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Clearing the Haze

Adolescent Vaping and Associated Lung Injuries

March 26, 2020

0910-1010



Presenter(s)



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Adolescent Medicine

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Harshita J. Saxena, MD is an Adolescent Medicine Board certified Pediatrician who has been serving military families in the Adolescent and Young Adult Medicine Clinic at Walter Reed National Military Medical Center since 2012. She completed her Fellowship training at Children's National Medical Center in Washington, DC, providing care to teens of underserved communities and has co-edited a textbook: "Basics in Adolescent Medicine: A Practical Manual for Signs, Symptoms and Solutions" for the general practitioner published in 2014. She is a 2nd generation Adolescent Medicine physician, inspired to follow in her mother's footsteps having grown up listening to stories of teen resilience in the face of adversity and strife and being profoundly impressed by the potential to impact a teen's life by taking the time to listen to them.

Michael McCown, DO



COL Michael McCown completed his pediatric residency at the National Capital Consortium in Bethesda, MD and his fellowship in Pediatric Pulmonary Medicine at Boston Children's Hospital in Boston, MA. He has been active in clinic pulmonology and hospital pediatrics. COL McCown is an active contributor to multiple national organizations, serving as the Vice Chair of the Pediatric Core in the American Thoracic Society, and on committees developing Clinical Practice Guidelines for the Cystic Fibrosis Foundation.

Disclosures



- COL McCown and Dr. Saxena have no relevant financial or non-financial relationships to disclose relating to the content of this activity.
- The views expressed in this presentation are those of the author and do not necessarily reflect the official policy or position of the Department of Defense, not the U.S. Government.
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Learning Objectives

- 1. Identify the available devices, mechanics of use, and common ingredients of an E-cigarette.**
- 2. Explain the historic and current use trends of e-cigarettes among adolescents.**
- 3. Discuss the ongoing legislative efforts to curb the sales and use of e-cigarettes in teen patients.**
- 4. Select strategies to screen for use, educate teens and families and provide counsel on e-cigarette use cessation.**
- 5. Describe the pathophysiology of E-cigarette or Vaping product use-Associated Lung Injury (EVALI).**
- 6. Review the Center for Disease Control and Prevention (CDC) guidelines for treatment of lung diseases suspected to be caused by e-cigarettes.**

E-Cigarettes

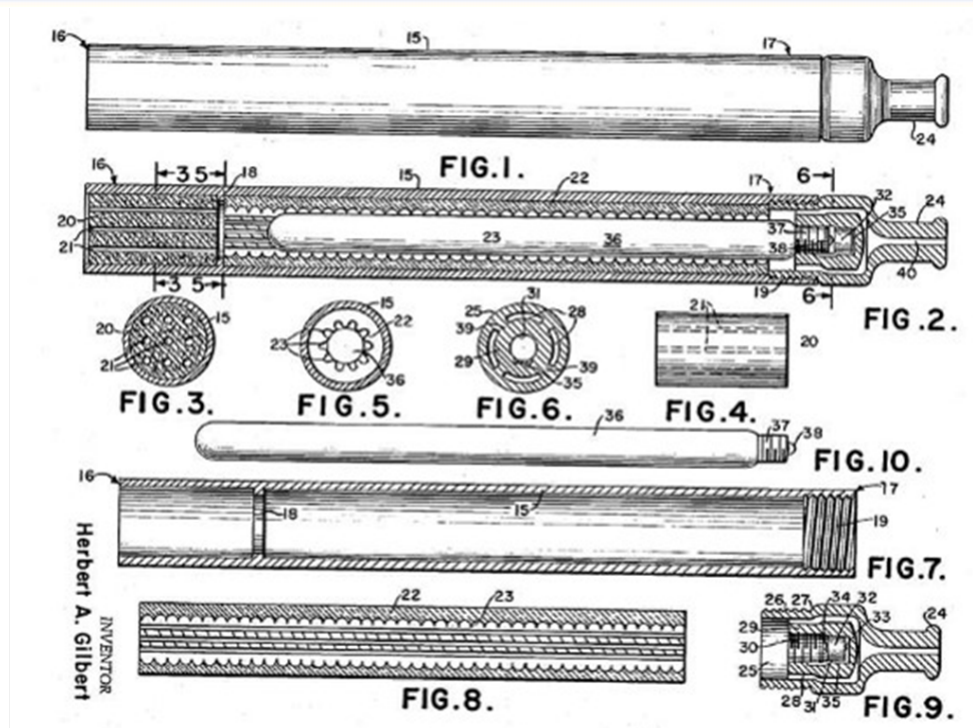
**Electronic Nicotine
Delivery Systems
(ENDS)**

**Electronic cigarette
(E-cigarettes)**

**Vaping
Juuling
Dripping
Dabbing**

**Vapes
E-cigs
Vape Pens
Vape Sticks
Vapers
Pods
Mods
Juul
Vape Tanks**

Early Model



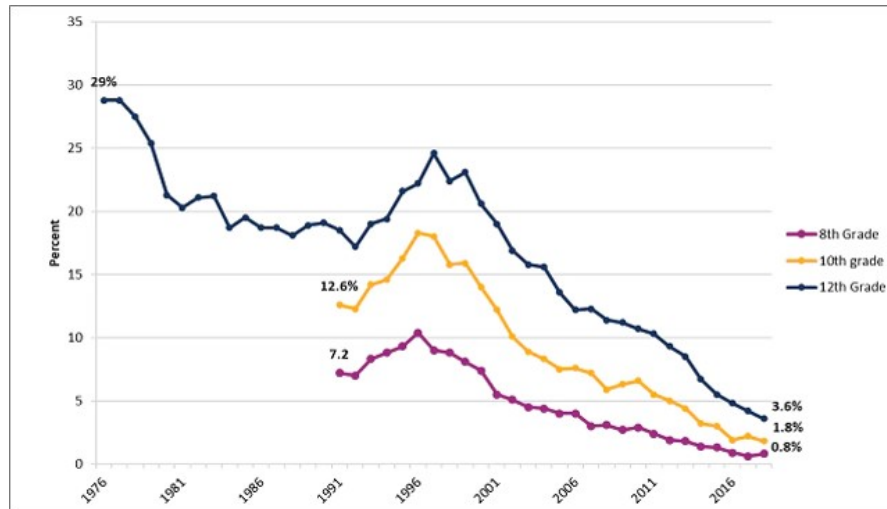
In 1963, Herbert A. Gilbert filed a patent for “a safe and harmless means for and method of smoking.” (U.S. Pat. No. 3,200,819)

2003



Used with Permission, Reuters News Agency

30 Day Prevalence of Daily Use of Cigarettes, by Grade, 1976-2018



Source: Johnston, L. D., Miech, R. A., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Patrick, M. E. (2019). *Monitoring the Future national survey results on drug use 1975-2018: Overview, key findings on adolescent drug use*. Ann Arbor: Institute for Social Research, University of Michigan. Retrieved from <http://www.monitoringthefuture.org/pubs/monographs/mtfoverview2018.pdf-PDF>

2007

2008

2009

"The electronic cigarette is not a proven nicotine replacement therapy," said Dr Ala Alwan, Assistant Director-General of WHO's Noncommunicable Diseases and Mental Health Cluster. "WHO has no scientific evidence to confirm the product's safety and efficacy. Its marketers should immediately remove from their web sites and other informational materials any suggestion that WHO considers it to be a safe and effective smoking cessation aid."

<https://www.who.int/mediacentre/news/releases/2008/pr34/en/>

The Family Smoking Prevention and Tobacco Control Act of 2009

Summary and Review for Informed Decision Making at the State and Local Level

"A cigarette is the only consumer product which when used as directed kills its consumer." —Dr. Gro Harlem Brundtland

On June 22, 2009, President Barack Obama signed into law the Family Smoking Prevention and Tobacco Control Act¹. The legislation provided the Federal Food and Drug Administration (FDA) with the authority to regulate tobacco products.

