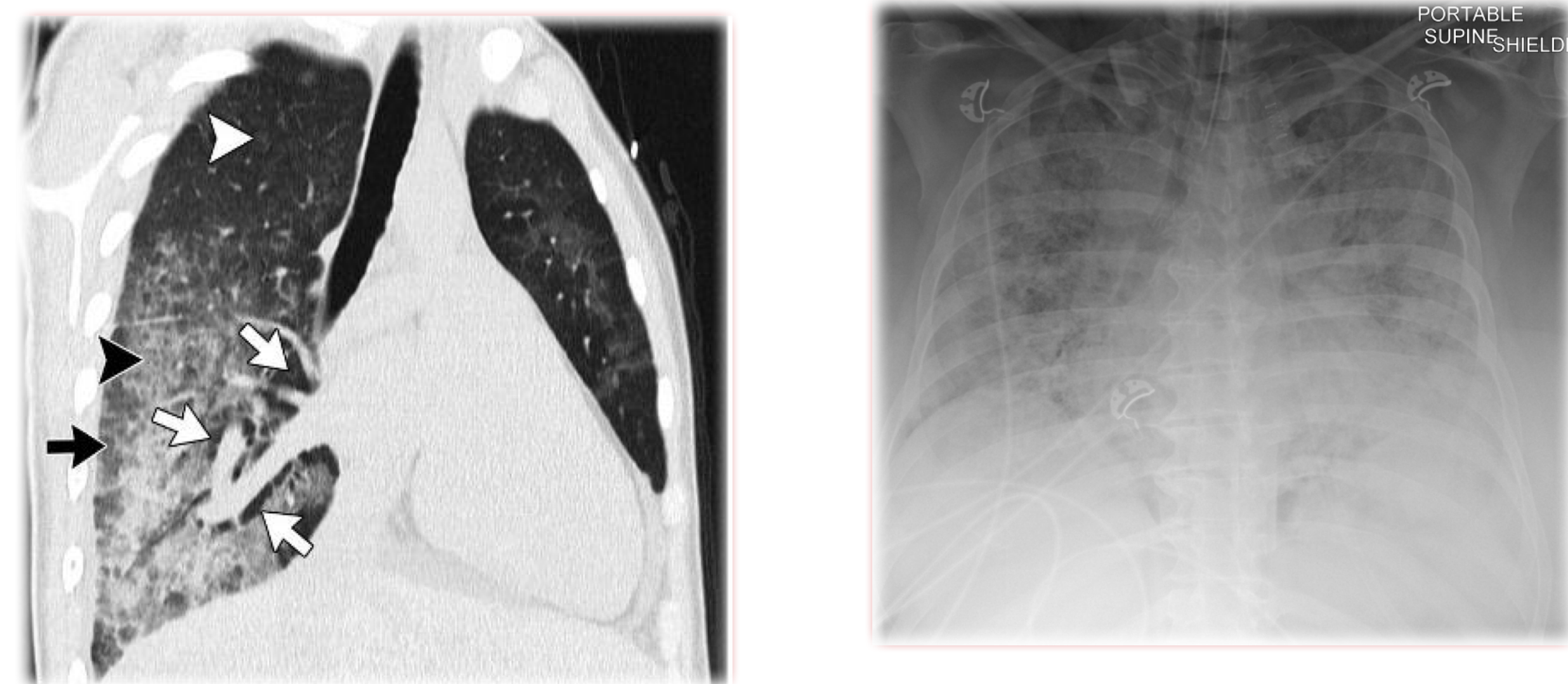




### Introduction

- E-cigarettes introduced to US market in 2007.
- Battery operated devices that heat up an e-liquid/ e-oil that produces an aerosol containing nicotine, THC or CBD.
- Chemicals, flavorings, heavy metals lead, tin, nickel, volatile organic compounds, carcinogens, and ultrafine particles are found in the aerosol of e-cigarettes.
- Vaping involves inhaling the aerosol delivered by e-cigarettes into the lungs.
- Vaping has caused pulmonary injury, cardiovascular damage, thermal injuries secondary to explosions.
- In 2019 an epidemic of E-cigarette or vaping product-use associated lung injury (EVALI), has killed at least 68 people and led to over 2800 hospitalizations.
- EVALI mimics viral-like illness: Presents with respiratory (98%), gastrointestinal (81%), and constitutional symptoms (100%).
- EVALI presents as pneumonitis-like reactions with pathologic findings of diffuse alveolar hemorrhage, pneumonitis, organizing pneumonia, and bronchiolitis. Typical chest imaging findings include "ground glass opacities" or hazy opacities.



