:

WBC: 12.54

Neutrophils: 88%

CMP:

Unremarkable

Other:

Lactic Acid: 1.2 (wnl)

COVID-19 negative

Viral respiratory panel negative

MRSA negative

Legionella antigen negative

S pneumo antigen negative

What Imaging Should We Order?

# Select the applicable ACR Appropriateness Criteria

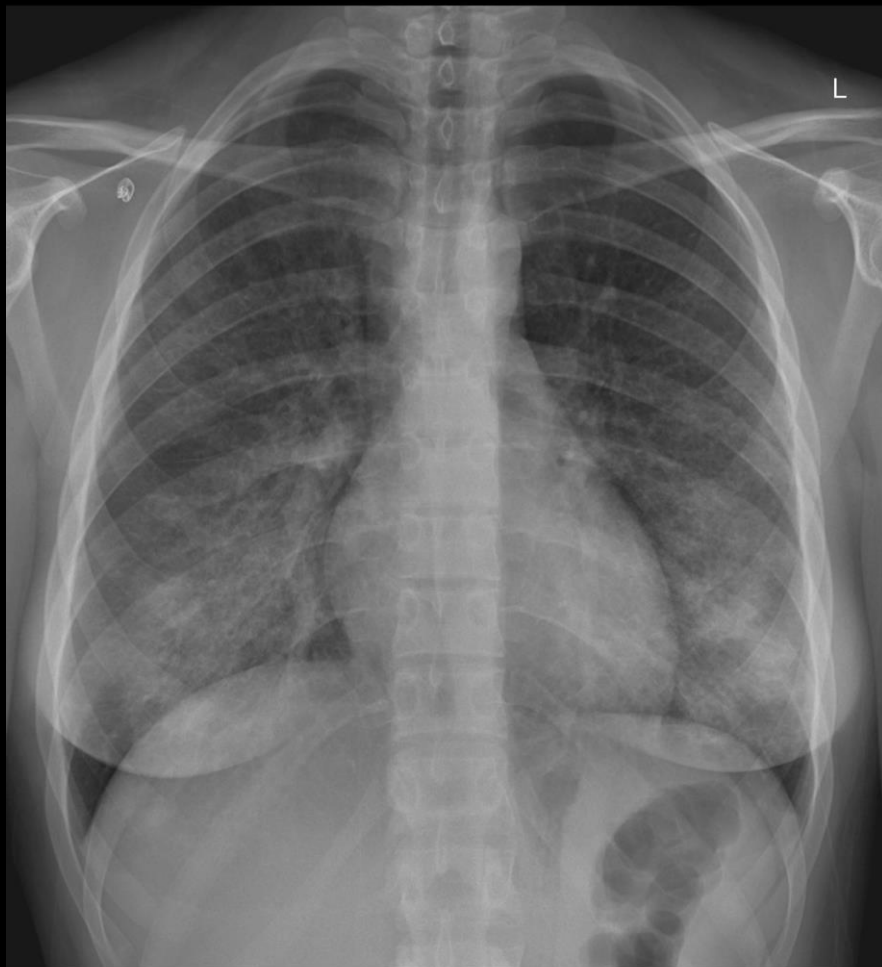
**Variant 2:**

**Acute respiratory illnesses in immunocompetent patients with positive physical examination, abnormal vital signs, organic brain disease, or other risk factors. Initial imaging.**