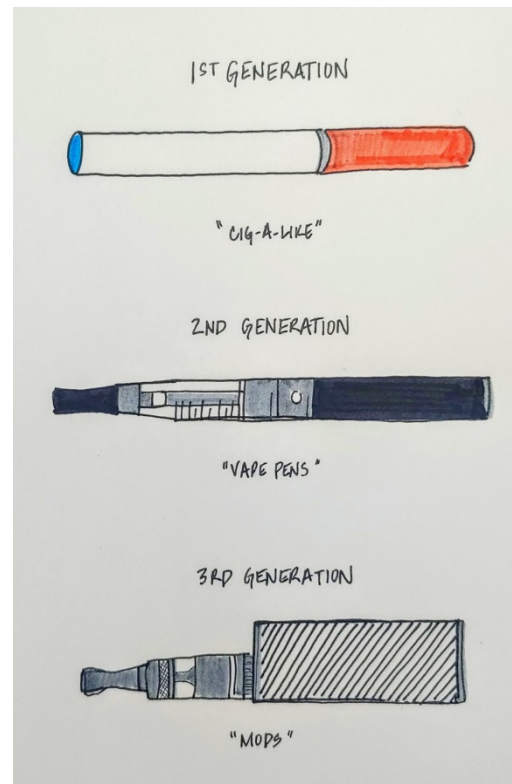
<https://www.slideshare.net/HPPofME/fda-tobacco-control-act-06-10>

Evolution of E-Cigarettes

“Cig-a-likes” Disposable/reusable cartridges

“Vapes” or Vape Pens
Refillable reservoir for e-liquid

“Mods” or Tank Systems
Wattage and voltage are modifiable



Drawing by Harshita J. Saxena

2014



VAPE

Oxford dictionary's word of the year, used as both a noun as in an "electronic cigarette or similar device" or a verb as in one would "inhale and exhale the vapor produced by an electronic cigarette or similar device," beating out serious contenders such as *Bae*, *even* and *salty*.



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2015



4th Generation: JUUL, Suorin, SMPO

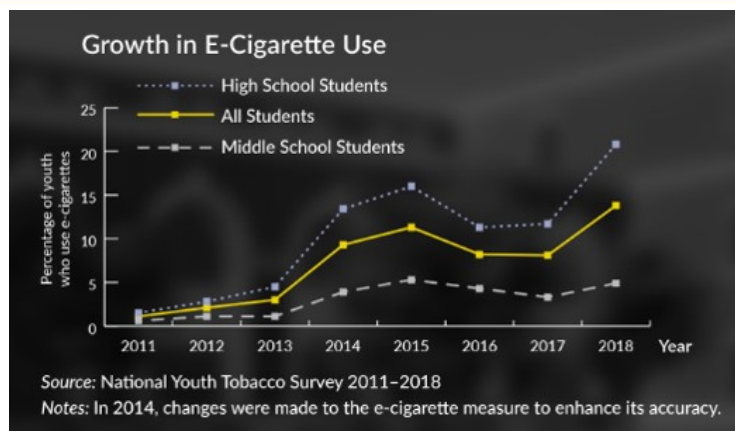


<http://cuatower.com/2018/10/vaping-is-it-good-or-bad/>
Drawing by Sarah Ajai, used with permission.

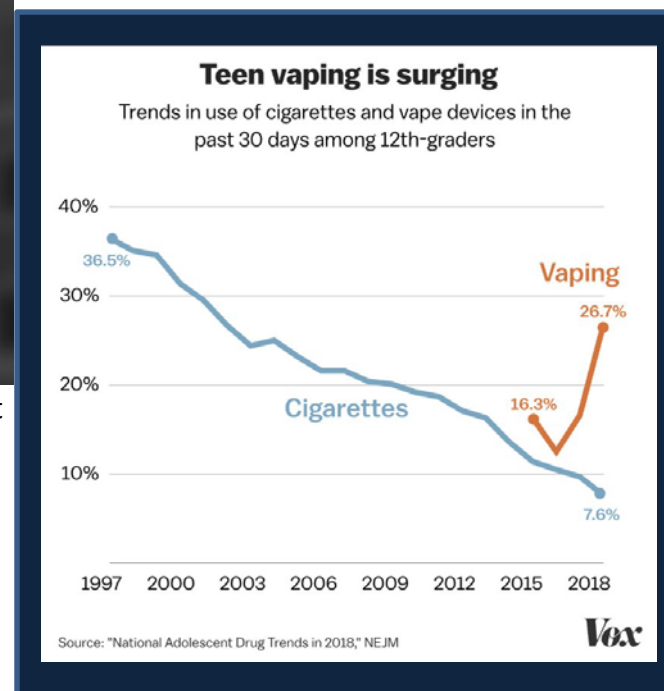


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2018



Surgeon General's Report



<https://www.vox.com/science-and-health/2018/5/1/17286638/juul-vaping-e-cigarette>

2019



Sept 11, 2019

Former FDA Commissioner Dr. Scott Gottlieb:

"E-cigs have become an almost ubiquitous – and dangerous – trend among teens. The disturbing and accelerating trajectory of use we're seeing in youth, and the resulting path to addiction, must end...The FDA won't tolerate a whole generation of young people becoming addicted to nicotine as a tradeoff for enabling adults to have unfettered access to these same products."

<https://www.fda.gov/news-events/press-announcements/statement-fda-commissioner-scott-gottlieb-md-new-steps-address-epidemic-youth-e-cigarette-use>



2020



House Approves Bill To Ban The Sale Of Flavored E-Cigarettes

The White House said in a statement that President Donald Trump's administration opposes the bill.

By Associated Press, News Partner
Mar 2, 2020 12:39 pm ET



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

February 27, 2020
(House)

STATEMENT OF ADMINISTRATION POLICY

H.R. 2339 – Reversing the Youth Tobacco Epidemic Act of 2019

(Rep. Pallone, D-NJ, and 126 cosponsors)

The Administration opposes H.R. 2339. The Administration is encouraged by legislative efforts to protect American youth from the harms of addiction and unsafe tobacco products, and it also acknowledges that H.R. 2339 exempts premium cigars, which have comparatively lower youth usage rates, from certain regulatory burdens. Unfortunately, however, this bill contains provisions that are unsupported by the available evidence regarding harm reduction and American tobacco use habits and another provision that raises constitutional concerns. Accordingly, the Administration cannot support H.R. 2339 in its current form.

The Administration cannot support H.R. 2339's counterproductive efforts to restrict access to products that may provide a less harmful alternative to millions of adults who smoke combustible cigarettes. This includes the bill's prohibition of menthol e-liquids, which available evidence indicates are used relatively rarely by youth. It also includes the bill's approach to remote retail sales. At this time, problems surrounding such sales should be addressed through the application of age verification technologies rather than, as this bill would do, prohibiting such sales entirely.

The Administration is also concerned about the constitutionality of a provision in the bill that prohibits certain advertising practices with respect to electronic nicotine delivery system (ENDS) products. The bill would prohibit marketing and advertising that "appeals to an individual under 21 years of age." This standard may not satisfy the stringent vagueness test applied to regulations of speech under the Constitution's Due Process Clause.

