The Mysterious Vaping Illness
That’s ‘Becoming an Epidemic’

Vaping and Acute Respiratory Illness
A Clinical Update

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Electronic Cigarettes

A nicotine delivery device that sometimes looks like a cigarette

Nicotine + propylene glycol or veg. glycerin + flavoring

No tobacco burned → Safer than cigarettes?
Not FDA approved → Many knowledge gaps
The devices are changing rapidly
Public Health Impact of Electronic Cigarettes
Depends on 3 factors

Potential benefit
- Help more smokers to quit smoking (especially those unable to quit with FDA-approved medications)

Potential risks
- Nonsmokers vape → nicotine dependence → transition to cigarettes
- Possible health risks of vaping
  - Absolute (vs. nonsmoking) – youth / nonsmokers
  - Relative to combustible tobacco – adult smokers
E-Cigarettes - Summary of the Evidence
2018 National Academy of Science, Engineering and Medicine Report

Exposure:
• E-cigarettes contain fewer (and lower levels) of toxic substances than conventional cigarettes

Health Effects:
• While not without health risks, they are likely to be far less harmful than combustible tobacco cigarettes
• Long-term health effects of e-cigarettes are not yet clear
Electronic Cigarettes  *What should you say to a smoker?*

- Many unanswered questions about safety and efficacy
- They are likely less harmful than smoking combustible cigarettes
- Recommend FDA-approved safe, effective treatments first
- If these treatments are not effective or desired, then what?
  - If using e-cigarettes, switch completely and stop smoking
  - Urge patients using e-cigarettes to plan to quit e-cigs too because health effects of long-term use are not known.

*Consistent with American College of Cardiology and American Cancer Society guidelines*
JUUL Phenomenon

- Sleek high-tech design
- Better nicotine delivery
- Social media marketing
THE PROMISE OF VAPING AND THE RISE OF JUUL

Teens have taken a technology that was supposed to help grownups stop smoking and invented a new kind of bad habit, molded in their own image.

Juuling: If you don’t know what it is, ask your kids

‘I Can’t Stop’: Schools Struggle With Vaping Explosion

Did Juul Lure Teenagers and Get ‘Customers for Life’?
Monitoring the Future Study

NEJM Dec. 2018

Annual cross-sectional school survey of US adolescents in grades 8-12

CAVEAT: Prevalence of smoking did not change and is at a historic low

Prevalence Of Nicotine Vaping
Past 30 days

<table>
<thead>
<tr>
<th>Grade</th>
<th>2017</th>
<th>2018</th>
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<tbody>
<tr>
<td>12th grade</td>
<td>11%</td>
<td>20.9%</td>
</tr>
<tr>
<td>10th grade</td>
<td>8.2%</td>
<td>16.1%</td>
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<tr>
<td>8th grade</td>
<td>3.5%</td>
<td>6.1%</td>
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Teenage Vaping Rises Sharply Again This Year

2019 Monitoring the Future Survey
E-cigarette use in the past 30 days

<table>
<thead>
<tr>
<th>Grade</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th</td>
<td>4%</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>10th</td>
<td>8%</td>
<td>16%</td>
<td>20%</td>
</tr>
<tr>
<td>12th</td>
<td>11%</td>
<td>21%</td>
<td>25%</td>
</tr>
</tbody>
</table>
NATIONAL YOUTH TOBACCO SURVEY*: YOUTH USE OF E-CIGARETTES CONTINUES TO CLIMB

* Preliminary data
* Reported use within 30 days preceding administration of survey.
Adult E-cigarette Use

National Health Interview Surveys, 2014-2018

Dai, JAMA 2019
Critical questions

- What will be the natural history of this cohort of young never smoking JUUL users?
  - How many will switch to combustible cigarettes?
    - Why would they switch to a “less desirable” product?
  - If few become smokers, how long will e-cig/JUUL use last?
    - How many will become nicotine dependent?
    - How many will need help to quit e-cigarettes?
    - How harmful is long-term JUUL use in young nonsmokers?
Mystery lung illness linked to vaping. Health officials investigating nearly 100 possible cases.