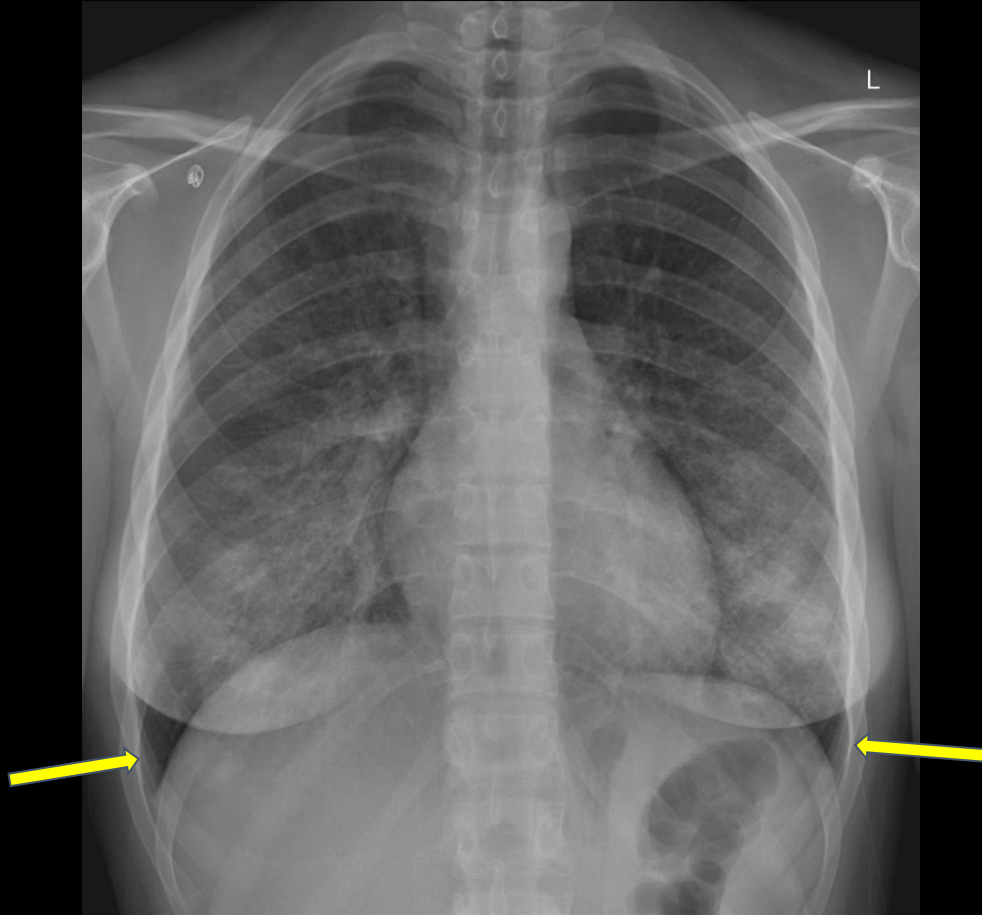
| Procedure                              | Appropriateness Category | Relative Radiation Level |
|--|--------------------------|--------------------------|
| Radiography chest                      | Usually Appropriate      | ☼                        |
| US chest                               | May Be Appropriate       | ○                        |
| CT chest with IV contrast              | Usually Not Appropriate  | ☼ ☼ ☼                    |
| CT chest without and with IV contrast  | Usually Not Appropriate  | ☼ ☼ ☼                    |
| CT chest without IV contrast           | Usually Not Appropriate  | ☼ ☼ ☼                    |
| MRI chest without and with IV contrast | Usually Not Appropriate  | ○                        |
| MRI chest without IV contrast          | Usually Not Appropriate  | ○                        |