State Laws



As of September 2019, not all states:

Define E-Cigarettes

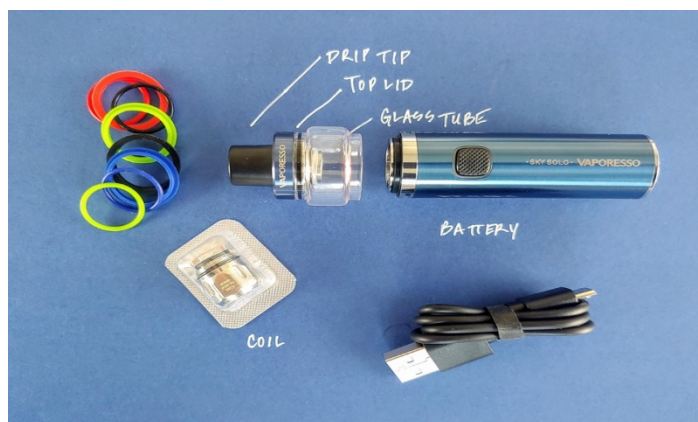
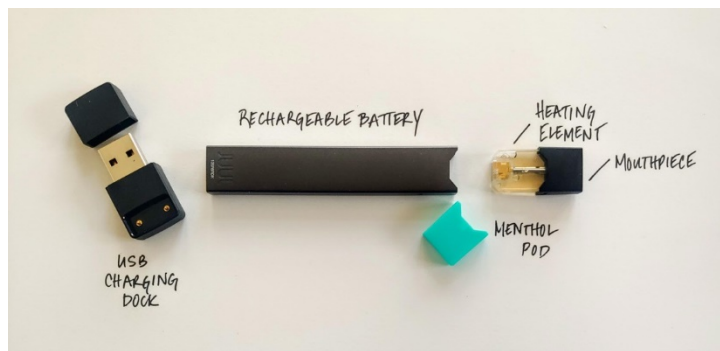
Tax E-cigarettes

Have product packaging laws

Require licensure for retail sales



E-Cigarette Elements



- Mouthpiece
- Reservoir or Tank
- Heating Coil or Atomizer
- Sensor/User Actuated Button
- Battery

Classification



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E-Liquids/Pods



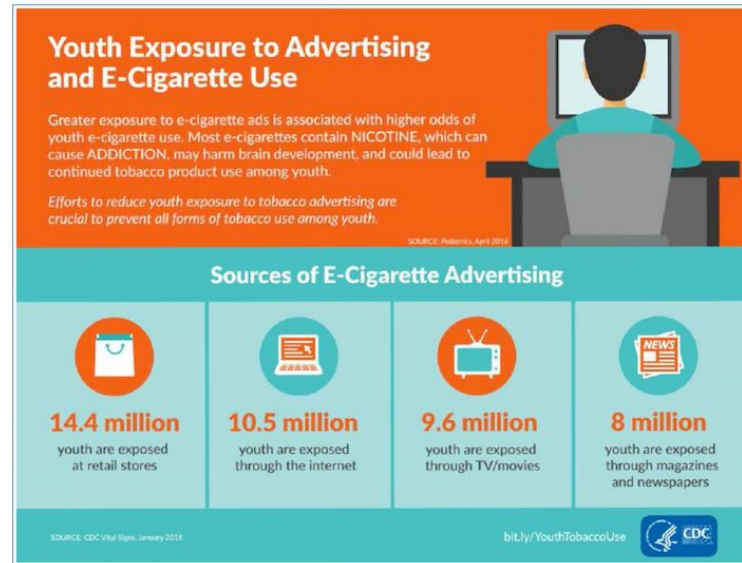
Picture taken by Harshita J. Saxena



Drawing by Harshita J. Saxena

Advertising

- 7 in 10 teens were exposed to e-cigarette advertisements in 2016 (Marynak K et al, 2018)
 - 68% retail stores
 - 40% online



https://www.cdc.gov/media/images/Releases/2016/p0425-CDC-ecig-marketing.pdf?s_cid=bb-osh-youth-graphic-009 title="Youth Exposure to Advertising and E-Cigarette

Social Media

- Vaping Tricks (Kong G et al, 2019)
 - 80% Male
 - 51.5% White
 - 85% 18-24 Years
 - 35% set to electronic/hip hop music
- Competitive Vaping
 - Cloud Chasing/Cloud Gazer
- Normalization of tobacco product use



"Vape NZ IMG_5380-2-April 10, 2016" by rodin1960 is licensed under CC BY-NC 2.0 

RISKS



- “Dual use”

Adolescents who use e-cigarettes are 3.5 times more likely to initiate conventional cigarette smoking.

(Soneji S et al, 2017 & 2018)

- Substance use: alcohol, marijuana and amphetamines

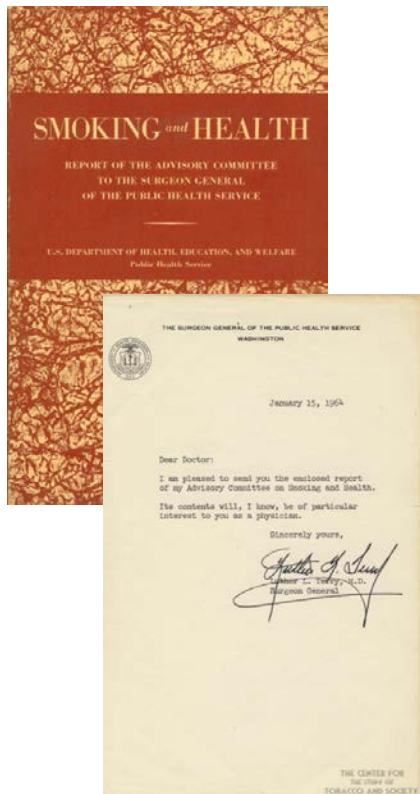
- Other problematic behaviors:

Violence: fighting and attempting suicide

Sexual risk behaviors

School-related problems: truancy, lower Grade Point Average (GPA)

Health Harms of E-cigarettes



- Known short and long term health risks associated with nicotine in conventional products
- Effects on developing brain
- Cardiovascular effects: increased heart rate and blood pressure
- Respiratory effects
- Carcinogenic potential: oxidative stress, chemicals that can cause DNA damage and mutagenesis
- Symptoms of dependence
- ADDICTION
- Long term effects? Unknowns?
- Unintended Injuries and Poisonings

Screening Tools

- Brief Screener for Tobacco, Alcohol and other Drugs
- Screening to Brief Intervention

S2BI:

In the PAST YEAR, how many times have you used:	Never	Once or twice	Monthly	Weekly
Tobacco:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alcohol:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marijuana:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