### Background and Significance

- E-cigarettes are unregulated by the FDA, not approved for smoking cessation.
- Use of E-cigarettes increased by 1800% in the youth from 2011-2019. High school students: 11% to 27.5% (2017-2019), middle school students 0.6% to 10.5% (2011-2019), young adults (18-24) 2.4% to 7.5% (2012-2018).
- 1 in every 20 Americans vape, 1 in 3 users vape daily.
- 66% of hospitalized EVALI patients were male, 34% female.
- Median age of hospitalized patients was 24 years old.
- Vitamin E Acetate believed to be causative agent of EVALI; not the sole culprit.
- 75%-80% of patients report use of THC vaping.
- Provider knowledge gaps in identification, screening, and management of EVALI.
- There are no validated screening tools to screen for EVALI in clinical practice.
- Emergency providers require education about EVALI, screening for EVALI, and education of treatment guidelines.

### Clinical Question

Does a screening tool to identify patients presenting to the emergency department with symptoms of EVALI, lead to the identification of EVALI patients for early diagnosis and treatment as compared to not using a screening tool?

### Aims and Objectives

**Aim:** To identify EVALI patients via the use of a screening tool for early diagnosis and treatment to reduce severe patient outcomes.

**Objectives:**

- Assess EVALI knowledge gains after educational intervention.
- Create and implement EVALI screening tool.
- Assess the number of patients identified with EVALI before and after screening tool.

### Methods

- Design:** Pre/Posttest, Retrospective & Prospective Chart Review.
- Setting:** Emergency Department in Monmouth County, NJ.
- Convenience Sampling:** (N=50) 39 RNs, 6 MDs, 4 PAs, 1 NP.
- Recruitment:** Emails, flyers, in person, and huddles.
- Interventions:** EVALI screening tool, pre & posttest, vaping seminar, Likert Survey.
- Compensation:** \$75 Amazon Gift Card raffled.

### Contact

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### E-CIGARETTE OR VAPING PRODUCT USE-ASSOCIATED LUNG INJURY (EVALI) SCREENING TOOL

**1) Does the patient have any of the following symptoms? (Check all that apply)**

#### RESPIRATORY

- Cough
- Shortness of breath
- Pleuritic chest pain
- Hemoptysis

#### GASTROINTESTINAL

- Abdominal pain
- Nausea/Vomiting
- Diarrhea

#### CONSTITUTIONAL

- Fevers/chills
- Body aches/headaches
- Fatigue
- Weight Loss

**2) Does the patient have any of the following physical exam findings? (Check all that apply)**

- Tachypnea (>20 breaths per min)
- Hypoxemia (less than 95%)
- Fever (>100.4)
- Tachycardia (>100 bmp)