This imaging modality was ordered by the ER physician

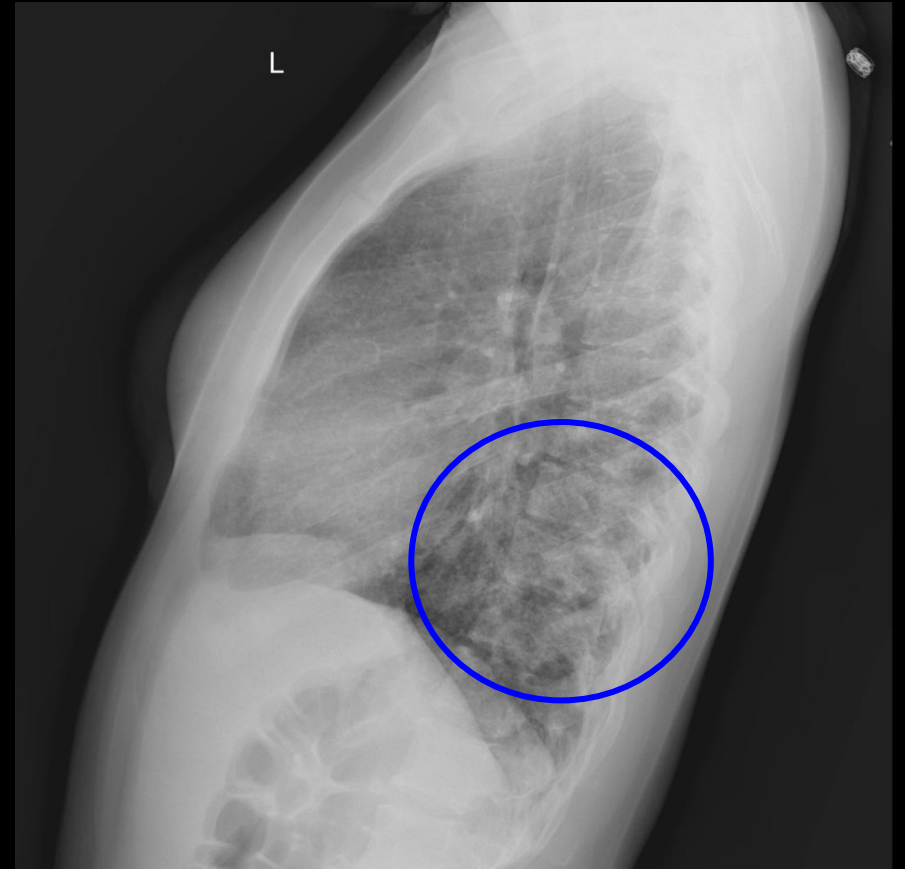
# Findings (unlabeled)



# Findings (labeled)



Bilateral, lower lobe predominant patchy airspace opacities with peripheral sparing (arrows)