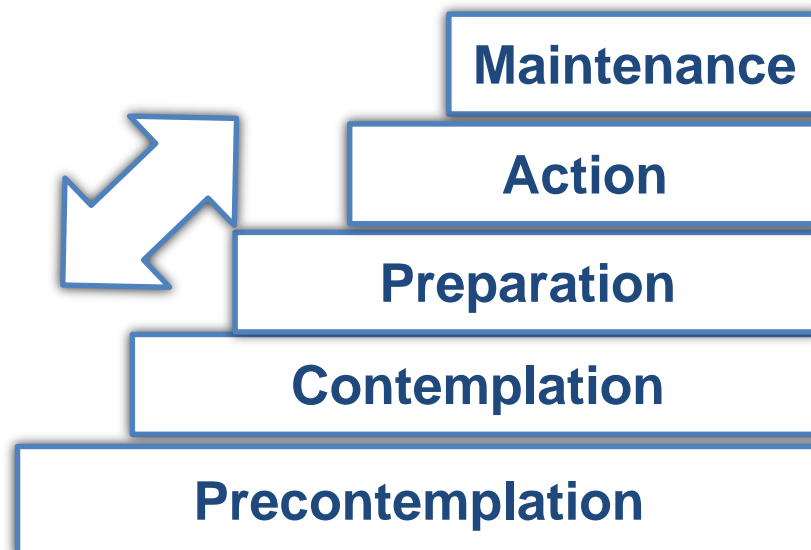
- HEADS

FRIENDS' USE	
Do you have friends who smoked cigarettes or used other tobacco products in the past year?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Do you have friends who drank beer, wine, or any drink containing alcohol in the past year?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Do you have friends who in the past year:	
- sniffed or "huffed" anything; - took illegal drugs like marijuana (weed, blunts), cocaine, etc; - took prescription medications that were not prescribed for them; or - took prescription or over-the-counter medications and took more than they were supposed to take?	
	<input type="checkbox"/> No <input type="checkbox"/> Yes
PERSONAL USE	
In the past year, have you smoked cigarettes or used other tobacco products?	<input type="checkbox"/> No <input type="checkbox"/> Yes
In the past year, have you had more than a few sips of beer, wine, or any drink containing alcohol?	<input type="checkbox"/> No <input type="checkbox"/> Yes
In the past year, have you:	
- sniffed or "huffed" anything; - taken illegal drugs like marijuana (weed, blunts), cocaine, etc; - taken prescription medications that were not prescribed for you; or - taken prescription or over-the-counter medications and took more than you were supposed to take?	
	<input type="checkbox"/> No <input type="checkbox"/> Yes
[IF DRUGS ARE ENDORSED IN THE PERSONAL USE QUESTION, ASK THE FOLLOWING:]	
Which of the following substances have you used in the past year? (check all that apply)	
<input type="checkbox"/> Marijuana or Hashish <input type="checkbox"/> Cocaine or crack <input type="checkbox"/> Heroin <input type="checkbox"/> Amphetamines or methamphetamine (nonpharmaceutical) <input type="checkbox"/> Hallucinogens (eg, Mushrooms, LSD) <input type="checkbox"/> Inhalants	
Which of the following medications have you used in the past year that were not prescribed for you or which you took more of than you were supposed to take? (check all that apply)	
<input type="checkbox"/> Prescription pain relievers (eg, morphine, percocet, vicodin, oxycontin, dilauid, methadone, buprenorphine) <input type="checkbox"/> Prescription sedatives (eg, Valium, Xanax, Klonopin, Ativan) <input type="checkbox"/> Prescription stimulants (eg, Adderall, Ritalin) <input type="checkbox"/> Over-the-Counter Medications (eg, Nyquil, Benadryl, cough medicine, sleeping pills)	
[FOR EACH SUBSTANCE WHERE USE WAS ENDORSED, ASK:]	
In the past 30 days, on how many days have you...	
smoked cigarettes or used other tobacco products/used alcohol/used [SUBSTANCE]?	<input type="checkbox"/> days
In the past 90 days, on how many days have you...	
smoked cigarettes or used other tobacco products/used alcohol/used [SUBSTANCE]?	<input type="checkbox"/> days
In the past year, on how many days have you...	
smoked cigarettes or used other tobacco products/used alcohol/used [SUBSTANCE]?	<input type="checkbox"/> days

Motivational Interviewing

Important to establish confidential and non-judgmental care

Stages of Change



Motivational Interviewing

Basic Principles

- Express Empathy
- Develop Discrepancy
- Roll with Resistance
- Support Self-efficacy

Techniques

- Open-Ended Questions
- Reflective Listening
- Affirmations
- Summary Statements

Counseling

- 5 Step algorithm: 5As/(6As)
 - ***Anticipate*** the risk of initiating smoking or vaping
 - ***Ask*** what? how often? why? pros and cons of use?
 - ***Advise*** using simple and youth tailored language
 - ***Assess*** motivations and readiness to quit
 - ***Assist*** resources for the patient and family. Therapy? Pharmacotherapy?
 - ***Arrange*** ongoing follow up

American Academy of Pediatrics(AAP) Policy Statement



- 1. The FDA should act immediately to regulate e-cigarettes and ban the sale of the products to people under 21 years old.**
- 2. Internet sales of e-cigarettes and e-cigarette solution should be banned.**
- 3. Efforts should be made to reduce youth demand, by banning characterizing flavors, including menthol in e-cigarettes.**
- 4. Advertising and promotion of e-cigarettes that are accessible to youth should be banned.**
- 5. E-cigarettes should be incorporated into current tobacco-free laws and ordinances where children and adolescents live, learn, play, work and visit.**
- 6. Pediatricians should screen for e-cigarette use, counsel about health effects and should not recommend e-cigarettes as a treatment option for tobacco cessation.**

Society for Adolescent Health and Medicine (SAHM) Position Statement



1. Advocate for policies and regulations to prevent marketing and sales of electronic cigarette (e-cigarette) products to youth.
2. Support public health-led education campaigns and educational curricula for schools, community programs, and health providers warning about the health risks of e-cigarette use by adolescent and young adults (AYAs).
3. Increase research to develop evidence-based guidelines for e-cigarette prevention and cessation for AYAs.
4. Support training for health providers to integrate screening for e-cigarette use into routine health visits for AYAs and increase the availability of evidence-based counseling and treatment resources for e-cigarette use cessation.



