

Vaping-Associated Lung Injury

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Academic Half Day

Disclosures

I have no commercial, non-commercial, or institutional financial interests or personal financial relationships to disclose regarding the material presented in this lecture.

Clinical Case

25 year old man w/ PTSD, tobacco use who presents to clinic:

“Hey doc I’ve started vaping to try and quit smoking, I usually only juice, but I’ve used wax once in a while. What are your thoughts?”

A. I feel comfortable discussing the risks/benefits vaping

B. I can make some limited comments about vaping but don’t know much

C. I have no idea what half of those words you just used mean...

Objectives

Define E-cigarette history, anatomy and terminology

Describe the clinical history and underlying pathophysiology of VALI

Review the use of E-cigarettes and smoking cessation

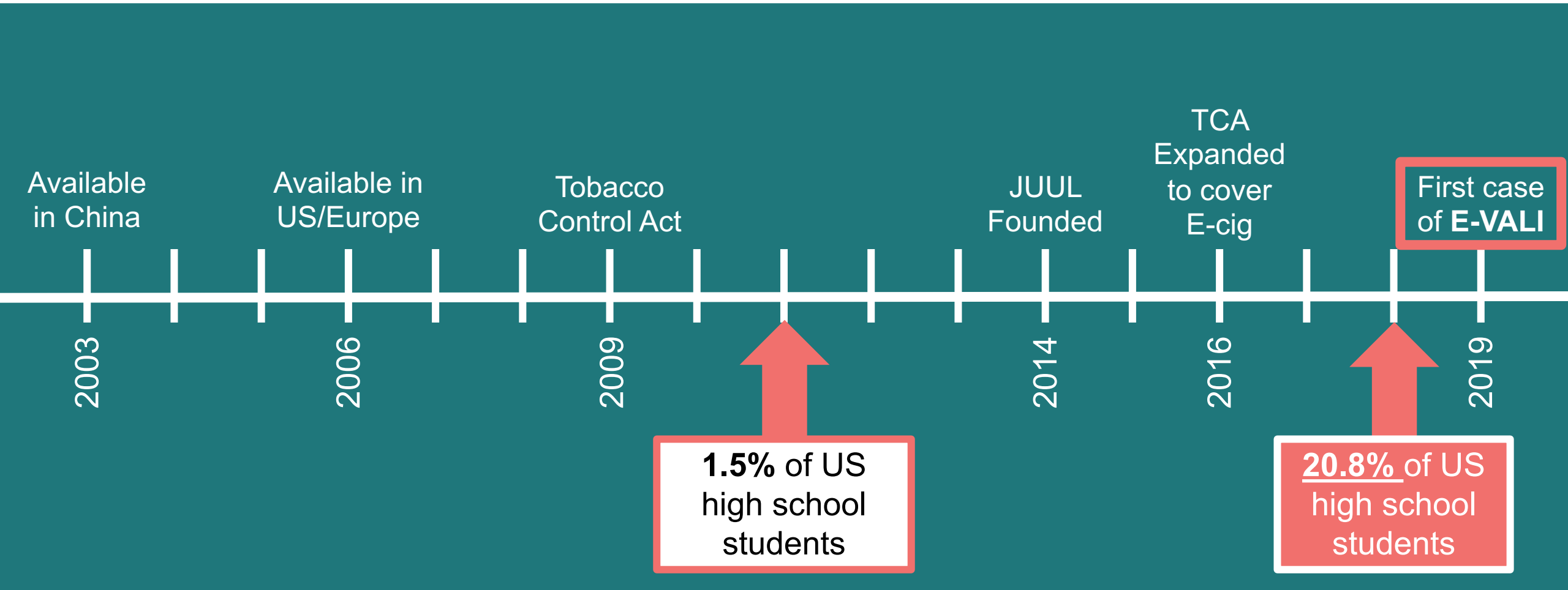
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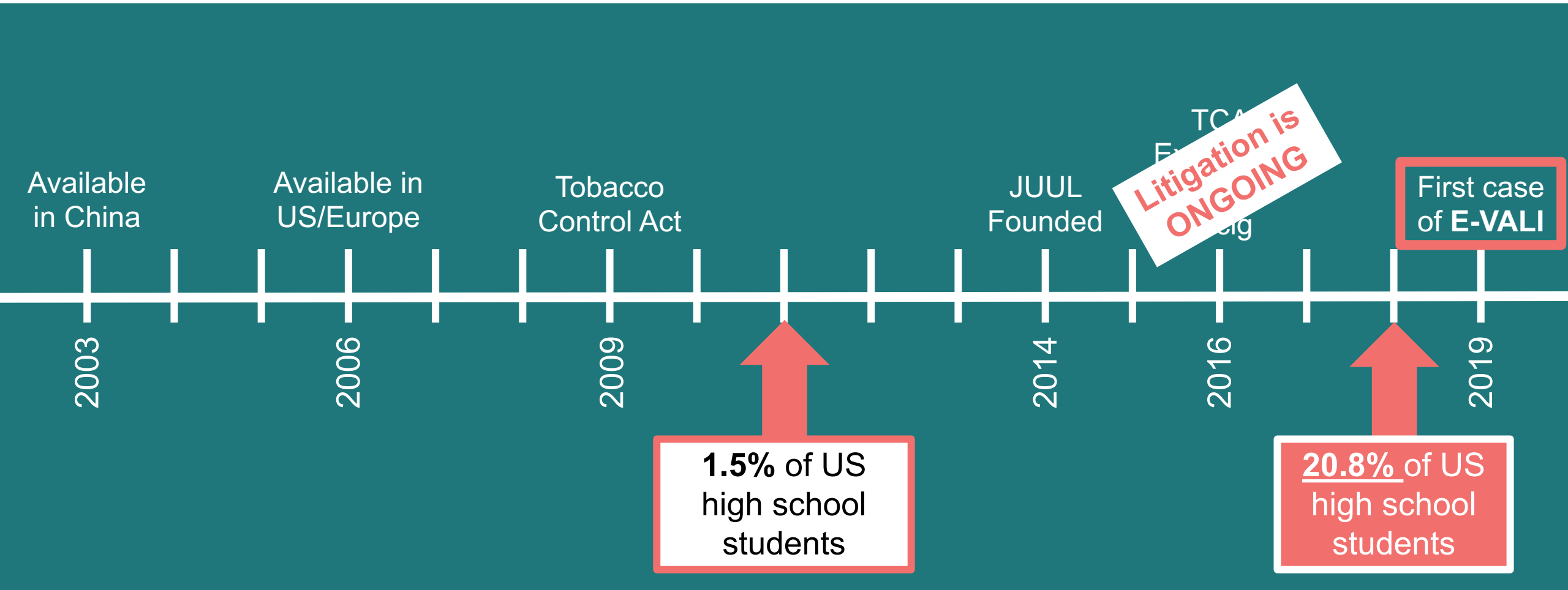
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Brief History of E-cigarettes