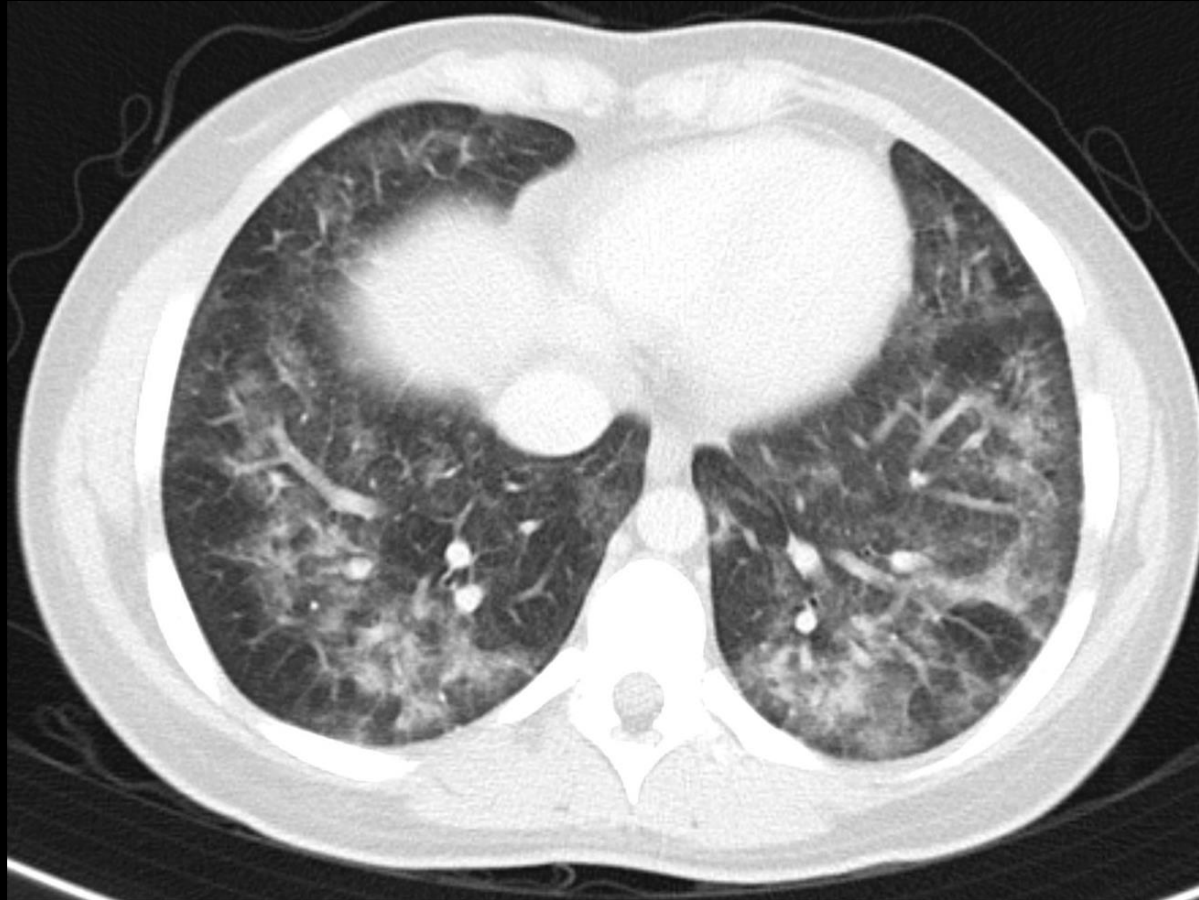


Positive spine sign with lower lobe predominant airspace opacities

A CT abdomen and pelvis with contrast was also ordered by the ER physician due to pt's RLQ abdominal pain

