

REGULATORY COMMITTEE INSIGHT

E-cigarette, or vaping, product use associated lung injury

Vaping is the practice of inhaling and exhaling aerosols or “vapors” produced by a delivery device referred to as an e-cigarette. Aerosols are produced by the heating of substances including chemicals, nicotine, flavorings, and a combination of propellants, solvents, and oils. These chemicals at times contain heavy metals, including lead, carcinogens, ultrafine particles, and agents used for cleaning the device, which are also inhaled. To further alter the composition for enhanced effects or a “kick,” users have reported adding other potentially harmful substances and oils.

Recently, the Centers for Disease Control and Prevention (CDC) has focused on vaping and its dangers due to the multiple reported hospitalizations and deaths associated with vaping. More than 800 cases of lung illness in 46 states have been linked to vaping, and 16 people have died, [according to the CDC](#).

The CDC has given this vaping-associated illness a name: E-cigarette, or vaping, product use associated lung injury (EVALI). EVALI appears to be affecting a much younger patient population. Thirty-seven percent of 12th graders have reported vaping in the past 12 months and 10% of 8th graders have reported vaping in the past 12 months. The mean age of a patient with EVALI has been reported to be 19 years of age, [according to the Children’s Hospital Association](#).

Mayo Clinic reviewed the 17 available lung biopsies that have been performed across the country of EVALI patients and found that the lung injury pattern in individuals who became ill after vaping nicotine or marijuana products resembled chemical burns. Brandon T. Larsen, MD, a surgical pathologist at the Mayo Clinic in Scottsdale, Arizona, [told the New York Times](#) that the change seen in the lungs was similar to “an unfortunate worker in an industrial accident where a big barrel of toxic chemicals spills and that person is exposed to toxic fumes and there is a chemical burn in the airways.”

Key points in identifying EVALI patients

- History of e-cigarette use/vaping within 90 days of onset
- Bilateral pulmonary infiltrate/ground glass appearance on x-ray/computerized tomography (CT) scan
- Absence of pulmonary infection on initial workup
- Other diagnoses ruled out, including cardiac, rheumatologic, or neoplastic

Case study 1

Let’s look at an example. A 23-year-old male with no significant past medical history presented to the ED with complaints of a temperature max of 103°F, worsening cough, increased shortness of breath, and poor oral intake resulting in a 15-pound weight loss. He presented to his primary care physician a week prior to arrival in the ED. He was prescribed azithromycin and prednisone, with no improvement in his symptoms. He did report excessive use of his vaping pen but quit using it two weeks prior to presentation.

His labs revealed a white blood cell (WBC) count of 15.5 with neutrophils of 15.51, temperature of

38.5°C, tachycardia, blood pressure of 129/68, and oxygen saturation of 88-89% on room air. His X-ray chest noted interstitial opacities throughout lungs bilaterally. His CT chest exam noted diffuse parenchymal ground glass opacifications through lungs bilaterally.

It was worth noting that his platelet count remained elevated throughout his stay—523 on admission and 1,030 at discharge. On the initial night of management, his hypoxia worsened, and he was rushed to the intensive care unit (ICU) with a diagnosis of respiratory failure and acute respiratory distress syndrome (ARDS). His management included high-flow nasal canula (HFNC) and NO2. High dose steroids were also added with immediate improvement. His length of stay was five days.

The provider documents pneumonitis related to cannabis use via vaping pen, ARDS, hypoxic respiratory failure, and severe malnutrition in the medical record:

ICD-10-CM code	CC/MCC	Severity of Illness (SOI)/risk of mortality (ROM)	
J18.9	Principal diagnosis		Pneumonia unspecified organism
J80	MCC	ROM 3	ARDS
E43	MCC	SOI 4	Unspecified severe-protein malnutrition
F12.99			Cannabis use unspecified with unspecified induced disorder

The MS-DRG for this case would be 193, Simple pneumonia with MCC, carrying a SOI of three and an ROM of two.