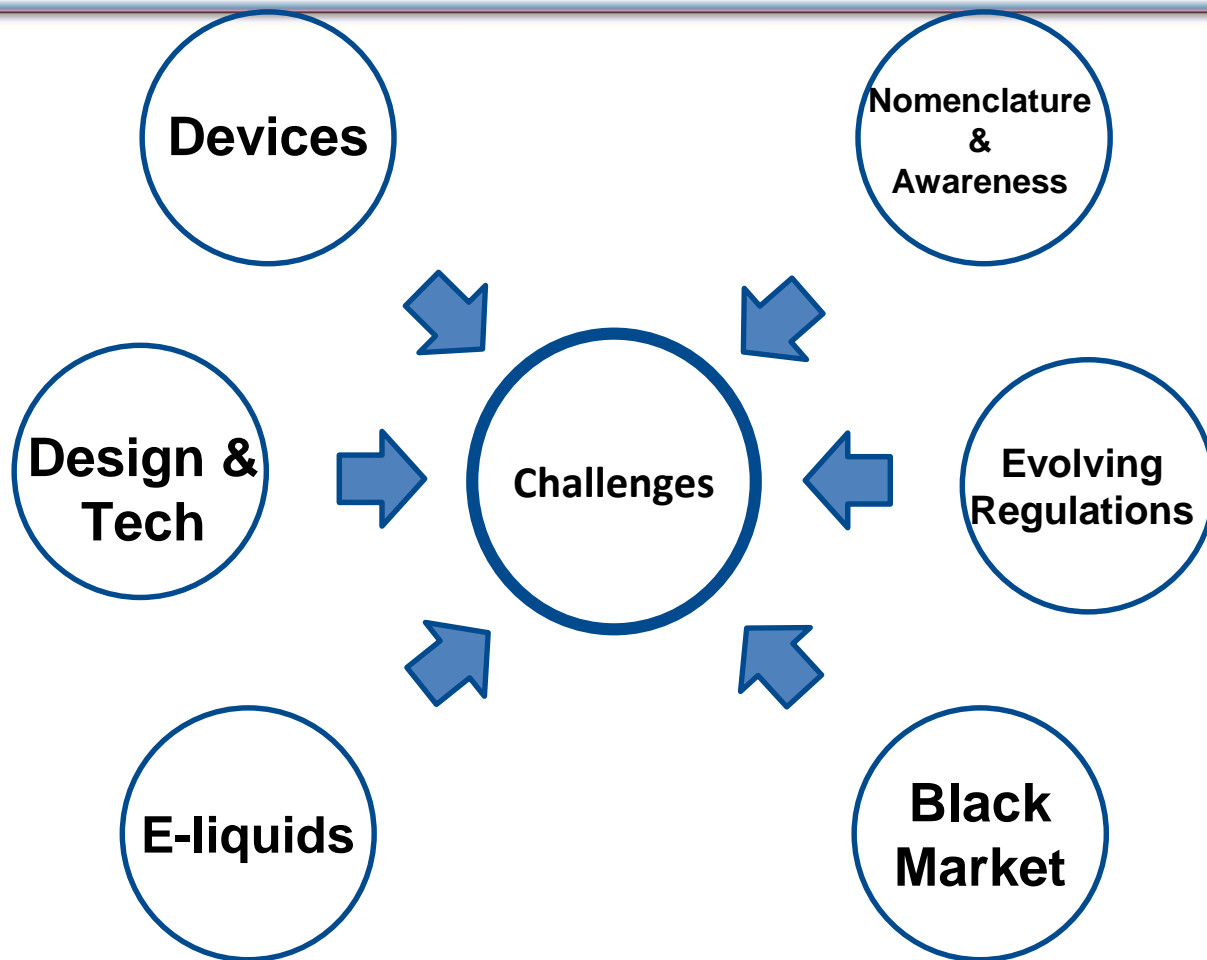
Resources

- **Integrated Health, Internal Medicine WRNMMC**
 - Smoking Cessation Program, 18 and older
 - America Building 2nd Floor, 301-295-8773
- **Smoking cessation resources**
 - <https://teen.smokefree.gov/quit-vaping>
 - BeTobaccoFree.gov (HHS.gov)
 - <https://www.ycq2.org/> (DOD sponsored for military)
 - <https://www.lung.org/stop-smoking/helping-teens-quit/> (American Lung Association)
- **Websites**
 - **American Academy of Pediatrics:** www.aap.org
 - **Society of Adolescent Health and Medicine:** adolescenthealth.org
 - **U.S. Food and Drug Administration (FDA):** www.fda.gov
 - **CDC:** https://www.cdc.gov/tobacco/basic_information/e-cigarettes/
 - **Surgeon General:** <https://www.hhs.gov/surgeongeneral/index.html>
 - E-Cigarette Use Among Youth and Young Adults
(https://ecigarettes.surgeongeneral.gov/documents/2016_SGR_Full_Report_508.pdf)



[E-cigarettes.surgeongeneral.gov](https://ecigarettes.surgeongeneral.gov)

Challenges



Pulmonary Effects of Vaping



Table 1. Constituents of Liquids and Aerosols in E-Cigarettes.

Liquids³⁰⁻³²

Listed ingredients

Glycerol
Propylene glycol
Nicotine

Other compounds detected

Acetone
Acrolein
1,3-Butadiene
Cyclohexane
Diethylene glycol
Ethylene glycol
Ethanol
Formaldehyde
Tobacco alkaloids (nornicotine, myosmine, and anabasine have been detected in some products, although tobacco was not listed as an ingredient)

Aerosols³³⁻³⁷

Listed ingredients

Glycerol
Propylene glycol
Nicotine

Other compounds detected

Acetaldehyde
Acetone
Acrolein
Formaldehyde
N'-nitrosonornicotine (NNN)
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)
Metals (cadmium, lead, nickel, tin, copper)
Toluene

Dinakar C, O'Connor G. N Engl J Med. 2016; 375 : 1372-1381

Pulmonary Effects -Animal Data

- **Associated with increased inflammation**
 - **Increased cytokines**
 - **Increased capillary leak**
 - **Endothelial Dysfunction**
- **Increase in airway hyperreactivity**

Pulmonary Effects – Human Data

- **Before 2019, primary focus was vaping vs. smoking**
 - **NO LONG TERM DATA**
 - **Less impact on some variables than cigarettes when vaping replaces cigarettes**
 - **Increased pulmonary symptoms reported**
 - **Many potential exposures**
- **Studies generally did not account for products with Tetrahydrocannabinol (THC)**
- **Use in smoking cessation**

Emergence of EVALI



Severe Pulmonary Disease Associated with Using E-Cigarette Products



Distributed via the CDC Health Alert Network
August 30, 2019, 0935 AM ET (9:35 AM ET)
CDCHAN-00421



Cases



- **As of February: 2,758 hospitalized cases**
 - **66% male**
 - **Median age 24 years (13-85 years)**
 - **15% < 18 years**
 - **37% 18 to 24 years**
 - **24% 25 to 34 years**
 - **24% 35 or older**
 - **64 deaths**
 - **Median age of deceased patients 51 years**

TABLE. (Continued) Demographic characteristics, substances used, and product sources among hospitalized* cases of e-cigarette, or vaping, product use–associated lung injury (EVALI) reported to CDC — United States, August 2019–January 2020†

Characteristic	Substance used No./Total no. (%)				All cases (N = 2,602)
	Any THC (N = 1,620)	Exclusive THC [§] (N = 665)	Any nicotine (N = 1,128)	Exclusive nicotine [¶] (N = 264)	
THC source					
Pop-up shop ^{¶¶}	20/783 (3)	9/277 (3)	6/423 (1)	N/A	20/783 (3)
Recreational dispensary ^{¶¶}	63/783 (8)	26/277 (9)	28/423 (7)	N/A	63/783 (8)
Medical dispensary ^{¶¶}	27/783 (3)	10/277 (4)	14/423 (3)	N/A	27/783 (3)
Vape or smoke shop ^{¶¶}	44/783 (6)	15/277 (5)	23/423 (5)	N/A	44/783 (6)
Store ^{¶¶}	15/783 (2)	4/277 (1)	10/423 (2)	N/A	15/783 (2)
Family or friend ^{***}	294/783 (38)	99/277 (36)	174/423 (41)	N/A	294/783 (38)
Dealer ^{***}	240/783 (31)	82/277 (30)	140/423 (33)	N/A	240/783 (31)
Online ^{***}	43/783 (5)	19/277 (7)	19/423 (4)	N/A	43/783 (5)
Other ^{***}	177/783 (23)	62/277 (22)	86/423 (20)	N/A	177/783 (23)
Only commercial sources	131/809 (16)	47/285 (16)	61/436 (14)	N/A	131/809 (16)
Only informal sources	627/809 (78)	216/285 (76)	352/436 (81)	N/A	627/809 (78)
Commercial and informal	51/809 (6)	22/285 (8)	23/436 (5)	N/A	51/809 (6)
Nicotine source					
Pop-up Shop ^{¶¶}	2/430 (0)	N/A	2/595 (0)	0/131 (0)	2/595 (0)
Recreational dispensary ^{¶¶}	7/430 (2)	N/A	7/595 (1)	0/131 (0)	7/595 (1)
Vape or smoke shop ^{¶¶}	197/430 (46)	N/A	287/595 (48)	67/131 (51)	287/595 (48)
Store ^{¶¶}	188/430 (44)	N/A	253/595 (43)	54/131 (41)	253/595 (43)
Family or friend ^{***}	76/430 (18)	N/A	91/595 (15)	13/131 (10)	91/595 (15)
Dealer ^{***}	15/430 (3)	N/A	15/595 (3)	0/131 (0)	15/595 (3)
Online ^{***}	40/430 (9)	N/A	54/595 (9)	10/131 (8)	54/595 (9)
Other ^{***}	42/430 (10)	N/A	57/595 (10)	12/131 (9)	57/595 (10)
Only commercial sources	289/442 (65)	N/A	421/613 (69)	105/136 (77)	421/613 (69)
Only informal sources	77/442 (17)	N/A	103/613 (17)	23/136 (17)	103/613 (17)
Commercial and informal	76/442 (17)	N/A	89/613 (15)	8/136 (6)	89/613 (15)

Ellington S, Salvatore P, Ko J, et al. MMWR Morb Mortal WKLY Rep 2020;69(2): 44-49

TABLE. (Continued) Demographic characteristics, substances used, and product sources among hospitalized* cases of e-cigarette, or vaping, product use–associated lung injury (EVALI) reported to CDC — United States, August 2019–January 2020[†]