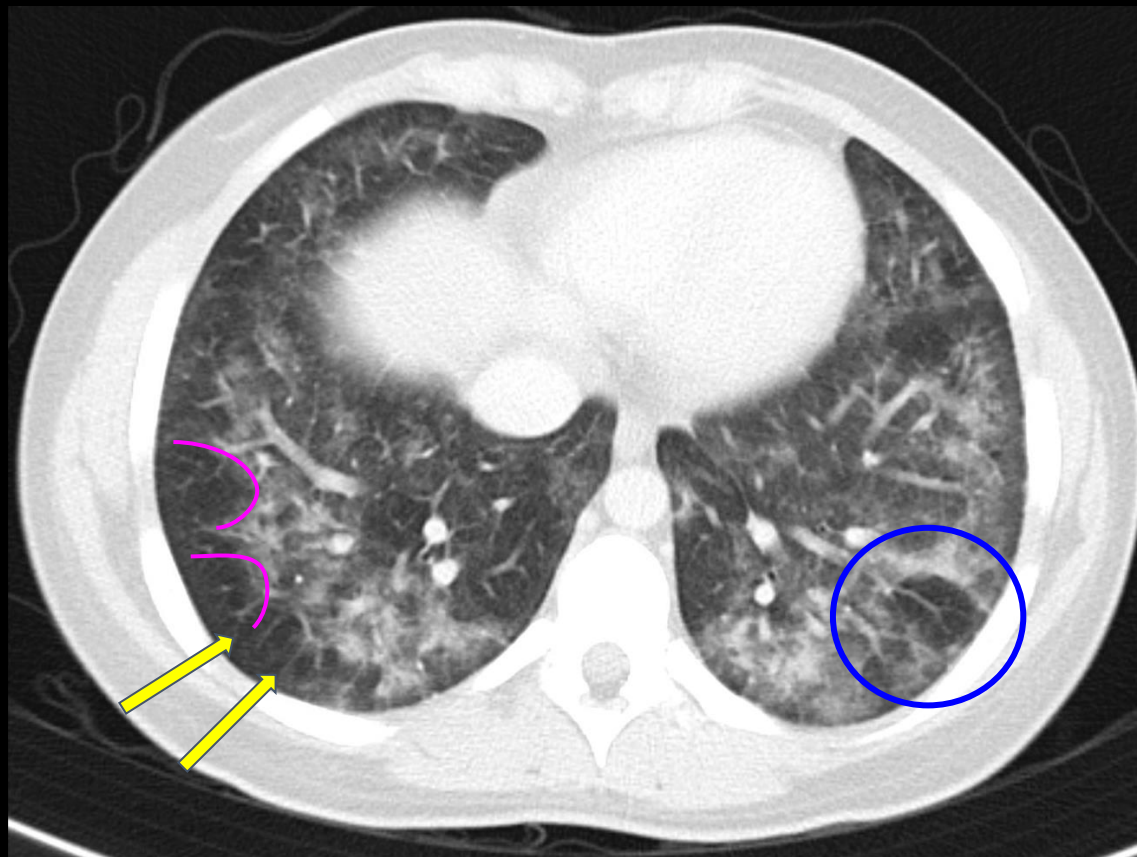


# Findings (unlabeled)



# Findings: (labeled)

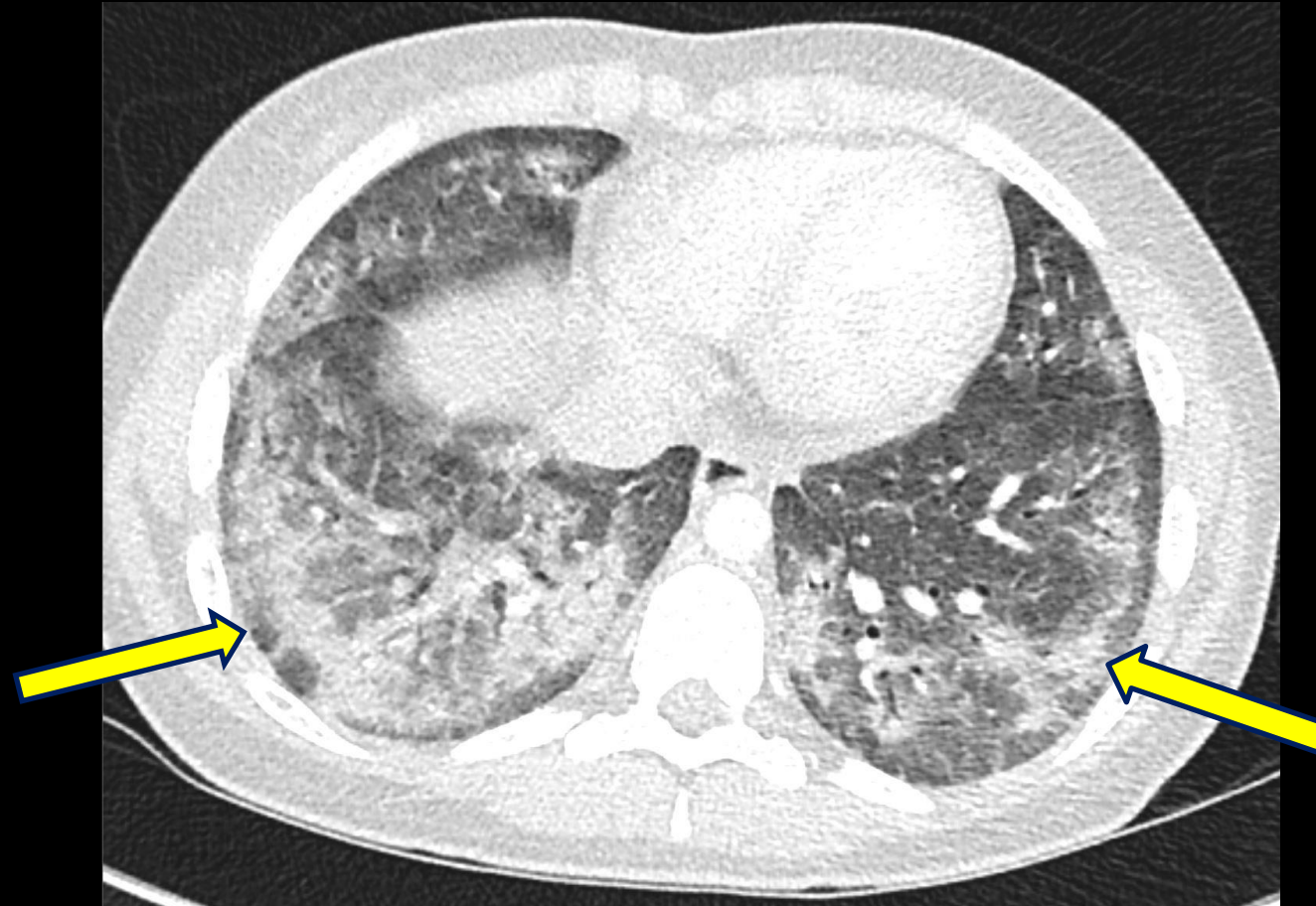
(No acute process in the abdomen or pelvis)



Lung bases showed bilateral ground-glass opacities with **subpleural sparing** (arrows), formations of **arcade-like bands of consolidation** (pink lines), and areas of **reversed halo sign or atoll sign** (blue circle)

Pt was started on broad-spectrum IV antibiotics, but did not improve clinically and a CT chest with contrast was ordered

## Findings: (labeled)



Worsening of bilateral ground-glass opacities in the lower lobes (arrows)

## Differential Dx (based on imaging):

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

Infection

Connective tissue disease

Diffuse alveolar hemorrhage

# Next Steps

Given the characteristic imaging findings and clinical picture, the patient was started on IV Solumedrol for treatment of a most likely diagnosis of EVALI.