**3) Is the patient a current e-cigarette/vape user?**

- YES
- NO

**4) Has the patient vaped within the last 30-90 days?**

- YES
- NO

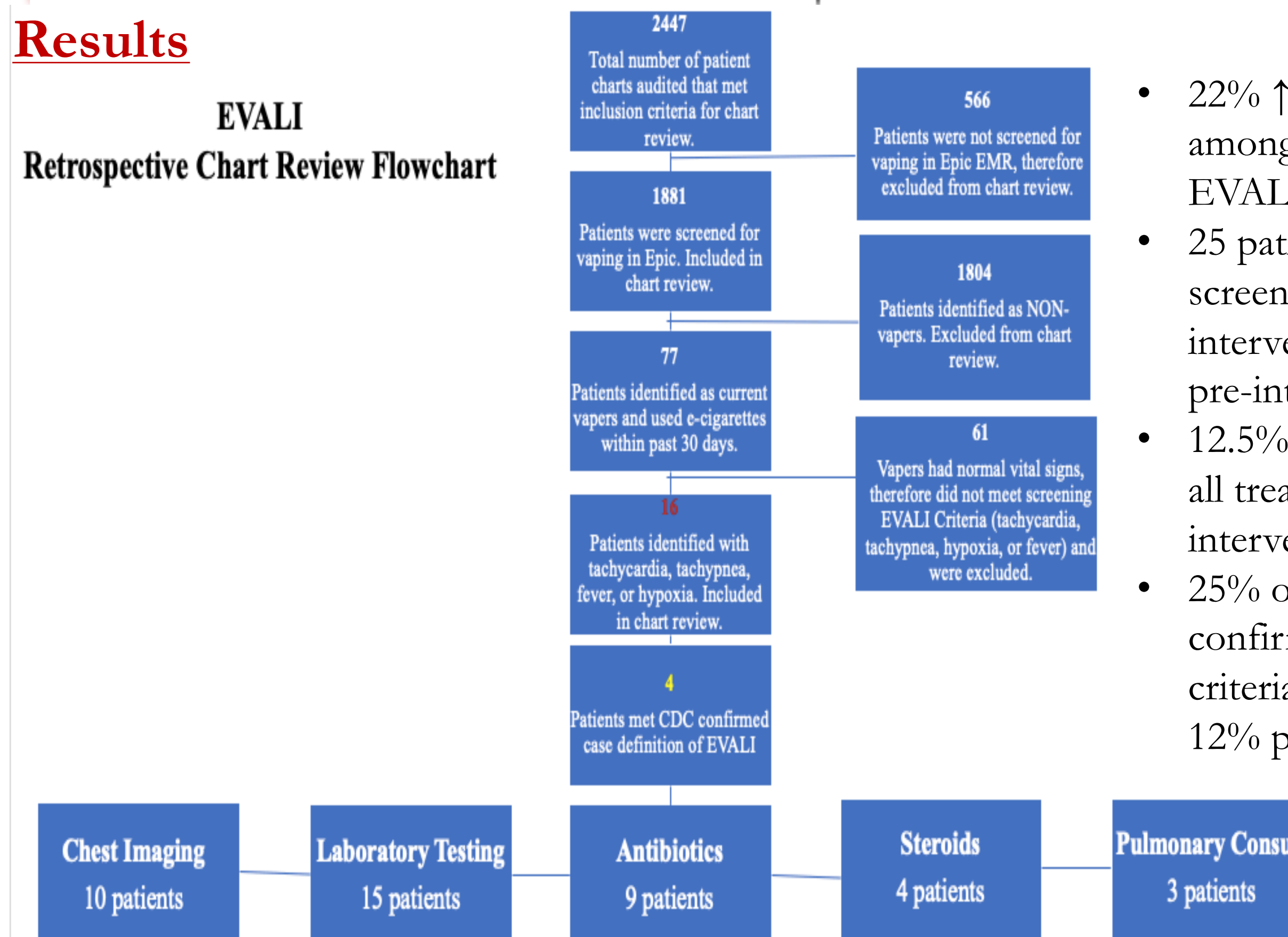
**5) What kind of vaping product does the patient use?**