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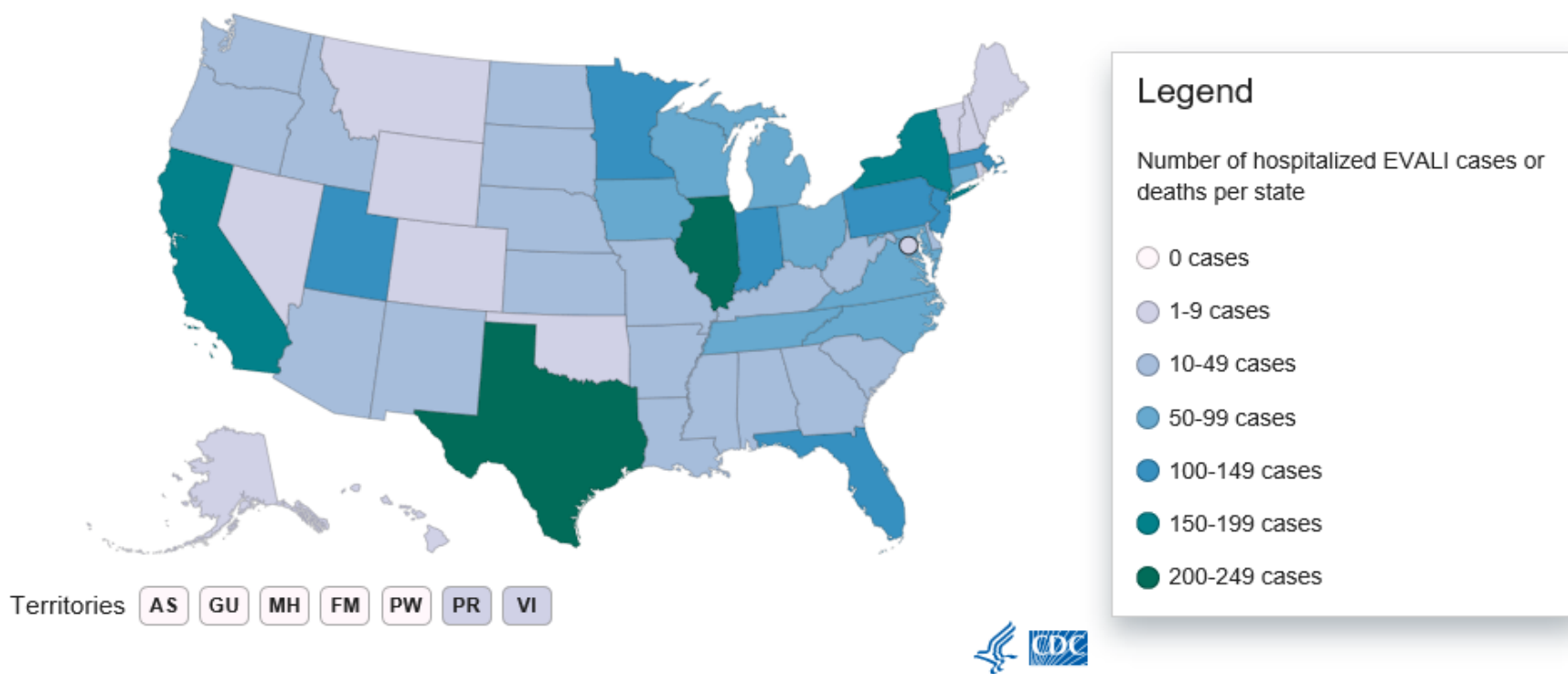
Ellington S, Salvatore P, Ko J, et al. MMWR Morb Mortal WKLY Rep 2020;69(2): 44-49

Cases



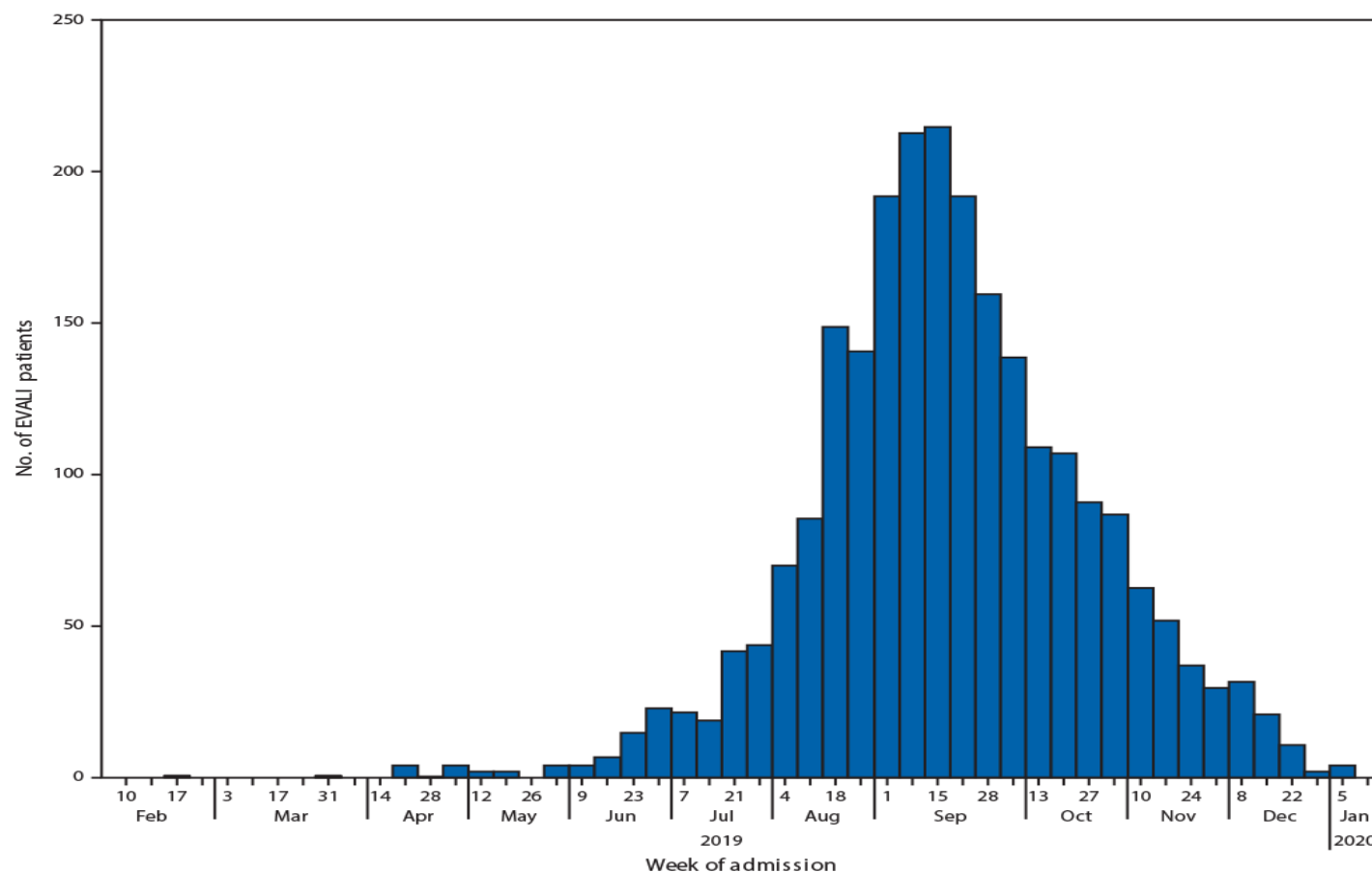
- **Data on substance use available on 2,022 patients**
 - **82% reported use of THC-containing products**
 - **33% reported exclusive use of THC-containing products**
 - **57% reported use of nicotine-containing products**
 - **14% reported exclusive use of nicotine-containing products**

Number of Hospitalized EVALI Cases or Deaths Reported to CDC as of February 18, 2020