## Further pertinent work-up to r/o other differentials:

Echocardiogram: unremarkable

HIV: negative

ANCA: negative

After 2 days of steroid treatment, pt showed rapid clinical improvement and was weaned down to room air. Repeat CXR showed significant improvement of bilateral lower lobe opacities!

**Final Dx:**

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

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

## Background:

- E-cigarettes are battery-powered devices that aerosolize substances, such as **flavors, THC, and/or nicotine** for inhalation.
- First introduced to the U.S. in 2007 with increased use among adolescents in the past few years.
- In 2019, the CDC issued a **health advisory** due to cases emerging of severe pulmonary disease associated with e-cigarette usage i.e. EVALI
- More than 2800 pts admitted to hospital due to EVALI and 68 reported deaths (as of Feb 2020).
- **Vitamin E acetate** has been the most recognized agent associated with EVALI (used as a diluent in THC-based cartridges).

## Presentation:

- Wide range of symptoms, from **respiratory** (cough, chest pain, SOB) to **gastrointestinal** (abdominal pain and N/V).



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

## Diagnosis:

- **Imaging plays a crucial role in the initial detection of EVALI.**
- Hx of e-cigarette use during 90 days before symptom onset.
- Diagnosis of exclusion, so other possible causes of lung injury should be ruled out.

## Imaging Findings:

- Many patterns of lung injury have been reported with EVALI → hypersensitivity pneumonitis, diffuse alveolar hemorrhage, acute eosinophilic pneumonia, organizing pneumonia
- Several studies have reported that the most common imaging findings thus far are **bilateral, lower lobe predominant ground-glass opacity and consolidation with areas of subpleural sparing.**

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

Below are characteristic features of **organizing pneumonia**, one of the patterns of lung injury seen in EVALI

**Reversed halo sign or atoll sign:** Central ground-glass opacity surrounded by a denser consolidation in crescentic shape.



Figure 1. Artunduaga M et al. (2020)

**Arcade-like sign:** Curved bands of parenchymal consolidation with thickening of the interlobular septa.

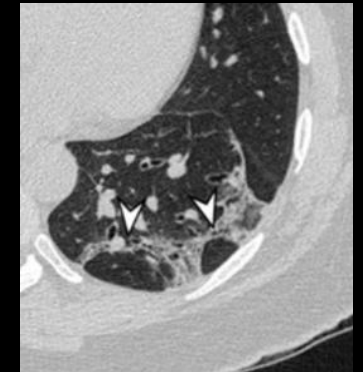
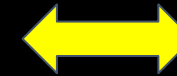


Figure 2. Tiralongo F et al. (2020)

## Treatment:

- Supportive care and possible high dose corticosteroid. Encourage vaping cessation.

## Prognosis:

- Relatively good, but can be a fatal disease. Long-term complications and risk of recurrence have yet to be established.

# References:

Artunduaga M, Rao D, Friedman J, et al. Pediatric Chest Radiographic and CT Findings of Electronic Cigarette or Vaping Product Use–associated Lung Injury (EVALI). *Radiology*. 2020;295(2):430-438. doi:[10.1148/radiol.2020192778](https://doi.org/10.1148/radiol.2020192778)

Hage R, Schuurmans MM. Suggested management of e-cigarette or vaping product use associated lung injury (EVALI). *J Thorac Dis*. 2020;12(7):3460-3468. doi:[10.21037/jtd.2020.03.101](https://doi.org/10.21037/jtd.2020.03.101)

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Zulfiqar H, Rahman O. Vaping Associated Pulmonary Injury. In: *StatPearls*. StatPearls Publishing; 2022. Accessed September 18, 2022. <http://www.ncbi.nlm.nih.gov/books/NBK560656/>