Brief History of E-cigarettes



Types of E-cigarettes

E-pipe



E-cigar



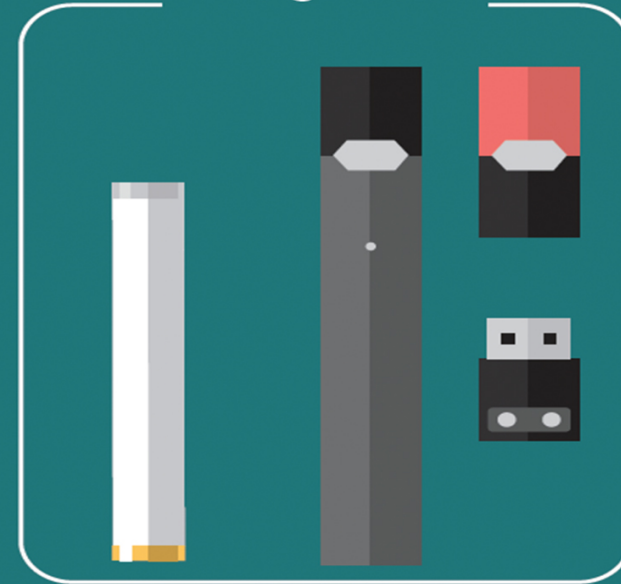
Large-size tank devices



Medium-size tank devices



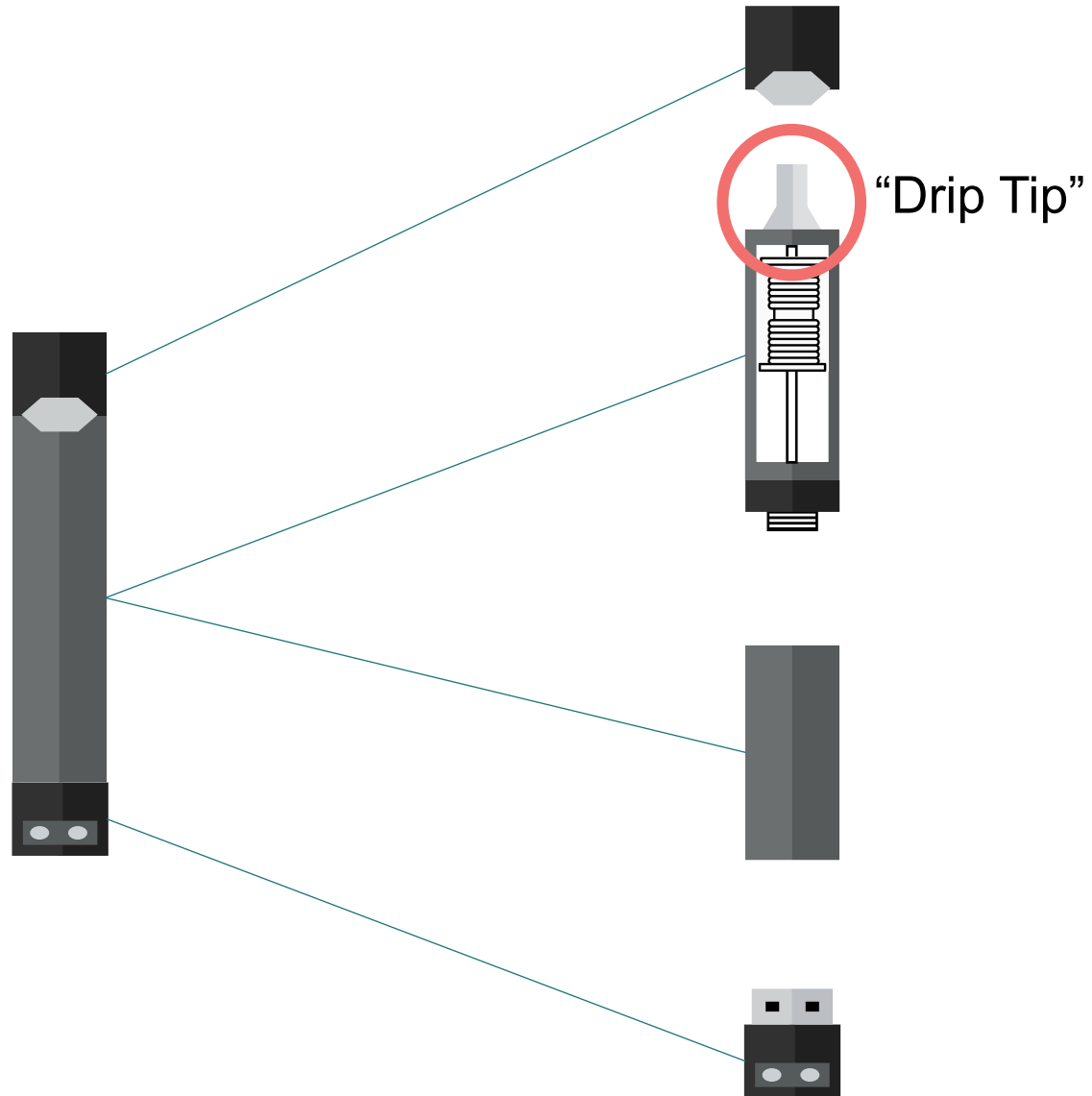
Rechargeable e-cigarette



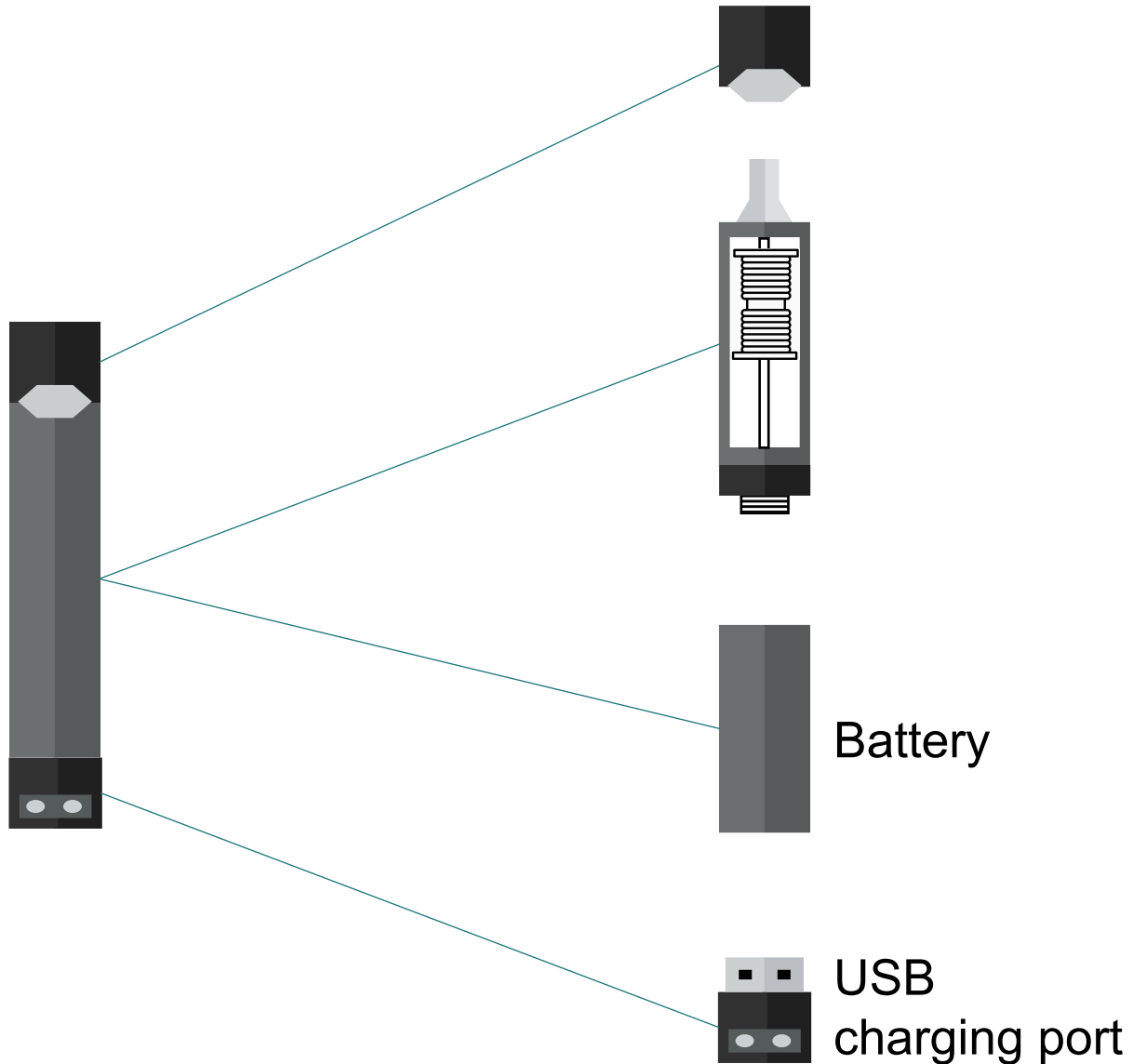
Disposable e-cigarette



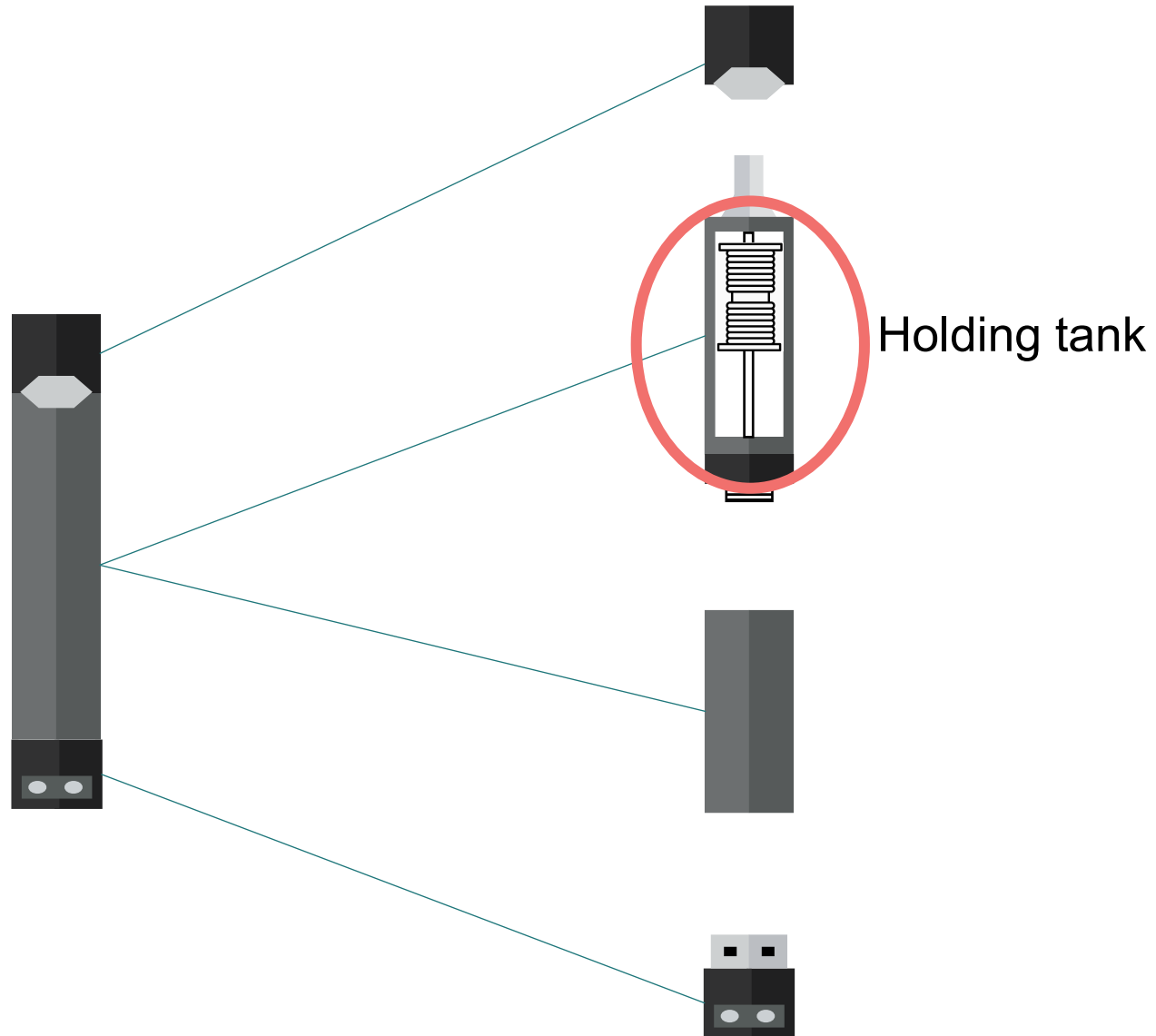
Anatomy of E-cigarettes



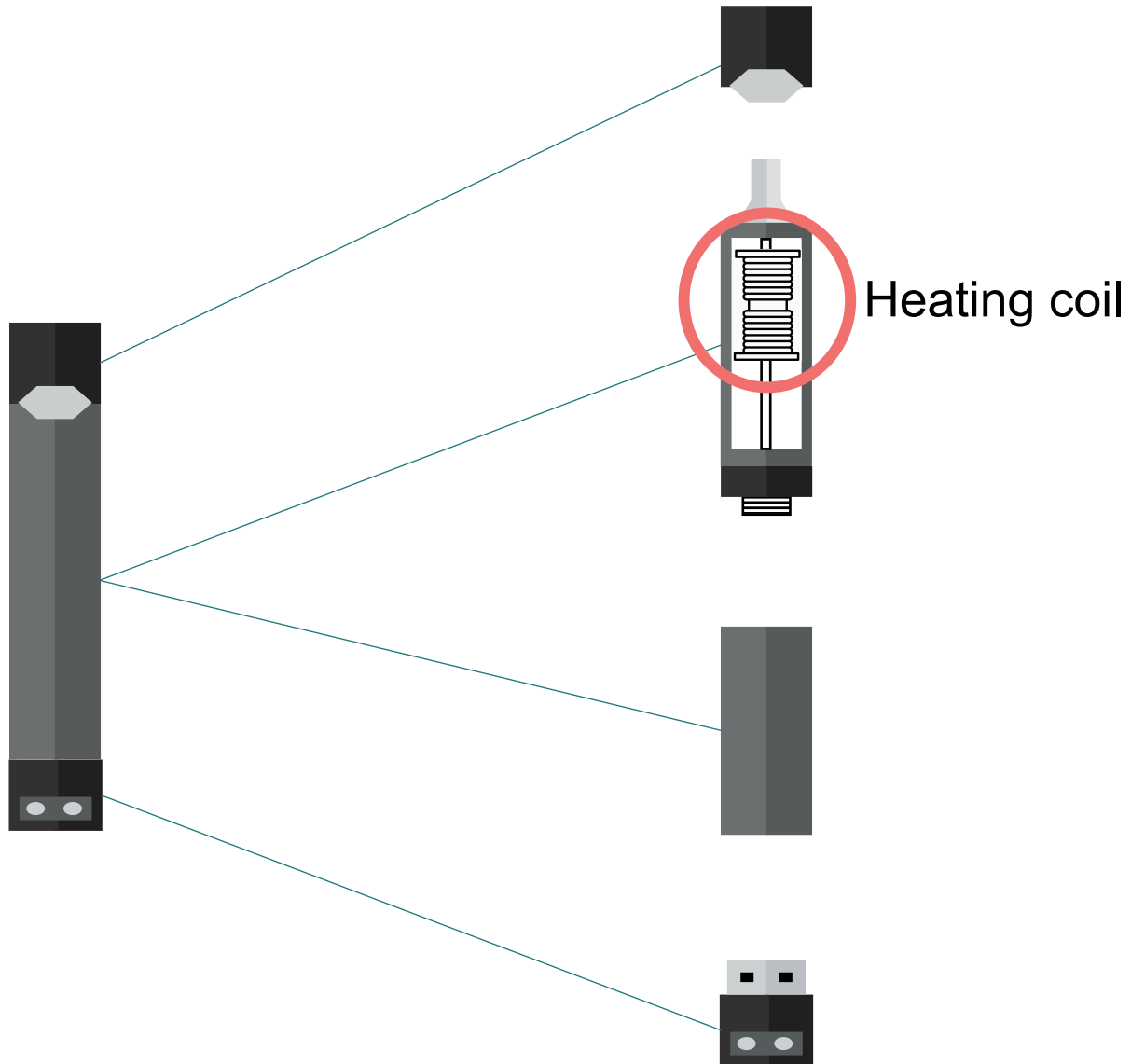
Anatomy of E-cigarettes



Anatomy of E-cigarettes