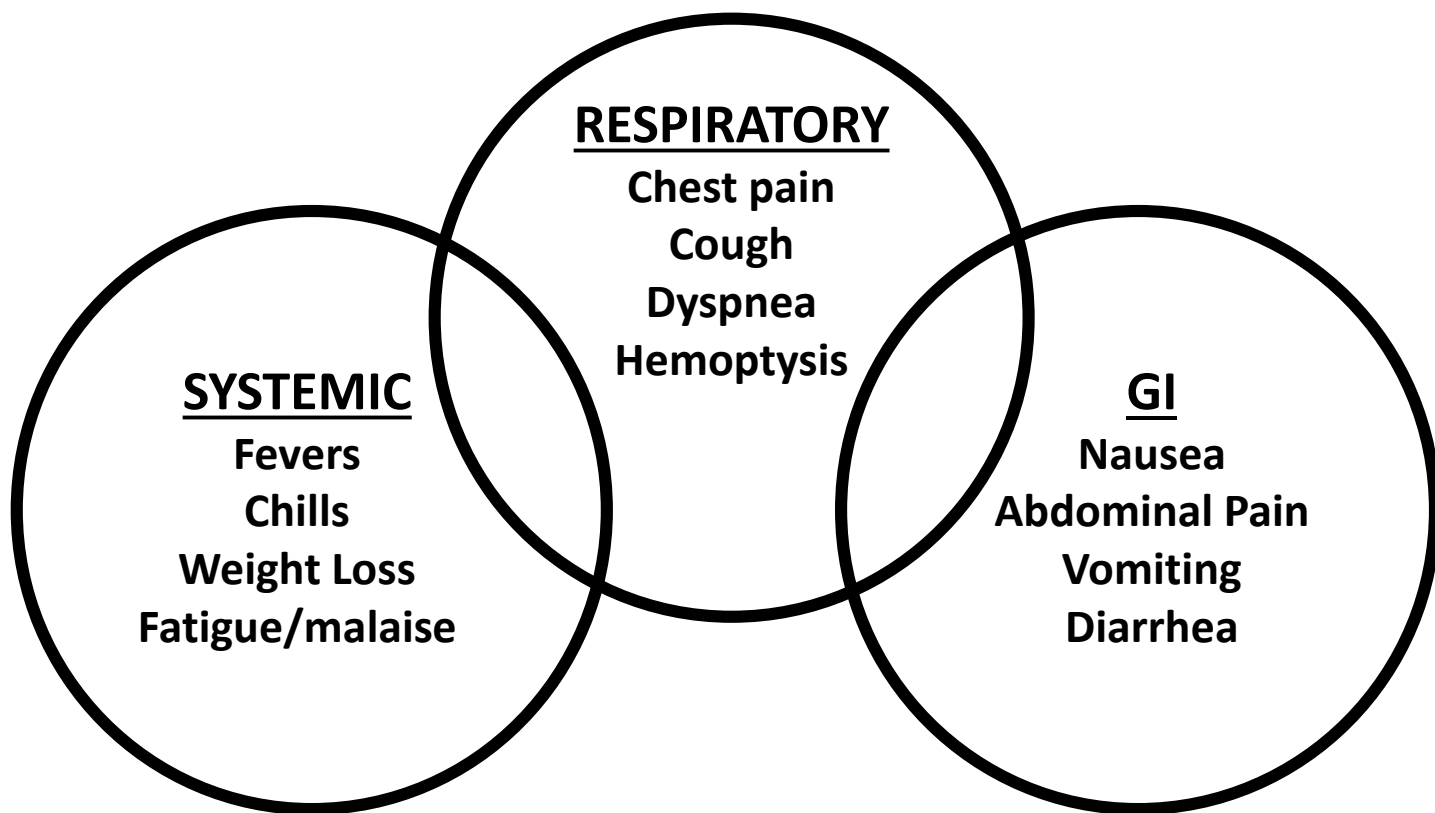
- Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products. February 18, 2020. Accessed from website: www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html.

FIGURE 1. Number of patients (N = 2,398) with e-cigarette, or vaping, product use–associated lung injury (EVALI) by hospital admission — United States, February 10, 2019–January 14, 2020



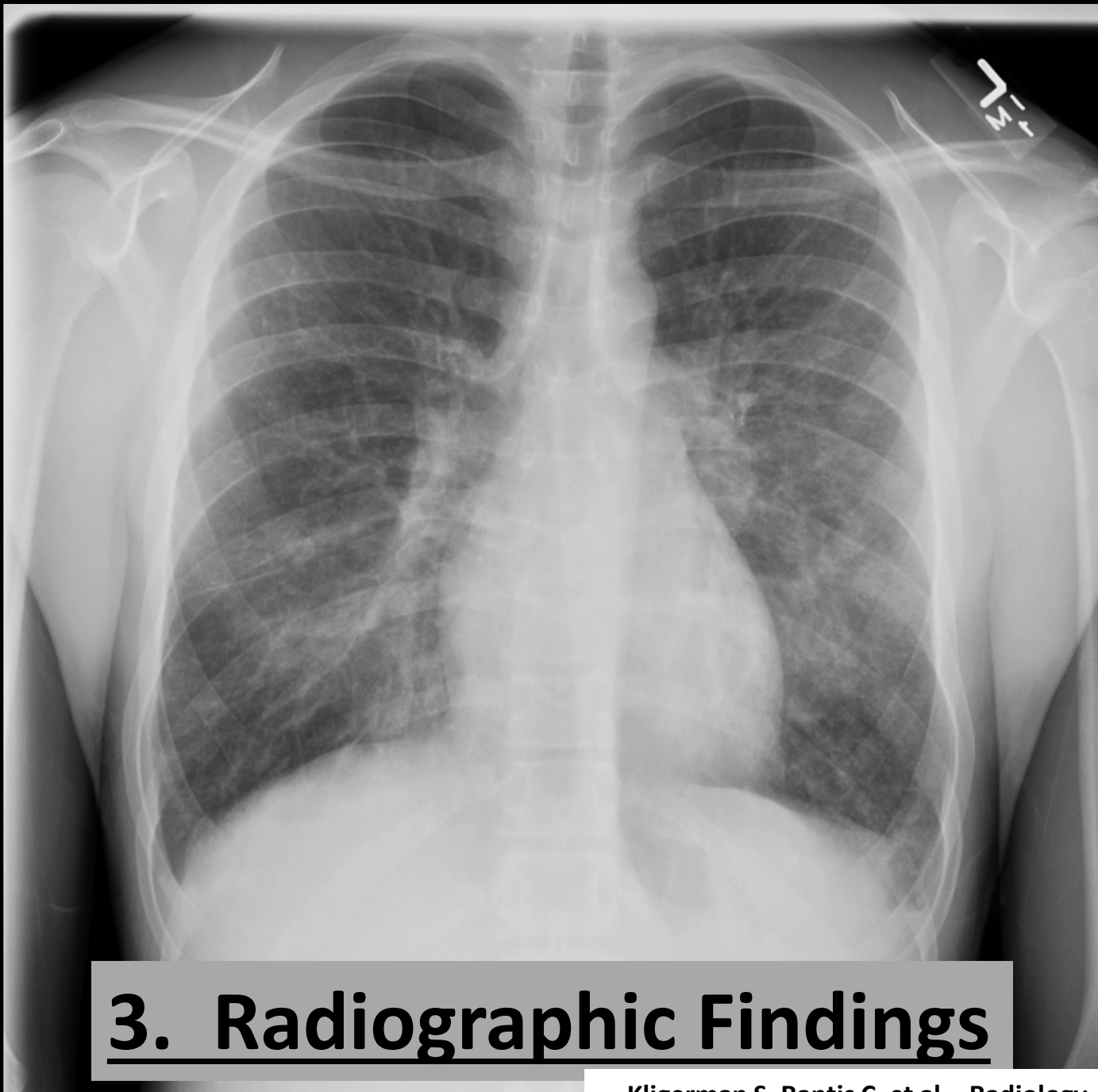
- Update: Characteristics of a Nationwide Outbreak of E-Cigarette, or Vaping, Product Use-Associated Lung Injury – United States, August 2019-January 2020: https://www.cdc.gov/mmwr/volumes/69/wr/mm6903e2.htm?s_cid=mm6903e2_w