What’s Behind A Cluster Of Vaping-Related Hospitalizations? Aug. 16, 2019

Vaping Sicknesses Rising: 153 Cases Reported in 16 States Aug. 21, 2019

First Death in a Spate of Vaping Sicknesses Reported by Health Officials

Another Patient Has Died From Lung Disease After Vaping Sept. 5, 2019
215 cases reported from 25 states, 1 death
Most in adolescents and young adults
Symptoms
  - Respiratory: cough, dyspnea, chest pain
  - GI: nausea, vomiting, diarrhea
  - Non-specific: fever, fatigue, weight loss
Onset: acute (several days) to subacute (weeks)
Exam: fever, tachycardia
Lab: ↑WBC; No infectious etiology identified after work-up
Exposures

- All used e-cigarette products (different devices) a few days to weeks before symptoms started
- Many reported using e-cigarettes containing cannabinoids (THC, CBD)
- Some used e-liquids not purchased from stores
- No single substance or product is associated with the illness
- In a few cases, oil staining in alveolar macrophages (BAL)
CXR: bilateral infiltrates

Clinical course

- Many required supplemental O$_2$
- Some needed mechanical ventilation
- Antimicrobials do not appear to be helpful
- Possible response to corticosteroids
Cases of Vaping-Related Lung Illness Surge, Health Officials Say

Sept. 11, 2019
380 cases
36 states + US VI
6 deaths
Outbreak of Electronic-Cigarette–Associated Acute Lipoid Pneumonia — North Carolina, July–August 2019

Summary and case report - 53 cases
Figure 3. Emergency Department (ED) Visits for Severe Unexplained Respiratory Illness among Patients 14 to 30 Years of Age, According to Sex, in Illinois Counties in 2018 and 2019.
Radiologists review of 34 cases

- “Ground glass” opacities on Lung CT
- Heterogeneous patterns and pathology

9/11/19

Scans of the lungs of four patients, aged 19 to 49, showing damage to the lungs from vaping devices. New England Journal of Medicine
Vitamin E Acetate - A possible culprit?
FDA Advisory

Information for the Public, FDA Actions, and Recommendations

• Most samples tested that had THC also had vitamin E acetate
• Vitamin E acetate is a lipid that is used commercially (skin products, in dietary supplements)
• Few data exist on its effects when inhaled

“While FDA does not have enough data presently to conclude that vitamin E acetate is the cause of the lung illness...the agency believes it is prudent to avoid inhaling this substance.”
Products that have been found to contain vitamin E acetate – NY DOH
Vaping Illnesses Increase to 530 Probable Cases, C.D.C. Says

More than three-fourths of those sickened are male, health officials said, and half are under 25. Missouri reported the eighth death linked to vaping during this summer’s crisis.
CDC Update – Sept. 19, 2019

• **Demographic data**: Complete sex and age data on 373 of 530 cases.
  • 72% of cases are male
  • 67% of cases are 18 to 34 years old
  • 16% of cases are under 18 years, 17% are 35 years or older

• **E-cigarette use: What We Know**
  • All reported cases have a history of e-cigarette product use or vaping.
  • Based on initial data from some states we know
    • Most patients reported using e-cigarette products containing THC.
    • Many patients reported using THC and nicotine.
    • Some reported the use of e-cigarette products containing only nicotine.

• **E-cigarette use: What We Don’t Know**
  • We do not yet know the specific cause of these lung injuries.
  • The investigation has not identified any specific e-cigarette or vaping product (devices, liquids, refill pods, and/or cartridges) or substance that is linked to all cases.
CDC Recommendations for the Public

- E-cigarettes should not be used by nonsmokers of any age.
- What about smokers or current e-cigarette users?
  - “While investigation is ongoing, if you are concerned about these specific health risks, consider refraining from using e-cigarettes.”