Anatomy of E-cigarettes



Vaping Concentrates

eJuice/eLiquid



Resin/Wax

“sap”
”shatter”
“snap n’ pull”
“butter”

Vaping Concentrates

eJuice/eLiquid

- Commercially available
- OR homemade recipes
- Nicotine OR THC containing



Resin/Wax

- Typically made at home from heating marijuana
- THC containing solid or semi-solid concentrates
- Can be cut with vitamin E

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5 CBS SF Bay Area NEWS WEATHER SPORTS MOTOR VIDEO MORE
1st Vaping Death Reported In California; 450+ Illnesses Nationwide

HEALTH

Vaping's Plausible Deniability Is Going Up in Smoke

Ongoing FDA investigations and a spate of hospitalizations show that "safer than cigarettes" does not mean safe.

AMANDA MULL SEP 6, 2019



NEWS

US tells smokers to stop vaping pending investigation into five deaths



NEWS

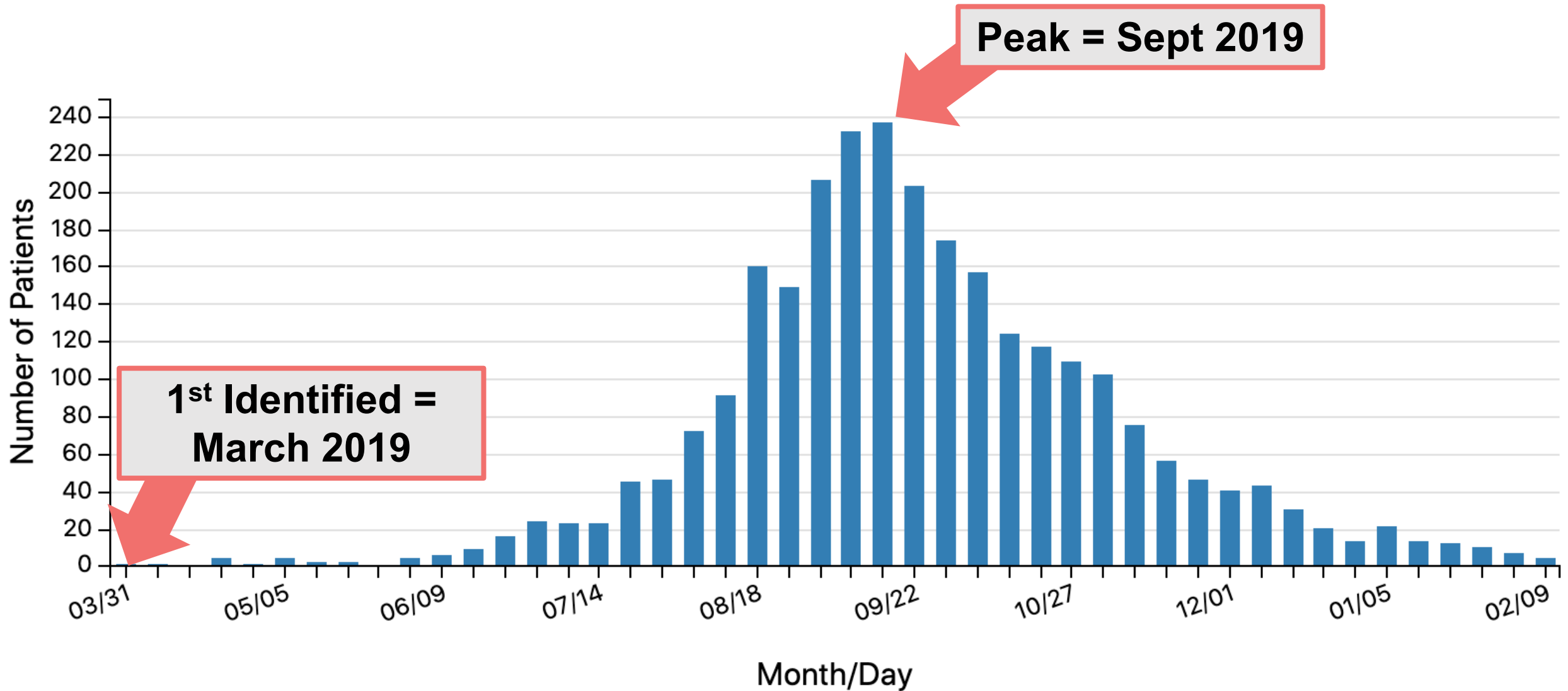
Death toll from mysterious vaping-related illnesses rises to five