1. Presenting Symptoms

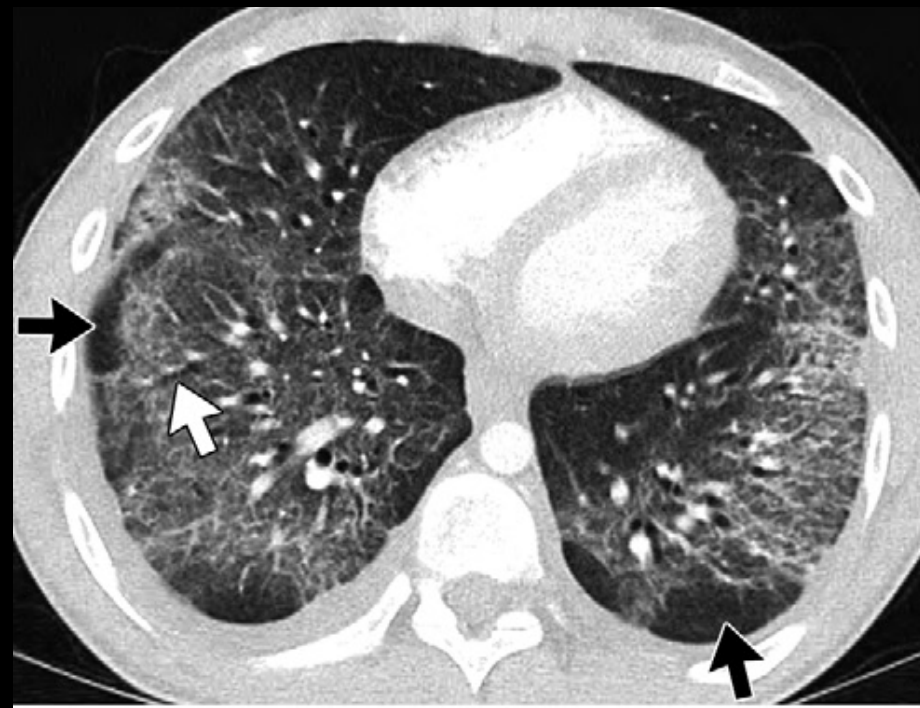


2. Vaping History

- **History of vaping or dabbing in past 90 days**
- **Approach to history:**
 - **Nonjudgmental and private questioning**
 - **Repeat questioning may be needed**
 - **Types of products/substances**
 - **Where were they obtained**
 - **Duration, frequency, and last use**



3. Radiographic Findings



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4. Rule Out Other Etiologies

- **Infections:**
 - **Influenza testing highly recommended**
 - **Community - acquired pneumonia**
 - **Others as appropriate**
- **Pulmonary manifestations of other disease**
 - **Autoimmune, cardiac, neoplastic, etc**

Diagnosis



Confirmed:

- **Use of E-Cigarette/Dabbing within 90 days**
- **Radiographic abnormalities on CXR or CT**
- **Absence of pulmonary infections on initial work-up**
- **No evidence of alternative plausible condition**

Diagnosis

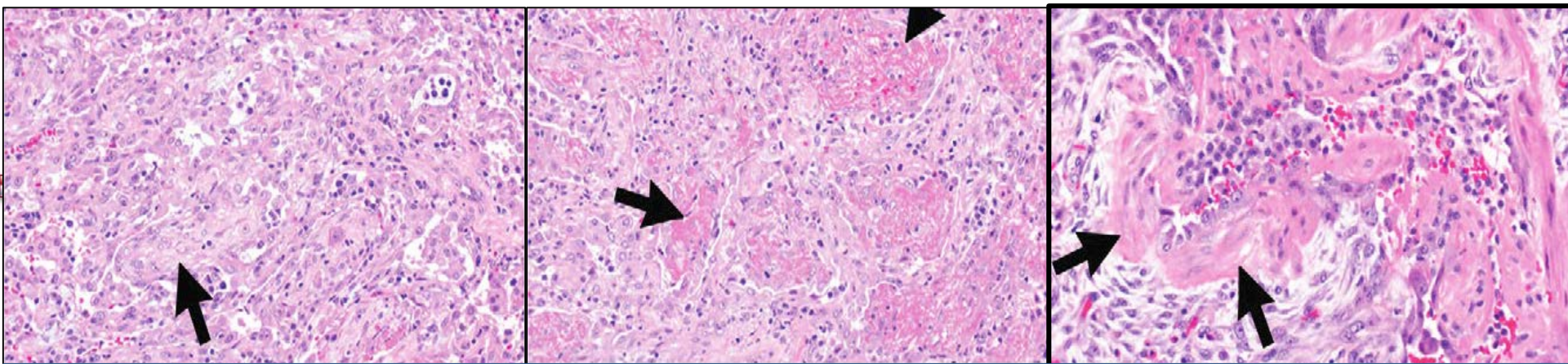


Probable:

- *Use of E-Cigarette/Dabbing within 90 days*
- *Radiographic abnormalities on CXR or CT*
- **Infection identified by culture or PCR but clinical team feels it isn't sole cause of disease process OR testing not completed and team feels infection isn't sole cause of disease**
- *No evidence of alternative plausible condition*

Bronchoscopy

- **Generally for progressive or severe symptoms**
- **Evaluation of infections**
- **No confirmatory testing for EVALI**
 - **Neutrophil predominance**
 - **Lipid Laden-Macrophages**
- **Relatively high complication rate reported**



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Pathology

- Various histologic findings noted
- No confirmatory diagnostic finding
- Consistent with inhalational injury



Vitamin E Acetate

- Added to THC-Containing vaping liquids
- Can disrupt surfactant function
- Can generate pulmonary irritants when heated



Vitamin E Acetate

- Found in 48 or 51 EVALI patients on BAL fluid
- Began to appear in THC products in 2019

Other Potential Causes

- Other oils, THC, Nicotine, unidentified agent⁵⁴

Disposition



- Vast majority of patients require admission
- Can consider outpatient management if:
 - Oxygen saturation >95%
 - No respiratory distress
 - No comorbid conditions
 - Able to follow-up as needed
- CDC encourages continued reporting to local or state health departments

Treatment

- Supportive treatment as needed
 - Supplemental oxygen
 - 50% require ICU care
 - NIV
 - Intubation (25%)
 - ECMO
- Empiric antimicrobials
- Corticosteroids

Treatment

- **Empiric antimicrobials**
 - Majority of patients started on therapy
 - Duration dictated by course and infectious work-up
- **Corticosteroids**
 - No formal studies
 - Threshold to begin varies
 - 0.5 to 1 mg/kg per day for 5-10 days
 - May have flare after stopping

Discharge Criteria



- Clinically stable for 24 – 48 hours
- Follow up within 48 hours
- Pulmonary follow up 2-4 weeks
- Screening for mental health disorders
- Cessation plan

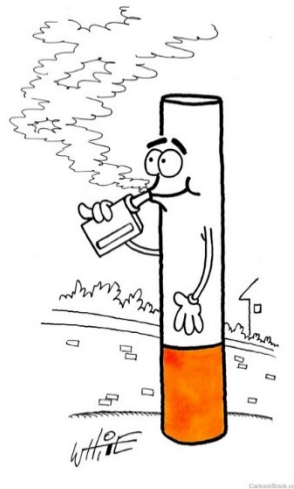
Outcomes

- **Around 3% required re-admission**
- **Long term effects unknown**
 - **Monitoring pulmonary function testing**
 - **Monitoring symptoms**
- **Patients should completely stop vaping**

Key Takeaways

- **The use of E-cigarettes is on the rise in adolescents despite public health efforts to curb teen/young adult tobacco use**
- **Vaping is not a valid smoking cessation tool**
- **EVALI is a life-threatening complication of vaping and the diagnosis can be challenging. Maintaining an index of suspicion is required when seeing potential cases**
- **Smoking and vaping will aggravate co-morbid pulmonary conditions**

Questions?



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