- **Current smokers**: use FDA approved cessation aids.
- **Current e-cigarette users**:
  - “If you are an adult who used e-cigarettes containing nicotine to quit cigarette smoking, do not return to smoking cigarettes.”
  - Don’t use bootleg or street-acquired products
  - Don’t add substances to cartridges or re-use cartridges
  - Monitor yourself for pulmonary symptoms
CDC Recommendations for Clinicians

- Report cases of severe pulmonary disease of unclear etiology and history of e-cig use in past 90 days to state health dep’t.
- Ask patients who vape about pulmonary symptoms

I would add

- Ask patients, especially youth and young adults, about vaping
- Record result in the EHR
Why is this appearing now?

- **New contaminant in the supply chain of e-cigarettes?**
  - Clustering of cases
  - E-cigs have been sold for years, including to youths, without these cases appearing
  - Apparent association with THC, home-made or street-bought e-liquids that may have new contaminants

- My hypothesis: Most likely due to illicit products, not to commercial e-cigarette products…*but we don’t know for sure yet*
Why is this appearing now?

- **New recognition of a complication of vaping?**
  - Was this a rare event that was not recognized?
  - Are cases be appearing now because
    - New vaping devices can deliver chemicals to the alveoli more effectively AND
    - Daily vaping prevalence has risen among youth?

**However,** few (any?) cases are associated with commercial nicotine e-cigarettes that have not been tampered with.
Why is this appearing now?

- **A combination of factors?**
  - Vaping impairs lung immune mechanisms, making lungs more susceptible to or less able to handle a 2nd insult (infection), increasing risk of acute respiratory distress syndrome (ARDS) when infection occurs.

- **However,**
  - Current case definition excludes an infectious cause.
  - Most cases appear to be associated with non-standard products.
Next Steps

- Finish the epidemiologic investigations

- In the meantime
  - Focus protective efforts on vaping devices with cannabis or noncommercial nicotine products
  - Stop the epidemic of youth vaping of any product

- These are related but different problems with different solutions
Potential Policies to Reduce Youth Vaping

- Supply reduction
  - Ban flavored e-cigarettes? Or all e-cigarettes?

**FLAVORS POPULAR AMONG HIGH SCHOOL USERS OF E-CIGARETTES**

*Preliminary NYTS data*
Trump Administration Combating Epidemic of Youth E-Cigarette Use with Plan to Clear Market of Unauthorized, Non-Tobacco-Flavored E-Cigarette Products

New York Moves to Ban Flavored E-Cigarettes by Emergency Order

Massachusetts Temporarily Banning Sale of Vaping Products
US DHHS
All flavored e-cigarettes except tobacco

MI, NY
All flavored e-cigarettes except tobacco and mint/menthol

MA
All e-cigarettes (including tobacco flavor)

SF
Ban sales and distribution of all e-cigarettes
States Rush to Limit Vaping, but Results Remain Uncertain

OPINION

Regulating e-cigarettes requires a scalpel, not a hammer | Editorial

Updated: September 16, 2019 - 2:41 PM

The Inquirer Editorial Board | opinion@inquirer.com
Potential Policies to Reduce Youth Vaping

- **Supply reduction**
  - Ban flavored e-cigarettes? Or all e-cigarettes?
  - Stop illegal sales to minors – how?

- **Demand reduction**
  - Raise price of products
  - Educate about harms – “denormalize” vaping?
  - Help current vapers to quit vaping
Caution

- Let’s not “throw the baby out with the bath water”
  - 1 in 2 smokers still die of tobacco related disease
  - Many smokers repeatedly fail to quit with existing treatments
  - E-cigarettes are less harmful than continuing to smoke
  - E-cigarettes can help smokers to quit
    - JUUL-like devices may be the most effective e-cig for cessation

- Critical Question
  - How can we realize the potential public health benefit AND minimize the public health harm of e-cigarettes?
Let’s not forget cigarette cessation

- Are JUULs effective smoking cessation tools?
- They might be the best e-cigarette to promote cessation among current cigarette smokers.
  - Efficacy for smoking cessation needs to be tested
  - How important are flavors to their appeal and success with adults?
Thank you!
nrigotti@partners.org