By Jon Levine

September 7, 2019 | 9:40am



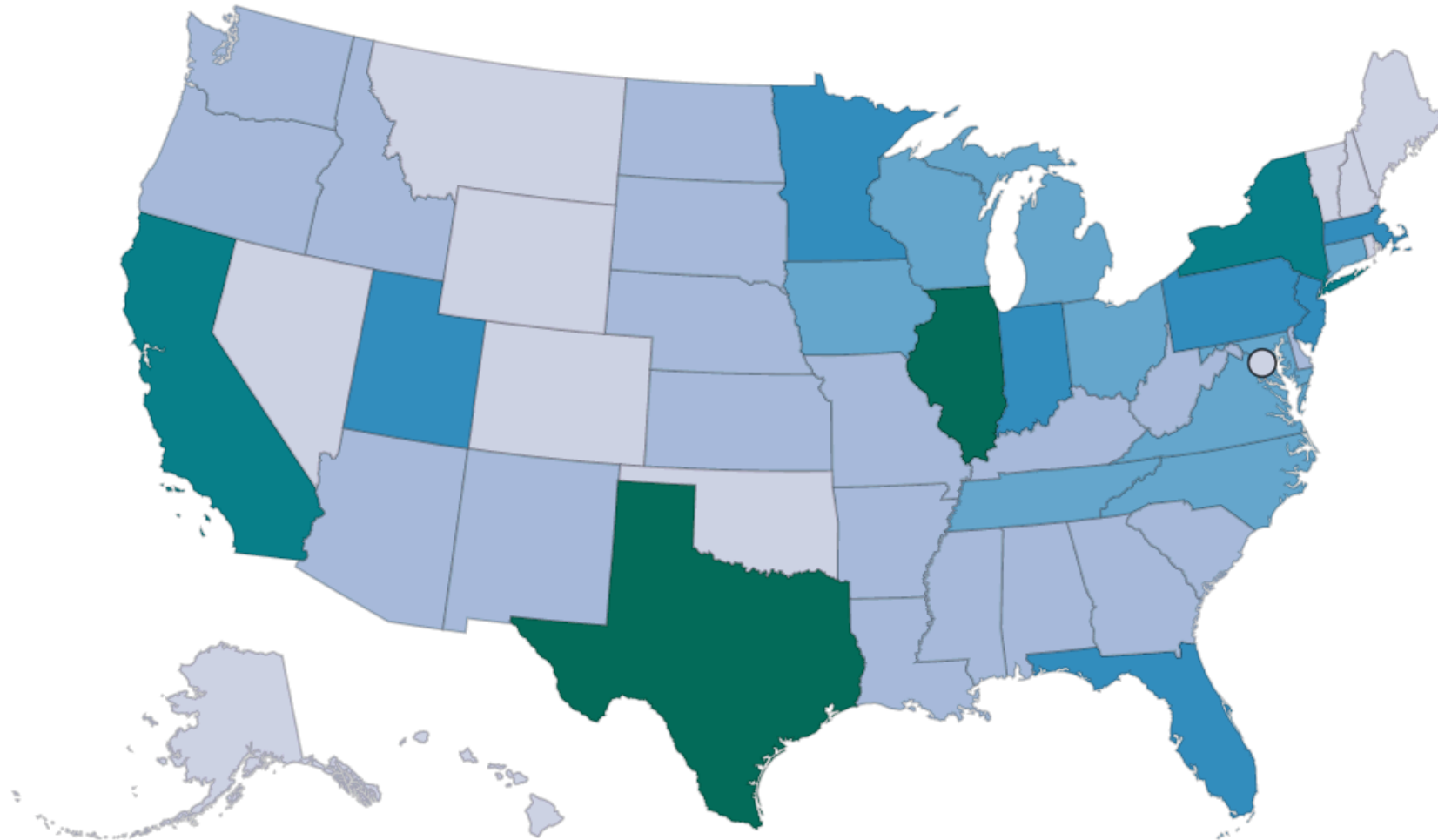
Dates of New Cases Recorded



Numbers do not sum to 2,807 due to missing admission dates.

Source: CDC.gov

Number of Hospitalized Cases or Deaths



Legend

Number of hospitalized EVALI cases or deaths per state

- 0 cases
- 1-9 cases
- 10-49 cases
- 50-99 cases
- 100-149 cases
- 150-199 cases
- 200-249 cases

Territories AS GU MH FM PW PR VI



VALI Definition

Use of E-cigarettes **within 90 days** of symptom onset

Bilateral pulmonary infiltrates on CXR or CT
on presentation

Absence of pulmonary infection or record of **other plausible diagnosis** (e.g. no rheumatologic disease)

Clinical Presentation

Symptom	Total cohort (n= 98)
Any Respiratory Symptom	95 (97%)
Dyspnea	83 (85%)
Cough	83 (85%)
Any Chest Pain	51 (52%)
Pleuritic Chest Pain	35 (36%)
Hemoptysis	8 (8%)
Any Gastrointestinal Symptoms	75 (77%)
Nausea	65 (66%)
Emesis	60 (61%)
Abdominal Pain	33 (34%)
Constitutional Symptoms	98 (100%)

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Some cohorts 90%
of pts had GI sx