Based on this documentation, however, there is a query opportunity to further specify the documentation of pneumonitis in order to obtain a more accurate coding profile for this complex patient.

Query 1:

Dr. Doctor,

Based on the clinical indicators below, in your clinical judgement, could the documented condition of suspected pneumonitis be clarified for the medical record?

- Lipoid pneumonia due to inhalants
- Hypersensitivity pneumonitis due to inhalants
- Other, please specify:
- Clinically unable to determine

Clinical indicators:

- 23-year-old male admitted from the ED for evaluation and treatment of hypoxia and suspected pneumonia.
- The history and physical (H&P) by Dr. Doctor documents “excessive vaping use stopped two weeks ago due to onset of fatigue and cough.”

- Viral and bacterial panels are negative for this encounter.
- The patient is receiving solumedrol 60 mg IV BID.
- Antibiotics were discontinued on day two of this encounter.
- Pneumonia ruled out and suspected pneumonitis is now documented to describe the patient's respiratory condition.

Query outcome

ICD-10-CM code	CC/MCC	SOI/ROM Impact	
J69.1	Principal diagnosis		Pneumonitis d/t Inhalants Oils Essences
E43	MCC	SOI 4	Uns Severe Malnutrition
J80	MCC	ROM 3	ARDS
F12.99			Cannabis Use Uns w/Uns Induced D/O

The MS-DRG after this query would be the following: MS-DRG 177, Respiratory infection and inflammation with MCC, carrying a SOI of three and an ROM of two.

Query 2:

Dr. Doctor,

Based on the clinical indicators below, in your clinical judgement, could the relationship between the documented condition of pneumonitis and the documented vape pen use be clarified for the medical record?

- Poisoning due to vaping
- Toxic effect of vaping
- Adverse effect of vaping
- Other, please specify:
- Unable to determine

Clinical Indicators

- 23-year-old male admitted from the ED for evaluation and treatment of hypoxia and suspected pneumonia.
- The H&P by Dr. Doctor documents "excessive vaping use stopped two weeks ago due to onset of fatigue and cough."
- Viral and bacterial panels are negative for this encounter.
- The patient is receiving solumedrol 60 mg IV BID.
- Antibiotics were discontinued on day two of this encounter.
- Pneumonia ruled out and suspected pneumonitis is now documented to describe the patient's respiratory condition.

Query outcome			
ICD-10-CM code	CC/MCC	SOI/ROM Impact	
T50.991A	Principal diagnosis		Poisoning by other drugs, medicants and biologics
J69.1	MCC	SOI 4 ROM 3	Pneumonitis d/t Inhaled Oils Essences
E43	MCC	SOI 4	Uns Severe-Protein Malnutrition
J80	MCC	ROM 3	ARDS

The MS-DRG after this query would be the following: MS-DRG 917, Poisoning and toxic effect drugs with MCC, carrying a SOI of four and an ROM of three.

During educational efforts, let physicians know that the CDI team is aware of the concerns around vaping and that they will be working to clarify records when necessary. Explain that further specificity of the relationship between the lung injury and vaping, if applicable, will improve the organizations ability to map this emerging disease since there is not currently a code for vaping or EVALI.

CDI's role with emerging diagnoses

The CDI professional is uniquely positioned to identify and code data that will affect surveillance and research of new and emerging diseases. We can partner with our infection control departments and providers to identify patients that meet CDC profiles for new and emerging diseases. We can also partner with professional agencies to identify combination of codes that can uniquely describe a patient with a new disease in the absence of an ICD-10 code. This will ensure the integrity of our research databases and facilitate early identification of best evidence-based care practices.

Acknowledgements

ACDIS would like to thank Haaris Ali, MD, CDIP, and Candace Blankenship, BSN, RN, CCDS, for principal authorship of this paper and the members of the ACDIS Regulatory committee for reviewing this publication.