- THC
- Nicotine
- Other

**EVALI SHOULD BE CONSIDERED IF SECTIONS 1-4 ARE CHECKED. CHEST IMAGING IS RECOMMENDED. PLEASE NOTIFY PROVIDER.**

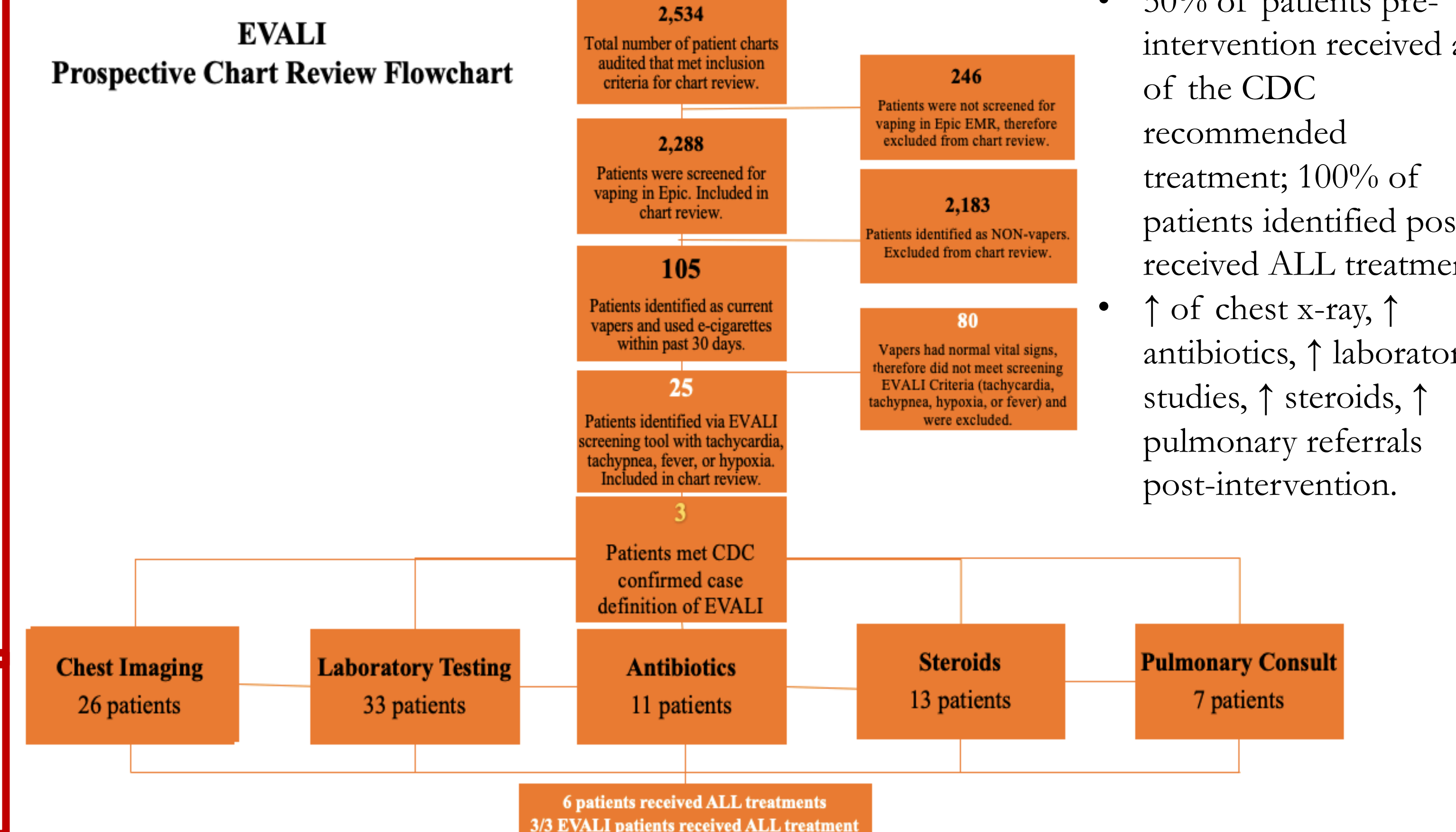
### Results

#### EVALI Retrospective Chart Review Flowchart



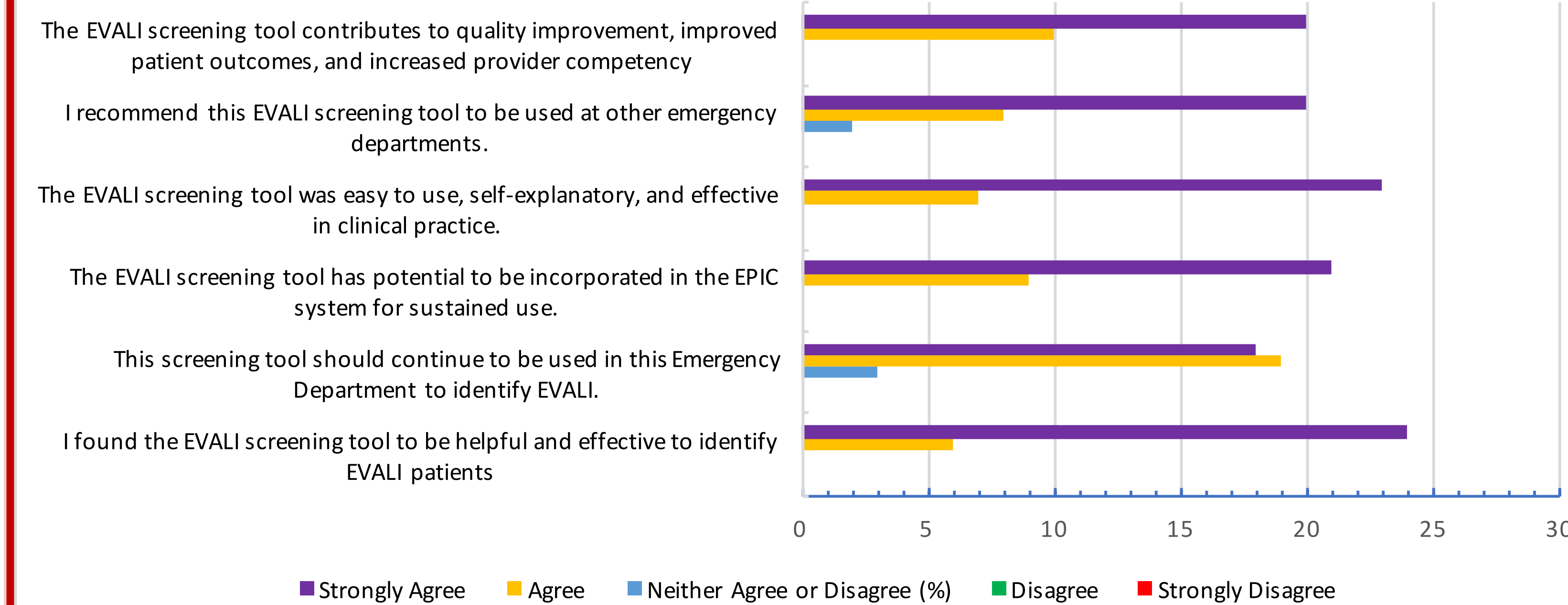
- 22% ↑ in vaping screening among all ER patients after EVALI Screening tool.
- 25 patients identified via screening tool post-intervention; 16 patients pre-intervention
- 12.5% of patients received all treatment pre-intervention and 24% post.
- 25% of patients met CDC confirmed case EVALI criteria pre-intervention; 12% post