Clinical Presentation

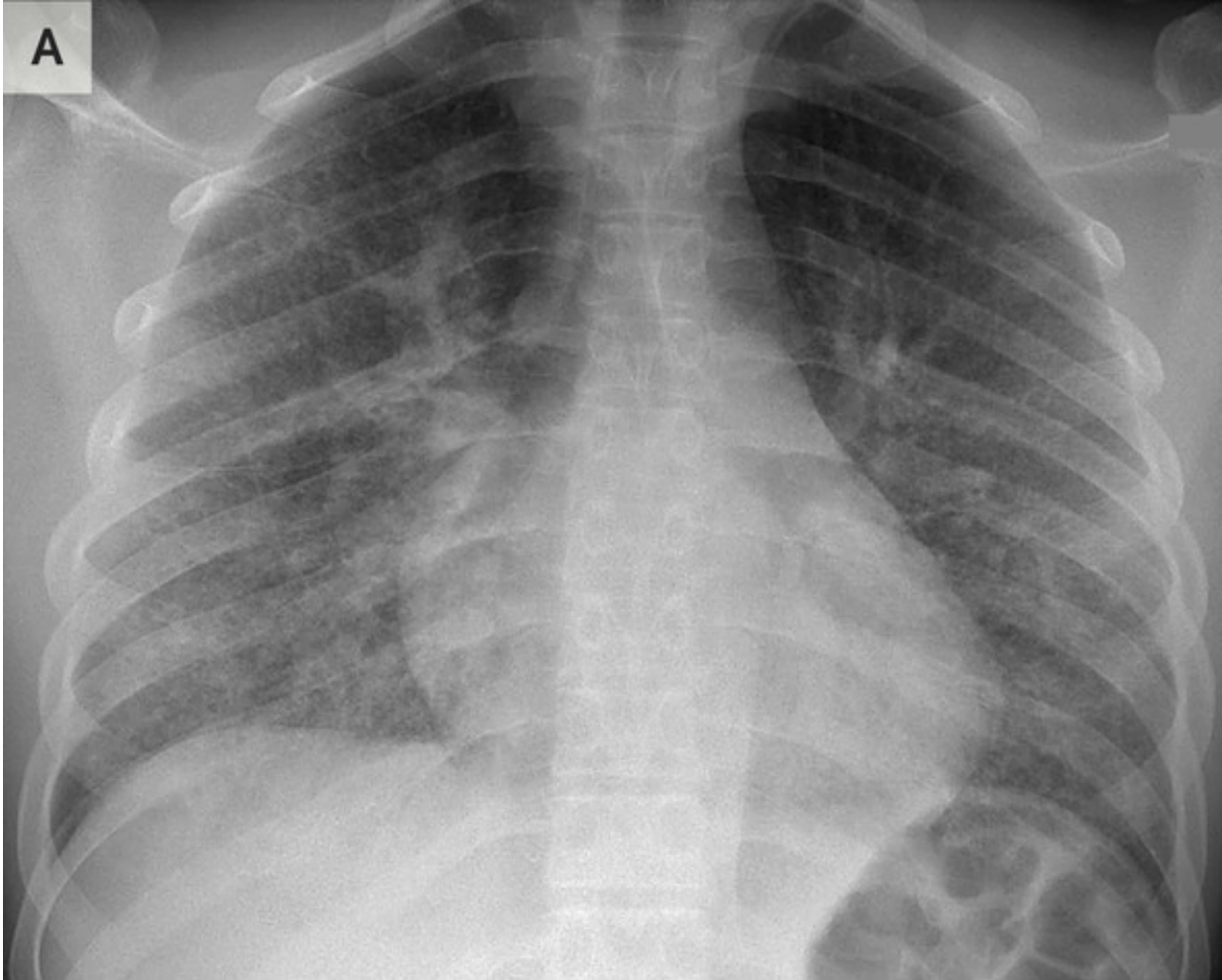
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Clinical Presentation

Signs	Total cohort (n= 93)
Temperature $\geq 38^{\circ}\text{C}$	34 (57%)
Heart Rate > 100 bpm	50 (83%)
Respiratory Rate > 20	43 (72%)
Oxygen Saturation	
$\geq 95\%$	8 (13%)
89-94%	19 (32%)
$\leq 88\%$	31 (52%)

More variability of initial vital sign presentation
between trial groups

Imaging

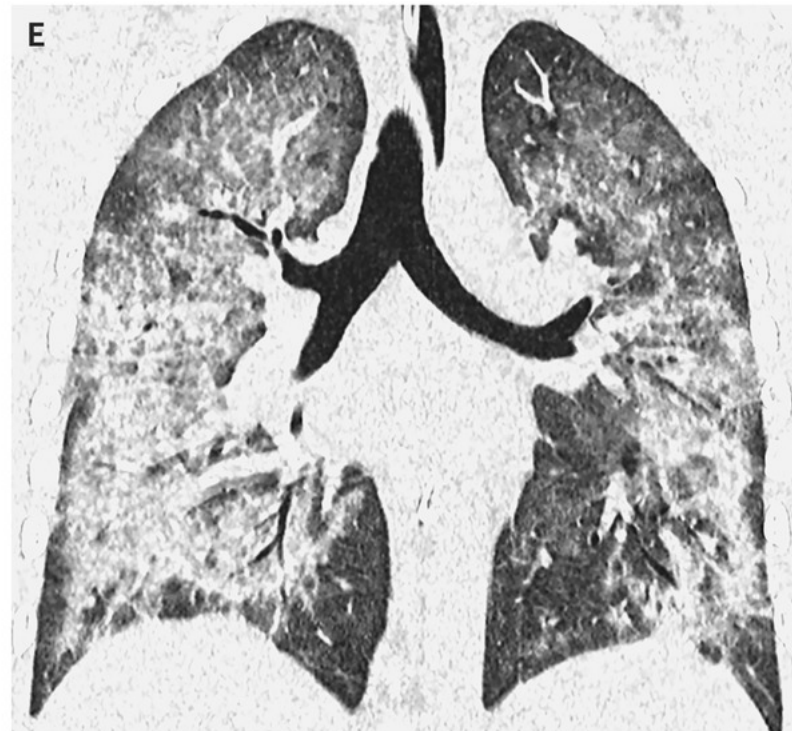
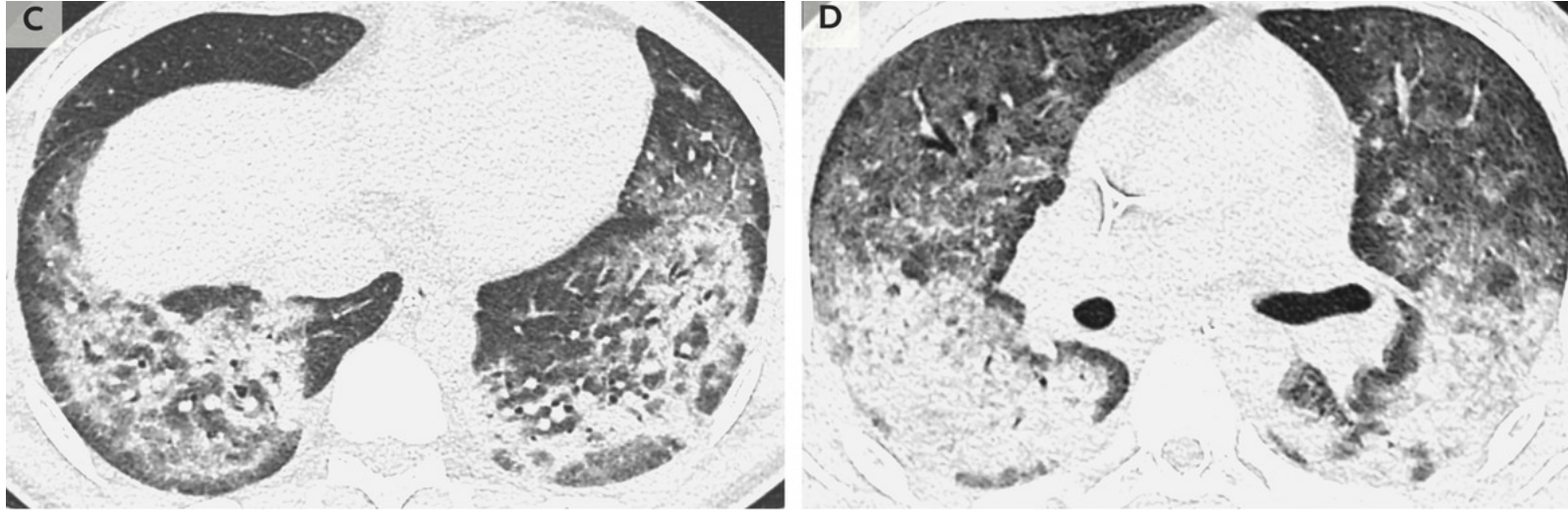


Admission XR



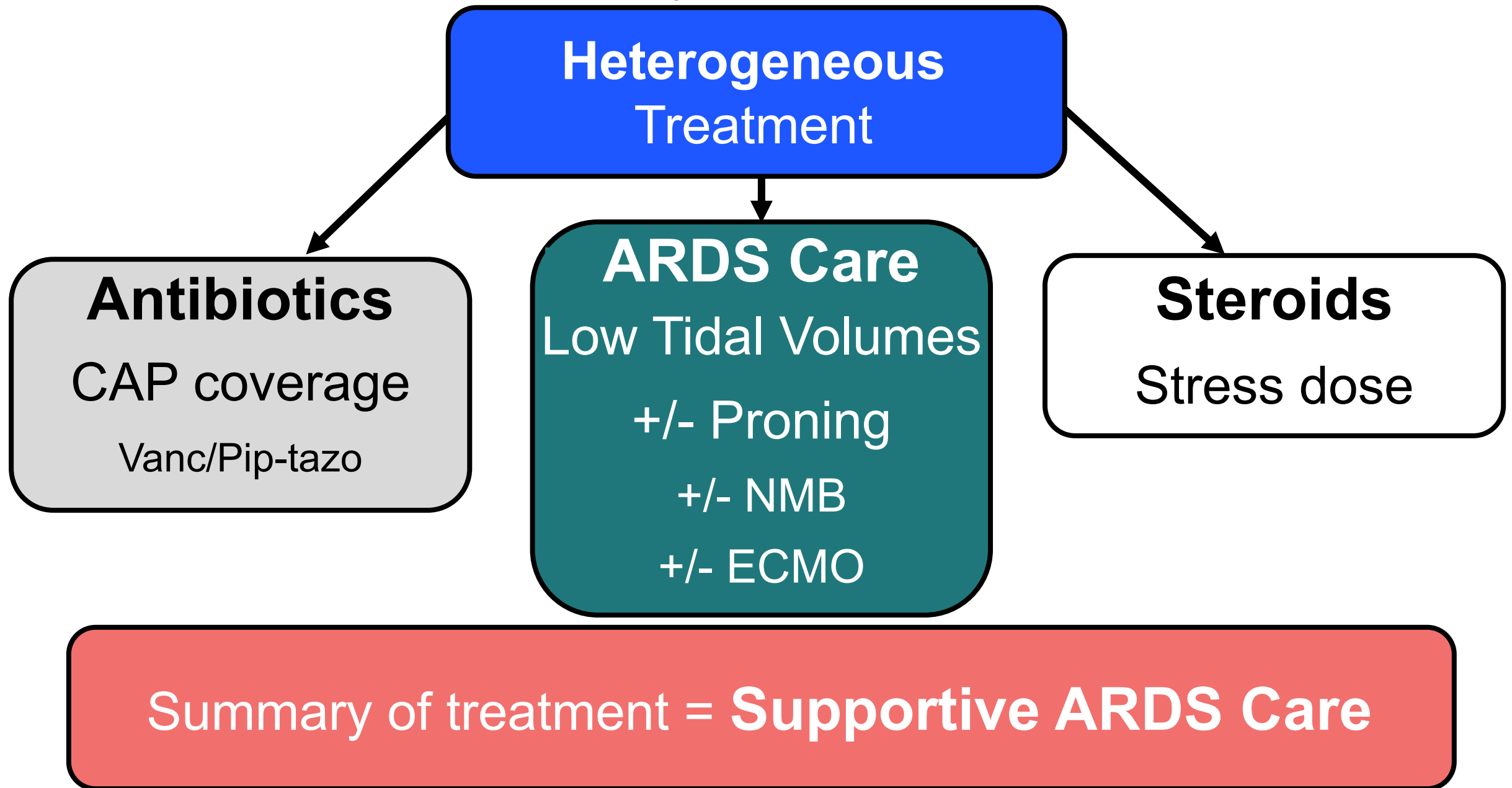
12hrs after admit

Imaging



~12hrs after admit

Summary of Treatment



Clinical Outcomes

Illinois + Wisconsin

95% Hospitalized

56% Admitted
to ICU

46% Intubated

48% ARDS

2 on ECMO

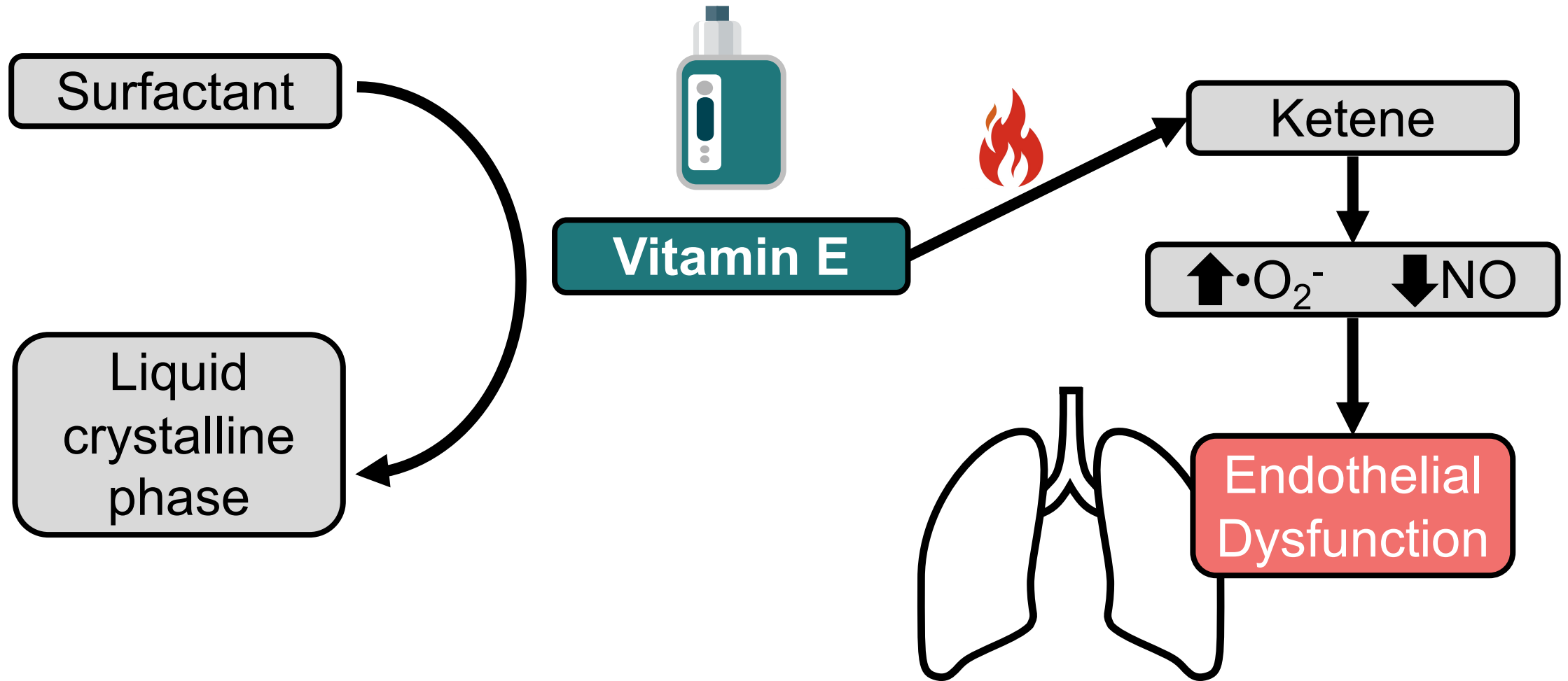
1 Died

United States

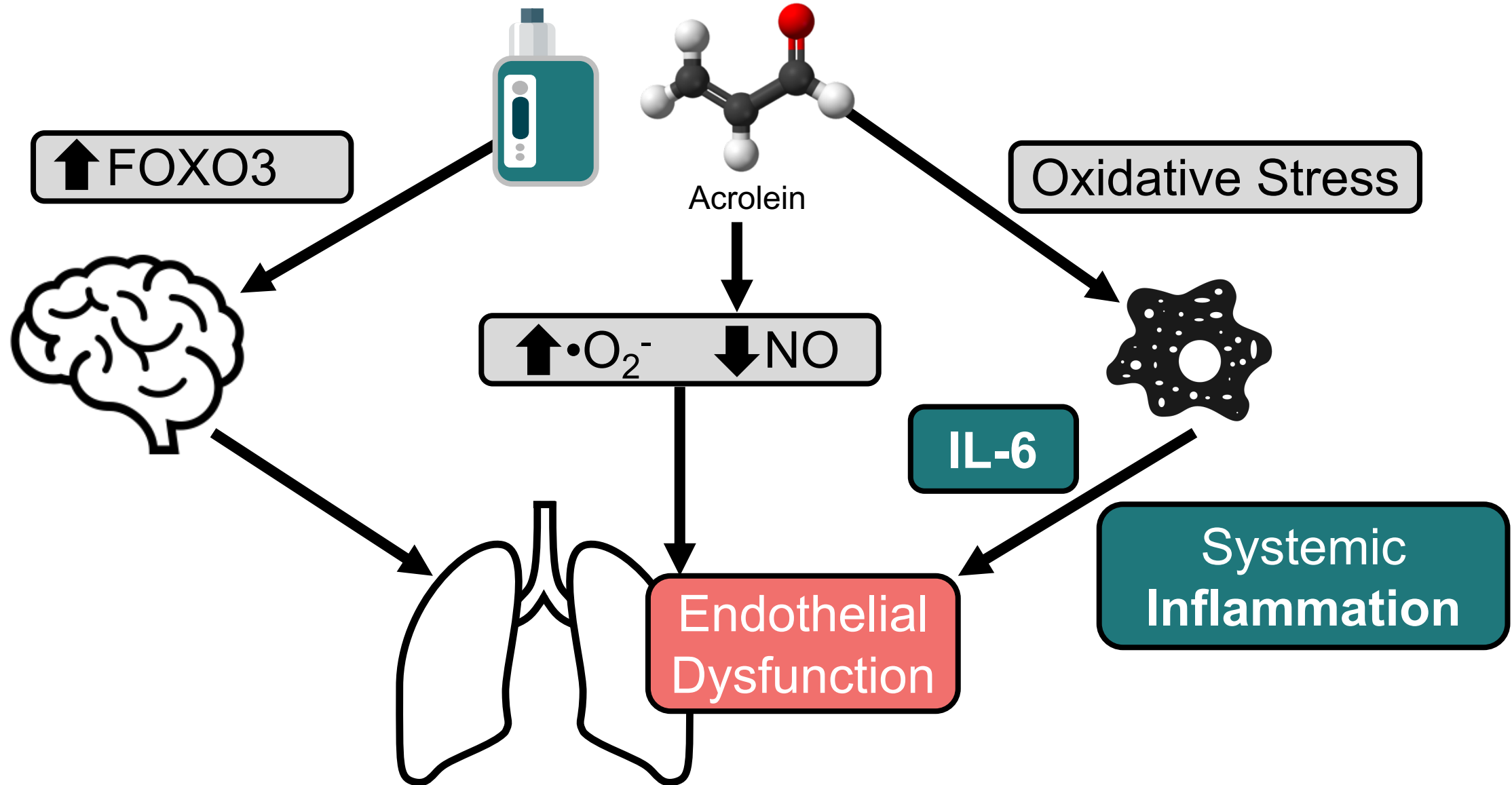
2,807
total cases

68 Deaths

VALI Pathophysiology – Vitamin E



VALI Pathophysiology – Acrolein



OTHER Vaping-Related Lung Disease

Pneumoconiosis

Secondary to **Cobalt Inhalation** from the heating coil

Looks exactly like berylliosis

Inflammatory Lung Disease

Hypersensitivity Pneumonitis

Eosinophilic Pneumonia

Diffuse Alveolar Hemorrhage

Inhalation Injury

Pneumothorax

Pneumomediastinum

Burns from modified devices

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25 year old man w/ PTSD, tobacco use who presents to clinic:

“We know cigarettes are bad for you, so why not do what I can to quit them right I’ll try and cut down on vaping next, I don’t modify my vape pen so I’m not worried.”

- A. There is limited data on E-cigarette/vaping use in smoking cessation
- B. The use of E-cigarettes reduces total tobacco product consumption
- C. E-cigarette use leads to dual consumption of tobacco & vaping

Vaping & Tobacco Use

Possible Positives

↑ **Successful quit rates**

When compared to nicotine product of their choice