#### EVALI Prospective Chart Review Flowchart



- 50% of patients pre-intervention received all of the CDC recommended treatment; 100% of patients identified post received ALL treatment.
- ↑ of chest x-ray, ↑ antibiotics, ↑ laboratory studies, ↑ steroids, ↑ pulmonary referrals post-intervention.

### EVALI Screening Tool Likert Survey Responses



Likert survey shows that participants found the screening tool effective, feasible, recommended for sustained use, led to quality improvement, ↑ patient outcomes, and ↑ provider competency.

- A Wilcoxon Signed Rank Test showed statistically significant ↑ in test scores

Provider	Pretest		Posttest		p <sup>a</sup>
	Mean(SD)	Median(IQR)	Mean(SD)	Median(IQR)	
Registered Nurse (n=39)	5.7(1.78)	6(3)	9.6(0.64)	10(1)	<.001
Nurse Practitioner (n=1)	5(--)	5(0)	8(--)	8(0)	--
Physician Assistant (n=4)	6.5(1.29)	6.5(1.5)	9(0.82)	9(0.5)	.044
Physician (n=6)	6.7(0.82)	6.5(1)	9.5(0.55)	9.5(1.0)	.017
<b>Total (n=50)</b>	<b>5.84(1.67)</b>	<b>6(2)</b>	<b>9.5(0.68)</b>	<b>10(1)</b>	<b>&lt;.001</b>

a- Wilcoxon Signed Rank Test

### Discussion

- Provider knowledge gaps addressed with education, post-test scores showed statistically significant increase.
  - General increase of vaping screening among all ED patients.
  - There were 25% confirmed cases of EVALI prior and 14% after EVALI screening tool.
  - 50% more patients received all CDC recommended treatment post intervention.
- Likert Survey suggests overall positive feedback from participants for continued use, effectiveness, relevance, and competency increase.
- EVALI patients presented with respiratory (100%), gastrointestinal (49%), and constitutional symptoms (100%).
  - 71% of EVALI patients male; 29% female.
- Product used among hospitalized EVALI patients THC (43%), nicotine (43%), and CBD (14%).

### Implications

- Practice:** There is a need for implementation of EVALI screening in the ED.
- Policy:** Policies addressing vaping screening should be considered, developed, and validated to guide providers.
- Education:** Vaping education should be implemented for all ED personal hired & yearly educational refresher courses should be studied.
- Sustainability:** EVALI screening should be implemented in the EMR.

### Limitations

- COVID-19 clinical presentation and chest imaging findings are extremely similar to EVALI.
  - COVID-19 makes EVALI diagnosis challenging.
  - IRB delayed project approval due to pandemic.
  - Not all ED providers participated in the originally estimated 61 participants for study.
- Physicians, PAs, and NP, did not attend in-person seminar leading to potentially underestimation of the effect of the intervention

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