(However MOST patients were still vaping even if they successfully quit cigarettes)

Possible Negatives

↑ **Relapse rates**

Compared to traditional NRT
Relapse seen in long-term abstinence

↑ **Dual Consumption**

↑ **Frequency of use**

Rehan, et al Curr Drug Saf. 2018;13(2):92-101

Dai, et al Drug & Alc Dep. 2019; 199:10-17

Am J Prev Med 2017;52(2):e33–e66

Vaping & Tobacco Use

Possible Positives

↑ Successful quit rates

When compared to nicotine replacement product of the same strength (e.g., transdermal patch, nicotine gum, nicotine inhalation therapy)

Possible Negatives

↑ Successful quit rates

When compared to traditional NRT
Relapse seen in long-term abstinence

↑ Dual Consumption

↑ Frequency of use

Trend towards no benefit or harm

Rehan, et al Curr Drug Saf. 2018;13(2):92-101

Dai, et al Drug & Alc Dep. 2019; 199:10-17

Am J Prev Med 2017;52(2):e33–e66

Hajek et. al N Engl J Med Feb 2019; 380:629-637

Conclusions




E-cigarettes are now **modifiable** which can lead to specific complications



VALI is thought to be secondary to **Vitamin E Acetate** from THC products OR **Acrolein** from nicotine products



E-cigarettes have been **linked to OTHER pulmonary diseases** (particularly with modifications)



E-cigarettes have mixed results for smoking cessation, with a trend towards **dual consumption**

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